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Final Report on Air pollution Exposure and Health Assessment for SAPALDIA4

Comparison of Air pollution

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1 SUMMARY OF ACHIEVEMENTS

The research activities and results in the framework of the BAFU project "Air pollution Exposure and Health Assessment for SAPALDIA4" (Vertrag 13.077.PJ/N173-0667) can be summarized as follows:

- Models for particulate matter < 2.5 μg/m^3 ($PM_{2.5}$) and < 10 μg/m^3 (PM_{10}) models could be extended from the original four areas used to develop the models to all eight areas of SAPALDIA and also some other Swiss areas where SAPALDIA subjects now live (Eeftens et al. 2016).
- Due to more complex spatial characteristics of ultrafine particles (PNC, LDSA) and $PM_{absorbance}$ the investigations revealed that those models cannot be extrapolated beyond the four areas without additional measurements (Eeftens et al. 2016).
- A novel Swiss wide spatiotemporal nitrogen dioxide (NO_2) model was created for the years 2000 to 2008 using passive NO_2 measurements, GIS data and dispersion model estimates (Héritier et al. 2018).
- Comparison analysis of eight PM_{10} models reflected the measurements very well and showed small differences in mean concentrations (up to 10%) and inter quartile range (IQR) between each other. Because of the similarity of the models, we cannot give a recommendation on which model is the "best" to use for further epidemiological analyses. Model selection depends on the research question and the underlying health dataset.
- Comparison analysis of eleven NO_2 models reflected the measurements well but showed larger differences in mean concentrations (up to 17%) and IQR between each other than for PM_{10} models. Similar to the PM_{10} models, we cannot give a clear recommendation on which model is the "best" to use for further epidemiological analyses.
- Due to sparse $PM_{2.5}$ reference measurements, validation and comparison of nine $PM_{2.5}$ models was difficult and the statistics have to be viewed with care.
- In 2016 and 2019, two air pollution workshops, attended by representatives of BAFU, Infras, Meteotest and Swiss TPH, were organized to discuss the progression and results of the different analyses (Appendix C).
- As the pollutant specific comparison of the different air pollution exposure models could not identify "best" models for the further use in epidemiological health analyses, we recommend evaluating the uncertainty of the health analysis results created by the choice of the air pollution model used. Health markers collected over 30 years in the SAPALDIA Cohort, mortality data from the Swiss National Cohort and the vast number of air pollution models available would not only allow us to evaluate these uncertainties, but give us also the unique chance to look at the associations between the rather low levels of air pollutants here in Switzerland and health outcomes.

Besides the above referenced modeling papers, other peer-reviewed publications on exposure (Aguilera et al. 2015; Eeftens et al. 2015; Meier et al. 2015a; Meier et al. 2015b; Meier et al. 2015c) and health (Aguilera et al. 2016; Endes et al. 2017; Eze et al. 2016a; Eze et al. 2016b; Eze et al. 2017; Foraster et al. 2017; Jeong et al. 2018), using the above exposure data, were also published in the last years.

2 INTRODUCTION

SAPALDIA (Swiss **S**tudy on **A**ir **P**ollution **A**nd **L**ung **D**isease **I**n **A**dults), funded by the Swiss National Science Foundation, is a cohort study designed to represent the adult general population in Switzerland. Starting in 1991 (SAP1) with the aim of identifying and quantifying long-term effects of air pollution on the respiratory health, the disease focus was expanded by also including cardiovascular and other non-communicable chronic diseases (SAP2 in 2002 and SAP3 in 2010). Meanwhile SAPALDIA has become a unique resource addressing research about healthy aging and multimorbidities (SAP4 in 2017 and SAP5 currently ongoing).

The SAPALDIA team was very successful in developing a cutting-edge agenda for home outdoor air pollution exposure assessment for an increasing number of pollutants and time windows, funded by various SAPALDIA grants from SNSF and EU and with very important contributions of BAFU. A range of other funders allowed a successful follow-up of the same study participants over 30 years. However, there were some major gaps in the air pollution measurement and modeling information available for SAP1 to SAP4 due to only partial overlap of time windows, limited monitoring resources, and changing research methods.

In addition, since 1991 (SAP1), many SAPALDIA participants have moved from the eight original SAPALDIA areas to other Swiss regions. To include these new locations in the exposure assessment and to fully characterize the historical exposure of all SAPALDIA participants, the main aims of this BAFU research grant were to create

(1) models that will spatially extend the particulate matter (PM) and ultrafine particle (UFP) land use regression (LUR) models from four to eight SAPALDIA areas and then nationally,
(2) spatiotemporal models of NO_2 & PM_{10} for the period of 1990-2010+ at a national level using historical data and available dispersion models.

As described in the last reports, the goals of this grant were partly achieved:

(1) $PM_{2.5}$ and PM_{10} models could be extended from the original four areas used to develop the models to all eight areas of SAPALDIA and also some other Swiss areas where SAPALDIA subjects now live. Instead, due to more complex spatial characteristics of ultrafine particles (PNC, LDSA) and $PM_{absorbance}$ the investigations revealed that those models cannot be extrapolated beyond the four areas without additional measurements (Eeftens et al. 2016).
(2) A novel Swiss wide spatiotemporal NO_2 model was created for the years 2000 to 2008 using passive NO_2 measurements, GIS data and dispersion model estimates (Héritier et al. 2018).

In the last years, due to fast progress in science, an abundance of spatially resolved Swiss air pollution models emerged from various research activities. A first overview of these models was presented at the air pollution workshop in April 2016 (see Appendix C.1) attended by representatives from BAFU, Meteotest, Infras and Swiss TPH. As described in the last report, the discussion afterwards revealed different modeling needs for public authorities and the science community. The authority’s needs are driven by the law to monitor and enforce the compliance to the air quality standards. Thus, the federal agencies may be interested in a model, which is most appropriate to characterize exposure distribution of the population, ideally complemented with information about the contributions of different emission sources. For epidemiological research individual exposure assignment is most crucial. Further, the consistency of models over space and time is of particular relevance for longitudinal health research, whereas federal models should represent the most up to date knowledge. Both constituencies, though, similarly struggle with the question which models to use in light of the recent inflation of published spatial models of ambient air pollutants. Thus, there is a need for a rigorous comparison and selection of estimates from the meanwhile available models prior to apply new exposure models to health analyses.

However, because of the different modeling approaches, it is difficult to compare the models with each other by just looking at the modeling statistics (e.g. r^2). The aim of this work was to evaluate the performance of the different models by comparing model estimates at specific coordinates (i.e. SAPALDIA participant addresses, Cantonal and NABEL monitoring stations) and by comparing model estimates with available measurements. Different characteristics of the models are described as guideline for epidemiologists to decide which model estimates to use for a specific need.

3 METHOD

3.1 Data collection

Within the Swiss SAPALDIA study – initiated 30 years ago – several air pollution models for NO_2, PM_{10} and $PM_{2.5}$ were developed to estimate the exposure at home for the participants. These models covered mainly the years of the first three health surveys, e.g. 1991 (SAP1), 2002 (SAP2) and 2010/11 (SAP3). For comparison we collected other Swiss models (e.g. developed at Swiss TPH for other studies, from Cantonal and Federal Offices, Meteotest, European studies, etc.) and measurements, which were taken during the same time span and for the same pollutants. All models used are summarized in Table 6-1 and their overlapping times are schematized in Figure 6-1 (NO_2), Figure 6-2 (PM_{10}) and Figure 6-3 ($PM_{2.5}$). We collected all available estimates for each model at the coordinates of the SAPALDIA participant home and work addresses (N=19155), the Cantonal measurement stations (N=279) and the NABEL stations (N=26) (Figure 6-1 to Figure 6-3). The Swiss NO_2 LUR model (CH_SNCLUR) (Héritier et al. 2018) and the Swiss Satellite $PM_{2.5}$ model (CH_SNCSat) (de Hoogh et al. 2018a) were developed for the coordinates of the Swiss National Cohort (SNC). To analyze these models we used a near match (ArcGIS 10.5) to the SAPALDIA, Cantonal and NABEL coordinates. About 90% of these coordinates were within 30 meters of SNC locations.

In the following description of models, model names as used in the data analyses are added in parenthesis.

3.1.1 Models

Dispersion Models

PolluMap Models for NO_2, PM_{10} and $PM_{2.5}$ (CH_Pollu) (BUWAL 1997; FOEN 2003, 2004, 2011, 2013):

PolluMap is a Gaussian plume dispersion model, that was used to predict ambient concentrations of NO_2 (BUWAL 1997; FOEN 2004, 2011), PM_{10} and $PM_{2.5}$ (FOEN 2003, 2013) for Switzerland. Estimates were calculated in a five-year interval from 1990 (NO_2) and 2000 (PM_{10}, $PM_{2.5}$) to 2020. Modeling was done using extensive emission inventories for different sources (transport, industry, households, and agriculture), meteorological data and traffic fleet information (e.g. Euro Norm data) to predict current and future air pollution concentrations. The original model from 1997 was continuously improved by updating the emission inventories and traffic fleet information, using different regions (alpine, central plateau, all other regions) instead of one region for whole Switzerland, and improving the resolution (1km to 400m to 100m).

SAPALDIA Extrapolation of PolluMap PM_{10} and $PM_{2.5}$ (CH_SapPollu):

Within the SAPALDIA study the above described PolluMap estimates for PM_{10} and $PM_{2.5}$ were extrapolated to the years with health surveys, i.e. 1991 (SAP1) and 2002 (SAP2). For 2010 (SAP3) the two models are the same (CH_SapPollu = CH_Pollu). To retrieve extrapolated estimates, area specific correction factors were calculated, assuming linear trends between the available years of CH_Pollu.

Interpolation Models

Meteotest Models for NO_2, PM_{10} and $PM_{2.5}$ (CH_Metv14, CH_Metv15) (Meteotest 2014, 2015a, b):

Meteotest used an interpolation approach to produce annual NO_2, PM_{10} and $PM_{2.5}$ maps from 1990 (NO_2) resp. 1998 (PM) to 2013 for Switzerland. There were two different versions of the models available: version 2014 (only NO_2, PM_{10}), CH_Metv14 (Meteotest 2014) and version 2015, CH_Metv15 (Meteotest 2015a, b). All available annual means of NO_2, PM_{10} and $PM_{2.5}$ measurements were collected from the Swiss Immission Databank (IDB Luft, FOEN, Bern, Switzerland). Data from extreme locations (e.g. traffic and high alpine sites) were excluded and missing data were replaced by estimates from a linear regression with values from a nearby monitoring station. PolluMap estimates for the years 1990, 2000, 2005, 2010 and 2015 were used as base maps. These maps were adjusted to the actual measurements in the different years by spatially interpolating ratios of measurements with base map values at monitoring stations to raster cells without measurements. These estimated ratios were then again multiplied with base map values to get final annual pollutant maps. Spatial interpolation was done with a distance weighting of 1/d (d = distance to measuring station) using the ten closest stations within 75km in version 2014. In version 2015, distance weighting was $1/d^{1/2}$, the 20 closest stations were used and a weight for elevation differences was applied. For $PM_{2.5}$ (v. 2015) all available stations (7) were used. In version 2014, interpolation was done with one map for whole Switzerland. In version 2015, the maps were split into three zones: Northern Switzerland including Wallis below 1000m elevation, Southern Switzerland below 1000m elevation and areas above 1000m elevation of all Switzerland. Interpolation was done separately for each zone and recombined to one map using a linear transition between 500 and 1000m elevation. The different treatment of locations above 1000m elevation in the two model versions were also visible in the Bland-Altman plots, producing “tails” for low pollution concentrations (e.g. Figure A 5, no2_diff2010_CH_Metv14_CH_Metv15) The final maps had a resolution of 200 x 200m.

Land Use Regression (LUR) Models

ESCAPE LUR Models for NO_2, PM_{10} and $PM_{2.5}$ (EUR_EscapeLUR, EUR_EscapeLUR_d, EUR_EscapeLUR_r) (Beelen et al. 2013; Eeftens et al. 2012):

Within the European Study of Cohorts for Air Pollution Effects (ESCAPE) project local LUR models for 36 (NO_2) and 20 (PM_{10}, $PM_{2.5}$) study areas all over Europe have been developed using a standardized approach. For Switzerland, there were models available for the areas of Basel (NO_2), Geneva (NO_2) and Lugano (NO_2 & PM). Linear regression models with a supervised forward stepwise procedure were developed using European and local GIS parameters (*e.g.* traffic, land use, population, altitude) and adjusted annual means of 14-day integrated measurements taken in three seasons in 2009 (see Difference Method Appendix B.2). Model estimates for 2009 (EUR_EscapeLUR) were then back-extrapolated to the years 1991 (SAP1) and 2002 (SAP2) using a ratio (EUR_EscapeLUR_r) or a difference approach (EUR_EscapeLUR_d) as shown in Appendix B.1 and B.2, respectively.

Swiss NO_2 LUR Model (CH_SNCLUR) (Héritier et al. 2018):

This LUR model used adjusted annual means (Ratio Method Appendix B.1) of 14-day passive NO_2 measurements collected from 2000 to 2008 by cantonal air pollution monitoring authorities and SAPALDIA participants. These annual means were regressed against PolluMap estimates and different local GIS parameters (e.g. traffic, land use, population, and altitude). Predictors were selected using elastic net regularization. In a second step, residuals from an annual kriged surface were added to the model estimates to yield the final predictions. The estimates were calculated at Swiss National Cohort (SNC) coordinates.

SAPALDIA NO_2 LUR Models (CH_Sap2LUR) (Liu et al. 2012):

Within the SAPALDIA study, these LUR models were developed for the time of SAP1 and SAP2 using passive outdoor measurements of NO_2 (Palmes tubes) at randomly selected participants' home in eight areas (Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne and Wald). In 1993, 7-day integrated measurements were collected at 57 – 119 residences per area over four consecutive weeks in three seasons. In 2003, 14-day integrated measurements were collected at 34 – 65 residences per area over two-week periods in three seasons. Area specific LUR models were built using forward stepwise regression. Instead of using adjusted annual means of the measurements, the ratio R_{ij} (i=site, j=time) of (bi)weekly NO_2 to concurrent central-site measurements were directly regressed against PolluMap estimates, GIS parameters (e.g. traffic, land use, population, altitude), temporal functions and meteorological parameters. All (bi)weekly predictions were then averaged over the year and multiplied by concurrent central-site annual means to obtain annual estimates. Modeling results were then extrapolated to the years between 1993 and 2003 using the trends in annual mean levels at different fixed monitoring stations.

SAPALDIA 3 LUR Models for NO_2, PM_{10} and $PM_{2.5}$ (CH_Sap3LUR) (Eeftens et al. 2016):

These SAPALDIA NO_2, PM_{10} and $PM_{2.5}$ models were developed for SAP3. For NO_2, home outdoor measurements were collected using passive samplers at forty sites in each of the eight SAPALDIA areas (Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne and Wald) and for PM_{10} and $PM_{2.5}$, additional co-located measurements were done using Harvard Impactors at 20 of the 40 sites in Basel, Geneva, Lugano and Wald. In each area, regional background, urban background and traffic sites were selected. For each site, one 14-day integrated measurement was collected in each of three seasons between January 2011 and December 2012 and averaged to an adjusted bi-annual mean using a ratio approach (Appendix B.1). Multi-area (all pollutants) and alpine, non-alpine and area specific (NO_2) LUR models were developed using a supervised forward stepwise procedure by regressing the bi-annual means against PolluMap estimates and different local GIS parameters (e.g. traffic, land use, building density, population, altitude). Final model predictions were truncated to the minimum and maximum values of the training data sets, which were used to develop the LUR models. For NO_2, estimates from different models were assigned to the SAPALDIA addresses, depending on their distance to the central sites: area specific model within 10km of a central site, or else alpine (altitude >1000m) or non-alpine (altitude <=1000m) model.

LUR Models including Satellite Data

European LUR Models for NO_2 and $PM_{2.5}$ (EUR_Sat) (de Hoogh et al. 2016):

These NO_2 and $PM_{2.5}$ models were developed for the year 2010 and the area of 19 European countries with available measurements in the AirBase dataset. Satellite derived (SAT) estimates with a 10km resolution were obtained by relating aerosol optical depth (AOD) from satellite instruments (NO_2: OMI from Aura satellite; $PM_{2.5}$: MODIS, MISR and SeaWiFS from NASA) to near-surface concentrations using the GEOS-Chem chemical transport model. In addition, annual NO_2 and $PM_{2.5}$ estimates from the chemical transport model (CTM) MACC-II ENSEMBLE were obtained for the study area at a 10km resolution in 2010. LUR models were developed using a supervised forward stepwise procedure by regressing annual means from AirBase measurements against different local (100 x 100m) GIS parameters (e.g. traffic, land cover, altitude, north-south / east-west trend), and/or SAT estimates, and/or CTM estimates. The final models applied to SAPALDIA participants and used for this analysis are the AirBase M3 (GIS and CTM) model for NO_2 and AirBase M4 (GIS, SAT and CTM) model for $PM_{2.5}$ described in the paper (de Hoogh et al. 2016).

ELAPSE European LUR Models for NO_2 and $PM_{2.5}$ (EUR_ElapseSat) (de Hoogh et al. 2018a):

Within the ELAPSE (Effects of Low-Level Air Pollution: A Study in Europe) study, improved NO_2 and $PM_{2.5}$ models were developed based on the models described above (EUR_Sat) for 2010. Improvements included kriging of residuals and adding additional fine scale (1km) $PM_{2.5}$ satellite data (V4.GL.02.NoGWR) and population data at 1 x 1km to the predictors. As described above, LUR models were developed using a supervised forward stepwise procedure by regressing annual means from AirBase measurements against different local GIS parameters (e.g. traffic, land cover, population density, altitude), and/or SAT estimates, and/or CTM estimates. North-south / east-west trend were only offered as predictors, if kriging of the residuals at urban and rural background sites was not successful.

Swiss Satellite $PM_{2.5}$ Model (CH_SNCSat) (de Hoogh et al. 2018b):

This model estimated daily $PM_{2.5}$ values across Switzerland from 2003 to 2013. Because $PM_{2.5}$ was only measured at ten NABEL sites, measurement data was supplemented by imputed $PM_{2.5}$ data at 89 Cantonal PM_{10} monitoring sites. Daily MAIAC AOD data was available from the MODIS instrument (AQUA satellite) with 1km resolution. Spatial and temporal predictor data were extracted on global (1 x 1km) and local (100 x 100m) scales. They included emission, traffic, elevation, land use, meteorology and NDVI (Normalized difference vegetation index) data. Modeling was done in four stages. (1) Within five nested regions (upper Rhine plains, Jura, Mittelland, Prealpine zones and Alps) nearest AOD was calibrated to the $PM_{2.5}$ monitoring data with a mixed effect model using all daily $PM_{2.5}$ measurements, AOD data and global spatio-temporal predictors. (2) These calibration models were then used to predict $PM_{2.5}$ in grid cells with AOD but without monitoring data. (3) In grid cells without AOD data, $PM_{2.5}$ was estimated with a generalized additive mixed model with spatial smoothing of nearby AOD and daily regional patterns. (4) Residuals from the stage 1 models were then regressed against local spatial and temporal predictors using machine-learning techniques to estimate $PM_{2.5}$ residuals at the local scale. Final $PM_{2.5}$ predictions were then built by adding these residuals to the global $PM_{2.5}$ estimates from stage 3. For this analysis, daily $PM_{2.5}$ estimates were available at SNC coordinates for 2010, and were averaged to annual means.

Global NO_2 LUR Model (GLOB_Sat) (Larkin et al. 2017):

This LUR model was estimating annual NO_2 levels on a global scale in 2011 using measurements from 5’220 monitoring sites in 58 countries (Europe: 2’351 sites), satellite derived estimates of surface NO_2 and available land use predictors. Mean annual NO_2 measurements per monitoring site were calculated using up to three annual measurements closest to the year 2011 collected from environmental and regulatory agency websites. Satellite data from 2010 to 2012 were retrieved from the SCIAMACHY and GOME-2 instruments, processed by the GEOS-Chem model to get NO_2 surface estimates at a 10km resolution and averaged over the three years. Land use parameters were calculated for different buffer sizes, ranging from 100m to 50km. The LUR mode was developed using Lasso variable selection by regressing the annual NO_2 measurements against the satellite derived NO_2 estimates, land use parameters (e.g. traffic, land cover, population density, power plant CO_2, active fires, distance to coast) and annual distribution of wind direction.

Weather Research and Forecasting (WRF) Model

Weather Research and Forecasting Models with Coupled Chemistry Module for NO_2 and PM_{10} (CH_SapWRF) (Ritter et al. 2013):

Within the SAPALDIA study, these models were developed for the time of SAP1 (1991, only NO_2), SAP2 (2002) and SAP3 (2010). To simulate air pollutants, the Weather Research and Forecasting Model (WRF), simulating the meteorology, was coupled with the WRF chemistry extension (WRF-Chem), which simulated aerosol interactions and chemistry. A Swiss domain (2km resolution) was simulated for the different years by using boundary conditions from model simulations on a European domain (30km resolution) and Swiss emission data. Due to the complex topography in Switzerland, a smoothing process was applied for grid points with an altitude higher than 1000m. Simulations were done for intervals of five days throughout the three years with output of hourly values. Hourly measurements were obtained from Cantonal and NABEL monitoring stations, which were categorized into rural, sub-urban, urban and freeway. Multi-linear regression models for each category were developed by regressing these NO_2 and PM_{10} measurements against the matched WRF-Chem output, meteorological and seasonal variation parameters. Hourly predictions were then averaged to annual means.

Bayesian Model

Bayesian Geostatistical Models for PM_{10} and $PM_{2.5}$ (EUR_BayesSat) (Beloconi et al. 2018):

These European models were developed for 2016 using annual means of PM_{10} and $PM_{2.5}$ from monitoring stations in 46 countries reported in the Air Quality e-Reporting database. Predictors included daily (averaged to yearly) MAIAC AOD values from the MODIS satellite (1km resolution), different land use / cover data, traffic, population density, elevation and meteorological data. Modeling was done with a Bayesian formulation using a restricted geostatistical regression model, which addressed spatial confounding by imposing a linear orthogonality constraint. For each pollutant, models for all possible combinations of predictors were fitted and the best model was selected based on the highest predictive performance (e.g. lowest logarithmic score).

3.1.2 Measurements

We collected all available annual means of NO_2, PM_{10} and $PM_{2.5}$ from the Swiss Immission Databank (IDB Luft, FOEN, Bern, Switzerland). IDB contains all measurements from the Cantonal and NABEL monitoring stations. Depending on the measuring method used, annual means are calculated from half-hour (continuous) or daily (gravimetric) averages. Annual means are not reported, if less than 90% of measurements are available or more than ten consecutive days are missing within a calendar year.

We also collected independent measurement data from different studies (SAPALDIA, ESCAPE, Cantonal campaigns (used in CH_SNCLUR)). These measurements were usually taken in three seasons for 14 days using passive samplers for NO_2 and Harvard Impactors for PM_{10} and $PM_{2.5}$. Because these measurements did not cover a whole year like the measurements from the Cantonal monitoring stations, a temporal adjustment was applied using either a ratio method (SAPALDIA, CH_SNCLUR) or a difference method (ESCAPE) as described in the Appendix B. Annual means were calculated by averaging the adjusted measurements over a year with at least three measurements.

3.2 Analysis

Comparison with measurements would be the ideal way to evaluate the predictive attributes of a model. However, some of the model estimates were only available for SAPALDIA addresses and not for the measurement locations. Because the Meteotest models were available for all coordinates and all years, we used these models as reference to compare with all other models.

For each model we calculated summary statistics: number of observations (N), mean, standard deviation (SD), standard error (SE), minimum (Min), maximum (Max), quartiles: 25% (p25), median (p50), 75% (p75) and the interquartile range (IQR=p75-p25). For each comparison, we calculated the difference between the estimates at each coordinate and tested for significance with a t-test (p).

Correlation between the models was assessed by Pearson correlation (r), concordance correlation coefficient (CCC) and intraclass correlation coefficient (ICC). CCC describes how well the scatter plot of the estimates of two models agrees with the identity line (x=y). CCC=1 means a perfect agreement between the two models. ICC is used to assess the consistency or conformity of estimates made by multiple models estimating the same quantity. It gives the proportion of the variance of each estimate explained by the underlying signal. ICC=1 means no estimation error.

We also calculated the Cohen's kappa coefficient (Kappa), which assesses the level of agreement beyond chance in a binary comparison. In our case we evaluated if the estimate in both models at a specific coordinate was below or above the air pollution limit value (NO_2=30 µg/m^3, PM_{10}=20 µg/m^3, $PM_{2.5}$=10 µg/m^3). κ=1 means total agreement, κ =0 no agreement among the models other than what would be expected by chance, and κ =-1 agreement is worse than random.

To check the distribution of the differences, we looked at the Bland-Altman plots (BA-plots). These graph the differences of the two model estimates against their mean values across all observational units. In the case of normal distribution, the point cloud has no slope, is symmetrical about the 0-line, has little and constant vertical variability and only about 5% lie outside the band (horizontal lines).

All statistical analyses were done in SAS 9.4 and StataIC 15.

4 RESULTS

4.1 NO_2

For model estimates SAP1 (1991), SAP2 (2002) and SAP3 (2010), mean annual NO_2 levels decreased from 32.9 – 48.3µg/m^3 (1991) to 23.3 – 30.0µg/m^3 (2002) to 19.2 – 26.0µg/m^3 (2010), respectively. During the same time, measurements at routine monitoring stations (IDB) decreased from 36.7µg/m^3 to 25.8µg/m^3 to 26.0µg/m^3, respectively (Table A 1 – Table A 3). In 2010 more than 50% of the locations showed NO_2 levels below the air pollution limit of 30µg/m^3 (median < 30µg/m^3, Table A 1).

4.1.1 Validation of Meteotest Models with independent and Cantonal NO2 Measurements

The comparison of independent measurements with estimates of the two different Meteotest models (CH_Metv14, CH_Metv15) resulted in almost identical statistical parameter values for both models (Table A 14,Table A 15). From 1991 to 2012, mean NO_2 differences were between 0.1 – 4.2µg/m^3 with no apparent trend over time. Correlations were moderate to high (r: 0.56 – 0.81; CCC: 0.48 – 0.78; ICC: 0.46 – 0.78) and generally higher before the year 2000. In these years there were also less independent measurements available (N<900). According to Infras PolluMap was underestimating the traffic component in the years 2000 to 2010, which explains the lower correlation of the Meteotest models with the measurements in these years. The agreement among the models in categorizing levels as "compliant with" versus "above the limit" levels decreased over time (see Kappa values) because the range of NO_2 levels narrowed and the mean levels decreased, approaching the air pollution limit of 30 µg/m^3. When NO_2 levels are close to this limit, the chance increases to have one value below and the other above the limit, resulting in a lower kappa.

Comparing the Meteotest models with IDB measurements in the SAPALDIA years (1991, 2002, 2010) resulted in lower mean differences (1.4 – 2.7µg/m^3) and higher correlations (r: 0.87 – 0.91; CCC: 0.81 – 0.89; ICC: 0.80 – 0.89) than seen in the comparison of Meteotest models with independent measurements (Table A 16). This is not surprising as most of the IDB measurements were used to develop the Meteotest models. In addition, IDB measurements are annual means calculated from daily measurements covering 90% of the year, while the independent measurements are adjusted annual means from multiple 14-day measurements often not covering the whole year. This added uncertainty in the independent measurements could also lead to lower correlations. Again, there were no big differences in statistical parameter values for the two Meteotest model versions.

Overall, Meteotest models underestimated the measurements and had smaller interquartile ranges (IQR), since the measurements also included traffic-impacted locations with higher NO_2 levels, while they were excluded in the modeling process. Nevertheless, because there were small mean differences and good correlations between the Meteotest models and the measurements, we will use the Meteotest version 2015 (CH_Metv15) model as point of reference for the comparison with all other models.

4.1.2 SAPALDIA 3 (2010)

Models vs. NO_2 IDB (*Table A 17*, Figure A 4*)*
Models used (sorted by descending CCC): CH_Pollu, CH_Metv15, CH_Metv14, EUR_ElapseSat, GLOB_Sat and CH_SapWRF.

The mean differences between the models and the IDB measurements were smallest and not significant for EUR_ElapseSat (-0.4 µg/m^3) and largest for GLOB_Sat (-6.5 µg/m^3) while ranging between -2.2 µg/m^3 and -2.7 µg/m^3 for all other models. All models underestimated the measurements and had smaller IQR. Correlations were high (r, CCC, ICC > 0.74) and kappa moderate (0.45 – 0.65) except for GLOB_Sat and CH_SapWRF.

EUR_ElapseSat estimates were very close to IDB measurements. They showed high correlations (r, CCC, ICC > 0.74), no significant difference in the mean, very similar IQR and distribution (quartiles). Looking at the Bland-Altman plot, we can assume a normal distribution of the differences (Figure A 4: no2_diff2010_EUR_ElapseSat_IDB).

Models vs. CH_Metv15 (*Figure 6-4*, *Table A 18*, *Figure A 5*)
Models used (sorted by descending CCC): CH_Metv14, CH_Pollu, CH_SapWRF, EUR_Sat, EUR_ElapseSat, CH_Sap3LUR and GLOB_Sat.

There were positive and negative mean differences to CH_Metv15 estimates with absolute values of 0.3 µg/m^3 to 3.6 µg/m^3 (2% to 17% of the mean value). All correlations (r>0.77, CCC>0.75, ICC>0.74) and kappa (>0.55, except GLOB_Sat) were moderate to high. CH_Metv14, CH_Pollu and CH_SapWRF were highly correlated with CH_Metv15, probably because all of them used PolluMap (2010) estimates in the modeling process.

4.1.3 SAPALDIA 2 (2002)

Models vs NO_2 IDB *(Table A 25, Figure A 12)*
Models used (sorted by descending CCC): CH_Metv14, CH_Metv15, CH_SNCLUR and CH_SapWRF.

Comparing IDB measurements with model estimates, we found very high correlations (r>0.90, CCC>0.85, ICC>0.85) and kappa (>0.77) for CH_Metv14, CH_Metv15 and CH_SNCLUR, while they were lower for CH_SapWRF (r=0.71, CCC=ICCC=0.63, kappa=0.43). CH_SNCLUR was overestimating, all other models underestimating the measurements with absolute mean differences of 1.4 µg/m^3 to 3.8 µg/m^3.

Models vs. CH_Metv15 *(Figure 6-4*, *Table A 26, Figure A 13)*
Models used (sorted by descending CCC): CH_Metv14, CH_SapWRF, CH_SNCLUR, CH_Sap2LUR, EUR_EscapeLUR_d and EUR_EscapeLUR_r.

Kappa and correlations with CH_Metv15 were very high for CH_Metv14, CH_SapWRF, CH_SNCLUR, and CH_Sap2LUR (R>0.84, CCC>0.82, ICC>0.81, kappa>0.70) and somewhat smaller for EUR_EscapeLUR_d and EUR_EscapeLUR_r (r: 0.71, 0.74; CCC: 0.64, 0.63; ICC: 0.63, 0.63; kappa: 0.57, 0.59, respectively). Mean differences were positive and negative with absolute values between 0.2 µg/m^3 and 3.7 µg/m^3 (1 to 13% of the mean value).

4.1.4 SAPALDIA 1 (1991)

Models vs NO_2 IDB *(Table A 33, Figure A 20)*
Models used (sorted by descending CCC): CH_Metv14, CH_Metv15 and CH_SapWRF

Kappa and correlations with IDB measurements were high for all models (r>0.77, CCC>0.71, ICC>0.71, kappa>0.60). They all underestimated the measurements with a mean difference between 1.7 µg/m^3 – 3.7 µg/m^3. CH_SapWRF showed the largest difference and the lowest correlations and kappa.

Models vs. CH_Metv15 *(Figure 6-4, Table A 34, Figure A 21)*
Models used (sorted by descending CCC): CH_Metv14, CH_SapWRF, CH_Sap2LUR, EUR_EscapeLUR_r and EUR_EscapeLUR_d

Compared with CH_Metv15, correlations and kappa were high for CH_Metv14, CH_SapWRF and CH_Sap2LUR (r>0.77, CCC=ICC>0.74, kappa>0.75) and very low for EUR_EscapeLUR_r and EUR_EscapeLUR_d (r: 0.53, 0.22; CCC: 0.46, 0.19; ICC: 0.46, 0.13; kappa: 0.19, 0.15), respectively. Absolute mean differences varied between 0.0 µg/m^3 – 3.6 µg/m^3 (0 to 8% of the mean value).

4.1.5 NO_2 Summary

In general, mean differences varied between 0 and 17% of the mean values and almost all models showed good correlations and kappa over the SAPALDIA years, except for GLOB_Sat, CH_SapWRF and EUR_EscapeLUR (Figure 6-4). GLOB_Sat had the largest mean differences and low kappa. In addition, characteristic parallel lines in the Bland-Altman plots (Figure A 9) point to a much coarser spatial resolution than the 100m claimed in the paper (Larkin et al. 2017). CH_SapWRF, the other model with a coarse spatial resolution (2km), showed always the smallest correlations compared to measurements. Compared with CH_Metv15, both Escape models had always the smallest correlations and kappa. Especially in 1991 (Sap 1), the EUR_EscapeLUR_d model showed very low correlations and kappa. This might be explained by the different modeling intentions. While the Escape LUR model was designed to refine the predictions at a local scale, the Meteotest model might not capture the NO_2 variation as well with a spatial resolution of 200 meter. Therefore, the two models did not correlate well.

For long-term analysis, we have three models covering the timespan of Sap1 – 3 (CH_Metv15, CH_Metv14, CH_SapWRF) and three additional ones covering only Sap1 – 2 (CH_Sap2LUR, EUR_EscapeLUR_r, EUR_EscapeLUR_d). Of these models, CH_Metv15 is the most consistent model, covering all of Switzerland with a resolution of 200m and a timespan from 1990 up to now. However, as seen above, it does not cover the entire range of measured air pollution and has to be seen as a model capturing best the background concentrations rather than very local conditions at hot-spots.

The EUR_ElapseSat model, a European wide model, compared very well with measurements in Switzerland in 2010. With only one year of annual means, it cannot be used for a time-series analysis. However, with a spatial resolution of 100m, it is a good choice for spatially resolved cross sectional analyses in 2010.

4.2 PM_{10}

For model estimates SAP2 (2002), SAP3 (2010) and 2016, mean annual PM_{10} levels decreased from 21.8 – 36.0µg/m^3 (2002) to 17.5 – 19.6µg/m^3 (2010) to 13.7 – 14.2µg/m^3 (2016), respectively. During the same time measurements (IDB) decreased from 23.4 µg/m^3 to 20.0µg/m^3 to 14.4µg/m^3, respectively (Table A 5 – Table A 9). In 2010 about 50% of the locations showed PM_{10} levels below the air pollution limit of 20µg/m^3 (median ~ 20µg/m^3, Table A 5) and in 2016 it was more than 75% (p75 < 20µg/m^3, Table A 9). Cantonal measurements of PM_{10} only started in 1998, hence there is no IDB data available for 1991 (SAP1). Escape models show very high mean PM_{10} compared to the other models in 2002 (SAP2) as well as in 1991 (SAP1) because they reflect only the area around Lugano, which is known to have high levels (Table A 6, Table A 7).

4.2.1 Validation of Meteotest Models with independent and Cantonal PM_{10} Measurements

For PM_{10} we had only a few independent measurements from the measuring campaigns of ESCAPE in 2009 (N=18, only Lugano) and SAPALDIA in 2011/12 (N=74, in Basel, Geneva, Lugano and Wald) (Table A 41).

In 2009 and 2011/12 we found no significant difference of the means between independent or IDB measurements and the two Meteotest models (CH_Metv14, CH_Metv15) (Table A 41). However, the IQR were smaller for the Meteotest models. Correlations and kappa were very high for the comparisons with IDB measurements, a little lower for SAPALDIA measurements and lowest for ESCAPE measurements. The only differences between the Meteotest models were low CCC (0.39) and ICC (0.39) for CH_Metv14 and very low kappa (0) for CH_Metv15 compared with ESCAPE measurements.

With almost the same performance of the Meteotes models, we will use the version 2015 (CH_Metv15) for the point of reference for comparisons with all other models.

4.2.2 SAPALDIA 3 (2010)

Models vs. PM_{10} IDB *(Table A 42, Figure A 29)*
Models used (sorted by descending CCC): CH_Metv14, CH_Metv15, CH_SapWRF and CH_Pollu (= CH_SapPollu).

Mean differences between IDB measurements and models were very small (<0.7), some not significant. IQR were generally small (<5.4). This reflects the more homogenous spatial distribution of PM_{10} compared to NO_2. Correlations and kappa were moderate (CH_Pollu, CH_SapWRF) to high (CH_Metv14, CH_Metv15).

Models vs. CH_Metv15 *(Figure 6-5, Table A 43, Figure A 30)*
Models used (sorted by descending CCC): CH_Metv14, CH_Pollu (= CH_SapPollu), CH_Sap3LUR and CH_SapWRF

Compared with CH_Metv15, all models showed very small (some not significant) differences (1 to 5% of the mean values), very high correlations (>0.85) and moderate to high kappa (>0.51). CH_SapWRF performed better than compared with IDB measurements, probably due to the use of PolluMap in the modeling process of both CH_Metv15 and CH_SapWRF.

4.2.3 SAPALDIA 2 (2002)

Models vs. PM_{10} IDB *(Table A 47, Figure A 34)*
Models used (sorted by descending CCC): CH_Metv14, CH_Metv15 and CH_SapWRF.

There were no significant mean differences and moderate (CH_SapWRF) to high (CH_Metv14, CH_Metv15) correlations between IDB measurements and models. Kappa was very variable, because of small numbers of data points (N), small IQR and PM_{10} levels close to the air pollution limit of 20µg/m^3.

Models vs. CH_Metv15 *(Figure 6-5, Table A 48, Figure A 35)*
Models used (sorted by descending CCC): CH_Metv14, CH_SapPollu, CH_SapWRF, EUR_EscapeLUR_r and EUR_EscapeLUR_d.

Compared with CH_Metv15, models showed very small differences (<0.8; 0 to 4% of the mean values), high correlations (>0.79) and moderate to high kappa (>0.56), except for the Escape models. They showed mean differences of 3.1 µg/m^3 (EUR_EscapeLUR_r) and 3.5 µg/m^3 (EUR_EscapeLUR_d) and lower correlations (<0.67). Kappa could not be calculated for the Escape models, because all estimates were above the PM_{10} limit of 20 µg/m^3.

4.2.4 SAPALDIA 1 (1991)

In 1991, there were no IDB measurements and no Meteotest model estimates available. Therefore, the three available models CH_SapPollu, EUR_EscapeLUR_r and EUR_EscapeLUR_d could only be compared to each other (Table A 54 – 56, Figure A 41 – 43). There were mean differences of 0.7 µg/m^3 – 2.1 µg/m^3 and only moderate correlations (0.48 – 0.60) between CH_SapPollu and the Escape models.

4.2.5 Bayes (2016)

The Bayesian model was only developed for the year 2016. It showed no significant mean difference to the IDB measurements and only a small difference (0.5 µg/m^3) compared to CH_Metv15 (Table A 57). In both comparisons correlations were high (r, CCC, ICC >0.80) and kappa moderate (0.48; 0.56).

4.2.6 PM_{10} Summary

The interquartile ranges (IQR) were consistently smaller for PM_{10} than for NO_2, reflecting less spatial variability and a smoother distribution. There were no significant differences between the measurements and the available model estimates at the corresponding sites. Comparison between the different models showed small mean differences (< 1 µg/m^3), high correlations and moderate to high kappa for almost all models, except EUR_EscapeLUR and CH_SapWRF (Figure 6-5). Escape models only used measurements from Lugano for modeling, which were rather high. This might be the reason for the lower correlations to the other models covering Switzerland. Despite the coarse spatial resolution of 1km, the EUR_BayesSat model performed well for Switzerland. Because of the very low mean differences and similar statistical outcomes for the different models, we have to look again at other attributes of the models, such as time span or spatial resolution, to decide which model to use best for specific analyses.

4.3 $PM_{2.5}$

For model estimates SAP2 (2002), SAP3 (2010) and 2016, mean annual $PM_{2.5}$ levels decreased from 16.7 – 17.3µg/m^3 (2002) to 12.1 – 17.5µg/m^3 (2010) to 9.2 – 10.3µg/m^3 (2016), respectively. During the same time, mean values of measurements (IDB) decreased from 18.8 µg/m^3 to 12.9 µg/m^3 to 10.0 µg/m^3, respectively (Table A 10 – Table A 13). Cantonal measurements of $PM_{2.5}$ are only available at a handful of sites starting in 1998, hence there is no IDB data available for 1991 (SAP1).

4.3.1 Validation of Meteotest Model with independent and Cantonal $PM_{2.5}$ Measurements

For $PM_{2.5}$ we had only a few independent measurements from the measuring campaigns of ESCAPE in 2009 (N=19, only Lugano) and SAPALDIA in 2011/12 (N=74, in Basel, Geneva, Lugano and Wald) (Table A 59). Even less measurements were available from the Cantonal sites (4 and 9, respectively). Therefore, caution has to be applied interpreting the statistical parameters.

In 2009 and 2011/12 we found small (<0.8 µg/m^3) or no significant differences of the means between independent or IDB measurements and the CH_Metv15 model (Table A 59). Correlations were high for the comparisons with IDB measurements, a little lower for SAPALDIA measurements and lowest for ESCAPE measurements. With only a few measurements, kappa is not meaningful.

4.3.2 SAPALDIA 3 (2010)

Models vs. $PM_{2.5}$ IDB *(Table A 60, Figure A 47)*
Models used (sorted by descending CCC): CH_Metv15, CH_Pollu (= CH_SapPollu), CH_SNCSat and EUR_ElapseSat.

With only 5 measurements (IDB), the statistics are errant and cannot be interpreted.

Models vs. CH_Metv15 *(Figure 6-6, Table A 61, Figure A 48)*
Models used (sorted by descending CCC): CH_Sap3LUR, EUR_Sat, CH_SapPollu = CH_Pollu, EUR_ElapseSat and CH_SNCSat

Compared with CH_Metv15, mean differences varied between 0.4 µg/m^3 – 5.3 µg/m^3 (3 to 35% of the mean values), while correlations and kappa were moderate to high (>0.66), except for EUR_ElapseSat and CH_SNCSat. CH_Sap3LUR, with bi-annual means, performed very well with low difference (0.4 µg/m^3) and high correlations and kappa (>0.94). All models with Satellite data covered larger range and IQR than CH_Metv15.

4.3.3 SAPALDIA 2 (2002)

Models vs. $PM_{2.5}$ IDB *(Table A 67, Figure A 54)*
Models used: CH_Metv15.

There were only six IDB measurements to compare with CH_Metv15. As these measurements were used in the modeling process, the correlations were very high (>0.91).

Models vs. CH_Metv15 *(Figure 6-6, Table A 67, Figure A 54)*
Models used: CH_SapPollu.

The only model available in 2002 besides CH_Metv15 is CH_SapPollu, which has only estimates for the SAPALDIA sites. Compared with CH_Metv15, it performed very well with a small mean difference (0.6), high correlations (>0.94) and high kappa (0.86).

4.3.4 Bayes (2016)

The Bayesian model, developed for the year 2016, showed no significant mean difference to the IDB measurements and only a small difference (1 µg/m^3) compared to CH_Metv15 (Table A 68). In both comparisons correlations were high (r, CCC, ICC >0.80) and kappa moderate (0.61; 0.56).

4.3.5 $PM_{2.5}$ Summary

Routine measurement locations for $PM_{2.5}$ were very sparse in Switzerland and therefore, validation of Swiss-wide models against measurements difficult. Compared to CH_Metv15 mean differences varied by 3 to 23% of the mean values (35% for CH_SNCSat) and correlations were moderate to high, except for CH_SNCSat (Figure 6-6). Visual inspection of the two maps revealed that concentration estimates of $PM_{2.5}$ close to streets were higher and the overall variation larger in CH_SNCSat than in CH_Metv15. Also noted should be that the CH_SNCSat model was created to predict daily estimates, which were then averaged over one year, whereas the CH_Metv15 model estimated annual means directly.

5 DISCUSSION AND OUTLOOK

At the air pollution workshop in April 2016, we identified different modeling needs for the authorities and the research community. The authority's needs are driven by the law to monitor and enforce the compliance to the air quality standards. The authorities are interested in the long-term evolution, communication of compliance to air quality standards and forecasts of trends, and estimates of the air pollution related burden of disease. Therefore, monitoring and modeling are needed on a national and population scale. The authority's priority is to have the best available model at any time. However, for epidemiological long-term studies it is crucial to have consistent models over time capturing local air pollution concentrations to assess individual exposure in order to evaluate health effects, including how changes in health conditions relate to changes in air quality. Thus, consistent validity of spatial models over longer time-span is a relevant criterion in the judgment and selection of models. Else, longitudinal epidemiological analyses may have to differentiate between true longitudinal changes in the associations between air pollutant exposures and health conditions and method-driven changes. In this analysis, the Meteotest NO_2 and PM_{10} models CH_Metv15, which are used by the Swiss authorities, were the most consistent models over time. However, they do not cover the entire range of measured air pollution and thus capture background concentrations rather than very local conditions. In addition, comparing them with older versions (CH_Metv14) showed that even small changes in the modeling approach could have a sizable impact on modeled estimates. On the other hand, study specific models captured local conditions better but did not use consistent modeling approaches over time. We thus face the challenge to find a standard modeling method, which can be easily updated in the future without a fundamental method change.

In our analysis, which looked at the performance of different models at the same time and place, we saw different results for different pollutants. $PM_{2.5}$ models were difficult to validate due to sparse measurements (5 for SAP3, 6 for SAP2). In addition, the reference model CH_Metv15 for $PM_{2.5}$ was built using only five to six measuring sites for the interpolation process (compared to about 70 sites used for NO_2 and PM_{10}), which results in some uncertainty of applying it as reference model. Also using PM_{10} to predict $PM_{2.5}$ would introduce too much uncertainty to apply these predictions as reference. Although $PM_{2.5}$ and PM_{10} correlate well, the correlations differ depending on the source of PM. For instance, correlations at traffic sites are smaller than at background sites and they also differ from year to year. Because of the validation difficulties, all comparisons done with the $PM_{2.5}$ models have to be interpreted with care. Recently (post 2010) more $PM_{2.5}$ measurements have become available in Switzerland, enabling more informed comparisons in the future.

PM_{10} models reflected the measurements very well and showed only small differences (mean and IQR) between each other. NO_2 models performed also well, with slightly larger differences (mean and IQR) between the different models. How these differences impact the results of epidemiological investigations of health effects related to these pollutants needs to be clarified, for instance by comparing a repeated health analysis using air pollution estimates from different models. These results could inform scientists about the uncertainties created by the choice of the model. However, due to the similarity of the models, it is currently difficult to choose a "best" model and other attributes have to be considered such as spatial resolution.

LUR models have been successful in enhancing the spatial resolution of air pollution exposures. Recent hybrid modeling approaches combine satellite derived air pollution data and LUR to develop models with a fine spatial resolution. For instance, the Escape LUR models (EUR_EscapeLUR), originally developed for 20 ($PM_{2.5}$) and 36 (NO_2) European areas, were later on enhanced to cover all western Europe with a spatial resolution of 100m by combining them with satellite derived data (EUR_Sat and EUR_ElapseSat). In addition, satellite data, which is available at a daily basis, combined with daily ground-based measurements allow for the development of spatiotemporal models, which can be used for assessing short-term health effects (e.g. CH_SNCSat).

Almost all models used in the analysis applied Pollumap or Meteotest models (derived from Pollumap) as a basic data in their modeling process. A promising development for future models are the new Pollumap models, announced for the end of this year. The new NO_2, PM_{10} and $PM_{2.5}$ Pollumap models for 2015, 2020 and 2030 include methodical enhancements, such as updated emission grids, improved traffic models and a much finer spatial resolution of 20m. However, these new models will not be applicable for air pollution models in the past.

Another approach combines satellite data with Bayesian modeling (Beloconi et al. 2018). The EUR_BayesSat model performed well in our analysis. One advantage of the Bayes approach is the simultaneous calculation of the uncertainty of the exposure estimates, which offers the possibility to also take these uncertainties into account when calculating the uncertainties of the health effect estimates. A disadvantage of the EUR_BayesSat model is the coarseness of the spatial resolution of 1km.

In view of the authorities needs to monitor and enforce the compliance to the air quality standards, we also compared the model's prediction agreement concerning the air pollution limit values using Cohen's kappa coefficient. Our analyses showed that statistical uncertainties in this compliance assessment increased (*e.g.* low kappa) over time. With the improvements of air quality in the last decades, air pollution estimates tended to cluster around the limit values, increasing the chance to have one value below and the other above the limit.

As an overall conclusion, the analyses confirm a rather good performance of the different models in predicting measured concentrations at different sites across Switzerland. However, the heterogeneity in the data availability over time and space jeopardizes the ability to make an a priori decision about the "best model(s)" to use for epidemiological analyses of health effects. There is a need to apply selected sets of models to epidemiological data or to simulations of respective data to understand the exposure modelling impact on associations between long-term health effects and air pollution. The relevance of valid models of past exposure also depends on the investigated hypotheses. For example, outcomes like lung cancer may require exposure windows over several decades while outcomes of cardiovascular dysfunction may be mostly strongly driven by exposure in recent years and months.

There is a need from both health research as well as policy and monitoring to understand exposure to source-specific pollution. Current modelling efforts do not cover those needs with sufficient spatiotemporal resolution.

This study also provides valuable inputs and further questions relevant for future modelling activities.

- Given the long-term needs of both researchers and public agencies, the derivation of a standard "reference" approach, which lasts for the future, would be a major advantage. Methodological changes – if any – and their statistical spatiotemporal impacts could be described and models should be made backward compatible.
- The availability of satellite data and the emergence of cheap "crowd measurement" data may offer inputs for modelling and monitoring. This may also offer new air quality monitoring approaches, in particular for detection of temporal-spatial hotspots with a potential reduction in fully equipped monitoring stations but an increased density of more specific monitoring (such as source specific speciation etc.).
- Some health outcomes are co-determined by short- and long-term effects of air pollution, thus, standard modelling approaches for the derivation of daily mean values may be of increasing interest.

6 TABLES AND FIGURES

Table 6-1: Description of models and measurements used for comparison

Abbreviation	Model	Study, Source	Method	Pollutants	Time resolution	Spatial resolution	Years	Area	For comparison available coordinates	Reference
CH_Metv14	Meteotest Interpolation Maps (version 2014)	Meteotest, BAFU	Interpolation of PolluMap data	NO2, PM10	annual	200m	1990 - 2012 (NO2) 1998 - 2012 (PM10)	Switzerland	SAPALDIA, Canton, NABEL, other measurement sites	Meteotest, 2014
CH_Metv15	Meteotest Interpolation Maps (version 2015)	Meteotest, BAFU	Interpolation of PolluMap data Follow up model of Metv14	NO2, PM10, PM2.5	annual	200m	1990 - 2013 (NO2) 1998 - 2016 (PM10, PM2.5)	Switzerland	SAPALDIA, Canton, NABEL, other measurement sites	Meteotest, 2015a, 2015b
CH_Pollu	PolluMap Dispersion Model	Meteotest, BAFU	Dispersion model	NO2, PM10, PM2.5	annual	200m	1990 and 1995 (only NO2), 2000, 2005, 2010	Switzerland	SAPALDIA	BUWAL, 1997; FOEN, 2003, 2004, 2011, 2013
CH_Sap2LUR	NO2 LUR Model	SAPALDIA	LUR model using GIS and PolluMap data	NO2	annual		1993, 2003 --> in-house extrapolation 1991, 2002	SAPALDIA	SAPALDIA	Liu et al., 2012
CH_Sap3LUR	SAPALDIA 3 LUR Model	SAPALDIA	LUR model using GIS and PolluMap data	NO2, PM10, PM2.5	bi-annual		2011/12	SAPALDIA	SAPALDIA	Eeftens et al., 2016
CH_SapPollu	SAPALDIA In-house Extrapolation from PolluMap	SAPALDIA, PolluMap	In-house extrapolation of PolluMap data	PM10, PM2.5	annual		1991, 2002, 2010 (PM10) 2002, 2010 (PM2.5)	SAPALDIA	SAPALDIA	
CH_SapWRF	WRF-Chem Model	SAPALDIA	Weather Research and Forecasting (WRF) model with coupled chemistry module (WRF-Chem)	NO2, PM10	hourly --> monthly, annual	2x2km	1991 (only NO2), 2002, 2010	Switzerland	SAPALDIA	Ritter et al., 2013
CH_SNCLUR	Swiss LUR Model	Swiss National Cohort (SNC)	LUR model using passive measurements of NO2 and GIS	NO2	annual		2000 - 2008	Switzerland	Original SNC coord. --> near match to SAPALDIA, Canton, NABEL coord.	Héritier et al., 2018
CH_SNCSat	Swiss Satellite PM2.5 Model	Swiss National Cohort (SNC)	LUR model using machine learning techniques including GIS and stellite derived data.	PM2.5	daily	100m (local) 1km (global)	2003 - 2013	Switzerland	Original SNC coord. --> near match to SAPALDIA, Canton, NABEL coord.	de Hoogh et al., 2018b
EUR_BayesSat	Bayesian Geostatistical Model	Swiss TPH	Bayesian geostatistical model including GIS and satellite derived data.	PM10, PM2.5	annual	1 km	2016	46 European countries	SAPALDIA, Canton, NABEL, other measurement sites	Beloconi et al., 2018
EUR_ElapseSat	European LUR Model (Elapse)	ELAPSE	LUR model including GIS, satellite derived data and chemical transport models (CMT). Follow up model of EurSat.	NO2, PM2.5	annual	100m	2010	Western Europe	SAPALDIA, Canton, NABEL, other measurement sites	de Hoogh et al., 2018a
EUR_EscapeLUR	Escape LUR Model	ESCAPE, SAPALDIA	LUR model	NO2, PM10, PM2.5	annual		2009	36 (NO2) and 20 (PM) European areas	SAPALDIA NO2: Basel, Geneva, Lugano PM10&PM2.5: Lugano	Eeftens et al., 2012
EUR_EscapeLUR_d	Back-extrapolated Escape LUR Model (Difference)	Escape, SAPALDIA	Back-extrapolation of Escape model using a "Difference" approach	NO2, PM10	annual		1991, 2002	SAPALDIA	SAPALDIA NO2: Basel, Geneva, Lugano PM10&PM2.5: Lugano	Eeftens et al., 2012
EUR_EscapeLUR_r	Back-extrapolated Escape LUR Model (Ratio)	Escape, SAPALDIA	Back-extrapolation of Escape model using a "Ratio" approach	NO2, PM10	annual		1991, 2002	SAPALDIA	SAPALDIA NO2: Basel, Geneva, Lugano PM10&PM2.5: Lugano	Eeftens et al., 2012
EUR_Sat	European LUR Model	EXPOsOMICS, ESCAPE	LUR model including GIS, satellite derived data and chemical transport models (CMT).	NO2, PM2.5	annual	100m	2010	Western Europe	SAPALDIA	de Hoogh et al., 2016
GLOB_Sat	Global LUR Model	Oregon State University	Global LUR model using GIS and satellite derived data	NO2	annual	100m to 10km	2011	World	SAPALDIA, Canton, NABEL, other measurement sites	Larkin et al., 2017
IDB	Routine monitoring measurements (Cantons, NABEL)	IDB (Imissionsdatenbank der Schweiz)	Measurements	NO2, PM10, PM2.5	daily, annual		1990 - 2016	Switzerland	Canton & NABEL measurement sites	
meas	Measurements	Canton, different Studies	Measurements	NO2, PM10, PM2.5	weekly, bi-weekly		different years	Study specific sites in Switzerland	other measurement sites	

Table 6-2: Attributes of NO_2 models

Model	Long-term	Short-term	Spatial resolution	Characteristic	Pro	Contra
CH_SapWRF	SAP 1/2/3	hourly	2km			Long computing time
CH_Sap2LUR	SAP 1/2			local		
CH_Sap3LUR				local		
CH_Metv15	1990 - now		200m	background	Available through FOEN; consistent method	
CH_Metv14	1990 - 2012		200m	background	Available through FOEN	
CH_Pollu	1990, 2000, then all 5 years		200m	background		
EUR_EscapeLUR	SAP 1/2/3			local		
CH_SNCLUR	2000 - 2008			local		
EUR_ElapseSat			100m			
EUR_Sat			100m			
GLOB_Sat			100m – 10km			

Table 6-3: Attributes of PM_{10} models

Model	Long-term	Short-term	Spatial resolution	Characteristic	Pro	Contra
CH_SapWRF	SAP 2/3	hourly	2km			Long computing time
CH_SapPollu	SAP 1/2/3		200m	background		
CH_Sap3LUR				local		
CH_Metv15	1998 - now		200m	background	Available through FOEN; consistent method	
CH_Metv14	1998 - 2012		200m	background	Available through FOEN	
CH_Pollu	1990, 2000, then all 5 years		200m	background		
EUR_EscapeLUR	SAP 1/2/3			local		
EUR_BayesSat			100m		Calculation of estimate uncertainties	

Table 6-4: Attributes of $PM_{2.5}$ models

Model	Long-term	Short-term	Spatial resolution	Characteristic	Pro	Contra
CH_SapPollu	SAP 2/3		200m	background		
CH_Sap3LUR				local		
CH_Metv15	1998 - now		200m	background	Available through FOEN	Based on only 7 measurement sites
CH_Pollu	all 5 years from 2000		200m	background		
EUR_EscapeLUR				local		
CH_SNCSat	2003 - 2013	daily	100m	local		
EUR_ElapseSat			100m			
EUR_Sat			100m			
EUR_BayesSat			100m		Calculation of estimate uncertainties	

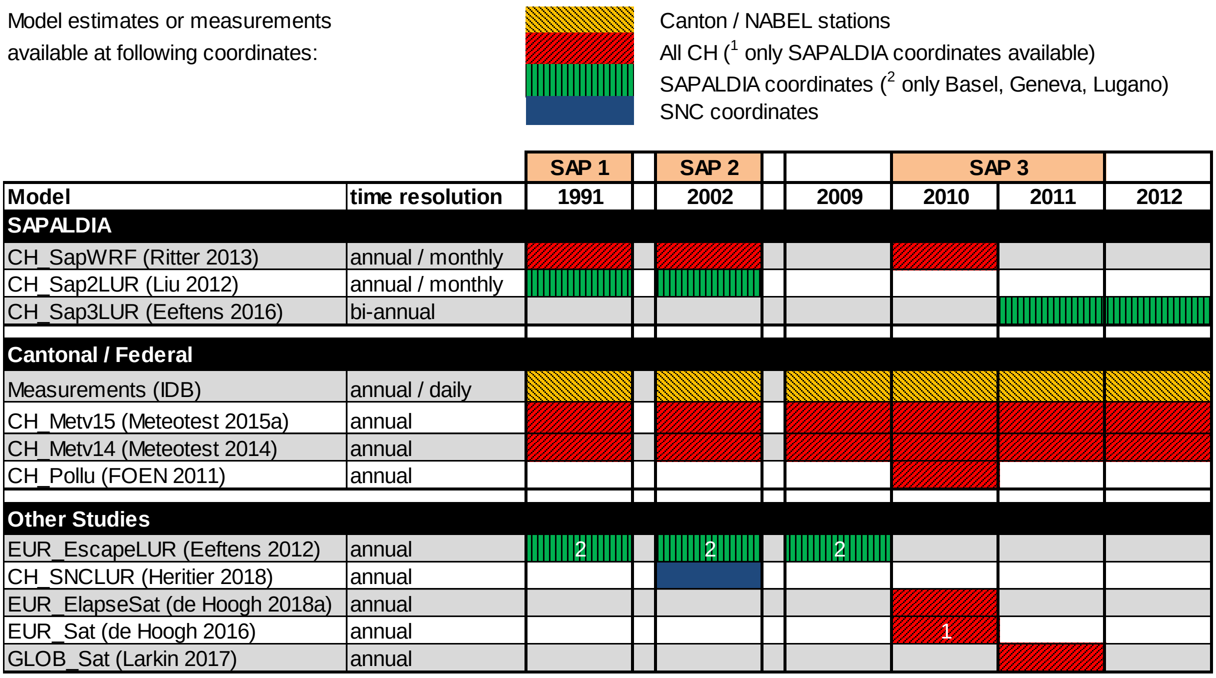

Figure 6-1: Timeframe of NO_2 models. Spatial availability (legend on top) of all NO_2 models used for the comparison analysis by year.

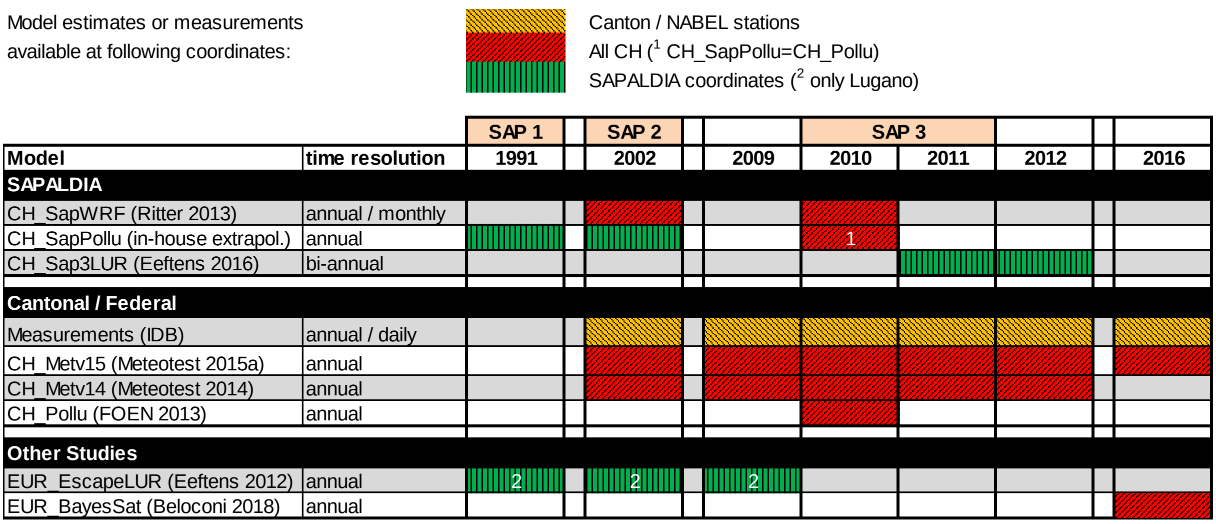

Figure 6-2: Timeframe of PM_{10} models. Spatial availability (legend on top) of all PM_{10} models used for the comparison analysis by year.

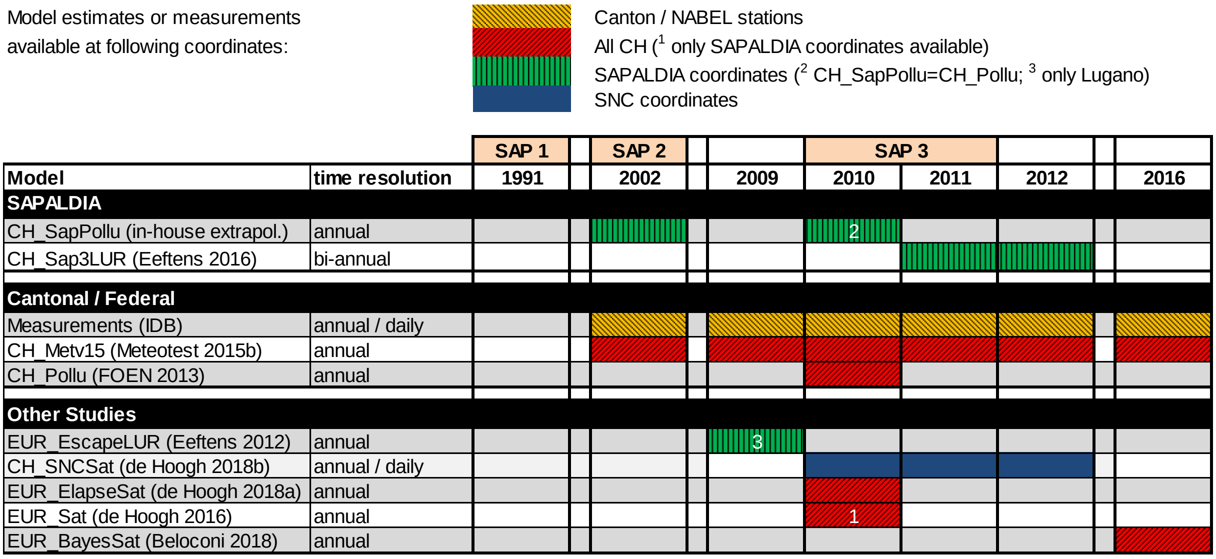

Figure 6-3: Timeframe of $PM_{2.5}$ models. Spatial availability (legend on top) of all $PM_{2.5}$ models used for the comparison analysis by year.

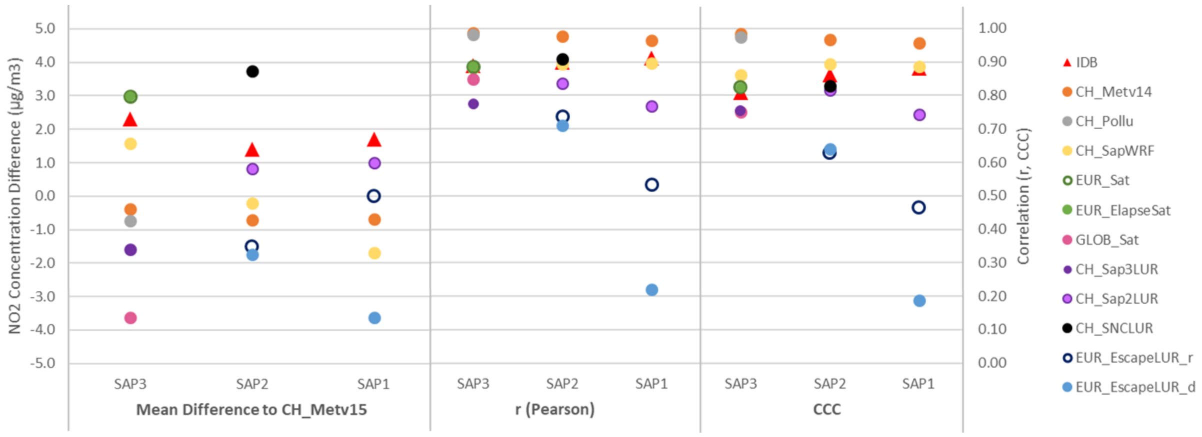

Figure 6-4: Summary of mean differences and correlations for NO_2. Mean differences (left axis) and correlations (Pearson r and CCC; right axis) between NO_2 measurements from IDB and the Meteotest CH_Metv15 model (red triangle) and between different models and the Meteotest CH_Metv15 model (circles) for the times of SAP3 (2010), SAP2 (2002) and SAP1 (1991).

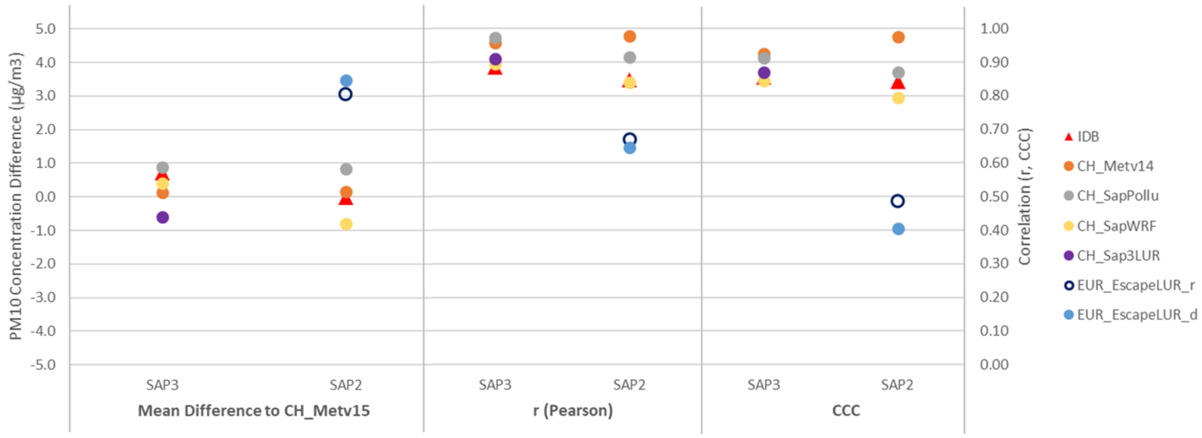

Figure 6-5: Summary of mean differences and correlations for PM_{10}. Mean differences (left axis) and correlations (Pearson r and CCC; right axis) between PM_{10} measurements from IDB and the Meteotest CH_Metv15 model (red triangle) and between different models and the Meteotest CH_Metv15 model (circles) for the times of SAP3 (2010), SAP2 (2002) and SAP1 (1991).

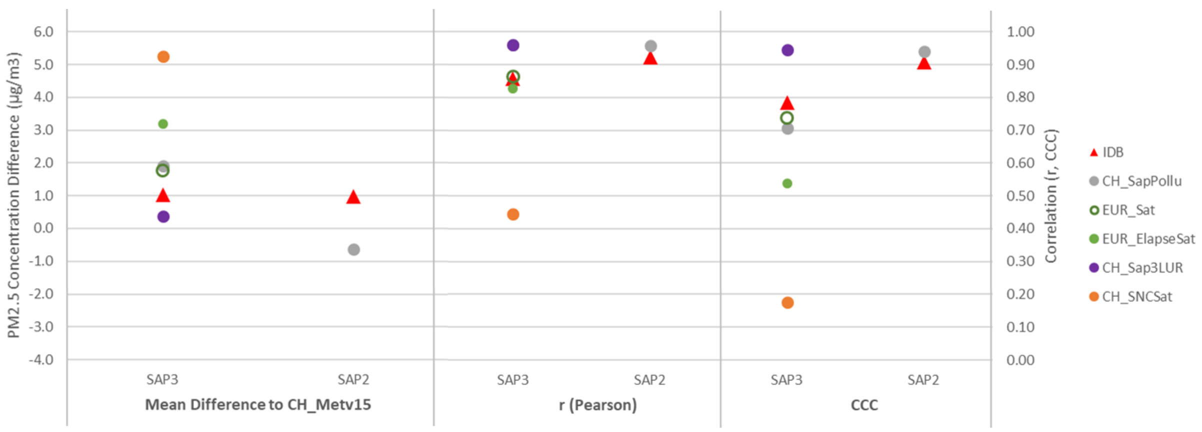

Figure 6-6: Summary of mean differences and correlations for $PM_{2.5}$. Mean differences (left axis) and correlations (Pearson r and CCC; right axis) between $PM_{2.5}$ measurements from IDB and the Meteotest CH_Metv15 model (red triangle) and between different models and the Meteotest CH_Metv15 model (circles) for the times of SAP3 (2010), SAP2 (2002) and SAP1 (1991).

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Appendix A: Comparison Analysis

Table of Tables

Table of Figures

A.1 Glossary

…_diff_xx_yy	Difference between xx and yy
95% CI_lb / CI_ub (ICC)	Lower (lb) and upper (ub) boundary of the 95% confidence interval of the intraclass correlation coefficient (ICC)
BA Plot	**Bland-Altman plot** graphs the differences of the two measurements (estimates) against their mean values across all observational units. Ideally: point cloud has no slope, symmetrical about the 0-line, little and constant vertical variability, only about 5% lie outside the band (horizontal lines) → normal distribution
CCC	**Concordance correlation coefficient** (CCC) describes how well the scatter plot of the two types of estimates agrees with the identity line (x=y). CCC=1: perfect agreement.
CH_Metv14 / CH_Metv15	Meteotest Interpolation Models (Meteotest 2014, 2015a, b) for NO_2, PM_{10} and $PM_{2.5}$
CH_Pollu	PolluMap Dispersion Models (BUWAL 1997; FOEN 2003, 2004, 2011, 2013) for NO_2, PM_{10} and $PM_{2.5}$
CH_Sap2LUR	SAPALDIA LUR Model (Liu et al. 2012) for NO_2 in SAP1 and SAP2
CH_Sap3LUR	SAPALDIA LUR Model (bi-annual) (Eeftens et al. 2016) for NO_2, PM_{10} and $PM_{2.5}$ in SAP3
CH_SapPollu	SAPALDIA in-house extrapolation of PolluMap data for PM_{10} and $PM_{2.5}$
CH_SapWRF	Weather Research and Forecasting Model with Coupled Chemistry Module (WRF-Chem) Model (Ritter et al. 2013) for NO_2 and PM_{10}
CH_SNCLUR	Swiss LUR Model (SNC) for NO_2 using passive measurements
CH_SNCSat	Swiss Satellite LUR Model (de Hoogh et al. 2018b) for daily $PM_{2.5}$
ELAPSE	ELAPSE (Effects of Low-Level Air Pollution: A Study in Europe) study
ESCAPE	ESCAPE (European Study of Cohorts for Air Pollution Effects) study
EUR_BayesSat	European Bayesian geostatistical Models (Beloconi et al. 2018) for PM_{10} and $PM_{2.5}$
EUR_ElapseSat	European Satellite LUR Models (ELAPSE study) (de Hoogh et al. 2018a) for NO_2 and $PM_{2.5}$
EUR_EscapeLUR	European LUR Models (ESCAPE study) for NO_2, PM_{10} and $PM_{2.5}$
EUR_EscapeLUR _d / EUR_EscapeLUR _r	Back-extrapolated European LUR Models (EUR_EscapeLUR) using different approaches: difference (_d) and ratio (_r) method (Appendix B)
EUR_Sat	European Satellite LUR Models (de Hoogh et al. 2016) for NO_2 and $PM_{2.5}$
GLOB_Sat	Global Satellite Model (Larkin et al. 2017) for NO_2
ICC	**Intraclass correlation coefficient** (ICC) is used to assess the consistency, or conformity, of measurements (estimates) made by multiple observers (models) measuring (estimating) the same quantity. It gives the proportion of the variance of each measurement explained by the underlying signal. ICC=1: no measurement error.
IDB	**“I**mmissions **D**aten **B**ank” of Switzerland. Measured data from fixed monitoring sites of the cantons and NABEL.
IQR	Interquartile range = difference between 75^{th} (p75) and 25^{th} (p25) percentiles
Kappa	Cohen’s kappa coefficient assesses the level of agreement (below / above AP limit values (NO_2=30 µg/m^3, PM_{10}=20 µg/m^3, $PM_{2.5}$=10 µg/m^3)) beyond chance: κ=1: total agreement, κ=0: If there is no agreement among the raters other than what would be expected by chance, κ=-1: agreement is worse than random
meas	Independent measurement data (not routinely measured by Canton or NABEL) of cantonal measurement campaigns or within Swiss TPH studies

p (t-test)	P value of the t-test statistics
p25 / p50 / p75	25th / 50th (median) / 75th percentile
r (Pearson)	Pearson correlation (r)
SAP1 / SAP2 / SAP3	SAPALDIA 1 (1991), SAPALDIA 2 (2002), SAPALDIA 3 (2010)
SAPALDIA	SAPALDIA (Swiss study on Air Pollution and Lung Disease in Adults) study
SD	Standard Deviation
SE	Standard Error
SNC	Swiss National Cohort

A.2 Summary Statistics

A.2.1 NO_2

Table A 1: Summary statistics of all NO_2 models used at time of SAPALDIA 3

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	no2_IDB_2010	107	26.0	11.1	1.1	13.5	0.3	19.0	24.3	32.5	64.0
CH_Metv15	no2_CH_Metv15_2010	21109	22.8	7.6	0.1	12.4	0.4	17.0	22.8	29.4	47.4
CH_Metv14	no2_CH_Metv14_2010	21108	22.4	7.9	0.1	12.4	0.3	16.7	22.7	29.1	46.5
CH_Pollu	no2_CH_Pollu_2010	19435	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4
CH_SapWRF	no2_CH_SapWRF_2010	19461	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3
EUR_ElapseSat	no2_EUR_ElapseSat_2010	21573	25.9	8.8	0.1	13.3	2.1	19.2	25.3	32.6	73.4
EUR_Sat	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5
GLOB_Sat	no2_GLOB_Sat_2011	19461	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1
mean_IDB	no2_IDB_mean_11_12	84	25.2	11.5	1.3	14.5	0.3	18.0	23.6	32.5	60.8
mean_CH_Metv15	no2_CH_Metv15_mean_11_12	21109	22.1	7.6	0.1	12.2	0.4	16.3	21.8	28.5	44.8
mean_CH_Metv14	no2_CH_Metv14_mean_11_12	21108	21.8	8.1	0.1	12.3	0.3	15.9	21.8	28.1	48.2
CH_Sap3LUR	no2_CH_Sap3LUR_11_12	11362	19.7	8.5	0.1	10.7	0.0	13.8	17.8	24.6	62.9

Table A 2: Summary statistics of all NO_2 models used at time of SAPALDIA 2

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3
CH_Metv15	no2_CH_Metv15_2002	21109	24.0	8.1	0.1	13.3	0.4	17.7	23.9	31.0	49.2
CH_Metv14	no2_CH_Metv14_2002	21108	23.3	9.1	0.1	14.5	0.3	16.3	23.4	30.8	50.6
CH_Sap2LUR	no2_CH_Sap2LUR_2002	12490	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5
CH_SapWRF	no2_CH_SapWRF_2002	19461	23.7	7.8	0.1	13.8	1.3	17.2	22.8	31.0	37.3
CH_SNCLUR	no2_CH_SNCLUR_2002	4249	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8
EUR_EscapeLUR_d	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6
EUR_EscapeLUR_r	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3

Table A 3: Summary statistics of all NO_2 models used at time of SAPALDIA 1

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	no2_IDB_1991	57	36.7	16.2	2.1	23.2	5.7	25.0	36.9	48.2	71.0
CH_Metv15	no2_CH_Metv15_1991	21109	34.6	12.4	0.1	19.6	0.5	25.5	34.7	45.1	72.9
CH_Metv14	no2_CH_Metv14_1991	21108	34.0	13.8	0.1	21.8	0.3	23.1	34.2	44.9	75.9
CH_Sap2LUR	no2_CH_Sap2LUR_1991	12490	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5
CH_SapWRF	no2_CH_SapWRF_1991	19461	32.9	12.3	0.1	23.0	4.1	21.6	31.3	44.5	54.6
EUR_EscapeLUR_d	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3
EUR_EscapeLUR_r	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4

Table A 4: Summary statistics of all NO_2 models in 2009

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	no2_IDB_2009	107	25.6	11.1	1.1	13.1	0.3	19.0	24.6	32.1	59.7
CH_Metv15	no2_CH_Metv15_2009	21236	22.7	7.7	0.1	12.5	0.4	16.8	22.6	29.3	47.2
CH_Metv14	no2_CH_Metv14_2009	21234	22.3	8.0	0.1	12.4	0.3	16.6	22.6	29.0	46.8
EUR_EscapeLUR	no2_EUR_EscapeLUR_2009	3278	27.6	6.5	0.1	7.4	6.8	24.0	28.3	31.4	59.3

A.2.2 PM_{10}

Table A 5: Summary statistics of all PM_{10} models used at time of SAPALDIA 3

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm10_IDB_2010	93	20.0	4.7	0.5	4.6	2.2	17.8	20.0	22.4	31.8
CH_Metv15	pm10_CH_Metv15_2010	19435	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2
CH_Metv14	pm10_CH_Metv14_2010	19435	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2
CH_Pollu	pm10_CH_Pollu_2010	19444	19.6	3.2	0.0	2.3	-10.0	18.9	20.0	21.2	30.1
CH_SapWRF	pm10_CH_SapWRF_2010	19461	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9
mean_IDB	pm10_IDB_mean_11_12	74	19.3	5.2	0.6	5.5	3.0	16.7	19.4	22.1	36.2
mean_CH_Metv15	pm10_CH_Metv15_mean_11_12	19435	18.3	4.4	0.0	3.5	3.3	16.8	19.0	20.2	34.2
mean_CH_Metv14	pm10_CH_Metv14_mean_11_12	19435	18.6	3.6	0.0	3.6	3.5	16.8	18.7	20.3	36.5
CH_Sap3LUR	pm10_CH_Sap3LUR_11_12	11362	17.5	6.0	0.1	6.3	0.0	15.2	18.7	21.5	45.8

Table A 6: Summary statistics of all PM_{10} models used at time of SAPALDIA 2

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm10_IDB_2002	59	23.4	5.1	0.7	5.8	11.5	20.0	23.0	25.8	39.0
CH_Metv15	pm10_CH_Metv15_2002	19435	22.6	5.7	0.0	2.7	3.7	21.3	23.1	24.0	43.4
CH_Metv14	pm10_CH_Metv14_2002	19435	22.8	5.6	0.0	4.6	3.5	20.1	22.7	24.7	40.4
CH_SapPollu	pm10_CH_SapPollu_2002	11482	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8
CH_SapWRF	pm10_CH_SapWRF_2002	19461	21.8	4.2	0.0	5.3	1.5	19.9	21.8	25.2	29.2
EUR_EscapeLUR_d	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9
EUR_EscapeLUR_r	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2

Table A 7: Summary statistics of all PM_{10} models used at time of SAPALDIA 1

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
CH_SapPollu	pm10_CH_SapPollu_1991	11482	28.9	9.0	0.1	10.5	6.8	24.2	30.6	34.6	54.7
EUR_EscapeLUR_d	pm10_EUR_EscapeLUR_d_1991	581	44.7	2.5	0.1	2.4	38.1	43.5	44.5	45.9	53.0
EUR_EscapeLUR_r	pm10_EUR_EscapeLUR_r_1991	581	46.1	4.7	0.2	4.2	33.8	44.1	45.5	48.3	61.9

Table A 8: Summary statistics of all PM_{10} models in 2009

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm10_IDB_2009	85	20.5	4.9	0.5	5.1	2.7	18.4	21.0	23.5	34.0
CH_Metv15	pm10_CH_Metv15_2009	18940	19.4	4.3	0.0	3.2	3.2	18.5	20.7	21.7	32.6
CH_Metv14	pm10_CH_Metv14_2009	18939	19.6	3.4	0.0	3.3	3.5	18.2	20.2	21.5	34.4
EUR_EscapeLUR	pm10_EUR_EscapeLUR_2009	886	23.2	2.8	0.1	2.9	17.6	21.9	23.3	24.8	31.7

Table A 9: Summary statistics of all PM_{10} models in 2016

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm10_IDB_2016	86	14.4	3.9	0.4	3.5	1.7	12.7	15.0	16.2	24.0
CH_Metv15	pm10_CH_Metv15_2016	21560	13.7	3.8	0.0	2.9	1.9	12.6	14.4	15.5	24.2
EUR_BayesSat	pm10_EUR_BayesSat_2016	21573	14.2	3.7	0.0	4.9	2.1	11.8	14.6	16.7	24.4

A.2.3 $PM_{2.5}$

Table A 10: Summary statistics of all $PM_{2.5}$ models used at time of SAPALDIA 3

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm25_IDB_2010	5	12.9	4.3	1.9	3.2	6.5	11.5	13.6	14.7	18.2
CH_Metv15	pm25_CH_Metv15_2010	19435	12.2	2.9	0.0	2.0	2.4	11.9	13.4	13.9	19.6
CH_Pollu	pm25_CH_Pollu_2010	19429	14.2	2.1	0.0	1.4	4.2	13.8	14.5	15.2	21.6
CH_SapPollu	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6
CH_SNCSat	pm25_CH_SNCSat_2010	19379	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4
EUR_ElapseSat	pm25_EUR_ElapseSat_2010	21573	15.5	3.3	0.0	3.5	3.3	14.5	15.9	18.1	27.4
EUR_Sat	pm25_EUR_Sat_2010	19155	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6
mean_IDB	pm25_IDB_mean_11_12	9	13.7	3.5	1.2	2.9	6.2	12.8	14.3	15.7	18.4
mean_CH_Metv15	pm25_CH_Metv15_mean_11_12	19435	12.1	3.1	0.0	1.9	2.3	11.6	13.0	13.5	21.5
CH_Sap3LUR	pm25_CH_Sap3LUR_11_12	11362	12.4	3.7	0.0	1.8	0.0	12.1	13.1	13.9	26.6

Table A 11: Summary statistics of all $PM_{2.5}$ models used at time of SAPALDIA 2

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm25_IDB_2002	6	18.8	6.3	2.6	7.8	8.7	15.9	18.9	23.7	26.9
CH_Metv15	pm25_CH_Metv15_2002	19435	17.3	4.7	0.0	2.9	3.4	16.1	18.0	19.0	35.0
CH_SapPollu	pm25_CH_SapPollu_2002	19131	16.7	4.1	0.0	4.1	4.9	14.8	16.7	18.9	26.4

Table A 12: Summary statistics of all $PM_{2.5}$ models in 2009

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm25_IDB_2009	5	13.3	4.2	1.9	2.8	7.1	12.1	13.8	14.9	18.6
CH_Metv15	pm25_CH_Metv15_2009	18940	13.1	3.1	0.0	1.7	2.6	12.8	14.0	14.5	21.4
CH_SapPollu	pm25_CH_SapPollu_2009	19132	14.6	2.2	0.0	1.6	5.1	14.1	15.0	15.7	22.2
CH_SNCSat	pm25_CH_SNCSat_2009	19379	16.5	2.9	0.0	3.6	0.0	14.5	16.0	18.1	28.4
EUR_EscapeLUR	pm25_EUR_EscapeLUR_2009	886	16.9	1.8	0.1	1.7	12.3	16.1	16.9	17.8	23.7

Table A 13: Summary statistics of all $PM_{2.5}$ models in 2016

Model	Variable	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max
IDB	pm25_IDB_2016	11	10.0	2.4	0.7	4.0	4.8	8.1	10.4	12.1	12.7
CH_Metv15	pm25_CH_Metv15_2016	21560	9.2	2.3	0.0	1.4	1.8	8.8	9.8	10.2	16.4
EUR_BayesSat	pm25_EUR_BayesSat_2016	21573	10.3	2.4	0.0	3.1	1.4	8.7	10.2	11.8	17.9

A.3 Tables and Bland-Altman Plots of Comparison Analysis

A.3.1 How to read the Comparison Tables

Example for "model x" vs. "model y"

Model, which all other models are compared with in the extended table

AP Time / model y	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
model x_model y		*Summary statistics of Variable x*																
	Variable x	19426	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
		Summary statistics of Variable y																
	Variable y	19426	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
		Summary statistics of the Difference diff=x-y											*Results of the statistical comparison tests*					
	Difference x-y	19426	0.7	1.6	0.0	1.7	-15.8	-0.2	0.7	1.5	11.7	0.03	0.98	0.97	0.97	0.97	0.98	0.90

AP (Air Pollutant): NO2, PM10, PM2.5
Time: Sapaldia 1 (S1), 2 (S2), 3 (S3) or year
Variable x: Variable of the model x (**AP_model x_year**)
Variable y: Variable of the model y (**AP_model y_year**)
Difference x-y: Variable of the difference x-y (**AP**_diff**year_model x_model y**)

Color scales:

Mean (only in Table A 14 - Table A 16)

Smallest absolute difference (min [abs(x)])

Largest absolute difference (max [abs(x)])

Comparison tests

Largest value

Smallest value

A.3.2 NO_2

A.3.2.1. Measurements vs. Meteotest Models

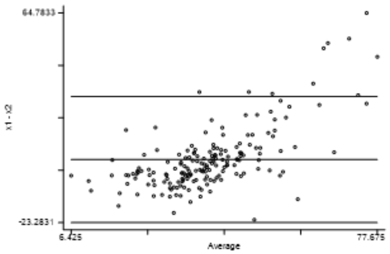
Table A 14: NO_2 independent measurements vs. model CH_Metv15

NO2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
meas_CH_Metv15_1991	no2_meas_1991	182	40.0	17.7	1.3	19.2	4.7	29.0	37.8	48.2	107.6							
	no2_CH_Metv15_1991	182	36.8	9.5	0.7	10.4	8.2	31.9	37.1	42.3	65.9							
	no2_diff1991_meas_CH_Metv15	182	3.2	13.2	1.0	11.3	-22.1	-4.5	0.2	6.8	64.8	< 0.01	0.68	0.55	0.55	0.44	0.64	0.58
meas_CH_Metv15_1992	no2_meas_1992	180	39.9	17.8	1.3	17.4	3.8	29.2	37.1	46.6	118.0							
	no2_CH_Metv15_1992	180	36.4	10.2	0.8	12.7	8.0	29.8	36.4	42.5	67.3							
	no2_diff1992_meas_CH_Metv15	180	3.5	12.8	1.0	11.2	-20.5	-4.2	2.1	7.0	62.4	< 0.01	0.71	0.59	0.59	0.48	0.68	0.49
meas_CH_Metv15_1993	no2_meas_1993	719	32.9	13.7	0.5	20.5	3.7	22.0	32.8	42.5	84.6							
SAP 1	no2_CH_Metv15_1993	719	31.3	10.9	0.4	18.3	6.1	22.7	32.0	41.0	63.4							
	no2_diff1993_meas_CH_Metv15	719	1.7	8.1	0.3	9.5	-18.3	-3.6	0.5	5.8	43.2	< 0.01	0.81	0.78	0.78	0.75	0.81	0.70
meas_CH_Metv15_1994	no2_meas_1994	186	34.4	13.7	1.0	17.9	3.9	25.1	32.9	42.9	87.9							
	no2_CH_Metv15_1994	186	30.6	8.4	0.6	10.6	7.1	25.3	30.9	35.9	57.9							
	no2_diff1994_meas_CH_Metv15	186	3.9	9.1	0.7	8.9	-15.7	-1.5	2.7	7.4	49.2	< 0.01	0.77	0.64	0.64	0.54	0.71	0.61
meas_CH_Metv15_1995	no2_meas_1995	344	32.2	11.0	0.6	12.6	3.6	25.6	31.3	38.2	81.1							
	no2_CH_Metv15_1995	344	29.3	7.0	0.4	8.4	6.7	25.4	29.8	33.8	55.2							
	no2_diff1995_meas_CH_Metv15	344	2.9	7.7	0.4	8.9	-16.8	-1.9	2.0	7.0	44.2	< 0.01	0.72	0.62	0.61	0.54	0.68	0.58
meas_CH_Metv15_1996	no2_meas_1996	282	30.6	10.8	0.6	13.4	3.7	23.2	30.2	36.6	78.3							
	no2_CH_Metv15_1996	282	30.5	7.4	0.4	8.9	8.0	26.1	30.9	35.0	56.1							
	no2_diff1996_meas_CH_Metv15	282	0.1	7.7	0.5	8.4	-18.7	-5.0	-0.6	3.4	40.3	0.84	0.70	0.65	0.65	0.58	0.71	0.53
meas_CH_Metv15_1997	no2_meas_1997	286	30.7	10.9	0.6	13.4	3.1	24.6	30.0	38.0	71.0							
	no2_CH_Metv15_1997	286	30.2	7.6	0.4	10.0	7.6	25.2	30.7	35.2	56.8							
	no2_diff1997_meas_CH_Metv15	286	0.4	7.8	0.5	9.8	-18.2	-4.6	-0.5	5.2	31.7	0.33	0.69	0.65	0.65	0.58	0.71	0.52
meas_CH_Metv15_1998	no2_meas_1998	302	30.6	12.4	0.7	14.7	2.9	23.3	29.6	38.1	72.0							
	no2_CH_Metv15_1998	302	29.1	8.9	0.5	11.7	6.8	23.3	29.3	35.0	57.0							
	no2_diff1998_meas_CH_Metv15	302	1.5	8.4	0.5	10.5	-16.8	-4.4	0.0	6.1	36.9	< 0.01	0.74	0.69	0.69	0.63	0.75	0.50
meas_CH_Metv15_1999	no2_meas_1999	780	27.7	10.8	0.4	13.6	2.5	20.6	27.0	34.3	69.4							
	no2_CH_Metv15_1999	780	25.7	7.7	0.3	9.2	2.7	20.8	25.7	30.0	57.0							
	no2_diff1999_meas_CH_Metv15	780	2.0	7.7	0.3	10.5	-16.3	-3.7	0.9	6.9	35.6	< 0.01	0.70	0.64	0.64	0.59	0.68	0.40
meas_CH_Metv15_2000	no2_meas_2000	932	28.5	10.5	0.3	13.2	2.0	21.8	28.0	35.1	65.0							
	no2_CH_Metv15_2000	932	24.4	7.0	0.2	8.7	2.5	19.9	24.3	28.6	52.0							
	no2_diff2000_meas_CH_Metv15	932	4.1	7.9	0.3	11.4	-13.8	-1.8	2.8	9.6	33.0	< 0.01	0.66	0.55	0.53	0.48	0.57	0.31
meas_CH_Metv15_2001	no2_meas_2001	837	26.7	10.0	0.3	12.8	2.8	20.3	26.3	33.1	60.0							
	no2_CH_Metv15_2001	837	23.6	7.3	0.3	8.6	2.5	19.0	23.0	27.6	50.2							
	no2_diff2001_meas_CH_Metv15	837	3.1	7.6	0.3	11.1	-16.7	-2.5	1.9	8.5	31.2	< 0.01	0.65	0.58	0.57	0.52	0.61	0.31
meas_CH_Metv15_2002	no2_meas_2002	927	26.2	9.9	0.3	12.7	0.3	19.7	25.2	32.4	64.8							
	no2_CH_Metv15_2002	927	24.2	7.0	0.2	8.1	2.6	19.9	23.8	28.0	49.2							
	no2_diff2002_meas_CH_Metv15	927	2.1	6.9	0.2	9.1	-16.0	-2.8	0.9	6.3	33.0	< 0.01	0.72	0.66	0.65	0.62	0.69	0.37

NO2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
meas_CH_Metv15_2003	no2_meas_2003	1259	25.9	10.9	0.3	13.9	2.2	18.4	25.2	32.3	95.1							
SAP 2	no2_CH_Metv15_2003	1259	25.2	8.0	0.2	10.5	2.7	19.8	25.3	30.3	54.8							
	no2_diff2003_meas_CH_Metv15	1259	0.7	7.5	0.2	8.4	-20.3	-4.2	-0.8	4.2	62.9	< 0.01	0.72	0.69	0.69	0.66	0.72	0.49
meas_CH_Metv15_2004	no2_meas_2004	902	24.6	9.8	0.3	11.6	2.1	18.0	23.6	29.6	84.0							
	no2_CH_Metv15_2004	902	23.7	7.0	0.2	8.2	2.4	19.3	23.4	27.5	50.3							
	no2_diff2004_meas_CH_Metv15	902	0.9	7.8	0.3	8.7	-22.1	-4.0	-0.4	4.7	51.8	< 0.01	0.61	0.57	0.57	0.53	0.61	0.27
meas_CH_Metv15_2005	no2_meas_2005	1123	25.5	9.8	0.3	11.6	2.3	19.2	24.9	30.8	80.5							
	no2_CH_Metv15_2005	1123	24.4	6.9	0.2	8.6	2.6	19.8	24.3	28.4	51.0							
	no2_diff2005_meas_CH_Metv15	1123	1.1	7.4	0.2	8.5	-18.4	-3.7	-0.1	4.8	47.8	< 0.01	0.66	0.61	0.61	0.57	0.65	0.41
meas_CH_Metv15_2006	no2_meas_2006	1054	26.6	9.8	0.3	11.7	2.4	20.3	25.6	32.0	75.0							
	no2_CH_Metv15_2006	1054	24.6	6.7	0.2	8.2	2.5	20.4	24.6	28.6	51.4							
	no2_diff2006_meas_CH_Metv15	1054	2.0	7.5	0.2	8.4	-16.6	-2.9	0.7	5.5	42.7	< 0.01	0.64	0.58	0.58	0.54	0.62	0.37
meas_CH_Metv15_2007	no2_meas_2007	1099	24.9	9.5	0.3	11.4	2.5	18.7	23.7	30.1	76.0							
	no2_CH_Metv15_2007	1099	23.2	6.2	0.2	7.5	2.4	19.3	23.1	26.8	47.2							
	no2_diff2007_meas_CH_Metv15	1099	1.7	7.6	0.2	8.8	-18.6	-3.4	0.4	5.4	46.5	< 0.01	0.60	0.54	0.53	0.49	0.57	0.27
meas_CH_Metv15_2008	no2_meas_2008	1146	25.2	9.4	0.3	10.8	1.0	19.3	24.2	30.1	74.0							
	no2_CH_Metv15_2008	1146	23.3	6.2	0.2	7.6	2.4	19.5	23.1	27.1	47.0							
	no2_diff2008_meas_CH_Metv15	1146	2.0	7.8	0.2	9.0	-24.8	-3.1	0.8	5.9	42.6	< 0.01	0.56	0.50	0.49	0.44	0.53	0.20
meas_CH_Metv15_2009	no2_meas_2009	1239	26.2	9.4	0.3	11.3	1.0	20.0	25.0	31.3	68.0							
ESCAPE	no2_CH_Metv15_2009	1239	23.9	6.2	0.2	7.9	2.4	20.0	23.6	27.9	47.2							
	no2_diff2009_meas_CH_Metv15	1239	2.3	7.7	0.2	8.9	-17.7	-2.9	0.9	6.0	45.5	< 0.01	0.58	0.51	0.50	0.46	0.54	0.28
meas_CH_Metv15_2010	no2_meas_2010	1095	26.3	9.6	0.3	11.4	1.1	20.1	25.0	31.5	70.4							
	no2_CH_Metv15_2010	1095	23.3	5.9	0.2	7.2	2.5	19.7	23.2	26.9	47.4							
	no2_diff2010_meas_CH_Metv15	1095	3.0	7.9	0.2	9.3	-16.9	-2.5	1.8	6.8	47.0	< 0.01	0.57	0.48	0.46	0.41	0.51	0.25
meas_CH_Metv15_2011	no2_meas_2011	1126	27.2	10.4	0.3	11.1	1.0	21.0	25.7	32.1	94.6							
	no2_CH_Metv15_2011	1126	23.1	6.3	0.2	7.9	2.4	19.0	22.8	26.9	45.3							
	no2_diff2011_meas_CH_Metv15	1126	4.2	8.0	0.2	9.0	-17.7	-1.3	2.8	7.7	64.7	< 0.01	0.64	0.51	0.48	0.44	0.53	0.28
meas_CH_Metv15_2012	no2_meas_2012	925	25.3	9.3	0.3	10.4	1.0	19.9	24.1	30.3	67.0							
	no2_CH_Metv15_2012	925	21.4	5.6	0.2	6.7	2.3	18.0	21.3	24.7	44.2							
	no2_diff2012_meas_CH_Metv15	925	3.8	7.3	0.2	8.6	-15.5	-1.3	2.4	7.3	43.3	< 0.01	0.62	0.49	0.46	0.41	0.51	0.19
meas_CH_Metv15_2011_12	no2_meas_2011_12	312	21.9	10.4	0.6	14.7	3.7	13.7	20.5	28.4	62.9							
SAP 3	no2_CH_Metv15_mean_11_12	312	20.6	8.1	0.5	13.6	5.0	14.4	19.4	28.0	39.7							
	no2_diff2011_12_meas_CH_Metv15	312	1.2	8.3	0.5	10.2	-10.7	-4.7	-0.9	5.5	35.5	< 0.01	0.63	0.60	0.60	0.53	0.67	0.52

…_meas_…	Measurement data (passive sampler data):	
	no indication (annual means)	*passive sampler measurements (usually 14-day measurements) from different Cantonal measurement campaigns collected by Harris Héritier for the CH_SNCLUR model.*
	ESCAPE (annual means)	*above data (no indication) & Basel, Geneva, Lugano: 14-day measurements in 3 seasons in 2009*
	SAP 1 (2) (annual means)	*above data (no indication) & Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne, Wald: 7/14-day measurements in 3 seasons in 1993 (2003)*
	SAP 3 (bi-annual means)	*above data (no indication) & Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne, Wald: 14-day measurements in 3 seasons in 2011/12*

no2_diff1991_meas_CH_Metv15



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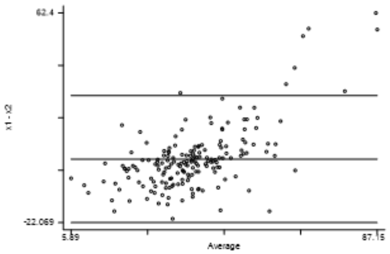

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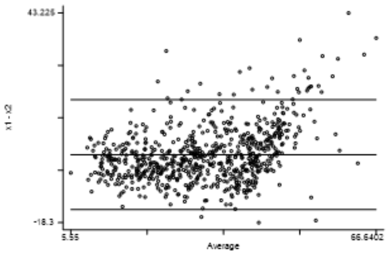

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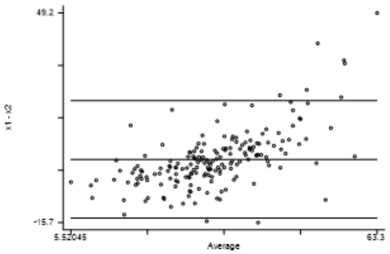

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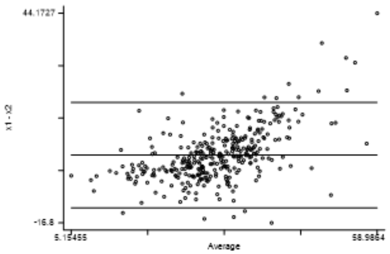

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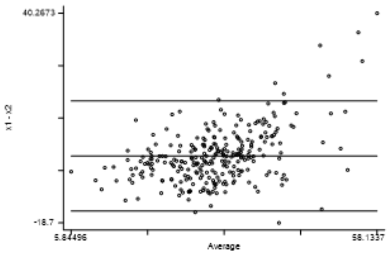
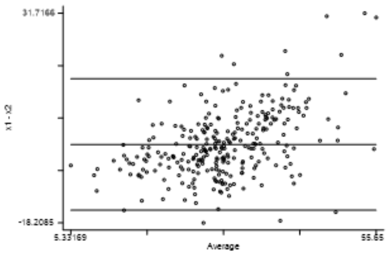


no2_diff1997_meas_CH_Metv15



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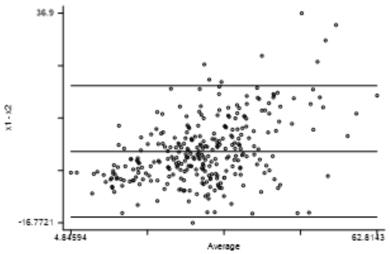

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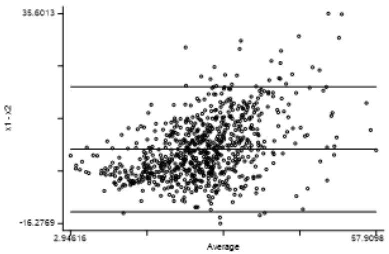

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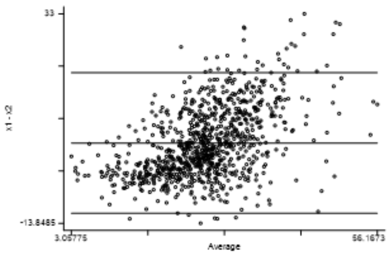

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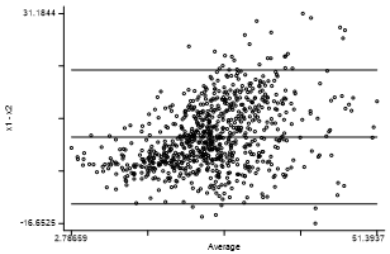

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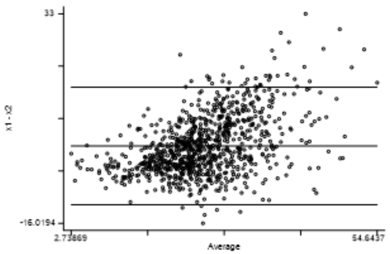


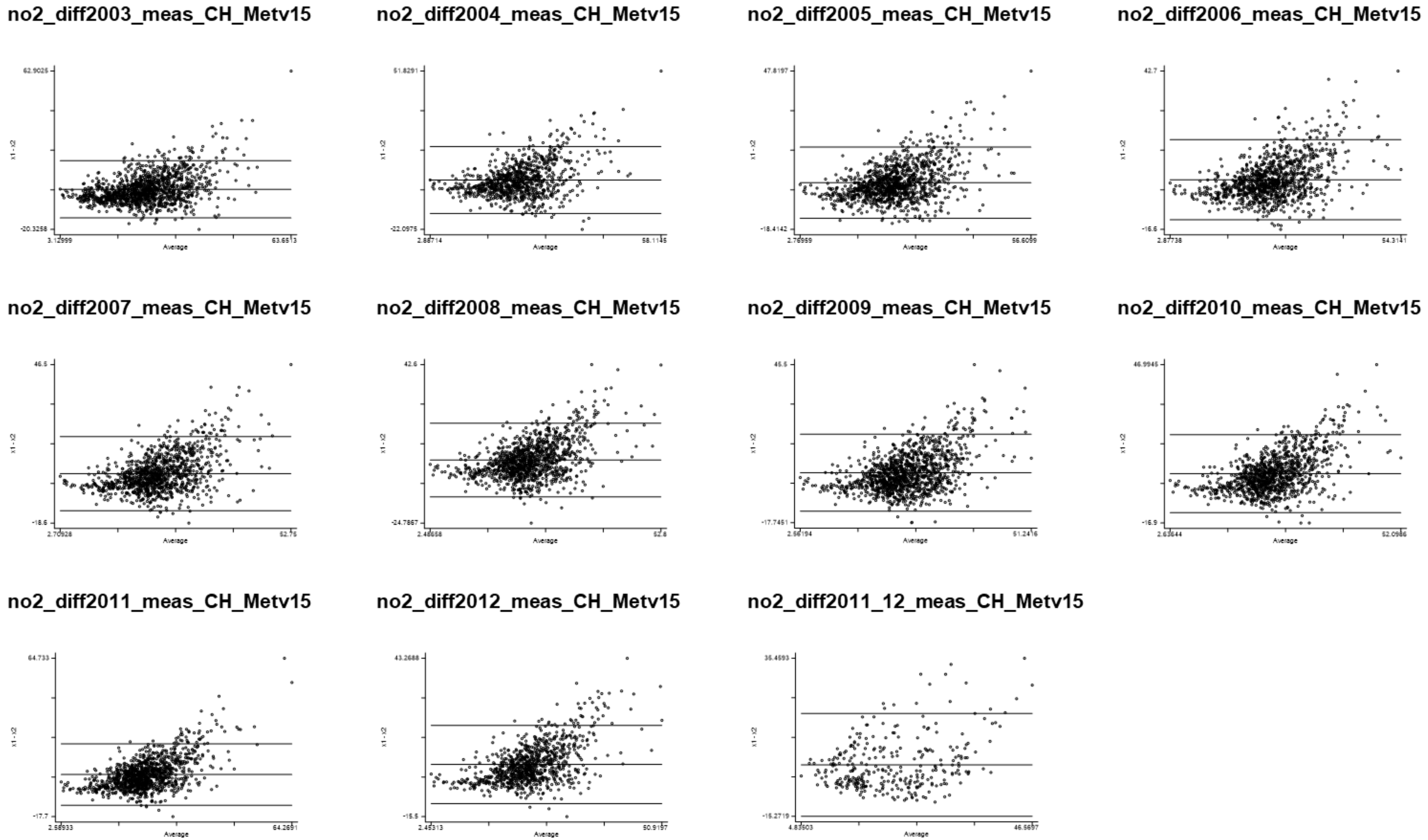


Figure A 1: BA plots of NO_2 independent measurements vs. CH_Metv15. Bland-Altman plots corresponding to Table A 14

Table A 15: NO_2 independent measurements vs. model CH_Metv14

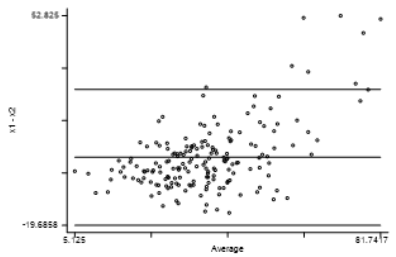
NO2 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
meas_CH_Metv14_1991	no2_meas_1991	182	40.0	17.7	1.3	19.2	4.7	29.0	37.8	48.2	107.6							
	no2_CH_Metv14_1991	182	36.2	11.6	0.9	14.9	5.6	29.0	36.3	43.9	65.0							
	no2_diff1991_meas_CH_Metv14	182	3.8	11.8	0.9	11.6	-15.4	-3.7	1.8	7.9	52.8	< 0.01	0.75	0.67	0.66	0.58	0.74	0.59
meas_CH_Metv14_1992	no2_meas_1992	180	39.9	17.8	1.3	17.4	3.8	29.2	37.1	46.6	118.0							
	no2_CH_Metv14_1992	180	35.5	12.0	0.9	15.4	5.4	27.9	33.6	43.3	66.2							
	no2_diff1992_meas_CH_Metv14	180	4.4	11.8	0.9	10.6	-18.5	-2.0	2.8	8.6	63.0	< 0.01	0.75	0.67	0.66	0.57	0.74	0.52
meas_CH_Metv14_1993	no2_meas_1993	719	32.9	13.7	0.5	20.5	3.7	22.0	32.8	42.5	84.6							
SAP 1	no2_CH_Metv14_1993	719	30.6	12.6	0.5	21.2	4.4	20.4	31.7	41.6	57.1							
	no2_diff1993_meas_CH_Metv14	719	2.4	8.5	0.3	10.1	-18.4	-3.2	1.1	6.9	41.7	< 0.01	0.79	0.78	0.78	0.75	0.80	0.68
meas_CH_Metv14_1994	no2_meas_1994	186	34.4	13.7	1.0	17.9	3.9	25.1	32.9	42.9	87.9							
	no2_CH_Metv14_1994	186	30.0	9.7	0.7	11.7	4.4	24.5	29.8	36.2	56.1							
	no2_diff1994_meas_CH_Metv14	186	4.4	8.7	0.6	8.3	-17.5	-0.5	3.1	7.8	47.9	< 0.01	0.78	0.69	0.68	0.59	0.75	0.56
meas_CH_Metv14_1995	no2_meas_1995	344	32.2	11.0	0.6	12.6	3.6	25.6	31.3	38.2	81.1							
	no2_CH_Metv14_1995	344	29.1	8.0	0.4	9.4	4.2	24.6	29.3	34.0	54.5							
	no2_diff1995_meas_CH_Metv14	344	3.1	7.5	0.4	8.4	-17.0	-1.4	2.3	7.0	42.5	< 0.01	0.73	0.66	0.65	0.59	0.71	0.50
meas_CH_Metv14_1996	no2_meas_1996	282	30.6	10.8	0.6	13.4	3.7	23.2	30.2	36.6	78.3							
	no2_CH_Metv14_1996	282	30.1	9.1	0.5	10.6	4.0	24.8	29.9	35.4	58.7							
	no2_diff1996_meas_CH_Metv14	282	0.5	7.8	0.5	8.1	-20.8	-4.0	-0.4	4.1	35.0	0.27	0.70	0.69	0.69	0.63	0.75	0.54
meas_CH_Metv14_1997	no2_meas_1997	286	30.7	10.9	0.6	13.4	3.1	24.6	30.0	38.0	71.0							
	no2_CH_Metv14_1997	286	29.7	9.3	0.5	11.3	4.0	24.1	29.3	35.4	60.8							
	no2_diff1997_meas_CH_Metv14	286	1.0	8.2	0.5	8.2	-23.1	-3.1	-0.2	5.1	32.1	0.05	0.68	0.67	0.67	0.60	0.73	0.52
meas_CH_Metv14_1998	no2_meas_1998	302	30.6	12.4	0.7	14.7	2.9	23.3	29.6	38.1	72.0							
	no2_CH_Metv14_1998	302	29.3	11.1	0.6	13.0	4.1	22.5	28.1	35.5	65.5							
	no2_diff1998_meas_CH_Metv14	302	1.4	9.0	0.5	9.6	-25.4	-3.5	0.2	6.1	34.4	< 0.01	0.71	0.70	0.70	0.64	0.75	0.48
meas_CH_Metv14_1999	no2_meas_1999	780	27.7	10.8	0.4	13.6	2.5	20.6	27.0	34.3	69.4							
	no2_CH_Metv14_1999	780	25.6	9.3	0.3	11.8	2.0	19.4	24.7	31.2	61.8							
	no2_diff1999_meas_CH_Metv14	780	2.1	8.6	0.3	10.4	-28.6	-3.3	1.2	7.1	32.6	< 0.01	0.64	0.62	0.61	0.57	0.66	0.34
meas_CH_Metv14_2000	no2_meas_2000	932	28.5	10.5	0.3	13.2	2.0	21.8	28.0	35.1	65.0							
	no2_CH_Metv14_2000	932	24.6	8.5	0.3	11.1	1.8	18.8	24.0	29.8	59.9							
	no2_diff2000_meas_CH_Metv14	932	3.9	8.6	0.3	11.3	-24.2	-2.0	2.5	9.3	33.7	< 0.01	0.60	0.54	0.53	0.48	0.57	0.33
meas_CH_Metv14_2001	no2_meas_2001	837	26.7	10.0	0.3	12.8	2.8	20.3	26.3	33.1	60.0							
	no2_CH_Metv14_2001	837	23.6	8.4	0.3	10.2	1.9	18.3	22.7	28.5	55.4							
	no2_diff2001_meas_CH_Metv14	837	3.1	8.3	0.3	11.4	-21.0	-2.6	2.0	8.8	31.1	< 0.01	0.60	0.56	0.55	0.50	0.59	0.25
meas_CH_Metv14_2002	no2_meas_2002	927	26.2	9.9	0.3	12.7	0.3	19.7	25.2	32.4	64.8							
	no2_CH_Metv14_2002	927	24.0	7.6	0.2	9.2	1.9	19.3	23.4	28.5	50.6							
	no2_diff2002_meas_CH_Metv14	927	2.3	6.9	0.2	8.9	-21.7	-2.6	1.0	6.3	33.1	< 0.01	0.71	0.67	0.66	0.62	0.70	0.38

NO2 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
meas_CH_Metv14_2003	no2_meas_2003	1259	25.9	10.9	0.3	13.9	2.2	18.4	25.2	32.3	95.1							
SAP 2	no2_CH_Metv14_2003	1259	25.1	8.9	0.3	11.5	2.1	19.1	24.9	30.6	54.7							
	no2_diff2003_meas_CH_Metv14	1259	0.8	7.7	0.2	8.6	-21.4	-4.1	-0.4	4.5	66.7	< 0.01	0.71	0.70	0.70	0.67	0.72	0.48
meas_CH_Metv14_2004	no2_meas_2004	902	24.6	9.8	0.3	11.6	2.1	18.0	23.6	29.6	84.0							
	no2_CH_Metv14_2004	902	23.4	7.2	0.2	9.1	2.1	18.8	23.0	27.9	49.4							
	no2_diff2004_meas_CH_Metv14	902	1.2	7.8	0.3	8.2	-19.3	-3.7	-0.2	4.5	54.2	< 0.01	0.62	0.58	0.58	0.54	0.62	0.31
meas_CH_Metv14_2005	no2_meas_2005	1123	25.5	9.8	0.3	11.6	2.3	19.2	24.9	30.8	80.5							
	no2_CH_Metv14_2005	1123	24.2	7.1	0.2	9.3	2.2	19.4	24.1	28.7	50.0							
	no2_diff2005_meas_CH_Metv14	1123	1.3	7.5	0.2	8.6	-17.4	-3.4	0.1	5.2	48.6	< 0.01	0.65	0.61	0.60	0.57	0.64	0.44
meas_CH_Metv14_2006	no2_meas_2006	1054	26.6	9.8	0.3	11.7	2.4	20.3	25.6	32.0	75.0							
	no2_CH_Metv14_2006	1054	24.4	6.9	0.2	8.8	2.3	19.8	24.1	28.6	51.1							
	no2_diff2006_meas_CH_Metv14	1054	2.2	7.5	0.2	8.7	-17.2	-2.7	0.8	6.0	43.9	< 0.01	0.64	0.58	0.57	0.53	0.61	0.40
meas_CH_Metv14_2007	no2_meas_2007	1099	24.9	9.5	0.3	11.4	2.5	18.7	23.7	30.1	76.0							
	no2_CH_Metv14_2007	1099	23.1	6.4	0.2	7.9	2.1	19.0	22.9	26.9	46.5							
	no2_diff2007_meas_CH_Metv14	1099	1.8	7.6	0.2	8.9	-19.2	-3.2	0.4	5.7	47.4	< 0.01	0.60	0.54	0.54	0.49	0.58	0.27
meas_CH_Metv14_2008	no2_meas_2008	1146	25.2	9.4	0.3	10.8	1.0	19.3	24.2	30.1	74.0							
	no2_CH_Metv14_2008	1146	23.0	6.2	0.2	7.6	2.2	19.1	22.9	26.7	45.9							
	no2_diff2008_meas_CH_Metv14	1146	2.3	7.8	0.2	9.2	-26.5	-2.9	1.2	6.4	43.4	< 0.01	0.56	0.50	0.49	0.44	0.53	0.23
meas_CH_Metv14_2009	no2_meas_2009	1239	26.2	9.4	0.3	11.3	1.0	20.0	25.0	31.3	68.0							
ESCAPE	no2_CH_Metv14_2009	1239	23.5	6.2	0.2	8.0	2.2	19.6	23.3	27.6	46.7							
	no2_diff2009_meas_CH_Metv14	1239	2.6	7.7	0.2	9.0	-17.9	-2.5	1.3	6.5	46.2	< 0.01	0.58	0.51	0.50	0.45	0.54	0.28
meas_CH_Metv14_2010	no2_meas_2010	1094	26.3	9.6	0.3	11.4	1.1	20.1	25.0	31.5	70.4							
	no2_CH_Metv14_2010	1094	23.0	6.0	0.2	7.5	2.2	19.3	22.9	26.8	46.3							
	no2_diff2010_meas_CH_Metv14	1094	3.3	7.8	0.2	9.1	-16.8	-2.1	2.0	7.0	47.9	< 0.01	0.58	0.48	0.46	0.41	0.51	0.24
meas_CH_Metv14_2011	no2_meas_2011	1125	27.2	10.4	0.3	11.1	1.0	21.0	25.7	32.1	94.6							
	no2_CH_Metv14_2011	1125	22.9	6.5	0.2	8.0	2.1	18.7	22.8	26.7	45.7							
	no2_diff2011_meas_CH_Metv14	1125	4.4	8.0	0.2	9.1	-17.2	-0.9	2.8	8.1	63.5	< 0.01	0.64	0.51	0.48	0.44	0.53	0.31
meas_CH_Metv14_2012	no2_meas_2012	924	25.3	9.3	0.3	10.4	1.0	19.9	24.1	30.3	67.0							
	no2_CH_Metv14_2012	924	21.4	5.8	0.2	7.4	2.1	17.7	21.2	25.1	43.9							
	no2_diff2012_meas_CH_Metv14	924	3.9	7.3	0.2	8.6	-14.4	-1.2	2.4	7.4	44.7	< 0.01	0.62	0.49	0.46	0.41	0.51	0.20
meas_CH_Metv14_2011_12	no2_meas_2011_12	312	21.9	10.4	0.6	14.7	3.7	13.7	20.5	28.4	62.9							
SAP 3	no2_CH_Metv14_mean_11_12	312	20.1	8.9	0.5	14.8	3.5	12.7	19.2	27.5	41.7							
	no2_diff2011_12_meas_CH_Metv14	312	1.8	9.0	0.5	10.2	-12.0	-4.4	-0.8	5.8	39.4	< 0.01	0.57	0.56	0.55	0.47	0.63	0.52

…_meas_… Measurement data (passive sampler data):

no indication (annual means)	*passive sampler measurements (usually 14-day measurements) from different Cantonal measurement campaigns collected by Harris Héritier for the CH_SNCLUR model.*
ESCAPE (annual means)	*above data (no indication) & Basel, Geneva, Lugano: 14-day measurements in 3 seasons in 2009*
SAP 1 (2) (annual means)	*above data (no indication) & Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne, Wald: 7/14-day measurements in 3 seasons in 1993 (2003)*
SAP 3 (bi-annual means)	*above data (no indication) & Aarau, Basel, Davos, Geneva, Lugano, Montana, Payerne, Wald: 14-day measurements in 3 seasons in 2011/12*

no2_diff1991_meas_CH_Metv14



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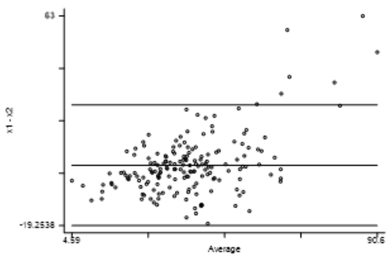

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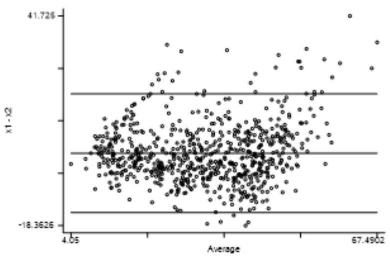

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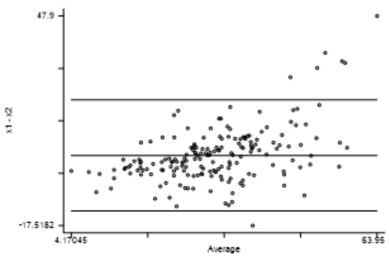

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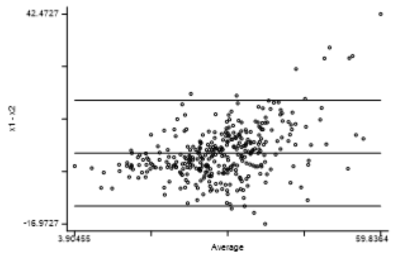

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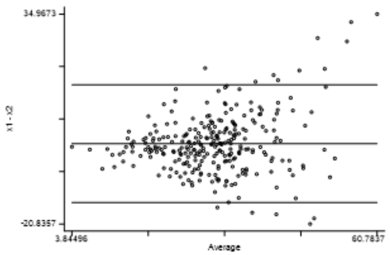

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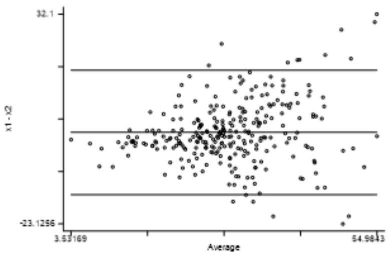

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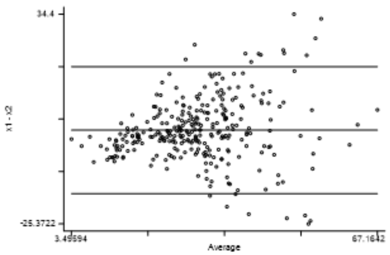

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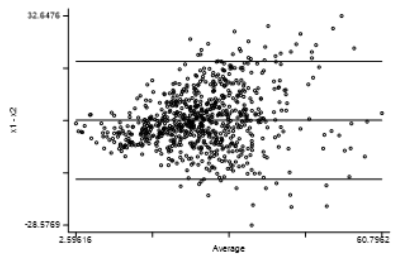

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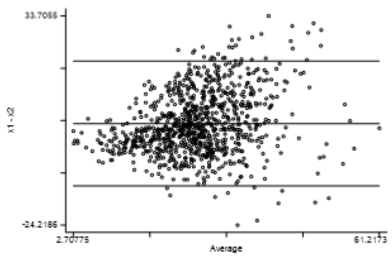

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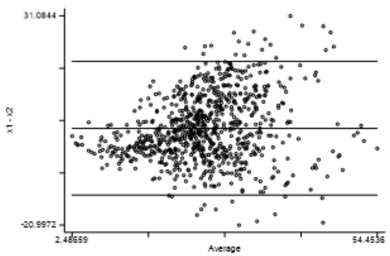

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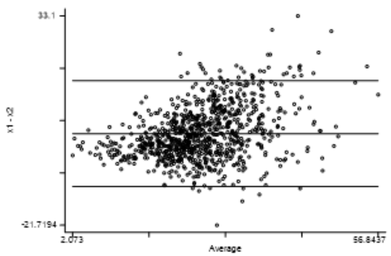


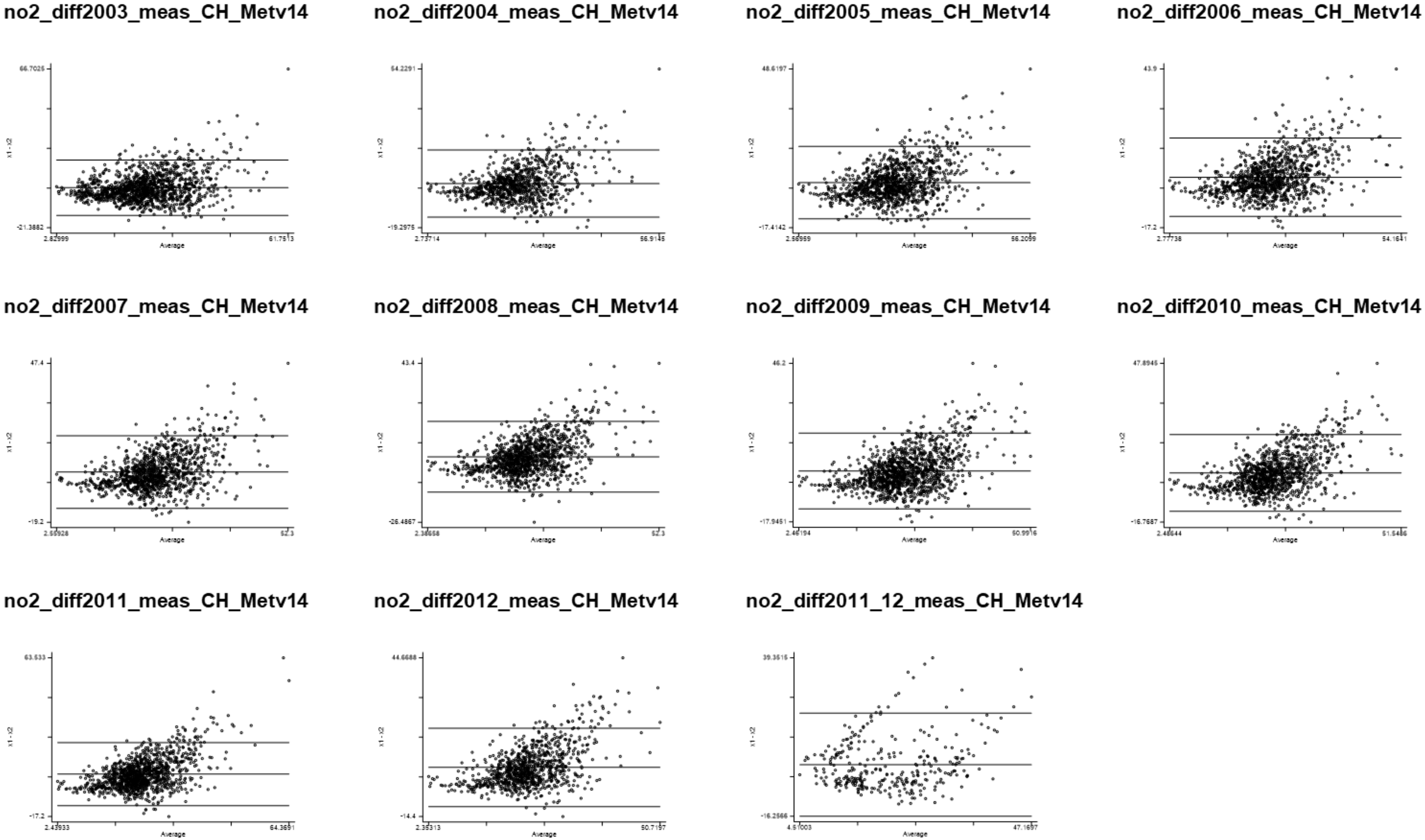


Figure A 2: BA plots of NO_2 independent measurements vs. CH_Metv14. Bland-Altman plots corresponding to Table A 15

Table A 16: NO_2 measurements vs. CH_Metv15 and CH_Metv14 for SAPALDIA. IDB and independent NO_2 measurements vs. Meteotest models CH_Metv15 and CH_Metv14 for the years 1991 (Sap1), 2002 (Sap2), 2010 (Sap3)

NO2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv15_1991	no2_IDB_1991	56	36.9	16.3	2.2	24.2	5.7	24.8	36.9	49.0	71.0							
	no2_CH_Metv15_1991	56	35.1	12.8	1.7	16.4	5.8	26.8	36.1	43.2	56.7							
	no2_diff1991_IDB_CH_Metv15	56	1.7	7.0	0.9	4.7	-13.9	-1.6	0.4	3.1	20.6	0.07	0.91	0.88	0.88	0.81	0.93	0.84
meas_CH_Metv15_1991	no2_meas_1991	182	40.0	17.7	1.3	19.2	4.7	29.0	37.8	48.2	107.6							
	no2_CH_Metv15_1991	182	36.8	9.5	0.7	10.4	8.2	31.9	37.1	42.3	65.9							
	no2_diff1991_meas_CH_Metv15	182	3.2	13.2	1.0	11.3	-22.1	-4.5	0.2	6.8	64.8	< 0.01	0.68	0.55	0.55	0.44	0.64	0.58
IDB_CH_Metv15_2002	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3							
	no2_CH_Metv15_2002	87	24.4	8.1	0.9	10.8	0.4	19.3	24.5	30.1	44.8							
	no2_diff2002_IDB_CH_Metv15	87	1.4	4.8	0.5	4.5	-5.9	-1.8	0.1	2.7	22.6	< 0.01	0.90	0.86	0.86	0.80	0.91	0.78
meas_CH_Metv15_2002	no2_meas_2002	927	26.2	9.9	0.3	12.7	0.3	19.7	25.2	32.4	64.8							
	no2_CH_Metv15_2002	927	24.2	7.0	0.2	8.1	2.6	19.9	23.8	28.0	49.2							
	no2_diff2002_meas_CH_Metv15	927	2.1	6.9	0.2	9.1	-16.0	-2.8	0.9	6.3	33.0	< 0.01	0.72	0.66	0.65	0.62	0.69	0.37
IDB_CH_Metv15_2010	no2_IDB_2010	105	26.1	11.2	1.1	13.3	0.3	19.2	24.3	32.5	64.0							
	no2_CH_Metv15_2010	105	23.8	7.7	0.8	10.0	0.4	19.0	23.7	29.0	44.6							
	no2_diff2010_IDB_CH_Metv15	105	2.3	5.6	0.5	5.8	-4.4	-1.2	0.4	4.6	30.5	< 0.01	0.89	0.81	0.81	0.73	0.87	0.65
meas_CH_Metv15_2010	no2_meas_2010	1095	26.3	9.6	0.3	11.4	1.1	20.1	25.0	31.5	70.4							
	no2_CH_Metv15_2010	1095	23.3	5.9	0.2	7.2	2.5	19.7	23.2	26.9	47.4							
	no2_diff2010_meas_CH_Metv15	1095	3.0	7.9	0.2	9.3	-16.9	-2.5	1.8	6.8	47.0	< 0.01	0.57	0.48	0.46	0.41	0.51	0.25

NO2 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv14_1991	no2_IDB_1991	56	36.9	16.3	2.2	24.2	5.7	24.8	36.9	49.0	71.0							
	no2_CH_Metv14_1991	56	34.6	14.8	2.0	19.5	5.5	24.3	35.8	43.8	65.1							
	no2_diff1991_IDB_CH_Metv14	56	2.3	7.2	1.0	1.8	-14.2	-0.5	0.3	1.3	22.0	0.02	0.90	0.88	0.88	0.81	0.93	0.88
meas_CH_Metv14_1991	no2_meas_1991	182	40.0	17.7	1.3	19.2	4.7	29.0	37.8	48.2	107.6							
	no2_CH_Metv14_1991	182	36.2	11.6	0.9	14.9	5.6	29.0	36.3	43.9	65.0							
	no2_diff1991_meas_CH_Metv14	182	3.8	11.8	0.9	11.6	-15.4	-3.7	1.8	7.9	52.8	< 0.01	0.75	0.67	0.66	0.58	0.74	0.59
IDB_CH_Metv14_2002	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3							
	no2_CH_Metv14_2002	87	24.1	9.2	1.0	13.9	0.3	17.5	24.9	31.4	42.7							
	no2_diff2002_IDB_CH_Metv14	87	1.7	4.4	0.5	1.7	-6.0	-0.1	0.2	1.6	22.0	< 0.01	0.91	0.89	0.89	0.84	0.93	0.84
meas_CH_Metv14_2002	no2_meas_2002	927	26.2	9.9	0.3	12.7	0.3	19.7	25.2	32.4	64.8							
	no2_CH_Metv14_2002	927	24.0	7.6	0.2	9.2	1.9	19.3	23.4	28.5	50.6							
	no2_diff2002_meas_CH_Metv14	927	2.3	6.9	0.2	8.9	-21.7	-2.6	1.0	6.3	33.1	< 0.01	0.71	0.67	0.66	0.62	0.70	0.38
IDB_CH_Metv14_2010	no2_IDB_2010	105	26.1	11.2	1.1	13.3	0.3	19.2	24.3	32.5	64.0							
	no2_CH_Metv14_2010	105	23.4	8.5	0.8	11.8	0.3	17.7	24.0	29.5	46.5							
	no2_diff2010_IDB_CH_Metv14	105	2.7	5.7	0.6	4.8	-5.5	-0.1	0.3	4.7	31.9	< 0.01	0.87	0.81	0.80	0.72	0.86	0.62
meas_CH_Metv14_2010	no2_meas_2010	1094	26.3	9.6	0.3	11.4	1.1	20.1	25.0	31.5	70.4							
	no2_CH_Metv14_2010	1094	23.0	6.0	0.2	7.5	2.2	19.3	22.9	26.8	46.3							
	no2_diff2010_meas_CH_Metv14	1094	3.3	7.8	0.2	9.1	-16.8	-2.1	2.0	7.0	47.9	< 0.01	0.58	0.48	0.46	0.41	0.51	0.24

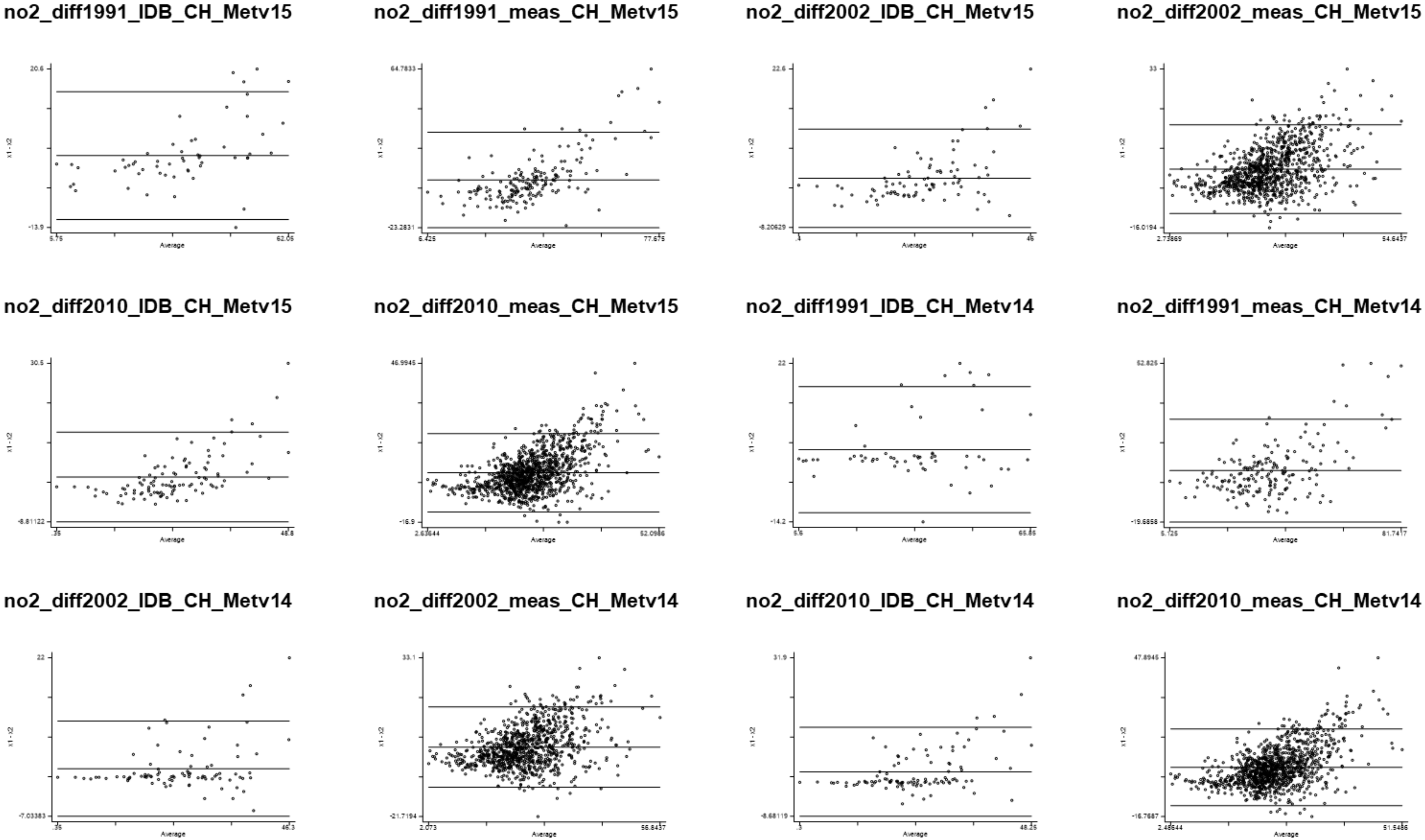


Figure A 3: BA plots of NO_2 measurements vs. CH_Metv15 and CH_Metv14 for SAPALDIA. Bland-Altman plots corresponding to Table A 16

A.3.2.2. SAPALDIA 3

Table A 17: NO_2 models vs. IDB measurements / SAP3. Comparison of all NO_2 models vs. IDB measurements for SAP3 (sorted by descending CCC)

NO2 S3 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Pollu_IDB	no2_CH_Pollu_2010	105	23.6	8.9	0.9	9.7	0.3	18.4	22.9	28.1	51.2							
	no2_IDB_2010	105	26.1	11.2	1.1	13.3	0.3	19.2	24.3	32.5	64.0							
	no2_diff2010_CH_Pollu_IDB	105	-2.6	5.2	0.5	6.9	-28.9	-5.9	-1.5	0.9	8.5	< 0.01	0.89	0.84	0.84	0.77	0.89	0.57
CH_Metv15_IDB	no2_CH_Metv15_2010	105	23.8	7.7	0.8	10.0	0.4	19.0	23.7	29.0	44.6							
	no2_IDB_2010	105	26.1	11.2	1.1	13.3	0.3	19.2	24.3	32.5	64.0							
	no2_diff2010_CH_Metv15_IDB	105	-2.3	5.6	0.5	5.8	-30.5	-4.6	-0.4	1.2	4.4	< 0.01	0.89	0.81	0.81	0.73	0.87	0.65
CH_Metv14_IDB	no2_CH_Metv14_2010	105	23.4	8.5	0.8	11.8	0.3	17.7	24.0	29.5	46.5							
	no2_IDB_2010	105	26.1	11.2	1.1	13.3	0.3	19.2	24.3	32.5	64.0							
	no2_diff2010_CH_Metv14_IDB	105	-2.7	5.7	0.6	4.8	-31.9	-4.7	-0.3	0.1	5.5	< 0.01	0.87	0.81	0.80	0.72	0.86	0.62
EUR_ElapseSat_IDB	no2_EUR_ElapseSat_2010	106	25.6	10.0	1.0	12.0	2.6	18.9	25.2	30.8	61.7							
	no2_IDB_2010	106	26.0	11.2	1.1	13.5	0.3	19.0	24.1	32.5	64.0							
	no2_diff2010_EUR_ElapseSat_IDB	106	-0.4	7.6	0.7	9.3	-25.0	-4.7	1.0	4.5	16.0	0.58	0.75	0.74	0.75	0.65	0.82	0.45
GLOB_Sat_IDB	no2_GLOB_Sat_2011	106	19.5	7.4	0.7	7.6	0.0	15.3	19.1	22.9	40.1							
	no2_IDB_2010	106	26.0	11.2	1.1	13.5	0.3	19.0	24.1	32.5	64.0							
	no2_diff2010_GLOB_Sat_IDB	106	-6.5	7.6	0.7	8.6	-35.3	-10.4	-5.1	-1.8	16.9	< 0.01	0.73	0.55	0.50	0.34	0.63	0.33
CH_SapWRF_IDB	no2_CH_SapWRF_2010	106	23.8	6.3	0.6	7.9	4.6	19.8	23.2	27.7	39.3							
	no2_IDB_2010	106	26.0	11.2	1.1	13.5	0.3	19.0	24.1	32.5	64.0							
	no2_diff2010_CH_SapWRF_IDB	106	-2.2	8.9	0.9	11.5	-37.2	-7.3	-0.5	4.3	12.1	0.01	0.61	0.51	0.50	0.35	0.63	0.26
mean_CH_Metv15_IDB	no2_CH_Metv15_mean_11_12	83	22.9	8.2	0.9	9.8	0.3	17.6	22.7	27.5	41.8							
	no2_IDB_mean_11_12	83	25.2	11.6	1.3	14.7	0.3	17.8	23.5	32.5	60.8							
	no2_diff2011_12_CH_Metv15_IDB	83	-2.3	5.4	0.6	6.4	-25.3	-5.0	-0.4	1.4	4.5	< 0.01	0.91	0.83	0.83	0.75	0.89	0.69
mean_CH_Metv14_IDB	no2_CH_Metv14_mean_11_12	83	22.7	9.2	1.0	13.9	0.3	15.9	22.8	29.8	43.1							
	no2_IDB_mean_11_12	83	25.2	11.6	1.3	14.7	0.3	17.8	23.5	32.5	60.8							
	no2_diff2011_12_CH_Metv14_IDB	83	-2.5	5.6	0.6	3.7	-26.3	-3.5	-0.1	0.2	5.8	< 0.01	0.88	0.83	0.83	0.75	0.89	0.76

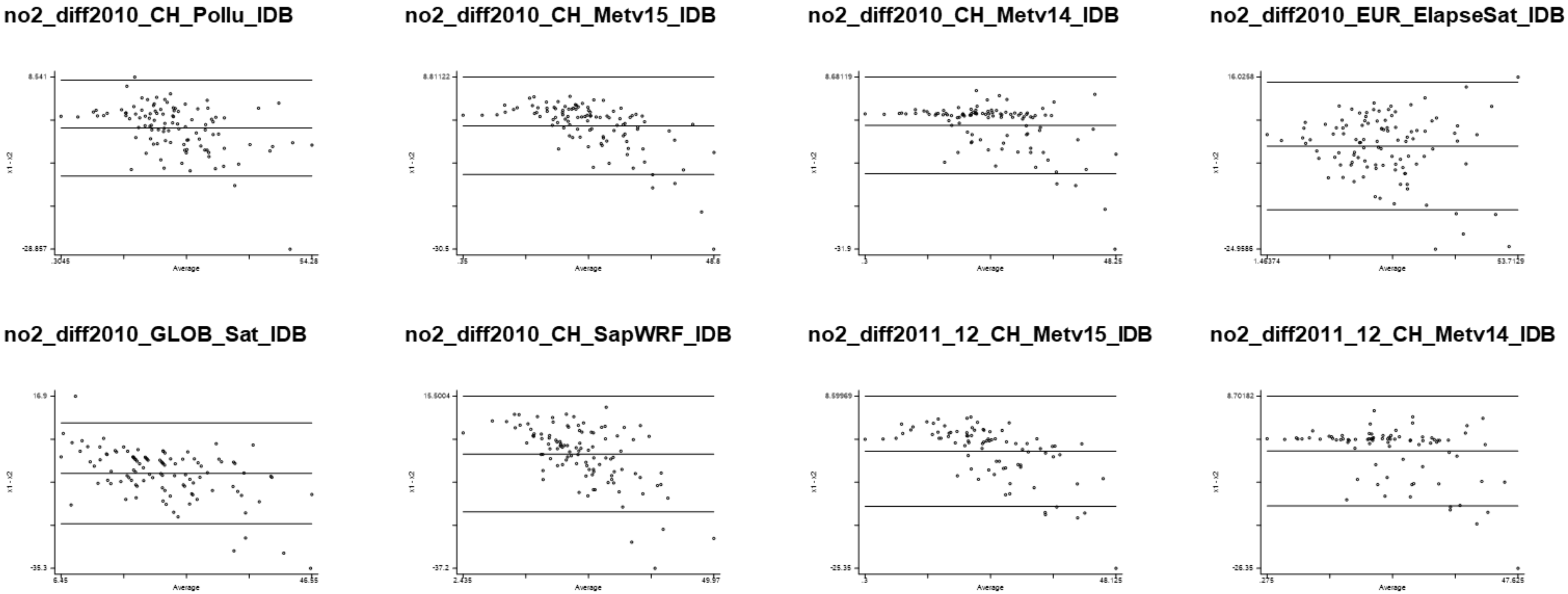
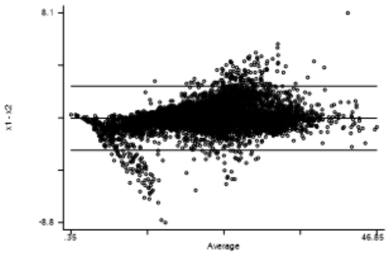


Figure A 4: BA plots of NO_2 models vs. IDB measurements / SAP3. Bland-Altman plots corresponding to Table A 17

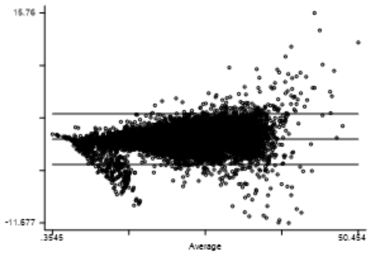
Table A 18: NO_2 models vs. CH_Metv15 / SAP3. Comparison of all NO_2 models vs. Meteotest model CH_Metv15 for SAP3 (sorted by descending CCC)

NO2 S3 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Metv15	no2_CH_Metv14_2010	21108	22.4	7.9	0.1	12.4	0.3	16.7	22.7	29.1	46.5							
	no2_CH_Metv15_2010	21108	22.8	7.6	0.1	12.4	0.4	17.0	22.8	29.4	47.4							
	no2_diff2010_CH_Metv14_CH_Metv15	21108	-0.4	1.3	0.0	1.0	-8.8	-0.9	-0.4	0.1	8.1	< 0.01	0.99	0.98	0.98	0.98	0.99	0.88
CH_Pollu_CH_Metv15	no2_CH_Pollu_2010	19426	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_CH_Metv15_2010	19426	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_diff2010_CH_Pollu_CH_Metv15	19426	-0.7	1.6	0.0	1.7	-11.7	-1.5	-0.7	0.2	15.8	< 0.01	0.98	0.97	0.97	0.97	0.98	0.90
CH_SapWRF_CH_Metv15	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_diff2010_CH_SapWRF_CH_Metv15	19434	1.6	3.6	0.0	4.3	-20.6	-0.4	1.7	3.9	19.6	< 0.01	0.88	0.86	0.86	0.86	0.86	0.63
EUR_Sat_CH_Metv15	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_CH_Metv15_2010	19138	22.8	7.6	0.1	12.8	1.1	16.9	22.8	29.7	46.3							
	no2_diff2010_EUR_Sat_CH_Metv15	19138	3.0	4.0	0.0	5.0	-19.8	0.4	2.7	5.4	35.0	< 0.01	0.89	0.82	0.82	0.81	0.82	0.72
EUR_ElapseSat_CH_Metv15	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_diff2010_EUR_ElapseSat_CH_Metv15	19434	3.0	4.1	0.0	5.1	-25.7	0.4	2.6	5.5	35.6	< 0.01	0.89	0.82	0.82	0.81	0.82	0.73
GLOB_Sat_CH_Metv15	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_diff2010_GLOB_Sat_CH_Metv15	19434	-3.6	4.1	0.0	5.1	-41.2	-6.3	-3.9	-1.2	24.1	< 0.01	0.85	0.75	0.74	0.73	0.74	0.33
mean_CH_Metv14_CH_Metv15	no2_CH_Metv14_mean_11_12	19434	21.8	8.3	0.1	12.5	0.3	15.8	21.8	28.2	48.2							
	no2_CH_Metv15_mean_11_12	19434	22.1	7.7	0.1	12.6	0.3	16.0	21.8	28.6	44.8							
	no2_diff2011_12_CH_Metv14_CH_Metv15	19434	-0.3	1.4	0.0	1.1	-9.4	-0.8	-0.3	0.3	7.1	< 0.01	0.99	0.98	0.98	0.98	0.98	0.85
CH_Sap3LUR_CH_Metv15	no2_CH_Sap3LUR_11_12	11357	19.7	8.5	0.1	10.7	0.0	13.8	17.8	24.6	62.9							
	no2_CH_Metv15_mean_11_12	11357	21.2	7.6	0.1	12.0	2.8	15.5	20.7	27.5	44.8							
	no2_diff2011_12_CH_Sap3LUR_CH_Metv15	11357	-1.6	5.5	0.1	5.9	-18.7	-5.3	-2.9	0.6	36.6	< 0.01	0.77	0.75	0.75	0.74	0.76	0.55

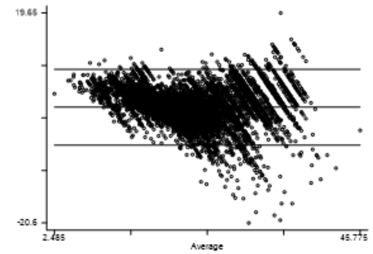
no2_diff2010_CH_Metv14_ CH_Metv15



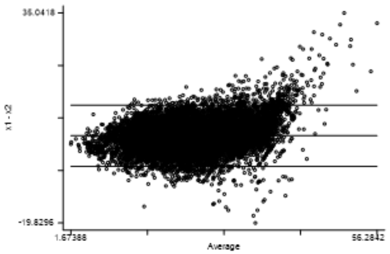
no2_diff2010_CH_Pollu_ CH_Metv15



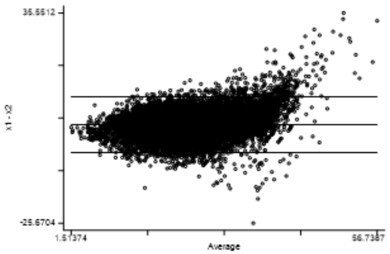
no2_diff2010_CH_SapWRF_ CH_Metv15



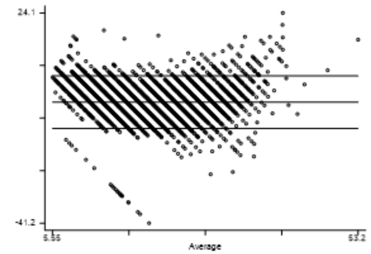
no2_diff2010_EUR_Sat_ CH_Metv15



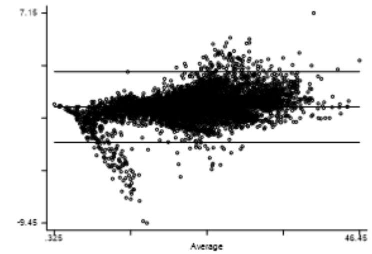
no2_diff2010_EUR_ElapseSat_ CH_Metv15



no2_diff2010_GLOB_Sat_ CH_Metv15



no2_diff2011_12_CH_Metv14_ CH_Metv15



no2_diff2011_12_CH_Sap3LUR_ CH_Metv15

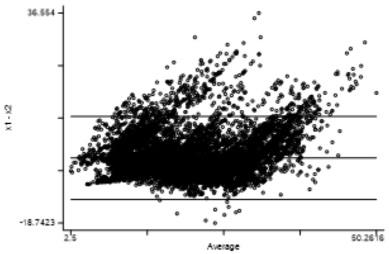


Figure A 5: BA plots of NO_2 models vs. CH_Metv15 / SAP3 Bland-Altman plots corresponding to Table A 18

Table A 19: NO_2 models vs. CH_Metv14 / SAP3. Comparison of all NO_2 models vs. Meteotest model CH_Metv14 for SAP3 (sorted by descending CCC)

NO2 S3 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Metv14	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_diff2010_CH_Metv15_CH_Metv14	19434	0.4	1.3	0.0	1.0	-8.1	-0.1	0.4	0.9	8.8	< 0.01	0.99	0.98	0.98	0.98	0.99	0.88
CH_Pollu_CH_Metv14	no2_CH_Pollu_2010	19426	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_CH_Metv14_2010	19426	22.4	8.1	0.1	13.0	0.3	16.5	22.8	29.5	46.5							
	no2_diff2010_CH_Pollu_CH_Metv14	19426	-0.3	1.9	0.0	1.8	-14.0	-1.2	-0.3	0.6	16.3	< 0.01	0.97	0.97	0.97	0.97	0.97	0.80
CH_SapWRF_CH_Metv14	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_diff2010_CH_SapWRF_CH_Metv14	19434	2.0	3.9	0.0	4.7	-23.0	-0.1	2.2	4.6	20.3	< 0.01	0.87	0.84	0.84	0.83	0.84	0.52
EUR_Sat_CH_Metv14	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_CH_Metv14_2010	19138	22.4	8.1	0.1	13.1	1.0	16.4	22.8	29.5	44.1							
	no2_diff2010_EUR_Sat_CH_Metv14	19138	3.4	4.1	0.0	5.2	-19.2	0.8	3.2	6.0	36.1	< 0.01	0.88	0.81	0.80	0.80	0.81	0.66
EUR_ElapseSat_CH_Metv14	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_diff2010_EUR_ElapseSat_CH_Metv14	19434	3.4	4.2	0.0	5.2	-24.4	0.8	3.2	6.0	36.7	< 0.01	0.88	0.81	0.80	0.80	0.81	0.66
GLOB_Sat_CH_Metv14	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_diff2010_GLOB_Sat_CH_Metv14	19434	-3.2	4.5	0.0	5.5	-41.1	-6.2	-3.7	-0.7	24.9	< 0.01	0.83	0.75	0.74	0.73	0.74	0.32
mean_CH_Metv15_CH_Metv14	no2_CH_Metv15_mean_11_12	19434	22.1	7.7	0.1	12.6	0.3	16.0	21.8	28.6	44.8							
	no2_CH_Metv14_mean_11_12	19434	21.8	8.3	0.1	12.5	0.3	15.8	21.8	28.2	48.2							
	no2_diff2011_12_CH_Metv15_CH_Metv14	19434	0.3	1.4	0.0	1.1	-7.1	-0.3	0.3	0.8	9.4	< 0.01	0.99	0.98	0.98	0.98	0.98	0.85
CH_Sap3LUR_CH_Metv14	no2_CH_Sap3LUR_11_12	11357	19.7	8.5	0.1	10.7	0.0	13.8	17.8	24.6	62.9							
	no2_CH_Metv14_mean_11_12	11357	21.0	8.1	0.1	12.3	2.3	15.0	20.5	27.3	48.2							
	no2_diff2011_12_CH_Sap3LUR_CH_Metv14	11357	-1.3	6.1	0.1	6.1	-19.6	-5.3	-2.7	0.9	37.9	< 0.01	0.73	0.72	0.72	0.71	0.73	0.52

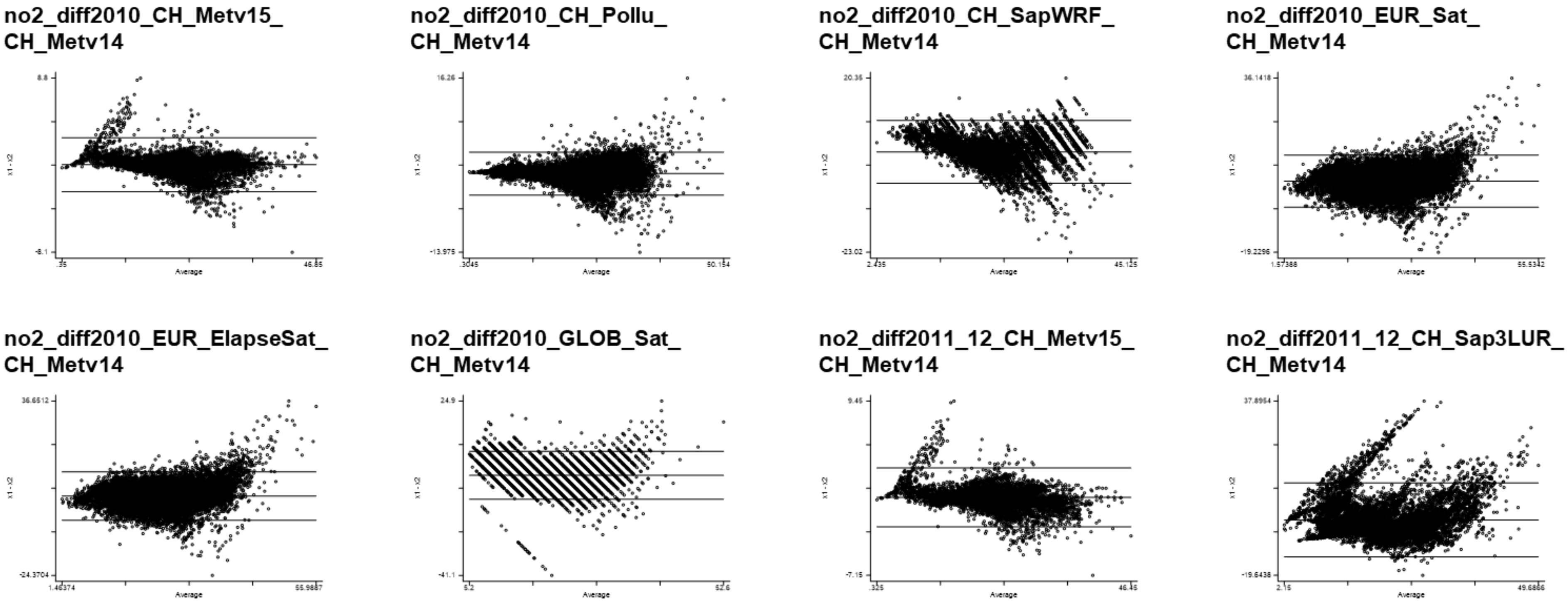


Figure A 6: BA plots of NO_2 models vs. CH_Metv14 / SAP3. Bland-Altman plots corresponding to Table A 19

Table A 20: NO_2 models vs EUR_Sat model / SAP3. Comparison of all NO_2 models vs. European Satellite model (EUR_Sat) for SAP3 (sorted by descending CCC)

NO2 S3 / EUR_Sat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_ElapseSat_EUR_Sat	no2_EUR_ElapseSat_2010	19155	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_EUR_ElapseSat_EUR_Sat	19155	0.0	0.7	0.0	0.7	-5.0	-0.4	-0.1	0.3	5.0	< 0.01	1.00	1.00	1.00	1.00	1.00	0.97
CH_Metv15_EUR_Sat	no2_CH_Metv15_2010	19138	22.8	7.6	0.1	12.8	1.1	16.9	22.8	29.7	46.3							
	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_CH_Metv15_EUR_Sat	19138	-3.0	4.0	0.0	5.0	-35.0	-5.4	-2.7	-0.4	19.8	< 0.01	0.89	0.82	0.82	0.81	0.82	0.72
CH_Pollu_EUR_Sat	no2_CH_Pollu_2010	19138	22.1	8.2	0.1	13.8	0.9	15.9	21.9	29.8	56.4							
	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_CH_Pollu_EUR_Sat	19138	-3.7	3.8	0.0	4.8	-36.3	-6.1	-3.5	-1.3	31.7	< 0.01	0.90	0.82	0.81	0.80	0.81	0.73
CH_Metv14_EUR_Sat	no2_CH_Metv14_2010	19138	22.4	8.1	0.1	13.1	1.0	16.4	22.8	29.5	44.1							
	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_CH_Metv14_EUR_Sat	19138	-3.4	4.1	0.0	5.2	-36.1	-6.0	-3.2	-0.8	19.2	< 0.01	0.88	0.81	0.80	0.80	0.81	0.66
CH_SapWRF_EUR_Sat	no2_CH_SapWRF_2010	19155	24.4	7.2	0.1	13.4	7.8	18.3	23.3	31.7	44.3							
	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_CH_SapWRF_EUR_Sat	19155	-1.4	4.8	0.0	6.2	-40.0	-4.4	-0.9	1.8	20.0	< 0.01	0.83	0.80	0.80	0.80	0.81	0.65
GLOB_Sat_EUR_Sat	no2_GLOB_Sat_2011	19155	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_diff2010_GLOB_Sat_EUR_Sat	19155	-6.6	4.5	0.0	5.5	-62.8	-9.5	-6.5	-3.9	14.8	< 0.01	0.85	0.61	0.55	0.54	0.56	0.25

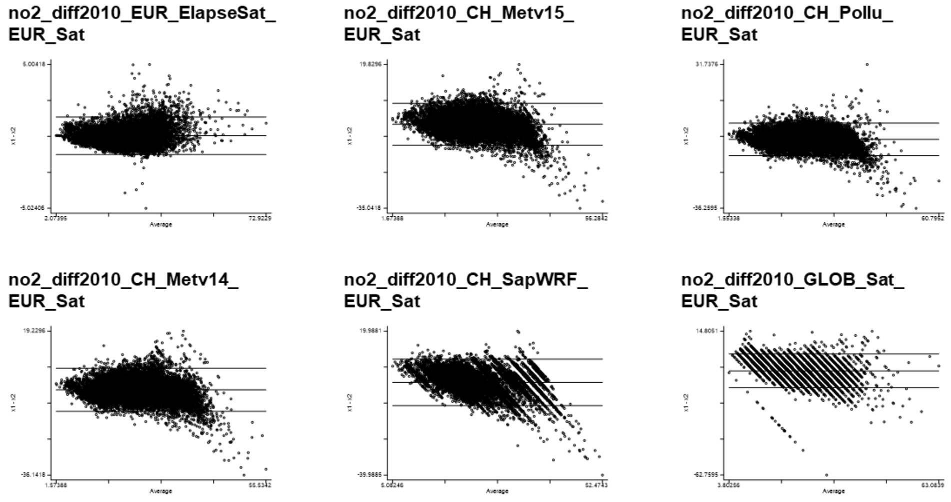


Figure A 7: BA plots of NO_2 models vs. EUR_Sat / SAP3. Bland-Altman plots corresponding to Table A 20

Table A 21: NO_2 models vs. EUR_ElapseSat / SAP3. Comparison of all NO_2 models vs. European Elapse Satellite model (EUR_ElapseSat) for SAP3 (sorted by descending CCC)

NO2 S3 / EUR_ElapseSat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_Sat_EUR_ElapseSat	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_EUR_ElapseSat_2010	19155	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_EUR_Sat_EUR_ElapseSat	19155	0.0	0.7	0.0	0.7	-5.0	-0.3	0.1	0.4	5.0	< 0.01	1.00	1.00	1.00	1.00	1.00	0.97
CH_Metv15_EUR_ElapseSat	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_CH_Metv15_EUR_ElapseSat	19434	-3.0	4.1	0.0	5.1	-35.6	-5.5	-2.6	-0.4	25.7	< 0.01	0.89	0.82	0.82	0.81	0.82	0.73
CH_Pollu_EUR_ElapseSat	NO2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_CH_Pollu_EUR_ElapseSat	19434	-3.7	3.9	0.0	4.9	-37.2	-6.2	-3.5	-1.3	30.5	< 0.01	0.90	0.82	0.81	0.80	0.81	0.74
CH_Metv14_EUR_ElapseSat	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_CH_Metv14_EUR_ElapseSat	19434	-3.4	4.2	0.0	5.2	-36.7	-6.0	-3.2	-0.8	24.4	< 0.01	0.88	0.81	0.80	0.80	0.81	0.66
CH_SapWRF_EUR_ElapseSat	no2_CH_SapWRF_2010	19460	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_EUR_ElapseSat_2010	19460	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_CH_SapWRF_EUR_ElapseSat	19460	-1.4	5.0	0.0	6.4	-40.9	-4.4	-0.8	1.9	22.8	< 0.01	0.82	0.79	0.79	0.79	0.80	0.65
GLOB_Sat_EUR_ElapseSat	no2_GLOB_Sat_2011	19460	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_EUR_ElapseSat_2010	19460	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_diff2010_GLOB_Sat_EUR_ElapseSat	19460	-6.6	4.6	0.0	5.6	-64.6	-9.5	-6.5	-3.9	20.6	< 0.01	0.86	0.61	0.56	0.55	0.57	0.26

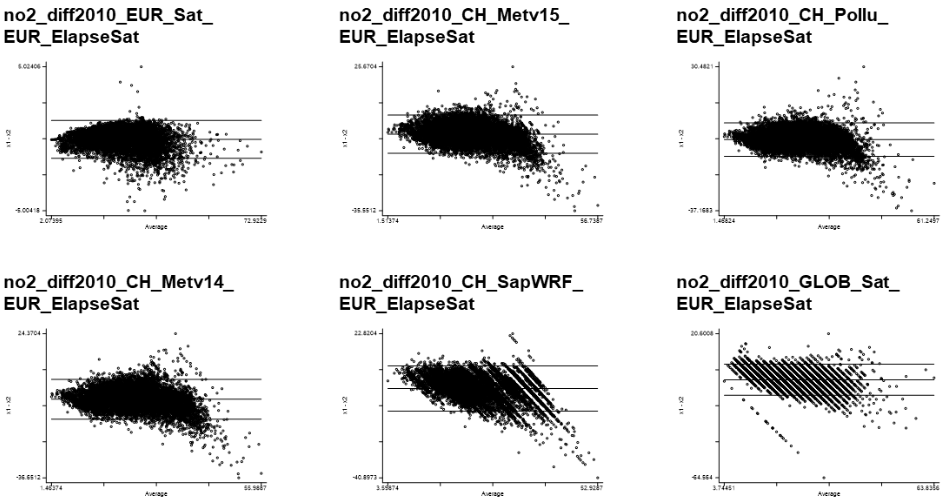


Figure A 8: BA plots of NO_2 models vs. EUR_ElapseSat model / SAP3. Bland-Altman plots corresponding to Table A 21

Table A 22: NO_2 models vs. GLOB_Sat / SAP3. Comparison of all NO_2 models vs. Global Satellite model (GLOB_Sat) for SAP3 (sorted by descending CCC)

NO2 S3 / GLOB_Sat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Pollu_GLOB_Sat	no2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_CH_Pollu_GLOB_Sat	19434	2.9	4.4	0.0	5.3	-22.4	0.5	3.2	5.8	39.4	< 0.01	0.84	0.77	0.76	0.76	0.77	0.33
CH_Metv15_GLOB_Sat	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_CH_Metv15_GLOB_Sat	19434	3.6	4.1	0.0	5.1	-24.1	1.2	3.9	6.3	41.2	< 0.01	0.85	0.75	0.74	0.73	0.74	0.33
CH_Metv14_GLOB_Sat	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_CH_Metv14_GLOB_Sat	19434	3.2	4.5	0.0	5.5	-24.9	0.7	3.7	6.2	41.1	< 0.01	0.83	0.75	0.74	0.73	0.74	0.32
CH_SapWRF_GLOB_Sat	no2_CH_SapWRF_2010	19460	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_GLOB_Sat_2011	19460	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_CH_SapWRF_GLOB_Sat	19460	5.2	4.2	0.0	5.1	-28.7	2.6	5.5	7.8	39.3	< 0.01	0.82	0.65	0.60	0.59	0.61	0.26
EUR_ElapseSat_GLOB_Sat	no2_EUR_ElapseSat_2010	19460	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_GLOB_Sat_2011	19460	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_EUR_ElapseSat_GLOB_Sat	19460	6.6	4.6	0.0	5.6	-20.6	3.9	6.5	9.5	64.6	< 0.01	0.86	0.61	0.56	0.55	0.57	0.26
EUR_Sat_GLOB_Sat	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_GLOB_Sat_2011	19155	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_diff2010_EUR_Sat_GLOB_Sat	19155	6.6	4.5	0.0	5.5	-14.8	3.9	6.5	9.5	62.8	< 0.01	0.85	0.61	0.55	0.54	0.56	0.25

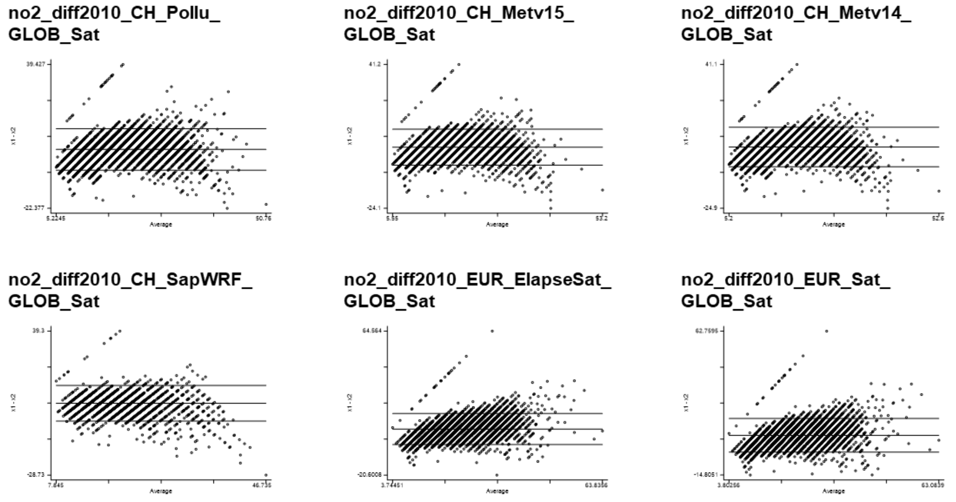


Figure A 9: BA plots of NO_2 models vs. GLOB_Sat / SAP3. Bland-Altman plots corresponding to Table A 22

Table A 23: NO_2 models vs. CH_SapWRF / SAP3. Comparison of all NO_2 models vs. WRF-Chem model (CH_SapWRF) for SAP3 (sorted by descending CCC)

NO2 S3 / CH_SapWRF	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_SapWRF	no2_CH_Metv15_2010	19434	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_diff2010_CH_Metv15_CH_SapWRF	19434	-1.6	3.6	0.0	4.3	-19.6	-3.9	-1.7	0.4	20.6	< 0.01	0.88	0.86	0.86	0.86	0.86	0.63
CH_Metv14_CH_SapWRF	no2_CH_Metv14_2010	19434	22.4	8.1	0.1	13.1	0.3	16.4	22.8	29.5	46.5							
	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_diff2010_CH_Metv14_CH_SapWRF	19434	-2.0	3.9	0.0	4.7	-20.3	-4.6	-2.2	0.1	23.0	< 0.01	0.87	0.84	0.84	0.83	0.84	0.52
CH_Pollu_CH_SapWRF	no2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_diff2010_CH_Pollu_CH_SapWRF	19434	-2.3	3.9	0.0	4.3	-19.5	-4.7	-2.5	-0.3	32.0	< 0.01	0.88	0.84	0.83	0.83	0.84	0.64
EUR_Sat_CH_SapWRF	no2_EUR_Sat_2010	19155	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_CH_SapWRF_2010	19155	24.4	7.2	0.1	13.4	7.8	18.3	23.3	31.7	44.3							
	no2_diff2010_EUR_Sat_CH_SapWRF	19155	1.4	4.8	0.0	6.2	-20.0	-1.8	0.9	4.4	40.0	< 0.01	0.83	0.80	0.80	0.80	0.81	0.65
EUR_ElapseSat_CH_SapWRF	no2_EUR_ElapseSat_2010	19460	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_CH_SapWRF_2010	19460	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_diff2010_EUR_ElapseSat_CH_SapWRF	19460	1.4	5.0	0.0	6.4	-22.8	-1.9	0.8	4.4	40.9	< 0.01	0.82	0.79	0.79	0.79	0.80	0.65
GLOB_Sat_CH_SapWRF	no2_GLOB_Sat_2011	19460	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_CH_SapWRF_2010	19460	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_diff2010_GLOB_Sat_CH_SapWRF	19460	-5.2	4.2	0.0	5.1	-39.3	-7.8	-5.5	-2.6	28.7	< 0.01	0.82	0.65	0.60	0.59	0.61	0.26

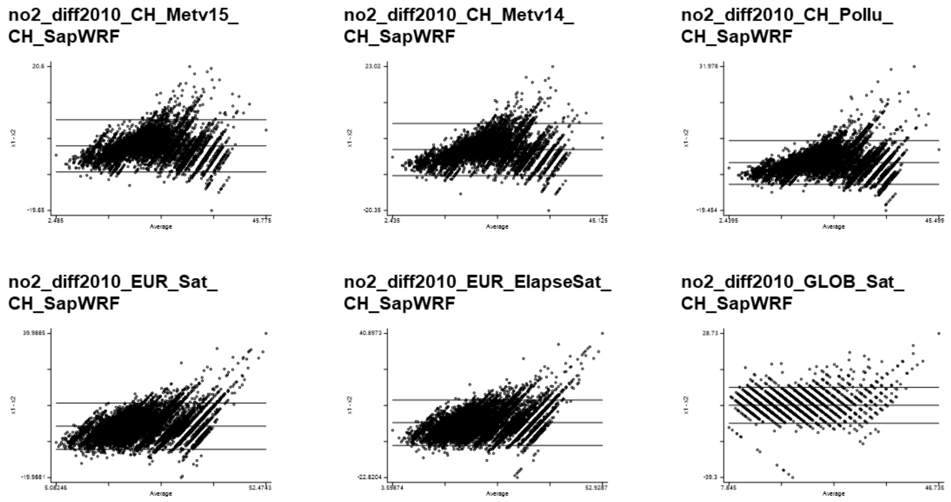


Figure A 10: BA plots of NO_2 models vs. CH_SapWRF / SAP3. Bland-Altman plots corresponding to Table A 23

Table A 24: NO_2 models vs. CH_Pollu / SAP3. Comparison of all NO_2 models vs. PolluMap model (CH_Pollu) for SAP3 (sorted by descending CCC)

NO2 S3 / CH_Pollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Pollu	no2_CH_Metv15_2010	19426	22.8	7.7	0.1	12.7	0.4	16.9	22.8	29.6	47.4							
	no2_CH_Pollu_2010	19426	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_diff2010_CH_Metv15_CH_Pollu	19426	0.7	1.6	0.0	1.7	-15.8	-0.2	0.7	1.5	11.7	< 0.01	0.98	0.97	0.97	0.97	0.98	0.90
CH_Metv14_CH_Pollu	no2_CH_Metv14_2010	19426	22.4	8.1	0.1	13.0	0.3	16.5	22.8	29.5	46.5							
	no2_CH_Pollu_2010	19426	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_diff2010_CH_Metv14_CH_Pollu	19426	0.3	1.9	0.0	1.8	-16.3	-0.6	0.3	1.2	14.0	< 0.01	0.97	0.97	0.97	0.97	0.97	0.80
CH_SapWRF_CH_Pollu	no2_CH_SapWRF_2010	19434	24.4	7.2	0.1	13.4	4.6	18.3	23.3	31.7	44.3							
	no2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_diff2010_CH_SapWRF_CH_Pollu	19434	2.3	3.9	0.0	4.3	-32.0	0.3	2.5	4.7	19.5	< 0.01	0.88	0.84	0.83	0.83	0.84	0.64
EUR_Sat_CH_Pollu	no2_EUR_Sat_2010	19138	25.8	8.6	0.1	13.3	2.0	19.2	25.3	32.6	72.5							
	no2_CH_Pollu_2010	19138	22.1	8.2	0.1	13.8	0.9	15.9	21.9	29.8	56.4							
	no2_diff2010_EUR_Sat_CH_Pollu	19138	3.7	3.8	0.0	4.8	-31.7	1.3	3.5	6.1	36.3	< 0.01	0.90	0.82	0.81	0.80	0.81	0.73
EUR_ElapseSat_CH_Pollu	no2_EUR_ElapseSat_2010	19434	25.8	8.8	0.1	13.5	2.1	19.1	25.2	32.6	73.4							
	no2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_diff2010_EUR_ElapseSat_CH_Pollu	19434	3.7	3.9	0.0	4.9	-30.5	1.3	3.5	6.2	37.2	< 0.01	0.90	0.82	0.81	0.80	0.81	0.74
GLOB_Sat_CH_Pollu	no2_GLOB_Sat_2011	19434	19.2	6.9	0.0	11.4	0.0	13.4	19.1	24.8	61.1							
	no2_CH_Pollu_2010	19434	22.1	8.2	0.1	13.8	0.3	15.9	21.9	29.7	56.4							
	no2_diff2010_GLOB_Sat_CH_Pollu	19434	-2.9	4.4	0.0	5.3	-39.4	-5.8	-3.2	-0.5	22.4	< 0.01	0.84	0.77	0.76	0.76	0.77	0.33

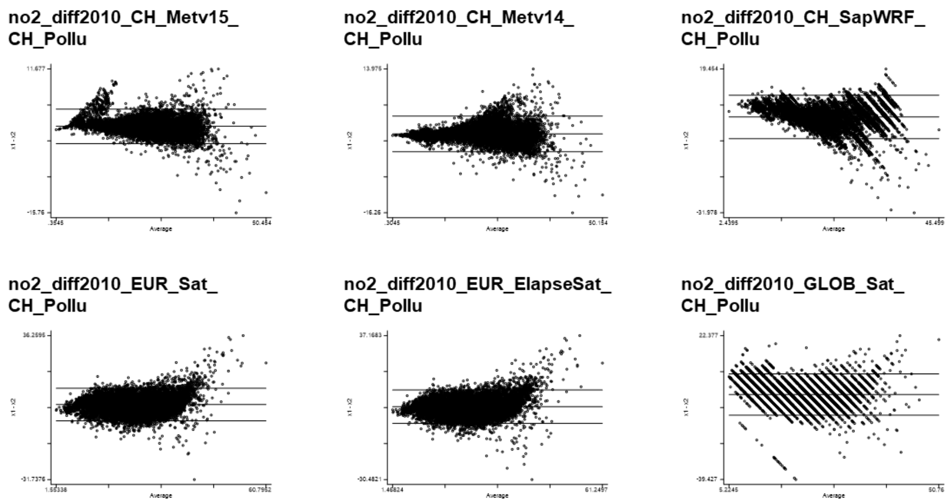


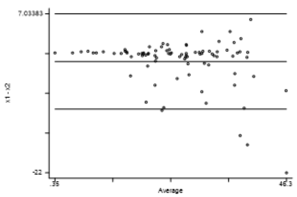
Figure A 11: BA plots of NO_2 models vs. CH_Pollu / SAP3. Bland-Altman plots corresponding to Table A 24

A.3.2.3. SAPALDIA 2

Table A 25: NO_2 models vs. IDB / SAP2. Comparison of all NO_2 models vs. IDB measurements for SAP2 (sorted by descending CCC)

NO2 S2 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_IDB	no2_CH_Metv14_2002	87	24.1	9.2	1.0	13.9	0.3	17.5	24.9	31.4	42.7							
	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3							
	no2_diff2002_CH_Metv14_IDB	87	-1.7	4.4	0.5	1.7	-22.0	-1.6	-0.2	0.1	6.0	< 0.01	0.91	0.89	0.89	0.84	0.93	0.84
CH_Metv15_IDB	no2_CH_Metv15_2002	87	24.4	8.1	0.9	10.8	0.4	19.3	24.5	30.1	44.8							
	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3							
	no2_diff2002_CH_Metv15_IDB	87	-1.4	4.8	0.5	4.5	-22.6	-2.7	-0.1	1.8	5.9	< 0.01	0.90	0.86	0.86	0.80	0.91	0.78
CH_SNCLUR_IDB	no2_CH_SNCLUR_2002	29	27.9	9.8	1.8	14.0	11.7	21.2	27.1	35.2	51.4							
	no2_IDB_2002	29	24.0	10.1	1.9	14.2	5.5	17.7	22.8	31.9	44.7							
	no2_diff2002_CH_SNCLUR_IDB	29	3.8	4.0	0.7	3.4	-6.9	3.0	3.9	6.4	11.1	< 0.01	0.92	0.85	0.85	0.72	0.93	0.77
CH_SapWRF_IDB	no2_CH_SapWRF_2002	87	23.2	7.1	0.8	10.7	1.3	17.8	22.5	28.5	36.7							
	no2_IDB_2002	87	25.8	10.5	1.1	13.9	0.4	18.6	26.5	32.5	57.3							
	no2_diff2002_CH_SapWRF_IDB	87	-2.6	7.4	0.8	10.2	-22.0	-7.5	-1.7	2.7	17.6	< 0.01	0.71	0.63	0.63	0.48	0.74	0.43

no2_diff2002_CH_Metv14_IDB



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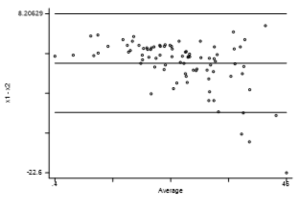

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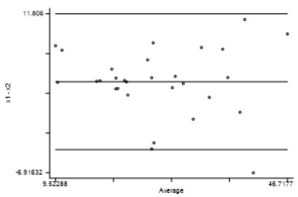

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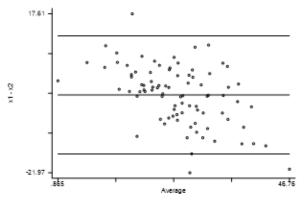

Figure A 12: BA plots of NO_2 models vs. IDB / SAP2. Bland-Altman plots corresponding to Table A 25

Table A 26: NO_2 models vs. CH_Metv15 / SAP2. Comparison of all NO_2 models vs. Meteotest model version CH_Metv15 for SAP2 (sorted by descending CCC)

NO2 S2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Metv15	no2_CH_Metv14_2002	19434	23.2	9.2	0.1	15.1	0.3	16.0	23.4	31.1	50.2							
	no2_CH_Metv15_2002	19434	24.0	8.2	0.1	13.7	0.4	17.6	23.8	31.3	49.2							
	no2_diff2002_CH_Metv14_CH_Metv15	19434	-0.7	2.1	0.0	2.1	-12.0	-1.7	-0.8	0.4	16.3	< 0.01	0.98	0.97	0.97	0.97	0.97	0.91
CH_SapWRF_CH_Metv15	no2_CH_SapWRF_2002	19434	23.7	7.8	0.1	13.8	1.3	17.2	22.8	31.0	37.3							
	no2_CH_Metv15_2002	19434	24.0	8.2	0.1	13.7	0.4	17.6	23.8	31.3	49.2							
	no2_diff2002_CH_SapWRF_CH_Metv15	19434	-0.2	3.7	0.0	4.5	-24.1	-2.3	-0.2	2.2	13.5	< 0.01	0.89	0.89	0.89	0.89	0.90	0.70
CH_SNCLUR_CH_Metv15	no2_CH_SNCLUR_2002	4245	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_CH_Metv15_2002	4245	26.3	8.4	0.1	15.8	4.3	19.0	24.8	34.8	47.4							
	no2_diff2002_CH_SNCLUR_CH_Metv15	4245	3.7	3.7	0.1	3.8	-10.6	1.7	3.2	5.5	34.7	< 0.01	0.91	0.83	0.82	0.81	0.83	0.75
CH_Sap2LUR_CH_Metv15	no2_CH_Sap2LUR_2002	12486	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_CH_Metv15_2002	12486	24.6	8.3	0.1	13.8	2.8	18.1	24.5	31.9	47.7							
	no2_diff2002_CH_Sap2LUR_CH_Metv15	12486	0.8	5.6	0.1	7.3	-21.7	-3.2	0.0	4.0	31.9	< 0.01	0.84	0.82	0.81	0.81	0.82	0.72
EUR_EscapeLUR_d_CH_Metv15	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_CH_Metv15_2002	1114	30.6	4.7	0.1	6.5	17.4	27.2	31.3	33.7	47.7							
	no2_diff2002_EUR_EscapeLUR_d_CH_Metv15	1114	-1.7	4.7	0.1	5.7	-18.0	-4.6	-1.3	1.1	21.4	< 0.01	0.71	0.64	0.63	0.59	0.67	0.57
EUR_EscapeLUR_r_CH_Metv15	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_CH_Metv15_2002	1114	30.6	4.7	0.1	6.5	17.4	27.2	31.3	33.7	47.7							
	no2_diff2002_EUR_EscapeLUR_r_CH_Metv15	1114	-1.5	5.5	0.2	6.6	-17.8	-5.0	-1.1	1.6	26.6	< 0.01	0.74	0.63	0.63	0.59	0.66	0.59

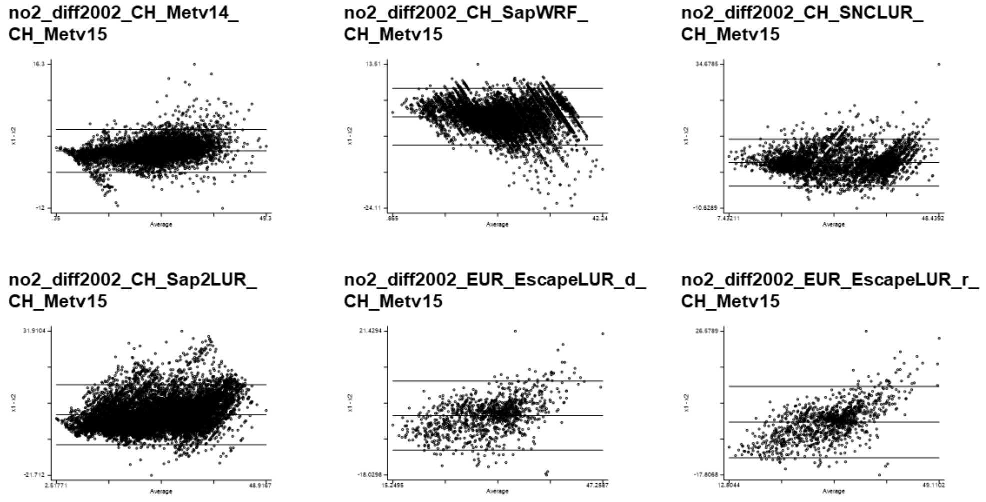

Figure A 13: BA plots of NO_2 models vs. CH_Metv15 / SAP2. Bland-Altman plots corresponding to Table A 26

Table A 27: NO_2 models vs. CH_Metv14 / SAP2. Comparison of all NO_2 models vs. Meteotest model version CH_Metv14 for SAP2 (sorted by descending CCC)

NO2 S2 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Metv14	no2_CH_Metv15_2002	19434	24.0	8.2	0.1	13.7	0.4	17.6	23.8	31.3	49.2							
	no2_CH_Metv14_2002	19434	23.2	9.2	0.1	15.1	0.3	16.0	23.4	31.1	50.2							
	no2_diff2002_CH_Metv15_CH_Metv14	19434	0.7	2.1	0.0	2.1	-16.3	-0.4	0.8	1.7	12.0	< 0.01	0.98	0.97	0.97	0.97	0.97	0.91
CH_SapWRF_CH_Metv14	no2_CH_SapWRF_2002	19434	23.7	7.8	0.1	13.8	1.3	17.2	22.8	31.0	37.3							
	no2_CH_Metv14_2002	19434	23.2	9.2	0.1	15.1	0.3	16.0	23.4	31.1	50.2							
	no2_diff2002_CH_SapWRF_CH_Metv14	19434	0.5	4.0	0.0	5.1	-24.4	-1.9	0.8	3.2	17.4	< 0.01	0.90	0.89	0.89	0.89	0.89	0.68
CH_SNCLUR_CH_Metv14	no2_CH_SNCLUR_2002	4245	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_CH_Metv14_2002	4245	25.9	8.8	0.1	16.6	2.9	18.2	24.2	34.8	44.3							
	no2_diff2002_CH_SNCLUR_CH_Metv14	4245	4.1	3.5	0.1	3.7	-6.4	2.2	3.6	5.9	35.1	< 0.01	0.92	0.83	0.82	0.81	0.83	0.74
CH_Sap2LUR_CH_Metv14	no2_CH_Sap2LUR_2002	12486	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_CH_Metv14_2002	12486	23.9	9.2	0.1	15.1	2.2	16.6	24.4	31.7	50.2							
	no2_diff2002_CH_Sap2LUR_CH_Metv14	12486	1.5	6.1	0.1	7.2	-23.0	-2.6	0.5	4.6	32.9	< 0.01	0.81	0.80	0.79	0.79	0.80	0.70
EUR_EscapeLUR_d_CH_Metv14	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_CH_Metv14_2002	1114	30.4	5.0	0.2	6.4	15.5	27.3	31.2	33.7	44.3							
	no2_diff2002_EUR_EscapeLUR_d_CH_Metv14	1114	-1.5	4.7	0.1	6.0	-17.4	-4.7	-1.2	1.3	20.7	< 0.01	0.71	0.66	0.65	0.62	0.69	0.55
EUR_EscapeLUR_r_CH_Metv14	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_CH_Metv14_2002	1114	30.4	5.0	0.2	6.4	15.5	27.3	31.2	33.7	44.3							
	no2_diff2002_EUR_EscapeLUR_r_CH_Metv14	1114	-1.3	5.5	0.2	6.8	-17.8	-5.0	-1.0	1.9	25.9	< 0.01	0.73	0.65	0.65	0.61	0.68	0.54

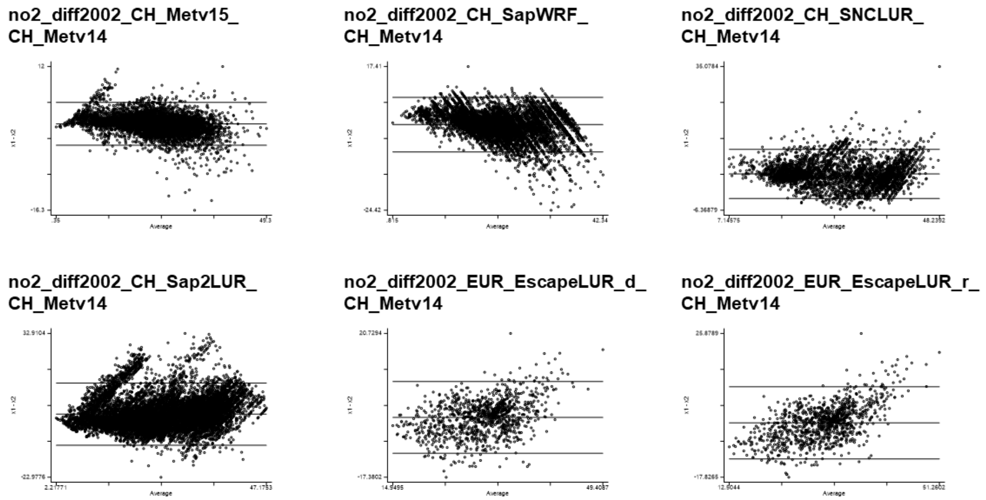

Figure A 14: BA plots of NO_2 models vs. CH_Metv14 / SAP2. Bland-Altman plots corresponding to Table A 27

Table A 28: NO_2 models vs. CH_SapWRF / SAP2. Comparison of all NO_2 models vs. WRF-Chem model (CH_SapWRF) for SAP2 (sorted by descending CCC)

NO2 S2 / CH_SapWRF	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_SapWRF	no2_CH_Metv15_2002	19434	24.0	8.2	0.1	13.7	0.4	17.6	23.8	31.3	49.2							
	no2_CH_SapWRF_2002	19434	23.7	7.8	0.1	13.8	1.3	17.2	22.8	31.0	37.3							
	no2_diff2002_CH_Metv15_CH_SapWRF	19434	0.2	3.7	0.0	4.5	-13.5	-2.2	0.2	2.3	24.1	< 0.01	0.89	0.89	0.89	0.89	0.90	0.70
CH_Metv14_CH_SapWRF	no2_CH_Metv14_2002	19434	23.2	9.2	0.1	15.1	0.3	16.0	23.4	31.1	50.2							
	no2_CH_SapWRF_2002	19434	23.7	7.8	0.1	13.8	1.3	17.2	22.8	31.0	37.3							
	no2_diff2002_CH_Metv14_CH_SapWRF	19434	-0.5	4.0	0.0	5.1	-17.4	-3.2	-0.8	1.9	24.4	< 0.01	0.90	0.89	0.89	0.89	0.89	0.68
CH_Sap2LUR_CH_SapWRF	no2_CH_Sap2LUR_2002	12490	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_CH_SapWRF_2002	12490	24.4	8.0	0.1	14.3	4.8	17.6	24.0	31.8	37.3							
	no2_diff2002_CH_Sap2LUR_CH_SapWRF	12490	1.1	6.8	0.1	8.1	-18.7	-3.5	0.1	4.6	33.6	< 0.01	0.75	0.72	0.72	0.71	0.73	0.58
CH_SNCLUR_CH_SapWRF	no2_CH_SNCLUR_2002	4249	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_CH_SapWRF_2002	4249	24.4	8.0	0.1	16.1	5.7	17.8	22.9	33.9	36.5							
	no2_diff2002_CH_SNCLUR_CH_SapWRF	4249	5.6	5.0	0.1	5.4	-10.1	2.5	4.7	7.9	29.3	< 0.01	0.82	0.67	0.64	0.62	0.66	0.60
EUR_EscapeLUR_d_CH_SapWRF	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_CH_SapWRF_2002	1114	30.0	5.2	0.2	8.8	16.6	25.6	30.6	34.3	36.5							
	no2_diff2002_EUR_EscapeLUR_d_CH_SapWRF	1114	-1.1	5.5	0.2	6.1	-16.8	-4.4	-1.5	1.7	23.3	< 0.01	0.61	0.58	0.57	0.53	0.61	0.48
EUR_EscapeLUR_r_CH_SapWRF	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_CH_SapWRF_2002	1114	30.0	5.2	0.2	8.8	16.6	25.6	30.6	34.3	36.5							
	no2_diff2002_EUR_EscapeLUR_r_CH_SapWRF	1114	-0.9	6.3	0.2	6.5	-17.4	-4.4	-1.3	2.1	28.2	< 0.01	0.62	0.56	0.56	0.51	0.59	0.52

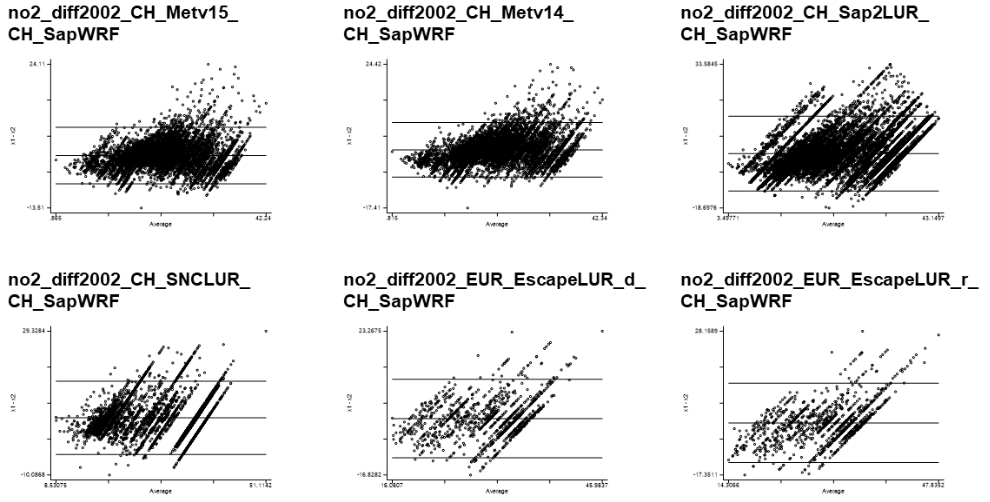

Figure A 15: BA plots of NO_2 models vs. CH_SapWRF / SAP2. Bland-Altman plots corresponding to Table A 28

Table A 29: NO_2 models vs. CH_Sap2LUR / SAP2. Comparison of all NO_2 models vs. SAPALDIA 2 LUR model (CH_Sap2LUR) for SAP2 (sorted by descending CCC)

NO2 S2 / CH_Sap2LUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Sap2LUR	no2_CH_Metv15_2002	12486	24.6	8.3	0.1	13.8	2.8	18.1	24.5	31.9	47.7							
	no2_CH_Sap2LUR_2002	12486	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_diff2002_CH_Metv15_CH_Sap2LUR	12486	-0.8	5.6	0.1	7.3	-31.9	-4.0	0.0	3.2	21.7	< 0.01	0.84	0.82	0.81	0.81	0.82	0.72
CH_Metv14_CH_Sap2LUR	no2_CH_Metv14_2002	12486	23.9	9.2	0.1	15.1	2.2	16.6	24.4	31.7	50.2							
	no2_CH_Sap2LUR_2002	12486	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_diff2002_CH_Metv14_CH_Sap2LUR	12486	-1.5	6.1	0.1	7.2	-32.9	-4.6	-0.5	2.6	23.0	< 0.01	0.81	0.80	0.79	0.79	0.80	0.70
CH_SNCLUR_CH_Sap2LUR	no2_CH_SNCLUR_2002	3025	30.9	8.8	0.2	15.7	11.8	22.5	31.0	38.2	65.8							
	no2_CH_Sap2LUR_2002	3025	26.5	9.9	0.2	17.0	5.5	17.1	26.9	34.1	48.7							
	no2_diff2002_CH_SNCLUR_CH_Sap2LUR	3025	4.4	5.3	0.1	6.2	-23.0	1.4	4.7	7.6	39.7	< 0.01	0.85	0.76	0.74	0.73	0.76	0.64
CH_SapWRF_CH_Sap2LUR	no2_CH_SapWRF_2002	12490	24.4	8.0	0.1	14.3	4.8	17.6	24.0	31.8	37.3							
	no2_CH_Sap2LUR_2002	12490	25.4	10.2	0.1	16.4	2.2	17.2	24.9	33.6	51.5							
	no2_diff2002_CH_SapWRF_CH_Sap2LUR	12490	-1.1	6.8	0.1	8.1	-33.6	-4.6	-0.1	3.5	18.7	< 0.01	0.75	0.72	0.72	0.71	0.73	0.58
EUR_EscapeLUR_d_CH_Sap2LUR	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_CH_Sap2LUR_2002	1114	32.9	6.3	0.2	8.7	13.0	28.5	33.1	37.2	50.1							
	no2_diff2002_EUR_EscapeLUR_d_CH_Sap2LUR	1114	-4.1	5.7	0.2	7.1	-24.3	-7.5	-4.0	-0.5	21.8	< 0.01	0.62	0.52	0.48	0.43	0.52	0.44
EUR_EscapeLUR_r_CH_Sap2LUR	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_CH_Sap2LUR_2002	1114	32.9	6.3	0.2	8.7	13.0	28.5	33.1	37.2	50.1							
	no2_diff2002_EUR_EscapeLUR_r_CH_Sap2LUR	1114	-3.8	6.7	0.2	7.6	-29.2	-7.6	-3.7	0.0	27.0	< 0.01	0.58	0.50	0.46	0.42	0.51	0.46

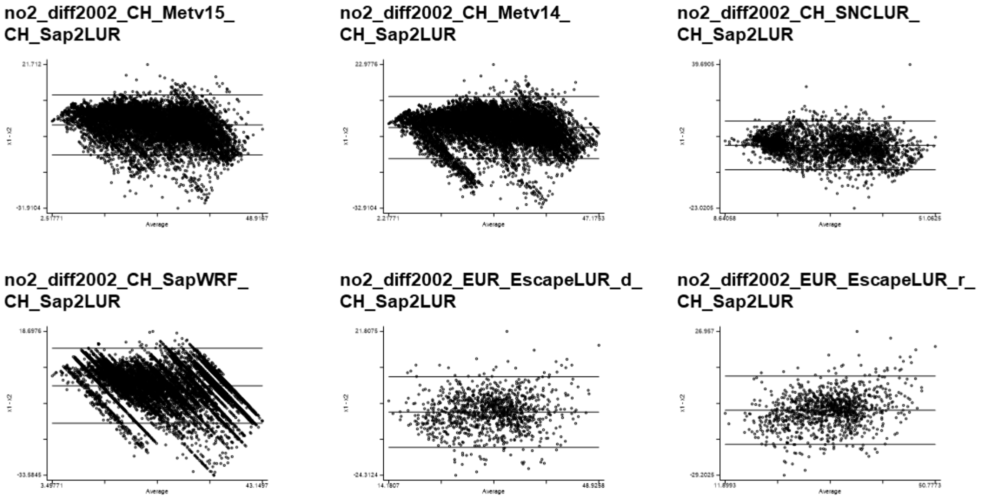

Figure A 16: BA plots of NO_2 models vs. CH_Sap2LUR / SAP2. Bland-Altman plots corresponding to Table A 29

Table A 30: NO_2 models vs. CH_SNCLUR / SAP2. Comparison of all NO_2 models vs. SNC NO_2 LUR model (CH_SNCLUR) for SAP2 (sorted by descending CCC)

NO2 S2 / CH_SNCLUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_SNCLUR	no2_CH_Metv15_2002	4245	26.3	8.4	0.1	15.8	4.3	19.0	24.8	34.8	47.4							
	no2_CH_SNCLUR_2002	4245	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_diff2002_CH_Metv15_CH_SNCLUR	4245	-3.7	3.7	0.1	3.8	-34.7	-5.5	-3.2	-1.7	10.6	< 0.01	0.91	0.83	0.82	0.81	0.83	0.75
CH_Metv14_CH_SNCLUR	no2_CH_Metv14_2002	4245	25.9	8.8	0.1	16.6	2.9	18.2	24.2	34.8	44.3							
	no2_CH_SNCLUR_2002	4245	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_diff2002_CH_Metv14_CH_SNCLUR	4245	-4.1	3.5	0.1	3.7	-35.1	-5.9	-3.6	-2.2	6.4	< 0.01	0.92	0.83	0.82	0.81	0.83	0.74
CH_Sap2LUR_CH_SNCLUR	no2_CH_Sap2LUR_2002	3025	26.5	9.9	0.2	17.0	5.5	17.1	26.9	34.1	48.7							
	no2_CH_SNCLUR_2002	3025	30.9	8.8	0.2	15.7	11.8	22.5	31.0	38.2	65.8							
	no2_diff2002_CH_Sap2LUR_CH_SNCLUR	3025	-4.4	5.3	0.1	6.2	-39.7	-7.6	-4.7	-1.4	23.0	< 0.01	0.85	0.76	0.74	0.73	0.76	0.64
CH_SapWRF_CH_SNCLUR	no2_CH_SapWRF_2002	4249	24.4	8.0	0.1	16.1	5.7	17.8	22.9	33.9	36.5							
	no2_CH_SNCLUR_2002	4249	30.0	8.8	0.1	15.4	9.5	21.9	29.7	37.3	65.8							
	no2_diff2002_CH_SapWRF_CH_SNCLUR	4249	-5.6	5.0	0.1	5.4	-29.3	-7.9	-4.7	-2.5	10.1	< 0.01	0.82	0.67	0.64	0.62	0.66	0.60
EUR_EscapeLUR_r_CH_SNCLUR	no2_EUR_EscapeLUR_r_2002	299	30.6	9.1	0.5	13.3	11.7	23.9	29.3	37.2	57.1							
	no2_CH_SNCLUR_2002	299	35.4	6.6	0.4	8.8	19.3	30.6	36.1	39.4	65.8							
	no2_diff2002_EUR_EscapeLUR_r_CH_SNCLUR	299	-4.8	6.2	0.4	7.1	-38.6	-8.4	-5.3	-1.3	19.6	< 0.01	0.73	0.59	0.56	0.47	0.63	0.40
EUR_EscapeLUR_d_CH_SNCLUR	no2_EUR_EscapeLUR_d_2002	299	28.6	7.3	0.4	10.3	12.8	23.2	27.6	33.4	50.0							
	no2_CH_SNCLUR_2002	299	35.4	6.6	0.4	8.8	19.3	30.6	36.1	39.4	65.8							
	no2_diff2002_EUR_EscapeLUR_d_CH_SNCLUR	299	-6.9	5.1	0.3	6.0	-40.0	-9.9	-6.9	-3.9	14.5	< 0.01	0.73	0.49	0.39	0.29	0.49	0.30

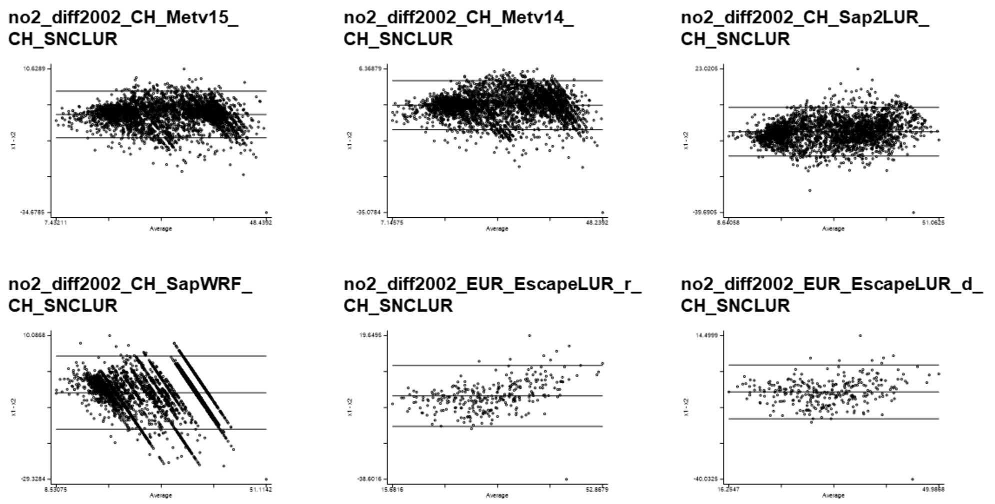

Figure A 17: BA plots of NO_2 models vs. CH_SNCLUR / SAP2. Bland-Altman plots corresponding to Table A 30

Table A 31: NO_2 models vs. EUR_EscapeLUR_r / SAP2. Comparison of all NO_2 models vs. back extrapolated Escape (ratio) LUR model (EUR_EscapeLUR_r) for SAP2 (sorted by descending CCC)

NO2 S2 / EUR_EscapeLUR Ratio	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_d_EUR_EscapeLUR_r	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_diff2002_EUR_EscapeLUR_d_EUR_EscapeLUR_r	1114	-0.2	1.9	0.1	1.4	-8.8	-0.9	-0.3	0.6	5.1	< 0.01	0.98	0.97	0.97	0.96	0.97	0.87
CH_Metv14_EUR_EscapeLUR_r	no2_CH_Metv14_2002	1114	30.4	5.0	0.2	6.4	15.5	27.3	31.2	33.7	44.3							
	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_diff2002_CH_Metv14_EUR_EscapeLUR_r	1114	1.3	5.5	0.2	6.8	-25.9	-1.9	1.0	5.0	17.8	< 0.01	0.73	0.65	0.65	0.61	0.68	0.54
CH_Metv15_EUR_EscapeLUR_r	no2_CH_Metv15_2002	1114	30.6	4.7	0.1	6.5	17.4	27.2	31.3	33.7	47.7							
	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_diff2002_CH_Metv15_EUR_EscapeLUR_r	1114	1.5	5.5	0.2	6.6	-26.6	-1.6	1.1	5.0	17.8	< 0.01	0.74	0.63	0.63	0.59	0.66	0.59
CH_SNCLUR_EUR_EscapeLUR_r	no2_CH_SNCLUR_2002	299	35.4	6.6	0.4	8.8	19.3	30.6	36.1	39.4	65.8							
	no2_EUR_EscapeLUR_r_2002	299	30.6	9.1	0.5	13.3	11.7	23.9	29.3	37.2	57.1							
	no2_diff2002_CH_SNCLUR_EUR_EscapeLUR_r	299	4.8	6.2	0.4	7.1	-19.6	1.3	5.3	8.4	38.6	< 0.01	0.73	0.59	0.56	0.47	0.63	0.40
CH_SapWRF_EUR_EscapeLUR_r	no2_CH_SapWRF_2002	1114	30.0	5.2	0.2	8.8	16.6	25.6	30.6	34.3	36.5							
	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_diff2002_CH_SapWRF_EUR_EscapeLUR_r	1114	0.9	6.3	0.2	6.5	-28.2	-2.1	1.3	4.4	17.4	< 0.01	0.62	0.56	0.56	0.51	0.59	0.52
CH_Sap2LUR_EUR_EscapeLUR_r	no2_CH_Sap2LUR_2002	1114	32.9	6.3	0.2	8.7	13.0	28.5	33.1	37.2	50.1							
	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_diff2002_CH_Sap2LUR_EUR_EscapeLUR_r	1114	3.8	6.7	0.2	7.6	-27.0	0.0	3.7	7.6	29.2	< 0.01	0.58	0.50	0.46	0.42	0.51	0.46

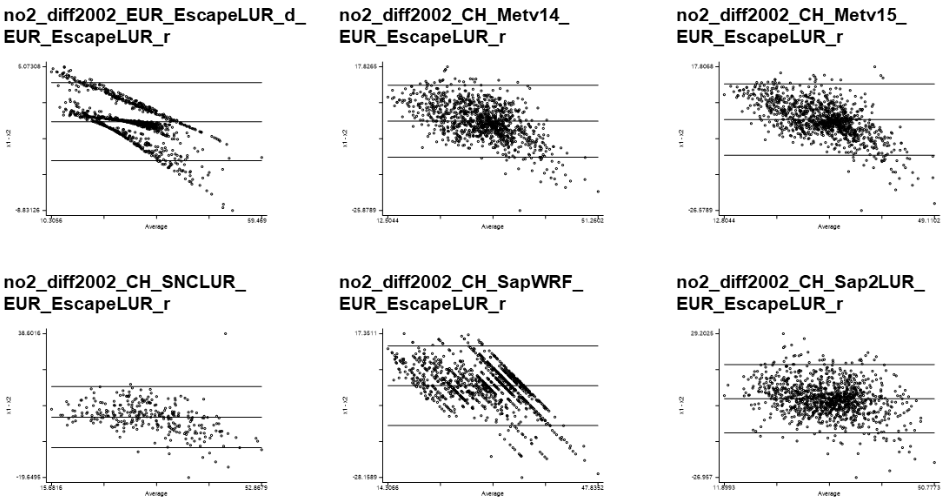

Figure A 18: BA plots of NO_2 models vs. EUR_EscapeLUR_r / SAP2. Bland-Altman plots corresponding to Table A 31

Table A 32: NO_2 models vs. EUR_EscapeLUR_d / SAP2. Comparison of all NO_2 models vs. back extrapolated Escape (difference) LUR model (EUR_EscapeLUR_d) for SAP2 (sorted by descending CCC)

NO2 S2 / EUR_EscapeLUR Diff	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_r_EUR_EscapeLUR_d	no2_EUR_EscapeLUR_r_2002	1114	29.1	8.0	0.2	9.5	8.0	24.1	29.6	33.6	61.3							
	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_diff2002_EUR_EscapeLUR_r_EUR_EscapeLUR_d	1114	0.2	1.9	0.1	1.4	-5.1	-0.6	0.3	0.9	8.8	< 0.01	0.98	0.97	0.97	0.96	0.97	0.87
CH_Metv14_EUR_EscapeLUR_d	no2_CH_Metv14_2002	1114	30.4	5.0	0.2	6.4	15.5	27.3	31.2	33.7	44.3							
	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_diff2002_CH_Metv14_EUR_EscapeLUR_d	1114	1.5	4.7	0.1	6.0	-20.7	-1.3	1.2	4.7	17.4	< 0.01	0.71	0.66	0.65	0.62	0.69	0.55
CH_Metv15_EUR_EscapeLUR_d	no2_CH_Metv15_2002	1114	30.6	4.7	0.1	6.5	17.4	27.2	31.3	33.7	47.7							
	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_diff2002_CH_Metv15_EUR_EscapeLUR_d	1114	1.7	4.7	0.1	5.7	-21.4	-1.1	1.3	4.6	18.0	< 0.01	0.71	0.64	0.63	0.59	0.67	0.57
CH_SapWRF_EUR_EscapeLUR_d	no2_CH_SapWRF_2002	1114	30.0	5.2	0.2	8.8	16.6	25.6	30.6	34.3	36.5							
	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_diff2002_CH_SapWRF_EUR_EscapeLUR_d	1114	1.1	5.5	0.2	6.1	-23.3	-1.7	1.5	4.4	16.8	< 0.01	0.61	0.58	0.57	0.53	0.61	0.48
CH_Sap2LUR_EUR_EscapeLUR_d	no2_CH_Sap2LUR_2002	1114	32.9	6.3	0.2	8.7	13.0	28.5	33.1	37.2	50.1							
	no2_EUR_EscapeLUR_d_2002	1114	28.9	6.7	0.2	8.4	12.6	24.5	29.6	32.9	57.6							
	no2_diff2002_CH_Sap2LUR_EUR_EscapeLUR_d	1114	4.1	5.7	0.2	7.1	-21.8	0.5	4.0	7.5	24.3	< 0.01	0.62	0.52	0.48	0.43	0.52	0.44
CH_SNCLUR_EUR_EscapeLUR_d	no2_CH_SNCLUR_2002	299	35.4	6.6	0.4	8.8	19.3	30.6	36.1	39.4	65.8							
	no2_EUR_EscapeLUR_d_2002	299	28.6	7.3	0.4	10.3	12.8	23.2	27.6	33.4	50.0							
	no2_diff2002_CH_SNCLUR_EUR_EscapeLUR_d	299	6.9	5.1	0.3	6.0	-14.5	3.9	6.9	9.9	40.0	< 0.01	0.73	0.49	0.39	0.29	0.49	0.30

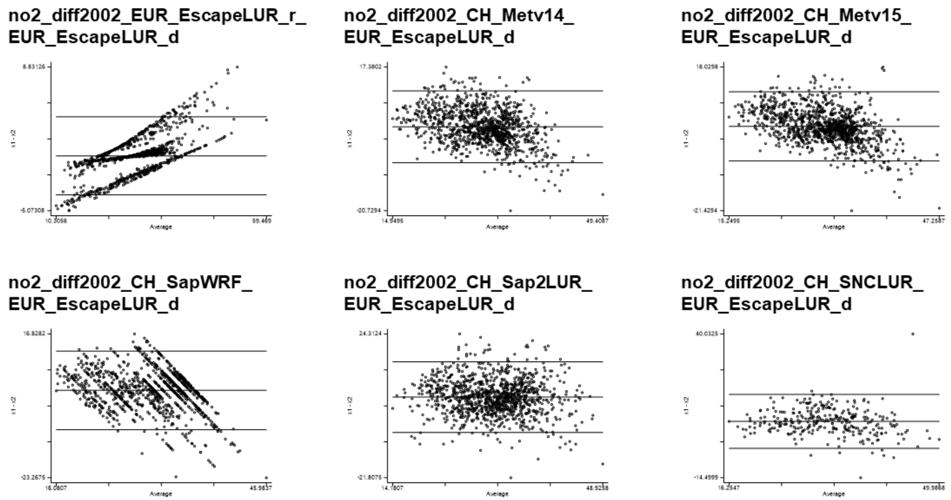

Figure A 19: BA plots of NO_2 models vs. EUR_EscapeLUR_d / SAP2. Bland-Altman plots corresponding to Table A 32

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Table A 33: NO_2 models vs. IDB measurements / SAP1. Comparison of all NO_2 models vs. IDB measurements for SAP1 (sorted by descending CCC)

NO2 S1 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_IDB	no2_CH_Metv14_1991	56	34.6	14.8	2.0	19.5	5.5	24.3	35.8	43.8	65.1							
	no2_IDB_1991	56	36.9	16.3	2.2	24.2	5.7	24.8	36.9	49.0	71.0							
	no2_diff1991_CH_Metv14_IDB	56	-2.3	7.2	1.0	1.8	-22.0	-1.3	-0.3	0.5	14.2	0.02	0.90	0.88	0.88	0.81	0.93	0.88
CH_Metv15_IDB	no2_CH_Metv15_1991	56	35.1	12.8	1.7	16.4	5.8	26.8	36.1	43.2	56.7							
	no2_IDB_1991	56	36.9	16.3	2.2	24.2	5.7	24.8	36.9	49.0	71.0							
	no2_diff1991_CH_Metv15_IDB	56	-1.7	7.0	0.9	4.7	-20.6	-3.1	-0.4	1.6	13.9	0.07	0.91	0.88	0.88	0.81	0.93	0.84
CH_SapWRF_IDB	no2_CH_SapWRF_1991	57	33.0	11.9	1.6	19.3	13.5	22.2	31.7	41.5	54.1							
	no2_IDB_1991	57	36.7	16.2	2.1	23.2	5.7	25.0	36.9	48.2	71.0							
	no2_diff1991_CH_SapWRF_IDB	57	-3.7	10.4	1.4	15.1	-22.5	-11.5	-3.7	3.6	23.5	0.01	0.77	0.71	0.71	0.55	0.82	0.60

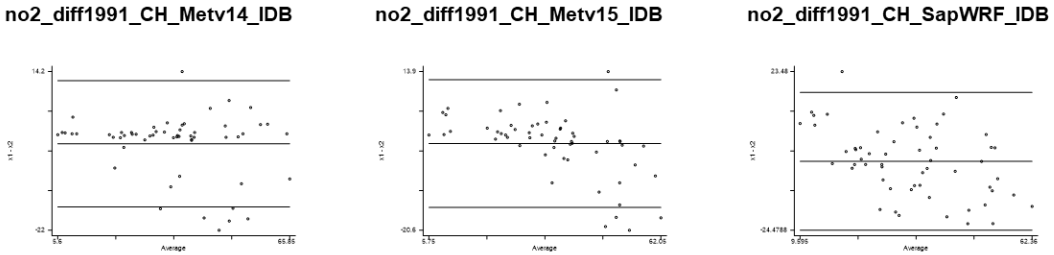


Figure A 20: BA plots of NO_2 models vs. IDB measurements / SAP1. Bland-Altman plots corresponding to Table A 33

Table A 34: NO_2 models vs. CH_Metv15 / SAP1. Comparison of all NO_2 models vs. Meteotest model version CH_Metv15 for SAP1 (sorted by descending CCC)

NO2 S1 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Metv15	no2_CH_Metv14_1991	19434	33.9	14.0	0.1	22.4	0.3	22.8	34.3	45.2	75.9							
	no2_CH_Metv15_1991	19434	34.6	12.6	0.1	20.2	0.5	25.3	34.6	45.5	72.9							
	no2_diff1991_CH_Metv14_CH_Metv15	19434	-0.7	3.8	0.0	4.2	-24.9	-2.8	-0.9	1.4	29.3	< 0.01	0.96	0.96	0.96	0.96	0.96	0.85
CH_SapWRF_CH_Metv15	no2_CH_SapWRF_1991	19434	32.9	12.3	0.1	23.4	4.1	21.6	31.3	45.0	54.6							
	no2_CH_Metv15_1991	19434	34.6	12.6	0.1	20.2	0.5	25.3	34.6	45.5	72.9							
	no2_diff1991_CH_SapWRF_CH_Metv15	19434	-1.7	5.7	0.0	7.1	-41.7	-5.1	-2.0	2.1	17.6	< 0.01	0.90	0.89	0.89	0.88	0.89	0.76
CH_Sap2LUR_CH_Metv15	no2_CH_Sap2LUR_1991	12486	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_CH_Metv15_1991	12486	35.7	12.8	0.1	20.7	3.6	26.3	35.8	47.0	72.9							
	no2_diff1991_CH_Sap2LUR_CH_Metv15	12486	1.0	10.5	0.1	9.6	-42.6	-4.9	-1.0	4.6	65.1	< 0.01	0.77	0.74	0.74	0.74	0.75	0.75
EUR_EscapeLUR_r_CH_Metv15	no2_EUR_EscapeLUR_r_1991	2163	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_CH_Metv15_1991	2163	48.3	6.0	0.1	6.9	26.8	45.2	48.6	52.1	72.9							
	no2_diff1991_EUR_EscapeLUR_r_CH_Metv15	2163	0.0	8.8	0.2	10.7	-25.2	-5.5	0.6	5.2	46.2	0.98	0.53	0.46	0.46	0.43	0.50	0.19
EUR_EscapeLUR_d_CH_Metv15	no2_EUR_EscapeLUR_d_1991	2163	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_CH_Metv15_1991	2163	48.3	6.0	0.1	6.9	26.8	45.2	48.6	52.1	72.9							
	no2_diff1991_EUR_EscapeLUR_d_CH_Metv15	2163	-3.6	8.3	0.2	10.3	-30.7	-8.7	-2.0	1.6	29.1	< 0.01	0.22	0.19	0.13	0.09	0.17	0.15

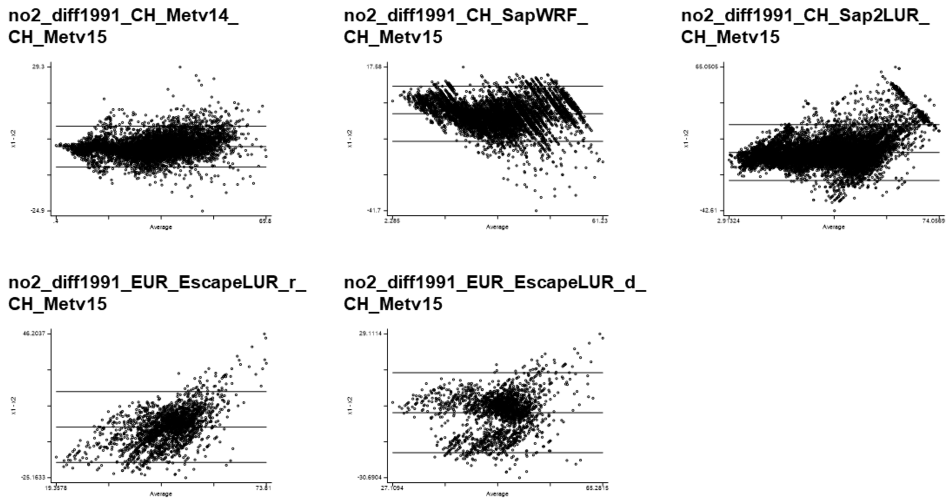


Figure A 21: BA plots of NO_2 models vs. CH_Metv15 / SAP1. Bland-Altman plots corresponding to Table A 34

Table A 35: NO_2 models vs. CH_Metv14 / SAP1. Comparison of all NO_2 models vs. Meteotest model version CH_Metv14 for SAP1 (sorted by descending CCC)

NO2 S1 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Metv14	no2_CH_Metv15_1991	19434	34.6	12.6	0.1	20.2	0.5	25.3	34.6	45.5	72.9							
	no2_CH_Metv14_1991	19434	33.9	14.0	0.1	22.4	0.3	22.8	34.3	45.2	75.9							
	no2_diff1991_CH_Metv15_CH_Metv14	19434	0.7	3.8	0.0	4.2	-29.3	-1.4	0.9	2.8	24.9	< 0.01	0.96	0.96	0.96	0.96	0.96	0.85
CH_SapWRF_CH_Metv14	no2_CH_SapWRF_1991	19434	32.9	12.3	0.1	23.4	4.1	21.6	31.3	45.0	54.6							
	no2_CH_Metv14_1991	19434	33.9	14.0	0.1	22.4	0.3	22.8	34.3	45.2	75.9							
	no2_diff1991_CH_SapWRF_CH_Metv14	19434	-1.0	6.2	0.0	7.8	-37.4	-4.6	-0.8	3.1	23.3	< 0.01	0.90	0.89	0.89	0.88	0.89	0.80
CH_Sap2LUR_CH_Metv14	no2_CH_Sap2LUR_1991	12486	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_CH_Metv14_1991	12486	35.0	14.2	0.1	23.1	3.3	23.9	35.5	47.0	75.9							
	no2_diff1991_CH_Sap2LUR_CH_Metv14	12486	1.6	10.8	0.1	10.1	-40.9	-4.4	-0.3	5.8	63.9	< 0.01	0.76	0.74	0.74	0.74	0.75	0.73
EUR_EscapeLUR_r_CH_Metv14	no2_EUR_EscapeLUR_r_1991	2163	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_CH_Metv14_1991	2163	48.8	7.6	0.2	8.8	22.7	44.9	49.2	53.7	68.6							
	no2_diff1991_EUR_EscapeLUR_r_CH_Metv14	2163	-0.5	9.4	0.2	12.2	-28.8	-6.6	0.0	5.6	42.0	< 0.01	0.49	0.46	0.46	0.43	0.49	0.62
EUR_EscapeLUR_d_CH_Metv14	no2_EUR_EscapeLUR_d_1991	2163	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_CH_Metv14_1991	2163	48.8	7.6	0.2	8.8	22.7	44.9	49.2	53.7	68.6							
	no2_diff1991_EUR_EscapeLUR_d_CH_Metv14	2163	-4.2	9.4	0.2	11.8	-32.8	-9.9	-2.3	1.9	29.6	< 0.01	0.20	0.17	0.11	0.07	0.15	0.14

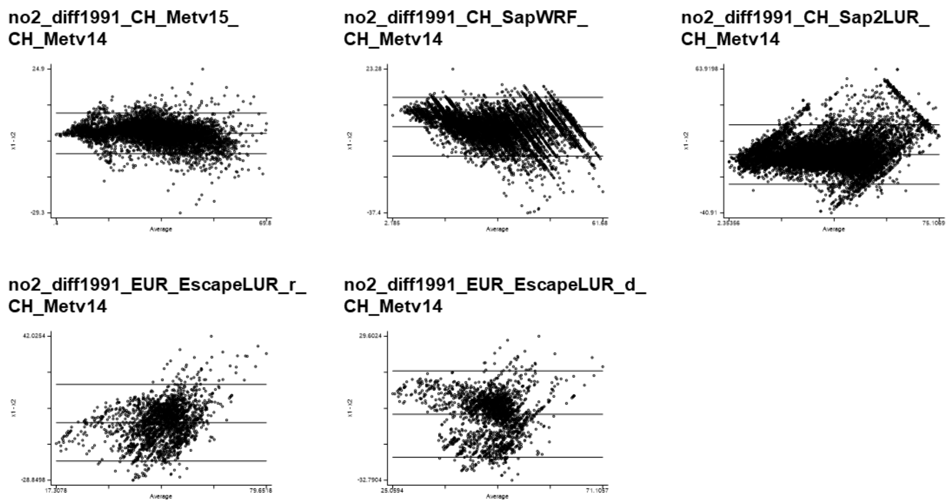


Figure A 22: BA plots of NO_2 models vs. CH_Metv14 / SAP1. Bland-Altman plots corresponding to Table A 35

Table A 36: NO_2 models vs. CH_SapWRF / SAP1. Comparison of all NO_2 models vs. WRF-Chem model (CH_SapWRF) for SAP1 (sorted by descending CCC)

NO2 S1 / CH_SapWRF	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_SapWRF	no2_CH_Metv15_1991	19434	34.6	12.6	0.1	20.2	0.5	25.3	34.6	45.5	72.9							
	no2_CH_SapWRF_1991	19434	32.9	12.3	0.1	23.4	4.1	21.6	31.3	45.0	54.6							
	no2_diff1991_CH_Metv15_CH_SapWRF	19434	1.7	5.7	0.0	7.1	-17.6	-2.1	2.0	5.1	41.7	< 0.01	0.90	0.89	0.89	0.88	0.89	0.76
CH_Metv14_CH_SapWRF	no2_CH_Metv14_1991	19434	33.9	14.0	0.1	22.4	0.3	22.8	34.3	45.2	75.9							
	no2_CH_SapWRF_1991	19434	32.9	12.3	0.1	23.4	4.1	21.6	31.3	45.0	54.6							
	no2_diff1991_CH_Metv14_CH_SapWRF	19434	1.0	6.2	0.0	7.8	-23.3	-3.1	0.8	4.6	37.4	< 0.01	0.90	0.89	0.89	0.88	0.89	0.80
CH_Sap2LUR_CH_SapWRF	no2_CH_Sap2LUR_1991	12490	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_CH_SapWRF_1991	12490	34.0	12.6	0.1	23.5	8.1	22.1	32.7	45.6	54.6							
	no2_diff1991_CH_Sap2LUR_CH_SapWRF	12490	2.7	12.1	0.1	12.3	-35.5	-4.8	0.7	7.5	67.0	< 0.01	0.68	0.64	0.64	0.63	0.65	0.68
EUR_EscapeLUR_r_CH_SapWRF	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_CH_SapWRF_1991	2164	46.4	6.8	0.1	12.8	26.3	40.2	49.0	53.0	53.7							
	no2_diff1991_EUR_EscapeLUR_r_CH_SapWRF	2164	1.9	10.1	0.2	11.3	-28.0	-4.3	1.8	7.0	58.3	< 0.01	0.36	0.33	0.32	0.28	0.36	0.30
EUR_EscapeLUR_d_CH_SapWRF	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_CH_SapWRF_1991	2164	46.4	6.8	0.1	12.8	26.3	40.2	49.0	53.0	53.7							
	no2_diff1991_EUR_EscapeLUR_d_CH_SapWRF	2164	-1.8	9.3	0.2	11.2	-27.1	-7.2	-1.6	3.9	41.2	< 0.01	0.11	0.10	0.09	0.05	0.13	0.11

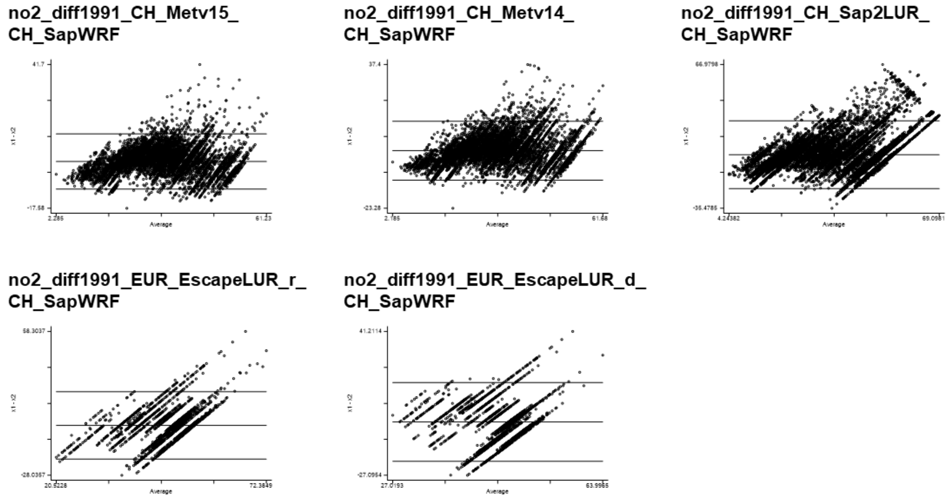
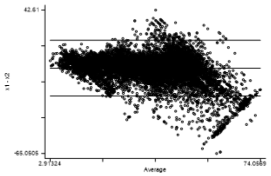


Figure A 23: BA plots of NO_2 models vs. CH_SapWRF / SAP1. Bland-Altman plots corresponding to Table A 36

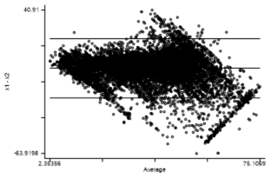
Table A 37: NO_2 models vs. CH_Sap2LUR / SAP1. Comparison of all NO_2 models vs. SAPALDIA 2 LUR model (CH_Sap2LUR) for SAP1 (sorted by descending CCC)

NO2 S1 / CH_Sap2LUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Sap2LUR	no2_CH_Metv15_1991	12486	35.7	12.8	0.1	20.7	3.6	26.3	35.8	47.0	72.9							
	no2_CH_Sap2LUR_1991	12486	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_diff1991_CH_Metv15_CH_Sap2LUR	12486	-1.0	10.5	0.1	9.6	-65.1	-4.6	1.0	4.9	42.6	< 0.01	0.77	0.74	0.74	0.74	0.75	0.75
CH_Metv14_CH_Sap2LUR	no2_CH_Metv14_1991	12486	35.0	14.2	0.1	23.1	3.3	23.9	35.5	47.0	75.9							
	no2_CH_Sap2LUR_1991	12486	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_diff1991_CH_Metv14_CH_Sap2LUR	12486	-1.6	10.8	0.1	10.1	-63.9	-5.8	0.3	4.4	40.9	< 0.01	0.76	0.74	0.74	0.74	0.75	0.73
CH_SapWRF_CH_Sap2LUR	no2_CH_SapWRF_1991	12490	34.0	12.6	0.1	23.5	8.1	22.1	32.7	45.6	54.6							
	no2_CH_Sap2LUR_1991	12490	36.7	16.3	0.1	21.8	-1.5	24.6	35.8	46.4	92.5							
	no2_diff1991_CH_SapWRF_CH_Sap2LUR	12490	-2.7	12.1	0.1	12.3	-67.0	-7.5	-0.7	4.8	35.5	< 0.01	0.68	0.64	0.64	0.63	0.65	0.68
EUR_EscapeLUR_r_CH_Sap2LUR	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_CH_Sap2LUR_1991	2164	49.0	11.7	0.3	12.1	19.5	41.7	47.2	53.7	90.6							
	no2_diff1991_EUR_EscapeLUR_r_CH_Sap2LUR	2164	-0.8	13.9	0.3	17.0	-53.7	-8.5	1.8	8.5	52.2	< 0.01	0.20	0.20	0.20	0.16	0.24	0.08
EUR_EscapeLUR_d_CH_Sap2LUR	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_CH_Sap2LUR_1991	2164	49.0	11.7	0.3	12.1	19.5	41.7	47.2	53.7	90.6							
	no2_diff1991_EUR_EscapeLUR_d_CH_Sap2LUR	2164	-4.4	12.8	0.3	13.0	-55.2	-9.2	-1.1	3.8	32.0	< 0.01	0.14	0.11	0.07	0.03	0.11	0.09

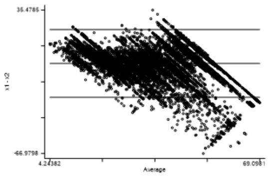
no2_diff1991_CH_Metv15_
CH_Sap2LUR



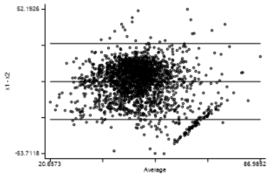
no2_diff1991_CH_Metv14_
CH_Sap2LUR



no2_diff1991_CH_SapWRF_
CH_Sap2LUR



no2_diff1991_EUR_EscapeLUR_r_
CH_Sap2LUR



no2_diff1991_EUR_EscapeLUR_d_
CH_Sap2LUR

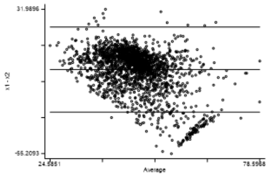


Figure A 24: BA plots of NO_2 models vs. CH_Sap2LUR / SAP1. Bland-Altman plots corresponding to Table A 37

Table A 38: NO_2 models vs. EUR_EscapeLUR_r / SAP1. Comparison of all NO_2 models vs. back extrapolated Escape (ratio) LUR model (EUR_EscapeLUR_r) for SAP1 (sorted by descending CCC)

NO2 S1 / EUR_EscapeLUR Ratio	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_d_EUR_EscapeLUR_r	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_diff1991_EUR_EscapeLUR_d_EUR_EscapeLUR_r	2164	-3.6	5.6	0.1	6.9	-26.4	-7.0	-4.6	-0.1	15.8	< 0.01	0.86	0.74	0.73	0.71	0.75	0.41
CH_Metv15_EUR_EscapeLUR_r	no2_CH_Metv15_1991	2163	48.3	6.0	0.1	6.9	26.8	45.2	48.6	52.1	72.9							
	no2_EUR_EscapeLUR_r_1991	2163	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_diff1991_CH_Metv15_EUR_EscapeLUR_r	2163	0.0	8.8	0.2	10.7	-46.2	-5.2	-0.6	5.5	25.2	0.98	0.53	0.46	0.46	0.43	0.50	0.19
CH_Metv14_EUR_EscapeLUR_r	no2_CH_Metv14_1991	2163	48.8	7.6	0.2	8.8	22.7	44.9	49.2	53.7	68.6							
	no2_EUR_EscapeLUR_r_1991	2163	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_diff1991_CH_Metv14_EUR_EscapeLUR_r	2163	0.5	9.4	0.2	12.2	-42.0	-5.6	0.0	6.6	28.8	< 0.01	0.49	0.46	0.46	0.43	0.49	0.62
CH_SapWRF_EUR_EscapeLUR_r	no2_CH_SapWRF_1991	2164	46.4	6.8	0.1	12.8	26.3	40.2	49.0	53.0	53.7							
	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_diff1991_CH_SapWRF_EUR_EscapeLUR_r	2164	-1.9	10.1	0.2	11.3	-58.3	-7.0	-1.8	4.3	28.0	< 0.01	0.36	0.33	0.32	0.28	0.36	0.30
CH_Sap2LUR_EUR_EscapeLUR_r	no2_CH_Sap2LUR_1991	2164	49.0	11.7	0.3	12.1	19.5	41.7	47.2	53.7	90.6							
	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_diff1991_CH_Sap2LUR_EUR_EscapeLUR_r	2164	0.8	13.9	0.3	17.0	-52.2	-8.5	-1.8	8.5	53.7	< 0.01	0.20	0.20	0.20	0.16	0.24	0.08

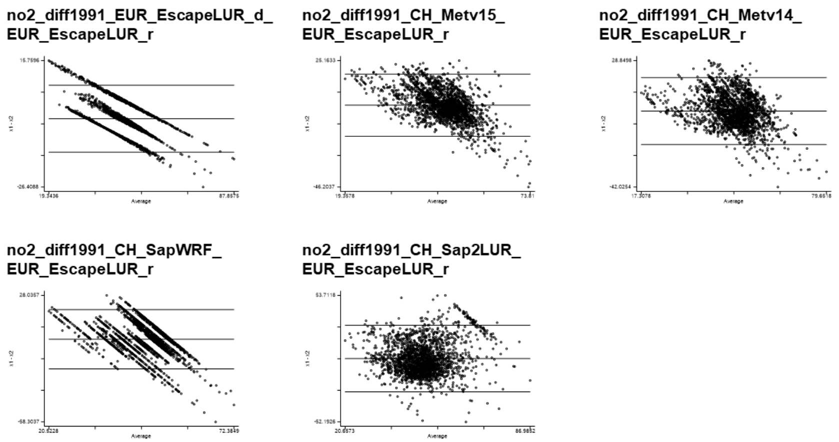


Figure A 25: BA plots of NO_2 models vs. EUR_EscapeLUR_r / SAP1. Bland-Altman plots corresponding to Table A 38

Table A 39: NO_2 models vs. EUR_EscapeLUR_d / SAP1. Comparison of all NO_2 models vs. back extrapolated Escape (difference) LUR model (EUR_EscapeLUR_d) for SAP1 (sorted by descending CCC)

NO2 S1 / EUR_EscapeLUR Diff	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_r_EUR_EscapeLUR_d	no2_EUR_EscapeLUR_r_1991	2164	48.3	10.4	0.2	12.1	11.5	42.0	49.2	54.1	96.4							
	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_diff1991_EUR_EscapeLUR_r_EUR_EscapeLUR_d	2164	3.6	5.6	0.1	6.9	-15.8	0.1	4.6	7.0	26.4	< 0.01	0.86	0.74	0.73	0.71	0.75	0.41
CH_Metv15_EUR_EscapeLUR_d	no2_CH_Metv15_1991	2163	48.3	6.0	0.1	6.9	26.8	45.2	48.6	52.1	72.9							
	no2_EUR_EscapeLUR_d_1991	2163	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_diff1991_CH_Metv15_EUR_EscapeLUR_d	2163	3.6	8.3	0.2	10.3	-29.1	-1.6	2.0	8.7	30.7	< 0.01	0.22	0.19	0.13	0.09	0.17	0.15
CH_Metv14_EUR_EscapeLUR_d	no2_CH_Metv14_1991	2163	48.8	7.6	0.2	8.8	22.7	44.9	49.2	53.7	68.6							
	no2_EUR_EscapeLUR_d_1991	2163	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_diff1991_CH_Metv14_EUR_EscapeLUR_d	2163	4.2	9.4	0.2	11.8	-29.6	-1.9	2.3	9.9	32.8	< 0.01	0.20	0.17	0.11	0.07	0.15	0.14
CH_Sap2LUR_EUR_EscapeLUR_d	no2_CH_Sap2LUR_1991	2164	49.0	11.7	0.3	12.1	19.5	41.7	47.2	53.7	90.6							
	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_diff1991_CH_Sap2LUR_EUR_EscapeLUR_d	2164	4.4	12.8	0.3	13.0	-32.0	-3.8	1.1	9.2	55.2	< 0.01	0.14	0.11	0.07	0.03	0.11	0.09
CH_SapWRF_EUR_EscapeLUR_d	no2_CH_SapWRF_1991	2164	46.4	6.8	0.1	12.8	26.3	40.2	49.0	53.0	53.7							
	no2_EUR_EscapeLUR_d_1991	2164	44.6	7.2	0.2	8.3	23.7	40.3	45.6	48.6	79.3							
	no2_diff1991_CH_SapWRF_EUR_EscapeLUR_d	2164	1.8	9.3	0.2	11.2	-41.2	-3.9	1.6	7.2	27.1	< 0.01	0.11	0.10	0.09	0.05	0.13	0.11

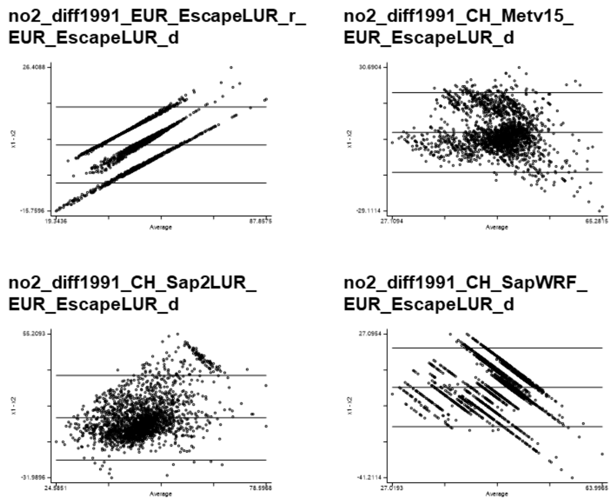


Figure A 26: BA plots of NO_2 models vs. EUR_EscapeLUR_d / SAP1. Bland-Altman plots corresponding to Table A 39

A.3.2.5. Other times

Table A 40: Comparison NO_2 Escape model 2009. Comparison of NO_2 IDB Measurements and Meteotest models (CH_Metv15, CH_Metv14) vs. Escape model (EUR_EscapeLUR) for 2009

NO2 2009 / EUR_EscapeLUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	no2_CH_Metv15_2009	105	23.5	8.1	0.8	9.8	0.4	18.8	23.5	28.6	47.2							
	no2_IDB_2009	105	25.7	11.2	1.1	12.7	0.3	19.4	24.6	32.1	59.7							
	no2_diff2009_CH_Metv15_IDB	105	-2.3	5.6	0.5	5.5	-26.8	-4.1	-0.5	1.4	5.6	< 0.01	0.88	0.81	0.81	0.74	0.87	0.55
CH_Metv15_EUR_EscapeLUR	no2_CH_Metv15_2009	3278	30.0	4.2	0.1	4.5	16.1	28.0	30.7	32.5	44.5							
	no2_EUR_EscapeLUR_2009	3278	27.6	6.5	0.1	7.4	6.8	24.0	28.3	31.4	59.3							
	no2_diff2009_CH_Metv15_EUR_EscapeLUR	3278	2.5	5.0	0.1	6.7	-23.8	-0.7	1.8	6.0	18.8	< 0.01	0.64	0.53	0.50	0.48	0.53	0.37
CH_Metv14_EUR_EscapeLUR	no2_CH_Metv14_2009	3277	29.6	4.1	0.1	4.7	16.0	27.3	30.1	32.0	44.6							
	no2_EUR_EscapeLUR_2009	3277	27.6	6.5	0.1	7.4	6.8	24.0	28.3	31.4	59.3							
	no2_diff2009_CH_Metv14_EUR_EscapeLUR	3277	2.0	5.3	0.1	7.5	-23.6	-1.6	1.1	5.9	19.2	< 0.01	0.59	0.50	0.49	0.46	0.51	0.30

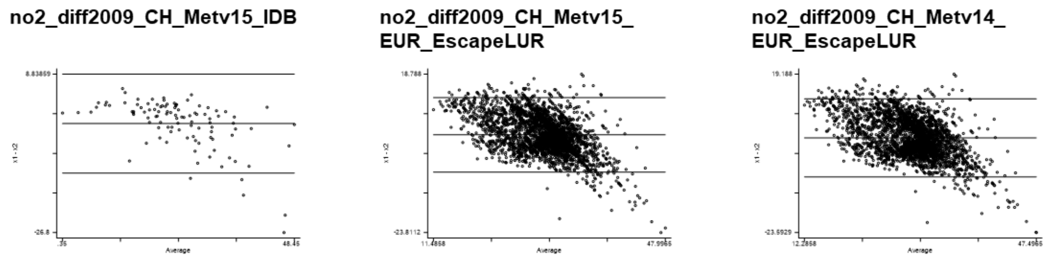


Figure A 27: BA plots of NO_2 Escape model comparison 2009. Bland-Altman plots corresponding to Table A 40

A.3.3 PM_{10}

A.3.3.1. Measurements vs. Meteotest Models

Table A 41: PM_{10} measurements vs. CH_Metv15 and CH_Metv14 for Escape and SAPALDIA. IDB and independent PM_{10} measurements vs. Meteotest models CH_Metv15 and CH_Metv14 for the years 2009 (Escape) and 2011/12 (Sap3)

PM10 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv15_2009	pm10_IDB_2009	54	20.3	5.7	0.8	5.0	2.7	18.0	20.9	23.0	34.0							
	pm10_CH_Metv15_2009	54	19.8	4.7	0.6	3.1	3.2	19.0	21.1	22.1	31.8							
	pm10_diff2009_IDB_CH_Metv15	54	0.4	2.2	0.3	2.3	-4.9	-0.9	0.2	1.4	6.2	0.16	0.93	0.91	0.91	0.85	0.95	0.89
meas_CH_Metv15_2009	pm10_meas_2009	18	23.9	3.5	0.8	3.5	18.5	22.0	23.9	25.5	32.4							
ESCAPE	pm10_CH_Metv15_2009	18	24.4	1.5	0.4	1.5	20.9	23.9	25.0	25.4	25.7							
	pm10_diff2009_meas_CH_Metv15	18	-0.5	2.7	0.6	2.9	-3.2	-2.2	-1.5	0.7	7.4	0.43	0.68	0.50	0.52	0.09	0.79	0.00
IDB_CH_Metv15_2011_12	pm10_IDB_mean_11_12	73	19.2	5.2	0.6	5.4	3.0	16.6	19.1	22.0	36.2							
	pm10_CH_Metv15_mean_11_12	73	18.9	4.4	0.5	3.6	3.3	17.4	19.2	21.0	33.3							
	pm10_diff2011_12_IDB_CH_Metv15	73	0.3	2.0	0.2	2.1	-4.9	-0.8	0.0	1.3	7.2	0.22	0.93	0.92	0.92	0.87	0.95	0.75
meas_CH_Metv15_2011_12	pm10_meas_2011_12	74	20.1	4.1	0.5	5.4	13.0	17.3	19.3	22.7	31.9							
SAP 3	pm10_CH_Metv15_mean_11_12	74	20.2	3.7	0.4	4.3	12.9	17.7	19.8	22.0	27.4							
	pm10_diff2011_12_meas_CH_Metv15	74	-0.2	2.5	0.3	2.8	-7.1	-1.7	-0.6	1.1	7.4	0.57	0.79	0.79	0.79	0.69	0.86	0.51

PM10/CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv14_2009	pm10_IDB_2009	54	20.3	5.7	0.8	5.0	2.7	18.0	20.9	23.0	34.0							
	pm10_CH_Metv14_2009	54	20.0	5.2	0.7	4.3	3.5	18.3	20.8	22.6	34.0							
	pm10_diff2009_IDB_CH_Metv14	54	0.3	1.7	0.2	0.3	-6.4	-0.1	0.0	0.2	6.6	0.25	0.95	0.95	0.95	0.92	0.97	0.96
meas_CH_Metv14_2009	pm10_meas_2009	18	23.9	3.5	0.8	3.5	18.5	22.0	23.9	25.5	32.4							
ESCAPE	pm10_CH_Metv14_2009	18	22.9	1.3	0.3	1.1	19.9	22.6	23.4	23.7	24.3							
	pm10_diff2009_meas_CH_Metv14	18	0.9	2.8	0.7	3.2	-2.1	-1.4	0.1	1.9	9.1	0.17	0.64	0.39	0.39	-0.06	0.72	0.77
IDB_CH_Metv14_2011_12	pm10_IDB_mean_11_12	73	19.2	5.2	0.6	5.4	3.0	16.6	19.1	22.0	36.2							
	pm10_CH_Metv14_mean_11_12	73	19.0	4.8	0.6	4.3	3.5	17.1	19.0	21.5	36.2							
	pm10_diff2011_12_IDB_CH_Metv14	73	0.2	1.6	0.2	0.4	-6.2	-0.2	0.0	0.2	6.3	0.35	0.95	0.95	0.95	0.92	0.97	0.83
meas_CH_Metv14_2011_12	pm10_meas_2011_12	74	20.1	4.1	0.5	5.4	13.0	17.3	19.3	22.7	31.9							
SAP 3	pm10_CH_Metv14_mean_11_12	74	20.3	3.1	0.4	5.7	14.9	17.5	19.7	23.2	26.0							
	pm10_diff2011_12_meas_CH_Metv14	74	-0.2	2.6	0.3	3.0	-4.9	-2.0	-0.4	1.0	9.1	0.47	0.78	0.75	0.75	0.64	0.84	0.51

..._meas_...	Measurement data:	
	ESCAPE (annual means)	*Lugano: 14-day measurements in 3 seasons in 2009*
	SAP 3 (bi-annual means)	*Basel, Geneva, Lugano, Wald: 14-day measurements in 3 seasons in 2011/12*

 Swiss TPH

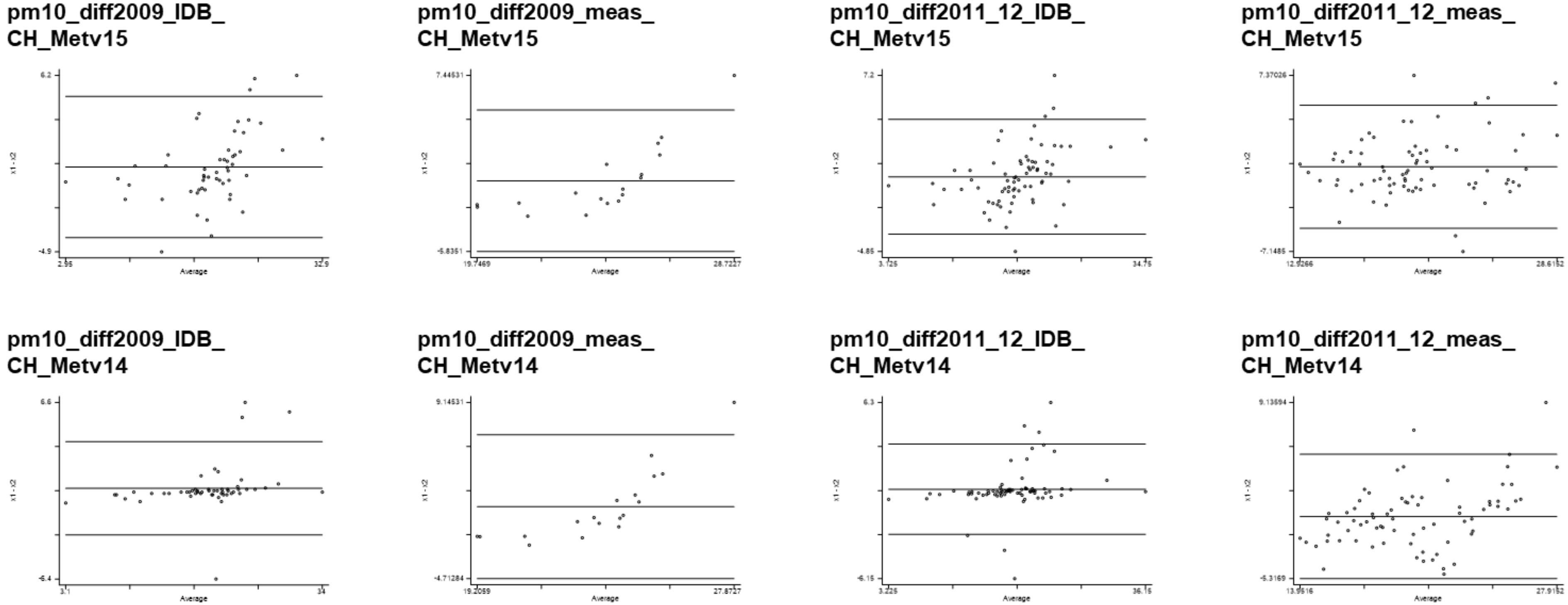


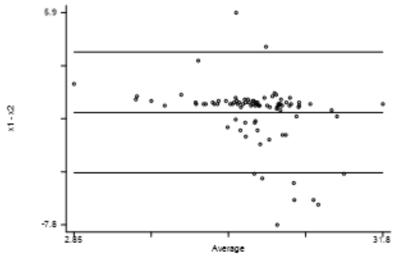
Figure A 28: BA plots of PM_{10} measurements vs. CH_Metv15 and CH_Metv14 for Escape and SAPALDIA. Bland-Altman plots corresponding to Table A 41

A.3.3.2. SAPALDIA 3

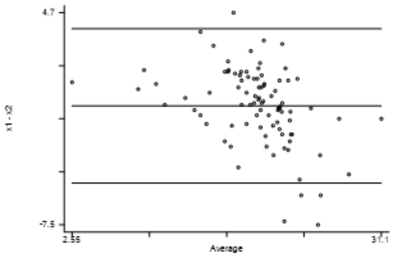
Table A 42: PM_{10} models vs. IDB measurements / SAP3. Comparison of all PM_{10} models vs. IDB measurements for SAP3 (sorted by descending CCC)

PM10 S3 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_IDB	pm10_CH_Metv14_2010	91	19.4	4.0	0.4	4.4	3.5	17.6	19.7	22.0	31.8							
	pm10_IDB_2010	91	20.0	4.7	0.5	4.6	2.2	17.8	20.0	22.4	31.8							
	pm10_diff2010_CH_Metv14_IDB	91	-0.5	2.0	0.2	0.5	-7.8	-0.4	0.0	0.1	5.9	< 0.01	0.91	0.89	0.89	0.84	0.93	0.76
CH_Metv15_IDB	pm10_CH_Metv15_2010	91	19.3	3.8	0.4	3.2	2.9	18.1	20.0	21.3	30.4							
	pm10_IDB_2010	91	20.0	4.7	0.5	4.6	2.2	17.8	20.0	22.4	31.8							
	pm10_diff2010_CH_Metv15_IDB	91	-0.7	2.2	0.2	2.7	-7.5	-1.8	-0.5	0.9	4.7	< 0.01	0.88	0.86	0.86	0.79	0.90	0.60
CH_SapWRF_IDB	pm10_CH_SapWRF_2010	92	19.2	2.7	0.3	2.6	4.2	18.1	19.2	20.6	24.9							
	pm10_IDB_2010	92	19.9	4.7	0.5	4.6	2.2	17.8	20.0	22.3	31.8							
	pm10_diff2010_CH_SapWRF_IDB	92	-0.7	3.4	0.4	4.2	-9.2	-2.9	-0.8	1.3	9.6	0.04	0.69	0.59	0.59	0.43	0.70	0.32
CH_Pollu_IDB	pm10_CH_Pollu_2010	92	19.6	4.2	0.4	1.9	-10.0	19.0	20.1	20.9	29.4							
	pm10_IDB_2010	92	19.9	4.7	0.5	4.6	2.2	17.8	20.0	22.3	31.8							
	pm10_diff2010_CH_Pollu_IDB	92	-0.3	4.1	0.4	3.8	-27.0	-2.0	0.1	1.8	6.9	0.44	0.58	0.57	0.57	0.42	0.70	0.48
mean_CH_Metv14_IDB	pm10_CH_Metv14_mean_11_12	73	19.0	4.8	0.6	4.3	3.5	17.1	19.0	21.5	36.2							
	pm10_IDB_mean_11_12	73	19.2	5.2	0.6	5.4	3.0	16.6	19.1	22.0	36.2							
	pm10_diff2011_12_CH_Metv14_IDB	73	-0.2	1.6	0.2	0.4	-6.3	-0.2	0.0	0.2	6.2	0.35	0.95	0.95	0.95	0.92	0.97	0.83
mean_CH_Metv15_IDB	pm10_CH_Metv15_mean_11_12	73	18.9	4.4	0.5	3.6	3.3	17.4	19.2	21.0	33.3							
	pm10_IDB_mean_11_12	73	19.2	5.2	0.6	5.4	3.0	16.6	19.1	22.0	36.2							
	pm10_diff2011_12_CH_Metv15_IDB	73	-0.3	2.0	0.2	2.0	-7.2	-1.3	0.0	0.8	4.9	0.22	0.93	0.92	0.92	0.87	0.95	0.75

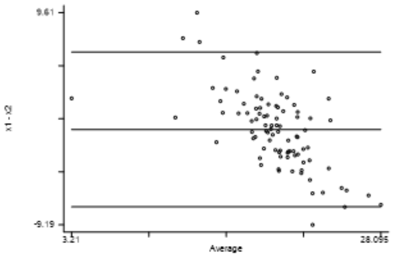
pm10_diff2010_CH_Metv14_IDB



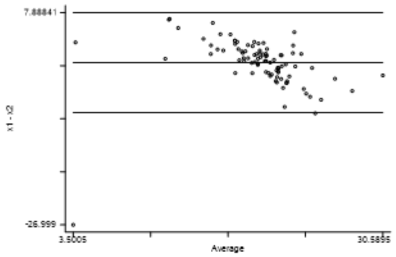
pm10_diff2010_CH_Metv15_IDB



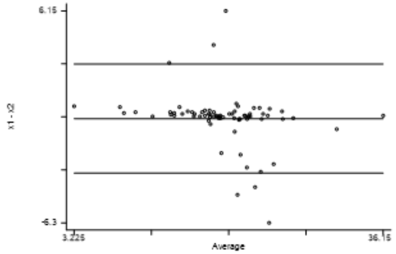
pm10_diff2010_CH_SapWRF_IDB



pm10_diff2010_CH_Pollu_IDB



pm10_diff2011_12_CH_Metv14_ IDB



pm10_diff2011_12_CH_Metv15_ IDB

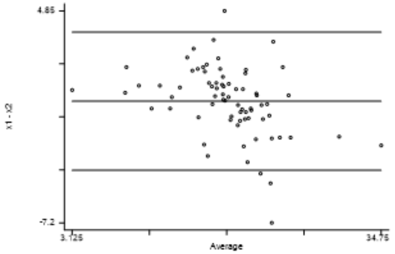


Figure A 29: BA plots of PM_{10} models vs. IDB measurements / SAP3. Bland-Altman plots corresponding to Table A 42

Table A 43: PM_{10} models vs. CH_Metv15 / SAP3. Comparison of all PM_{10} models vs. Meteotest model CH_Metv15 for SAP3 (sorted by descending CCC)

PM10 S3 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Metv15	pm10_CH_Metv14_2010	19434	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_CH_Metv15_2010	19434	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_diff2010_CH_Metv14_CH_Metv15	19434	0.1	1.4	0.0	1.3	-3.0	-0.6	-0.1	0.7	4.9	< 0.01	0.96	0.92	0.92	0.92	0.93	0.85
CH_Pollu_CH_Metv15	pm10_CH_Pollu_2010	19427	19.6	3.1	0.0	2.3	5.2	18.9	20.0	21.2	30.1							
	pm10_CH_Metv15_2010	19427	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_diff2010_CH_Pollu_CH_Metv15	19427	0.9	1.3	0.0	1.3	-2.4	0.2	0.5	1.4	6.6	< 0.01	0.97	0.91	0.91	0.91	0.91	0.88
CH_SapWRF_CH_Metv15	pm10_CH_SapWRF_2010	19434	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_CH_Metv15_2010	19434	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_diff2010_CH_SapWRF_CH_Metv15	19434	0.4	2.0	0.0	1.9	-8.9	-0.9	0.3	1.0	8.6	< 0.01	0.90	0.85	0.85	0.84	0.85	0.73
mean_CH_Metv14_CH_Metv15	pm10_CH_Metv14_mean_11_12	19434	18.6	3.6	0.0	3.5	3.5	16.8	18.7	20.3	36.5							
	pm10_CH_Metv15_mean_11_12	19434	18.3	4.4	0.0	3.5	3.3	16.8	19.0	20.2	34.2							
	pm10_diff2011_12_CH_Metv14_CH_Metv15	19434	0.3	1.5	0.0	1.7	-3.0	-0.5	0.0	1.2	5.9	< 0.01	0.95	0.92	0.92	0.92	0.93	0.84
CH_Sap3LUR_CH_Metv15	pm10_CH_Sap3LUR_11_12	11357	17.5	6.0	0.1	6.3	0.0	15.2	18.7	21.5	45.8							
	pm10_CH_Metv15_mean_11_12	11357	18.1	4.5	0.0	3.8	5.2	16.3	18.7	20.0	34.2							
	pm10_diff2011_12_CH_Sap3LUR_CH_Metv15	11357	-0.6	2.6	0.0	3.2	-8.5	-2.2	0.0	1.0	12.6	< 0.01	0.91	0.87	0.87	0.86	0.87	0.51

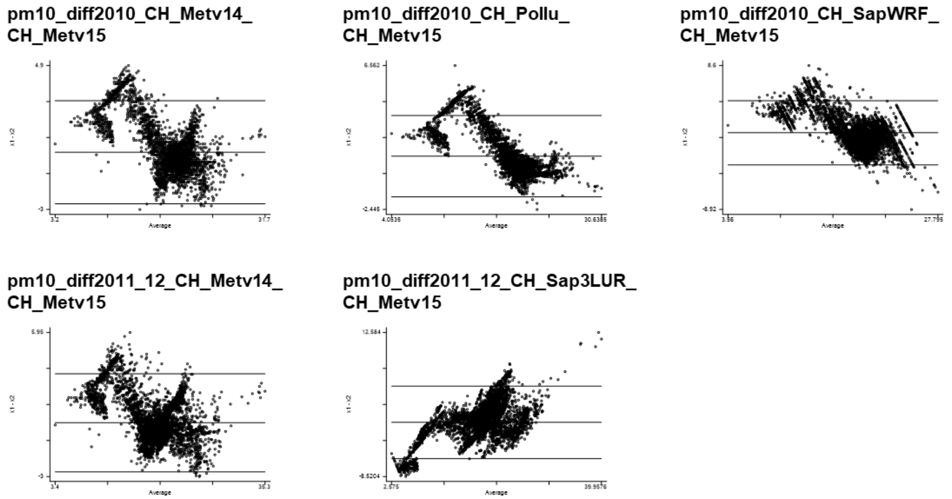


Figure A 30: BA plots of PM_{10} models vs. CH_Metv15 / SAP3. Bland-Altman plots corresponding to Table A 43

Table A 44: PM_{10} models vs. CH_Metv14 / SAP3. Comparison of all PM_{10} models vs. Meteotest model CH_Metv14 for SAP3 (sorted by descending CCC)

PM10 S3 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Pollu_CH_Metv14	pm10_CH_Pollu_2010	19427	19.6	3.1	0.0	2.3	5.2	18.9	20.0	21.2	30.1							
	pm10_CH_Metv14_2010	19427	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_diff2010_CH_Pollu_CH_Metv14	19427	0.8	0.9	0.0	0.9	-5.5	0.2	0.8	1.0	6.6	< 0.01	0.96	0.93	0.93	0.93	0.93	0.79
CH_Metv15_CH_Metv14	pm10_CH_Metv15_2010	19434	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_CH_Metv14_2010	19434	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_diff2010_CH_Metv15_CH_Metv14	19434	-0.1	1.4	0.0	1.3	-4.9	-0.7	0.1	0.6	3.0	< 0.01	0.96	0.92	0.92	0.92	0.93	0.85
CH_SapWRF_CH_Metv14	pm10_CH_SapWRF_2010	19434	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_CH_Metv14_2010	19434	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_diff2010_CH_SapWRF_CH_Metv14	19434	0.3	1.3	0.0	1.5	-8.8	-0.5	0.3	1.0	9.1	< 0.01	0.91	0.90	0.90	0.90	0.90	0.70
mean_CH_Metv15_CH_Metv14	pm10_CH_Metv15_mean_11_12	19434	18.3	4.4	0.0	3.5	3.3	16.8	19.0	20.2	34.2							
	pm10_CH_Metv14_mean_11_12	19434	18.6	3.6	0.0	3.5	3.5	16.8	18.7	20.3	36.5							
	pm10_diff2011_12_CH_Metv15_CH_Metv14	19434	-0.3	1.5	0.0	1.7	-5.9	-1.2	0.0	0.5	3.0	< 0.01	0.95	0.92	0.92	0.92	0.93	0.84
CH_Sap3LUR_CH_Metv14	pm10_CH_Sap3LUR_11_12	11357	17.5	6.0	0.1	6.3	0.0	15.2	18.7	21.5	45.8							
	pm10_CH_Metv14_mean_11_12	11357	18.5	3.6	0.0	3.6	7.5	16.6	18.4	20.2	36.5							
	pm10_diff2011_12_CH_Sap3LUR_CH_Metv14	11357	-0.9	3.1	0.0	3.3	-9.8	-2.2	-0.2	1.1	10.0	< 0.01	0.91	0.78	0.78	0.78	0.79	0.49

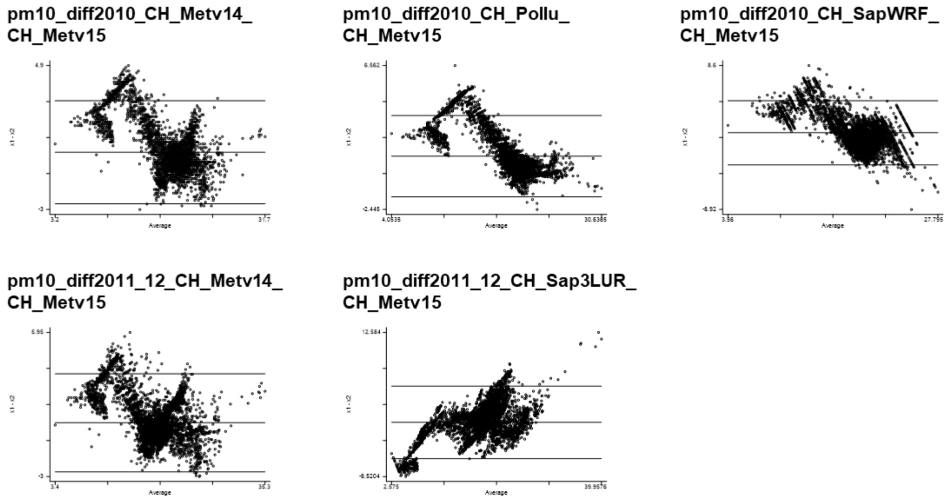


Figure A 31: BA plots of PM_{10} models vs. CH_Metv14 / SAP3. Bland-Altman plots corresponding to Table A 44

Table A 45: PM_{10} models vs. CH_SapWRF / SAP3. Comparison of all PM_{10} models vs. WRF-Chem model (CH_SapWRF) for SAP3 (sorted by descending CCC)

PM10 S3 / CH_SapWRF	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_SapWRF	pm10_CH_Metv14_2010	19434	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_CH_SapWRF_2010	19434	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_diff2010_CH_Metv14_CH_SapWRF	19434	-0.3	1.3	0.0	1.5	-9.1	-1.0	-0.3	0.5	8.8	< 0.01	0.91	0.90	0.90	0.90	0.90	0.70
CH_Pollu_CH_SapWRF	pm10_CH_Pollu_2010	19443	19.6	3.2	0.0	2.3	-10.0	18.9	20.0	21.2	30.1							
	pm10_CH_SapWRF_2010	19443	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_diff2010_CH_Pollu_CH_SapWRF	19443	0.5	1.4	0.0	1.8	-30.3	-0.4	0.4	1.4	9.7	< 0.01	0.91	0.89	0.89	0.89	0.90	0.71
CH_Metv15_CH_SapWRF	pm10_CH_Metv15_2010	19434	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_CH_SapWRF_2010	19434	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_diff2010_CH_Metv15_CH_SapWRF	19434	-0.4	2.0	0.0	1.9	-8.6	-1.0	-0.3	0.9	8.9	< 0.01	0.90	0.85	0.85	0.84	0.85	0.73

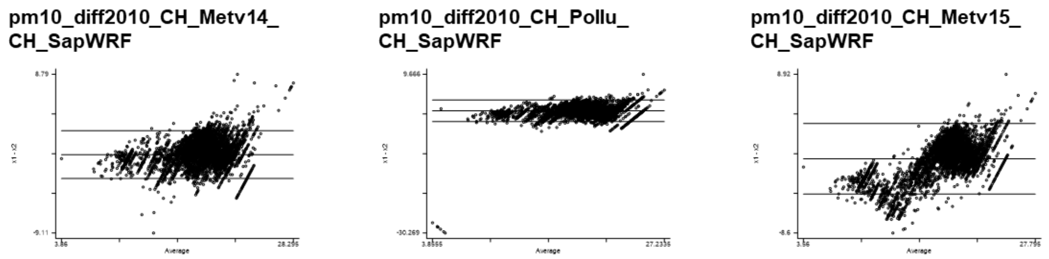


Figure A 32: BA plots of PM_{10} models vs. CH_SapWRF / SAP3. Bland-Altman plots corresponding to Table A 45

Table A 46: PM_{10} models vs. CH_Pollu / SAP3. Comparison of all PM_{10} models vs. PolluMap model (CH_Pollu) for SAP3 (sorted by descending CCC)

PM10 S3 / CH_Pollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Pollu	pm10_CH_Metv14_2010	19427	18.8	3.2	0.0	3.5	3.5	17.4	19.6	20.9	32.2							
	pm10_CH_Pollu_2010	19427	19.6	3.1	0.0	2.3	5.2	18.9	20.0	21.2	30.1							
	pm10_diff2010_CH_Metv14_CH_Pollu	19427	-0.8	0.9	0.0	0.9	-6.6	-1.0	-0.8	-0.2	5.5	< 0.01	0.96	0.93	0.93	0.93	0.93	0.79
CH_Metv15_CH_Pollu	pm10_CH_Metv15_2010	19427	18.7	4.1	0.0	3.4	2.9	17.6	19.9	21.0	31.2							
	pm10_CH_Pollu_2010	19427	19.6	3.1	0.0	2.3	5.2	18.9	20.0	21.2	30.1							
	pm10_diff2010_CH_Metv15_CH_Pollu	19427	-0.9	1.3	0.0	1.3	-6.6	-1.4	-0.5	-0.2	2.4	< 0.01	0.97	0.91	0.91	0.91	0.91	0.88
CH_SapWRF_CH_Pollu	pm10_CH_SapWRF_2010	19443	19.1	3.0	0.0	3.7	4.2	17.7	19.1	21.4	24.9							
	pm10_CH_Pollu_2010	19443	19.6	3.2	0.0	2.3	-10.0	18.9	20.0	21.2	30.1							
	pm10_diff2010_CH_SapWRF_CH_Pollu	19443	-0.5	1.4	0.0	1.8	-9.7	-1.4	-0.4	0.4	30.3	< 0.01	0.91	0.89	0.89	0.89	0.90	0.71

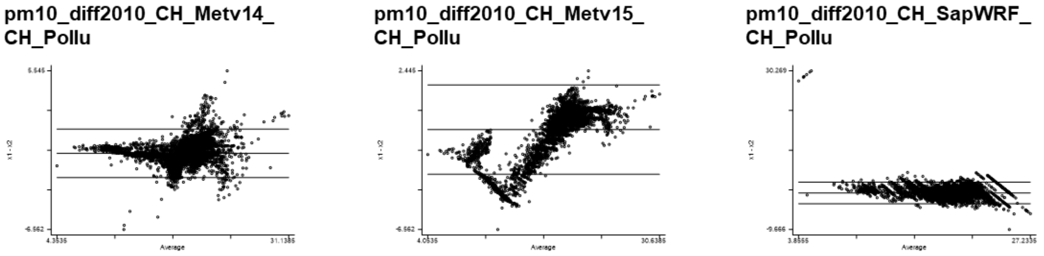


Figure A 33: BA plots of PM_{10} models vs. CH_Pollu / SAP3. Bland-Altman plots corresponding to Table A 46

A.3.3.4. SAPALDIA 2

Table A 47: PM_{10} models vs. IDB measurements / SAP2. Comparison of all PM_{10} models vs. IDB measurements for SAP2 (sorted by descending CCC)

PM10 S2 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_IDB	pm10_CH_Metv14_2002	59	23.5	4.8	0.6	4.6	11.6	21.0	22.9	25.6	39.1							
	pm10_IDB_2002	59	23.4	5.1	0.7	5.8	11.5	20.0	23.0	25.8	39.0							
	pm10_diff2002_CH_Metv14_IDB	59	0.1	2.2	0.3	0.3	-12.0	-0.1	0.0	0.2	8.7	0.72	0.90	0.90	0.90	0.84	0.94	0.81
CH_Metv15_IDB	pm10_CH_Metv15_2002	59	23.4	4.6	0.6	2.5	12.6	21.7	23.2	24.2	42.5							
	pm10_IDB_2002	59	23.4	5.1	0.7	5.8	11.5	20.0	23.0	25.8	39.0							
	pm10_diff2002_CH_Metv15_IDB	59	0.0	2.7	0.4	2.3	-12.9	-1.1	0.1	1.2	7.1	0.95	0.85	0.84	0.85	0.75	0.90	0.32
CH_SapWRF_IDB	pm10_CH_SapWRF_2002	59	22.5	2.8	0.4	3.4	14.6	20.9	22.5	24.4	29.2							
	pm10_IDB_2002	59	23.4	5.1	0.7	5.8	11.5	20.0	23.0	25.8	39.0							
	pm10_diff2002_CH_SapWRF_IDB	59	-0.9	3.7	0.5	3.3	-13.0	-2.3	-0.6	1.0	7.4	0.06	0.70	0.57	0.57	0.38	0.72	0.51

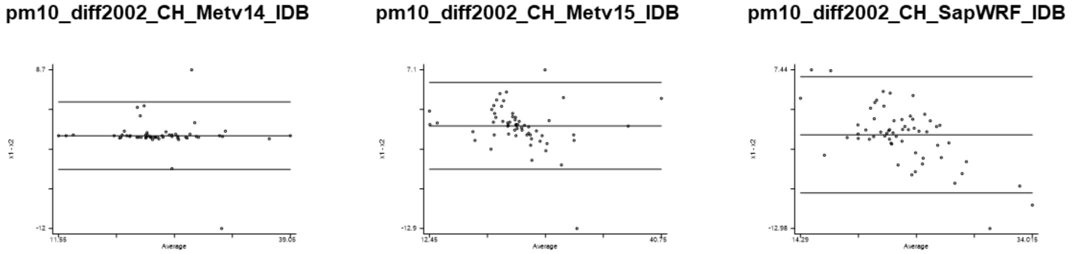


Figure A 34: BA plots of PM_{10} models vs. IDB measurements / SAP2. Bland-Altman plots corresponding to Table A 47

Table A 48: PM_{10} models vs. CH_Metv15 / SAP2. Comparison of all PM_{10} models vs. Meteotest model CH_Metv15 for SAP2 (sorted by descending CCC)

PM10 S2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_Metv15	pm10_CH_Metv14_2002	19434	22.8	5.6	0.0	4.6	3.5	20.1	22.7	24.7	40.4							
	pm10_CH_Metv15_2002	19434	22.6	5.7	0.0	2.7	3.7	21.3	23.1	24.0	43.4							
	pm10_diff2002_CH_Metv14_CH_Metv15	19434	0.2	1.2	0.0	1.8	-5.6	-0.8	0.2	1.0	9.1	< 0.01	0.98	0.98	0.98	0.98	0.98	0.81
CH_SapPollu_CH_Metv15	pm10_CH_SapPollu_2002	11458	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_CH_Metv15_2002	11458	22.7	5.6	0.1	2.3	6.6	21.8	23.3	24.1	42.7							
	pm10_diff2002_CH_SapPollu_CH_Metv15	11458	0.8	3.3	0.0	5.0	-9.4	-2.1	1.1	3.0	19.0	< 0.01	0.92	0.87	0.87	0.86	0.87	0.75
CH_SapWRF_CH_Metv15	pm10_CH_SapWRF_2002	19434	21.8	4.2	0.0	5.3	1.5	19.9	21.8	25.2	29.2							
	pm10_CH_Metv15_2002	19434	22.6	5.7	0.0	2.7	3.7	21.3	23.1	24.0	43.4							
	pm10_diff2002_CH_SapWRF_CH_Metv15	19434	-0.8	3.1	0.0	3.8	-14.4	-2.6	-0.7	1.2	9.3	< 0.01	0.84	0.80	0.79	0.79	0.80	0.56
EUR_EscapeLUR_r_CH_Metv15	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_CH_Metv15_2002	305	32.5	3.3	0.2	5.5	21.8	30.1	32.2	35.6	39.1							
	pm10_diff2002_EUR_EscapeLUR_r_CH_Metv15	305	3.1	3.6	0.2	4.1	-5.4	1.0	2.8	5.2	19.9	< 0.01	0.67	0.49	0.43	0.33	0.51	
EUR_EscapeLUR_d_CH_Metv15	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_CH_Metv15_2002	305	32.5	3.3	0.2	5.5	21.8	30.1	32.2	35.6	39.1							
	pm10_diff2002_EUR_EscapeLUR_d_CH_Metv15	305	3.5	2.7	0.2	3.5	-3.4	1.7	3.5	5.2	13.6	< 0.01	0.65	0.40	0.27	0.16	0.37	

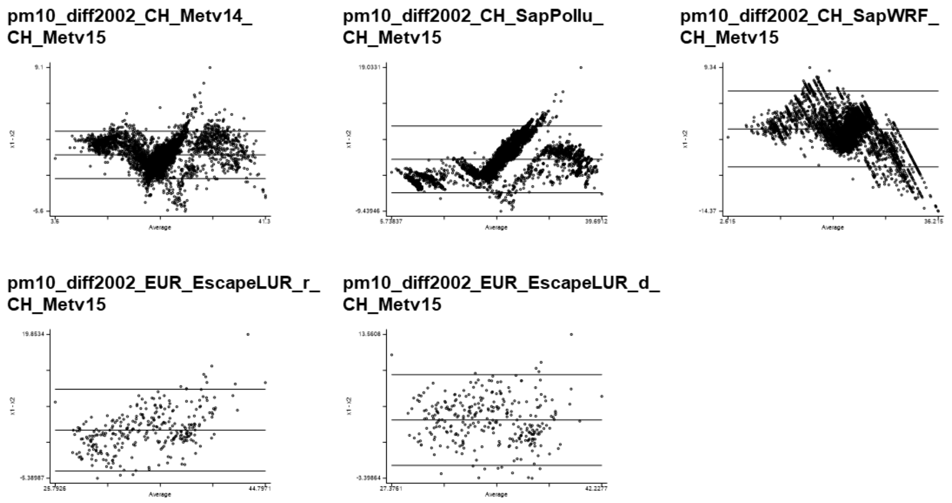


Figure A 35: BA plots of PM_{10} models vs. CH_Metv15 / SAP2. Bland-Altman plots corresponding to Table A 48

Table A 49: PM_{10} models vs. CH_Metv14 / SAP2. Comparison of all PM_{10} models vs. Meteotest model CH_Metv14 for SAP2 (sorted by descending CCC)

PM10 S2 / CH_Metv14	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_CH_Metv14	pm10_CH_Metv15_2002	19434	22.6	5.7	0.0	2.7	3.7	21.3	23.1	24.0	43.4							
	pm10_CH_Metv14_2002	19434	22.8	5.6	0.0	4.6	3.5	20.1	22.7	24.7	40.4							
	pm10_diff2002_CH_Metv15_CH_Metv14	19434	-0.2	1.2	0.0	1.8	-9.1	-1.0	-0.2	0.8	5.6	< 0.01	0.98	0.98	0.98	0.98	0.98	0.81
CH_SapPollu_CH_Metv14	pm10_CH_SapPollu_2002	11458	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_CH_Metv14_2002	11458	23.0	5.5	0.1	4.3	7.5	20.5	23.3	24.8	40.4							
	pm10_diff2002_CH_SapPollu_CH_Metv14	11458	0.6	3.1	0.0	3.4	-7.1	-1.2	0.7	2.2	9.9	< 0.01	0.94	0.89	0.89	0.89	0.89	0.88
CH_SapWRF_CH_Metv14	pm10_CH_SapWRF_2002	19434	21.8	4.2	0.0	5.3	1.5	19.9	21.8	25.2	29.2							
	pm10_CH_Metv14_2002	19434	22.8	5.6	0.0	4.6	3.5	20.1	22.7	24.7	40.4							
	pm10_diff2002_CH_SapWRF_CH_Metv14	19434	-1.0	3.0	0.0	2.9	-14.0	-2.1	-0.4	0.9	7.3	< 0.01	0.85	0.81	0.80	0.80	0.81	0.60
EUR_EscapeLUR_r_CH_Metv14	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_CH_Metv14_2002	305	32.9	3.9	0.2	4.7	21.5	31.0	34.0	35.7	39.2							
	pm10_diff2002_EUR_EscapeLUR_r_CH_Metv14	305	2.7	3.8	0.2	4.8	-6.8	0.2	3.0	5.0	18.0	< 0.01	0.64	0.53	0.49	0.40	0.57	
EUR_EscapeLUR_d_CH_Metv14	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_CH_Metv14_2002	305	32.9	3.9	0.2	4.7	21.5	31.0	34.0	35.7	39.2							
	pm10_diff2002_EUR_EscapeLUR_d_CH_Metv14	305	3.1	3.1	0.2	4.0	-4.3	1.0	2.8	5.0	11.7	< 0.01	0.62	0.44	0.35	0.24	0.44	

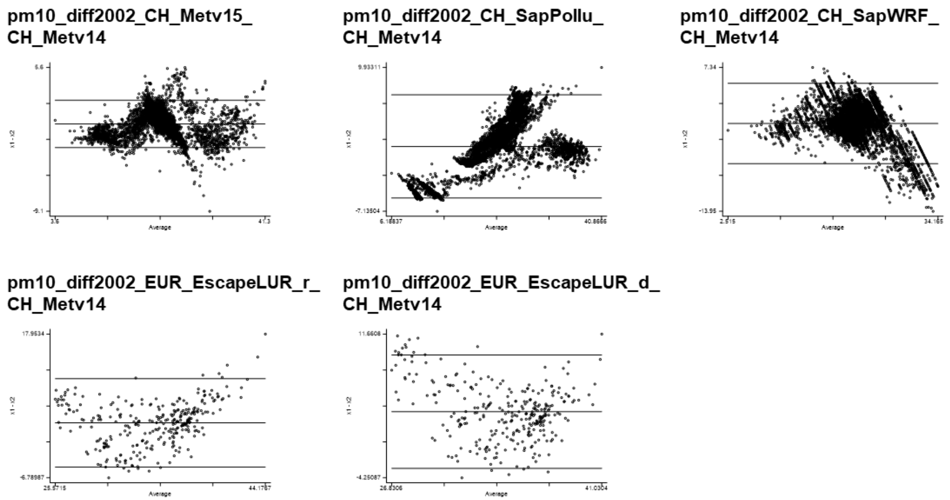


Figure A 36: BA plots of PM_{10} models vs. CH_Metv14 / SAP2. Bland-Altman plots corresponding to Table A 49

Table A 50: PM_{10} models vs. CH_SapWRF / SAP2. Comparison of all PM_{10} models vs. WRF-Chem model (CH_SapWRF) for SAP2 (sorted by descending CCC)

PM10 S2 / CH_SapWRF	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_SapWRF	pm10_CH_Metv14_2002	19434	22.8	5.6	0.0	4.6	3.5	20.1	22.7	24.7	40.4							
	pm10_CH_SapWRF_2002	19434	21.8	4.2	0.0	5.3	1.5	19.9	21.8	25.2	29.2							
	pm10_diff2002_CH_Metv14_CH_SapWRF	19434	1.0	3.0	0.0	2.9	-7.3	-0.9	0.4	2.1	14.0	< 0.01	0.85	0.81	0.80	0.80	0.81	0.60
CH_Metv15_CH_SapWRF	pm10_CH_Metv15_2002	19434	22.6	5.7	0.0	2.7	3.7	21.3	23.1	24.0	43.4							
	pm10_CH_SapWRF_2002	19434	21.8	4.2	0.0	5.3	1.5	19.9	21.8	25.2	29.2							
	pm10_diff2002_CH_Metv15_CH_SapWRF	19434	0.8	3.1	0.0	3.8	-9.3	-1.2	0.7	2.6	14.4	< 0.01	0.84	0.80	0.79	0.79	0.80	0.56
CH_SapPollu_CH_SapWRF	pm10_CH_SapPollu_2002	11464	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_CH_SapWRF_2002	11464	22.1	4.4	0.0	5.6	5.8	19.9	22.7	25.5	29.2							
	pm10_diff2002_CH_SapPollu_CH_SapWRF	11464	1.4	4.0	0.0	5.3	-11.3	-1.0	1.3	4.3	21.9	< 0.01	0.91	0.77	0.76	0.76	0.77	0.60
EUR_EscapeLUR_r_CH_SapWRF	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_CH_SapWRF_2002	305	26.8	2.1	0.1	3.1	21.6	26.1	26.9	29.2	29.2							
	pm10_diff2002_EUR_EscapeLUR_r_CH_SapWRF	305	8.8	3.9	0.2	5.3	0.9	5.9	8.8	11.1	24.0	< 0.01	0.64	0.12	-0.39	-0.48	-0.29	
EUR_EscapeLUR_d_CH_SapWRF	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_CH_SapWRF_2002	305	26.8	2.1	0.1	3.1	21.6	26.1	26.9	29.2	29.2							
	pm10_diff2002_EUR_EscapeLUR_d_CH_SapWRF	305	9.2	2.4	0.1	3.0	2.7	7.6	9.0	10.6	17.7	< 0.01	0.61	0.08	-0.61	-0.68	-0.54	

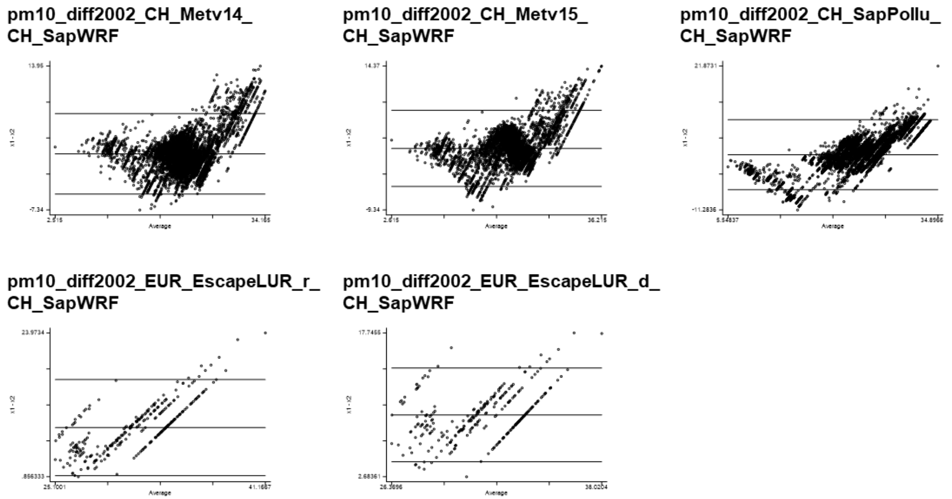
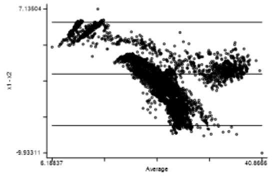


Figure A 37: BA plots of PM_{10} models vs. CH_SapWRF / SAP2. Bland-Altman plots corresponding to Table A 50

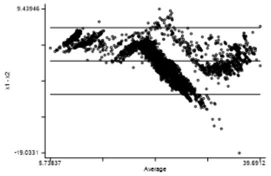
Table A 51: PM_{10} models vs. CH_SapPollu / SAP2. Comparison of all PM_{10} models vs. SAPALDIA Extrapolation of PolluMap model (CH_SapPollu) for SAP2 (sorted by descending CCC)

PM10 S2 / CH_SapPollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv14_CH_SapPollu	pm10_CH_Metv14_2002	11458	23.0	5.5	0.1	4.3	7.5	20.5	23.3	24.8	40.4							
	pm10_CH_SapPollu_2002	11458	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_diff2002_CH_Metv14_CH_SapPollu	11458	-0.6	3.1	0.0	3.4	-9.9	-2.2	-0.7	1.2	7.1	< 0.01	0.94	0.89	0.89	0.89	0.89	0.88
CH_Metv15_CH_SapPollu	pm10_CH_Metv15_2002	11458	22.7	5.6	0.1	2.3	6.6	21.8	23.3	24.1	42.7							
	pm10_CH_SapPollu_2002	11458	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_diff2002_CH_Metv15_CH_SapPollu	11458	-0.8	3.3	0.0	5.0	-19.0	-3.0	-1.1	2.1	9.4	< 0.01	0.92	0.87	0.87	0.86	0.87	0.75
CH_SapWRF_CH_SapPollu	pm10_CH_SapWRF_2002	11464	22.1	4.4	0.0	5.6	5.8	19.9	22.7	25.5	29.2							
	pm10_CH_SapPollu_2002	11464	23.5	7.6	0.1	8.8	4.9	19.9	25.2	28.7	45.8							
	pm10_diff2002_CH_SapWRF_CH_SapPollu	11464	-1.4	4.0	0.0	5.3	-21.9	-4.3	-1.3	1.0	11.3	< 0.01	0.91	0.77	0.76	0.76	0.77	0.60
EUR_EscapeLUR_r_CH_SapPollu	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_CH_SapPollu_2002	305	32.7	4.6	0.3	3.8	17.1	31.8	34.5	35.6	38.1							
	pm10_diff2002_EUR_EscapeLUR_r_CH_SapPollu	305	2.9	4.1	0.2	5.5	-7.6	0.1	3.0	5.6	17.6	< 0.01	0.61	0.52	0.48	0.39	0.56	0.00
EUR_EscapeLUR_d_CH_SapPollu	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_CH_SapPollu_2002	305	32.7	4.6	0.3	3.8	17.1	31.8	34.5	35.6	38.1							
	pm10_diff2002_EUR_EscapeLUR_d_CH_SapPollu	305	3.3	3.7	0.2	4.4	-5.1	0.8	2.6	5.2	15.9	< 0.01	0.59	0.41	0.32	0.22	0.42	0.00

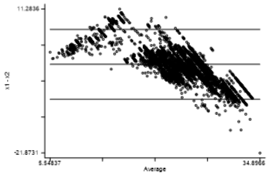
pm10_diff2002_CH_Metv14_ CH_SapPollu



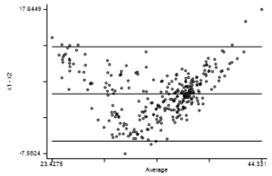
pm10_diff2002_CH_Metv15_ CH_SapPollu



pm10_diff2002_CH_SapWRF_ CH_SapPollu



pm10_diff2002_EUR_EscapeLUR_r_ CH_SapPollu



pm10_diff2002_EUR_EscapeLUR_d_ CH_SapPollu

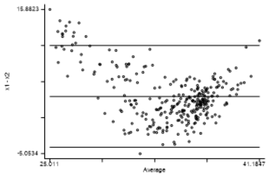


Figure A 38: BA plots of PM_{10} models vs. CH_SapPollu / SAP2. Bland-Altman plots corresponding to Table A 51

 Swiss TPH

Table A 52: PM_{10} models vs. EUR_EscapeLUR_r / SAP2. Comparison of all PM_{10} models vs. back extrapolated Escape (ratio) LUR model (EUR_EscapeLUR_r) for SAP2 (sorted by descending CCC)

PM10 S2 / EUR_EscapeLUR Ratio	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_d_EUR_EscapeLUR_r	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_diff2002_EUR_EscapeLUR_d_EUR_EscapeLUR_r	305	0.4	1.8	0.1	2.6	-6.3	-0.7	0.2	1.9	3.3	< 0.01	0.99	0.89	0.89	0.87	0.91	
CH_Metv14_EUR_EscapeLUR_r	pm10_CH_Metv14_2002	305	32.9	3.9	0.2	4.7	21.5	31.0	34.0	35.7	39.2							
	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_diff2002_CH_Metv14_EUR_EscapeLUR_r	305	-2.7	3.8	0.2	4.8	-18.0	-5.0	-3.0	-0.2	6.8	< 0.01	0.64	0.53	0.49	0.40	0.57	
CH_SapPollu_EUR_EscapeLUR_r	pm10_CH_SapPollu_2002	305	32.7	4.6	0.3	3.8	17.1	31.8	34.5	35.6	38.1							
	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_diff2002_CH_SapPollu_EUR_EscapeLUR_r	305	-2.9	4.1	0.2	5.5	-17.6	-5.6	-3.0	-0.1	7.6	< 0.01	0.61	0.52	0.48	0.39	0.56	0.00
CH_Metv15_EUR_EscapeLUR_r	pm10_CH_Metv15_2002	305	32.5	3.3	0.2	5.5	21.8	30.1	32.2	35.6	39.1							
	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_diff2002_CH_Metv15_EUR_EscapeLUR_r	305	-3.1	3.6	0.2	4.1	-19.9	-5.2	-2.8	-1.0	5.4	< 0.01	0.67	0.49	0.43	0.33	0.51	
CH_SapWRF_EUR_EscapeLUR_r	pm10_CH_SapWRF_2002	305	26.8	2.1	0.1	3.1	21.6	26.1	26.9	29.2	29.2							
	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_diff2002_CH_SapWRF_EUR_EscapeLUR_r	305	-8.8	3.9	0.2	5.3	-24.0	-11.1	-8.8	-5.9	-0.9	< 0.01	0.64	0.12	-0.39	-0.48	-0.29	

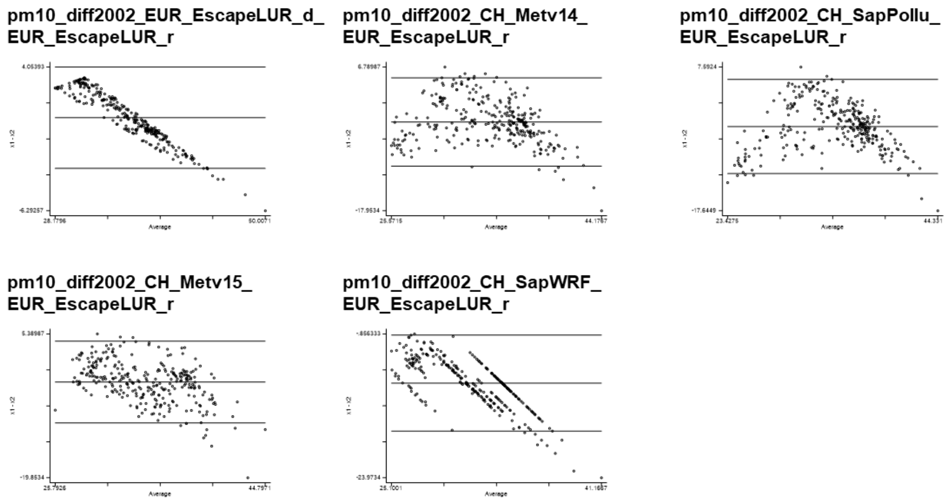


Figure A 39: BA plots of PM_{10} models vs. EUR_EscapeLUR_r / SAP2. Bland-Altman plots corresponding to Table A 52

Table A 53: PM_{10} models vs. EUR_EscapeLUR_d / SAP2. Comparison of all PM_{10} models vs. back extrapolated Escape (difference) LUR model (EUR_EscapeLUR_d) for SAP2 (sorted by descending CCC)

PM10 S2 / EUR_EscapeLUR Diff	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_r_EUR_EscapeLUR_d	pm10_EUR_EscapeLUR_r_2002	305	35.6	4.8	0.3	7.5	26.9	31.3	36.1	38.9	53.2							
	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_diff2002_EUR_EscapeLUR_r_EUR_EscapeLUR_d	305	-0.4	1.8	0.1	2.6	-3.3	-1.9	-0.2	0.7	6.3	< 0.01	0.99	0.89	0.89	0.87	0.91	
CH_Metv14_EUR_EscapeLUR_d	pm10_CH_Metv14_2002	305	32.9	3.9	0.2	4.7	21.5	31.0	34.0	35.7	39.2							
	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_diff2002_CH_Metv14_EUR_EscapeLUR_d	305	-3.1	3.1	0.2	4.0	-11.7	-5.0	-2.8	-1.0	4.3	< 0.01	0.62	0.44	0.35	0.24	0.44	
CH_SapPollu_EUR_EscapeLUR_d	pm10_CH_SapPollu_2002	305	32.7	4.6	0.3	3.8	17.1	31.8	34.5	35.6	38.1							
	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_diff2002_CH_SapPollu_EUR_EscapeLUR_d	305	-3.3	3.7	0.2	4.4	-15.9	-5.2	-2.6	-0.8	5.1	< 0.01	0.59	0.41	0.32	0.22	0.42	0.00
CH_Metv15_EUR_EscapeLUR_d	pm10_CH_Metv15_2002	305	32.5	3.3	0.2	5.5	21.8	30.1	32.2	35.6	39.1							
	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_diff2002_CH_Metv15_EUR_EscapeLUR_d	305	-3.5	2.7	0.2	3.5	-13.6	-5.2	-3.5	-1.7	3.4	< 0.01	0.65	0.40	0.27	0.16	0.37	
CH_SapWRF_EUR_EscapeLUR_d	pm10_CH_SapWRF_2002	305	26.8	2.1	0.1	3.1	21.6	26.1	26.9	29.2	29.2							
	pm10_EUR_EscapeLUR_d_2002	305	36.0	3.1	0.2	4.5	29.4	33.5	36.1	38.1	46.9							
	pm10_diff2002_CH_SapWRF_EUR_EscapeLUR_d	305	-9.2	2.4	0.1	3.0	-17.7	-10.6	-9.0	-7.6	-2.7	< 0.01	0.61	0.08	-0.61	-0.68	-0.54	

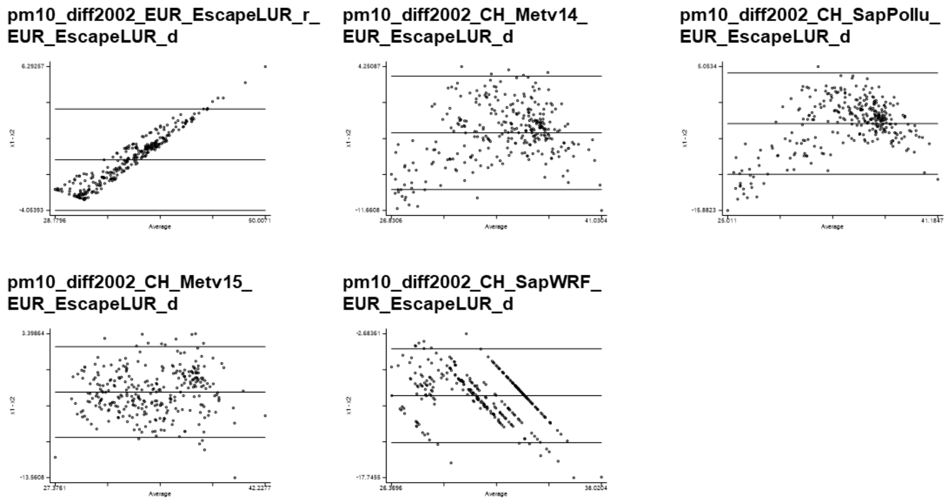


Figure A 40: BA plots of PM_{10} models vs. EUR_EscapeLUR_d / SAP2. Bland-Altman plots corresponding to Table A 53

A.3.3.5. SAPALDIA 1

Table A 54: PM_{10} models vs. CH_SapPollu / SAP1. Comparison of all PM_{10} models vs. SAPALDIA Extrapolation of PolluMap model (CH_SapPollu) for SAP1 (sorted by descending CCC)

PM10 S1 / CH_SapPollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_r_CH_SapPollu	pm10_EUR_EscapeLUR_r_1991	581	46.1	4.7	0.2	4.2	33.8	44.1	45.5	48.3	61.9							
	pm10_CH_SapPollu_1991	581	44.0	4.6	0.2	2.5	25.2	43.9	45.1	46.4	48.6							
	pm10_diff1991_EUR_EscapeLUR_r_CH_SapPollu	581	2.1	4.2	0.2	5.5	-7.5	-0.8	1.5	4.7	14.9	< 0.01	0.60	0.54	0.52	0.46	0.58	
EUR_EscapeLUR_d_CH_SapPollu	pm10_EUR_EscapeLUR_d_1991	581	44.7	2.5	0.1	2.4	38.1	43.5	44.5	45.9	53.0							
	pm10_CH_SapPollu_1991	581	44.0	4.6	0.2	2.5	25.2	43.9	45.1	46.4	48.6							
	pm10_diff1991_EUR_EscapeLUR_d_CH_SapPollu	581	0.7	3.8	0.2	3.7	-5.5	-1.8	-0.1	1.9	14.9	< 0.01	0.59	0.48	0.48	0.41	0.54	

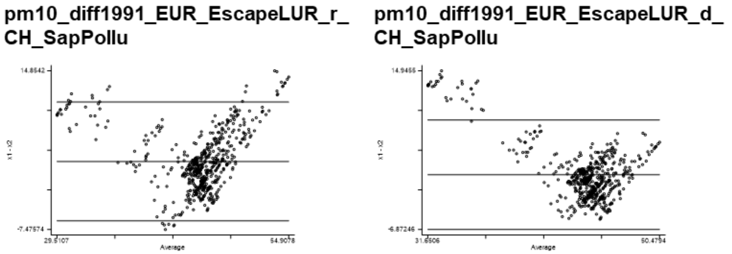


Figure A 41: BA plots of PM_{10} models vs. CH_SapPollu / SAP1. Bland-Altman plots corresponding to Table A 54

Table A 55: PM_{10} models vs. EUR_EscapeLUR_r / SAP1. Comparison of all PM_{10} models vs. back extrapolated Escape (ratio) LUR model (EUR_EscapeLUR_r) for SAP1 (sorted by descending CCC)

PM10 S1 /EUR_EscapeLUR Ratio	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_d_EUR_EscapeLUR_r	pm10_EUR_EscapeLUR_d_1991	581	44.7	2.5	0.1	2.4	38.1	43.5	44.5	45.9	53.0							
	pm10_EUR_EscapeLUR_r_1991	581	46.1	4.7	0.2	4.2	33.8	44.1	45.5	48.3	61.9							
	pm10_diff1991_EUR_EscapeLUR_d_EUR_EscapeLUR_r	581	-1.4	2.2	0.1	1.8	-8.9	-2.5	-1.0	-0.7	4.5	< 0.01	0.99	0.77	0.76	0.72	0.79	
CH_SapPollu_EUR_EscapeLUR_r	pm10_CH_SapPollu_1991	581	44.0	4.6	0.2	2.5	25.2	43.9	45.1	46.4	48.6							
	pm10_EUR_EscapeLUR_r_1991	581	46.1	4.7	0.2	4.2	33.8	44.1	45.5	48.3	61.9							
	pm10_diff1991_CH_SapPollu_EUR_EscapeLUR_r	581	-2.1	4.2	0.2	5.5	-14.9	-4.7	-1.5	0.8	7.5	< 0.01	0.60	0.54	0.52	0.46	0.58	

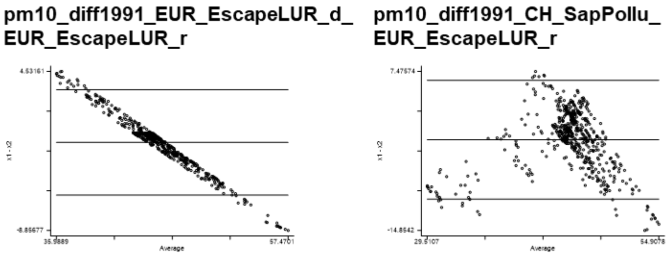


Figure A 42: BA plots of PM_{10} models vs. EUR_EscapeLUR_r / SAP1. Bland-Altman plots corresponding to Table A 55

Table A 56: PM_{10} models vs. EUR_EscapeLUR_d / SAP1. Comparison of all PM_{10} models vs. back extrapolated Escape (difference) LUR model (EUR_EscapeLUR_d) for SAP1 (sorted by descending CCC)

PM10 S1 / EUR_EscapeLUR Diff	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_EscapeLUR_r_EUR_EscapeLUR_d	pm10_EUR_EscapeLUR_r_1991	581	46.1	4.7	0.2	4.2	33.8	44.1	45.5	48.3	61.9							
	pm10_EUR_EscapeLUR_d_1991	581	44.7	2.5	0.1	2.4	38.1	43.5	44.5	45.9	53.0							
	pm10_diff1991_EUR_EscapeLUR_r_EUR_EscapeLUR_d	581	1.4	2.2	0.1	1.8	-4.5	0.7	1.0	2.5	8.9	< 0.01	0.99	0.77	0.76	0.72	0.79	
CH_SapPollu_EUR_EscapeLUR_d	pm10_CH_SapPollu_1991	581	44.0	4.6	0.2	2.5	25.2	43.9	45.1	46.4	48.6							
	pm10_EUR_EscapeLUR_d_1991	581	44.7	2.5	0.1	2.4	38.1	43.5	44.5	45.9	53.0							
	pm10_diff1991_CH_SapPollu_EUR_EscapeLUR_d	581	-0.7	3.8	0.2	3.7	-14.9	-1.9	0.1	1.8	5.5	< 0.01	0.59	0.48	0.48	0.41	0.54	

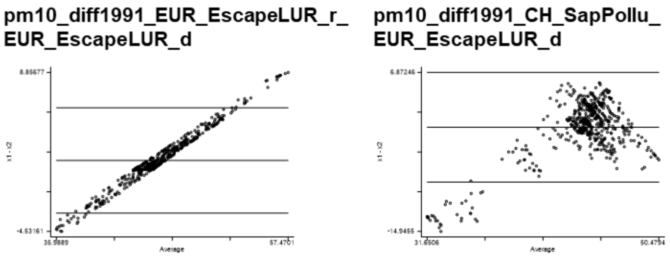


Figure A 43: BA plots of PM_{10} models vs. EUR_EscapeLUR_d / SAP1. Bland-Altman plots corresponding to Table A 56

A.3.3.6. Other times

Table A 57: Comparison PM_{10} Bayesian model 20016. PM_{10} IDB measurements and Meteotest model (CH_Metv15) vs. Bayesian model (EUR_BayesSat) for 2016

PM10 2016 / EUR_BayesSat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	pm10_v15_2016	86	13.9	3.6	0.4	2.5	1.9	13.0	14.4	15.5	23.7							
	pm10_IDB_2016	86	14.4	3.9	0.4	3.5	1.7	12.7	15.0	16.2	24.0							
	pm10_diff2016_IDB_CH_Metv15	86	-0.5	1.7	0.2	1.6	-7.9	-1.1	-0.3	0.5	3.1	< 0.01	0.90	0.88	0.89	0.83	0.92	0.74
IDB_EUR_BayesSat	pm10_IDB_2016	86	14.4	3.9	0.4	3.5	1.7	12.7	15.0	16.2	24.0							
	pm10_EUR_BayesSat_2016	86	13.9	3.5	0.4	3.1	2.1	12.4	14.4	15.5	24.2							
	pm10_diff2016_EUR_BayesSat_IDB	86	0.5	2.3	0.2	2.8	-5.8	-1.0	0.3	1.7	9.2	0.04	0.81	0.80	0.80	0.71	0.86	0.48
CH_Metv15_EUR_BayesSat	pm10_v15_2016	21560	13.7	3.8	0.0	2.9	1.9	12.6	14.4	15.5	24.2							
	pm10_EUR_BayesSat_2016	21560	14.2	3.7	0.0	4.9	2.1	11.8	14.6	16.7	24.4							
	pm10_diff2016_EUR_BayesSat_CH_Metv15	21560	-0.5	1.3	0.0	1.8	-6.6	-1.4	-0.5	0.4	8.7	< 0.01	0.94	0.94	0.93	0.93	0.94	0.56

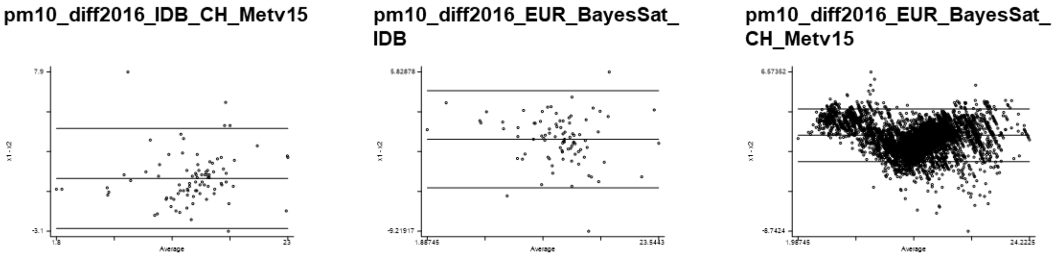


Figure A 44: BA plots of PM_{10} Bayesian model comparison 20016. Bland-Altman plots corresponding to Table A 57

Table A 58: Comparison PM_{10} Escape model 2009. PM_{10} IDB Measurements and Meteotest models (CH_Metv15, CH_Metv14) vs. Escape model (EUR_EscapeLUR) for 2009

PM10 2009 / EUR_EscapeLUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	pm10_CH_Metv15_2009	54	19.8	4.7	0.6	3.1	3.2	19.0	21.1	22.1	31.8							
	pm10_IDB_2009	54	20.3	5.7	0.8	5.0	2.7	18.0	20.9	23.0	34.0							
	pm10_diff2009_CH_Metv15_IDB	54	-0.4	2.2	0.3	2.3	-6.2	-1.4	-0.2	0.9	4.9	0.16	0.93	0.91	0.91	0.85	0.95	0.89
CH_Metv15_EUR_EscapeLUR	pm10_CH_Metv15_2009	886	24.5	1.7	0.1	1.8	16.8	23.7	25.0	25.5	28.1							
	pm10_EUR_EscapeLUR_2009	886	23.2	2.8	0.1	2.9	17.6	21.9	23.3	24.8	31.7							
	pm10_diff2009_CH_Metv15_EUR_EscapeLUR	886	1.3	2.0	0.1	2.1	-6.7	0.3	1.5	2.4	7.1	< 0.01	0.69	0.54	0.50	0.45	0.55	0.18
CH_Metv14_EUR_EscapeLUR	pm10_CH_Metv14_2009	886	23.3	1.5	0.0	1.4	19.0	22.7	23.5	24.1	27.3							
	pm10_EUR_EscapeLUR_2009	886	23.2	2.8	0.1	2.9	17.6	21.9	23.3	24.8	31.7							
	pm10_diff2009_CH_Metv14_EUR_EscapeLUR	886	0.1	2.3	0.1	2.4	-8.4	-1.1	0.0	1.3	6.8	0.35	0.57	0.47	0.47	0.42	0.52	0.32

pm10_diff2009_CH_Metv15_IDB **pm10_diff2009_CH_Metv15_EUR_EscapeLUR** **pm10_diff2009_CH_Metv14_EUR_EscapeLUR**

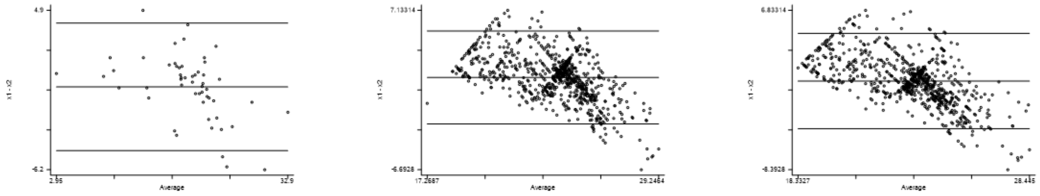


Figure A 45: BA plots of PM_{10} Escape model comparison 2009. Bland-Altman plots corresponding to Table A 58

A.3.4 $PM_{2.5}$

A.3.4.1. Measurements vs. Meteotest Models

Table A 59: $PM_{2.5}$ measurements vs. CH_Metv15 for Escape and SAPALDIA. IDB and independent $PM_{2.5}$ measurements vs. Meteotest model CH_Metv15 for the years 2009 (Escape) and 2011/12 (Sap3)

PM2.5 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv15_2009	pm25_IDB_2009	4	12.9	4.7	2.4	6.6	7.1	9.6	13.0	16.2	18.6							
	pm25_CH_Metv15_2009	4	12.1	3.4	1.7	3.8	7.0	10.2	13.7	14.0	14.0							
	pm25_diff2009_IDB_CH_Metv15	4	0.8	2.6	1.3	3.0	-1.2	-0.7	0.0	2.4	4.6	0.57	0.85	0.78	0.83	0.04	0.99	1.00
meas_CH_Metv15_2009	pm25_meas_2009	19	17.2	2.3	0.5	2.8	13.7	15.8	16.9	18.6	22.5							
ESCAPE	pm25_CH_Metv15_2009	19	16.4	0.8	0.2	1.1	14.8	15.9	16.7	17.0	17.3							
	pm25_diff2009_meas_CH_Metv15	19	0.8	2.2	0.5	2.3	-1.7	-0.5	0.1	1.8	6.5	0.12	0.33	0.19	0.17	-0.29	0.57	
IDB_CH_Metv15_2011_12	pm25_IDB_mean_11_12	9	13.7	3.5	1.2	2.9	6.2	12.8	14.3	15.7	18.4							
	pm25_CH_Metv15_mean_11_12	9	13.0	3.0	1.0	1.4	6.2	12.8	13.4	14.1	16.9							
	pm25_diff2011_12_CH_Metv15_IDB	9	0.6	1.9	0.6	0.3	-0.8	-0.1	0.0	0.2	5.6	0.35	0.84	0.81	0.83	0.44	0.96	1.00
meas_CH_Metv15_2011_12	pm25_meas_2011_12	74	14.2	3.0	0.4	3.4	7.8	12.6	13.5	16.0	25.1							
SAP 3	pm25_CH_Metv15_mean_11_12	74	13.5	2.1	0.2	1.1	8.4	12.8	13.4	13.9	17.3							
	pm25_diff2011_12_meas_CH_Metv15	74	0.7	2.1	0.2	2.3	-4.3	-0.5	0.8	1.8	8.1	< 0.01	0.72	0.65	0.65	0.49	0.76	-0.04

…_meas_…	Measurement data:	
	ESCAPE (annual means)	*Lugano: 14-day measurements in 3 seasons in 2009*
	SAP 3 (bi-annual means)	*Basel, Geneva, Lugano, Wald: 14-day measurements in 3 seasons in 2011/12*

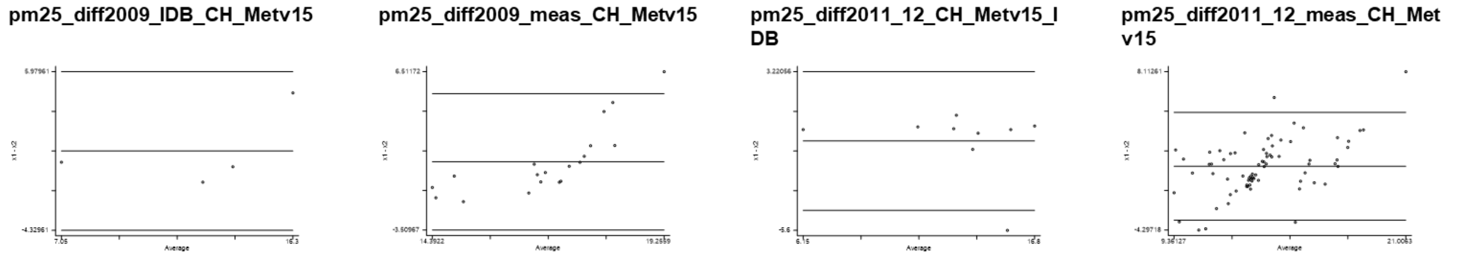


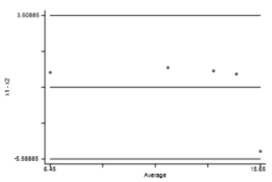
Figure A 46: BA plots of $PM_{2.5}$ measurements vs. CH_Metv15 for Escape and SAPALDIA. Bland-Altman plots corresponding to Table A 59

A.3.4.2. SAPALDIA 3

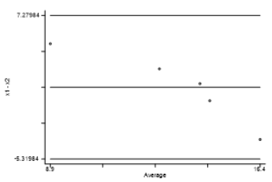
Table A 60: $PM_{2.5}$ models vs. IDB measurements / SAP3. Comparison of all $PM_{2.5}$ models vs. IDB measurements for SAP3 (sorted by descending CCC)

PM2.5 S3 / IDB	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	pm25_CH_Metv15_2010	5	11.9	3.2	1.4	1.9	6.4	11.7	13.1	13.6	14.5							
	pm25_IDB_2010	5	12.9	4.3	1.9	3.2	6.5	11.5	13.6	14.7	18.2							
	pm25_diff2010_CH_Metv15_IDB	5	-1.0	2.3	1.0	0.2	-5.1	-0.2	-0.1	0.0	0.2	0.36	0.86	0.79	0.82	0.16	0.98	1.00
CH_Pollu_IDB	pm25_CH_Pollu_2010	5	13.9	1.5	0.7	0.5	11.3	14.1	14.5	14.6	14.9							
	pm25_IDB_2010	5	12.9	4.3	1.9	3.2	6.5	11.5	13.6	14.7	18.2							
	pm25_diff2010_CH_Pollu_IDB	5	1.0	3.1	1.4	2.8	-3.6	-0.2	1.3	2.6	4.8	0.52	0.86	0.50	0.56	-0.35	0.94	0.00
CH_SNCSat_IDB	pm25_CH_SNCSat_2010	5	17.9	4.3	1.9	7.3	12.4	14.1	19.7	21.4	21.8							
	pm25_IDB_2010	5	12.9	4.3	1.9	3.2	6.5	11.5	13.6	14.7	18.2							
	pm25_diff2010_CH_SNCSat_IDB	5	5.0	2.2	1.0	2.7	2.6	3.2	5.0	5.9	8.2	< 0.01	0.87	0.47	0.41	-0.51	0.92	0.00
EUR_ElapseSat_IDB	pm25_EUR_ElapseSat_2010	5	16.2	2.0	0.9	0.8	12.8	16.5	17.0	17.3	17.5							
	pm25_IDB_2010	5	12.9	4.3	1.9	3.2	6.5	11.5	13.6	14.7	18.2							
	pm25_diff2010_EUR_ElapseSat_IDB	5	3.3	2.8	1.3	2.3	-1.2	2.8	3.7	5.0	6.3	0.06	0.85	0.40	0.35	-0.56	0.90	0.00
mean_CH_Metv15_IDB	pm25_CH_Metv15_mean_11_12	9	13.0	3.0	1.0	1.4	6.2	12.8	13.4	14.1	16.9							
	pm25_IDB_mean_11_12	9	13.7	3.5	1.2	2.9	6.2	12.8	14.3	15.7	18.4							
	pm25_diff2011_12_CH_Metv15_IDB	9	-0.6	1.9	0.6	0.3	-5.6	-0.2	0.0	0.1	0.8	0.35	0.84	0.81	0.83	0.44	0.96	1.00

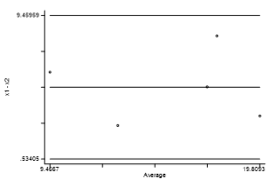
pm25_diff2010_CH_Metv15_IDB



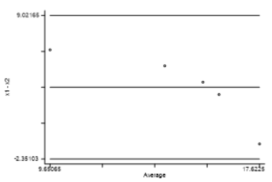
pm25_diff2010_CH_Pollu_IDB



pm25_diff2010_CH_SNCSat_IDB



pm25_diff2010_EUR_ElapseSat_IDB



pm25_diff2011_12_CH_Metv15_IDB

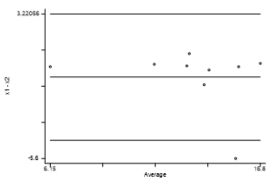
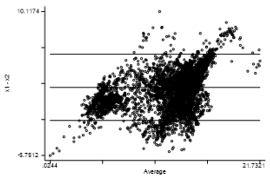


Figure A 47: BA plots of $PM_{2.5}$ models vs. IDB measurements / SAP3. Bland-Altman plots corresponding to Table A 60

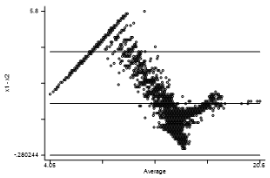
Table A 61: $PM_{2.5}$ models vs. CH_Metv15 / SAP3. Comparison of all $PM_{2.5}$ models vs. Meteotest model CH_Metv15 for SAP3 (sorted by descending CCC)

PM2.5 S3 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_Sat_CH_Metv15	pm25_EUR_Sat_2010	19138	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_CH_Metv15_2010	19138	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_diff2010_EUR_Sat_CH_Metv15	19138	1.8	1.8	0.0	2.6	-5.8	0.6	1.9	3.2	10.1	< 0.01	0.86	0.74	0.72	0.71	0.73	0.90
CH_SapPollu_CH_Metv15	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_CH_Metv15_2010	19132	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_diff2010_CH_SapPollu_CH_Metv15	19132	1.9	1.1	0.0	0.8	0.0	1.3	1.6	2.1	5.8	< 0.01	0.96	0.71	0.67	0.66	0.68	0.67
CH_Pollu_CH_Metv15	pm25_CH_Pollu_2010	19428	14.2	2.1	0.0	1.4	4.2	13.8	14.5	15.2	21.6							
	pm25_CH_Metv15_2010	19428	12.2	2.9	0.0	2.0	2.4	11.9	13.4	13.9	19.6							
	pm25_diff2010_CH_Pollu_CH_Metv15	19428	1.9	1.1	0.0	0.8	0.0	1.3	1.6	2.1	5.8	< 0.01	0.96	0.71	0.67	0.66	0.68	0.66
EUR_ElapseSat_CH_Metv15	pm25_EUR_ElapseSat_2010	19435	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_CH_Metv15_2010	19435	12.2	2.9	0.0	2.0	2.4	11.9	13.4	13.9	19.6							
	pm25_diff2010_EUR_ElapseSat_CH_Metv15	19435	3.2	1.9	0.0	2.7	-3.9	1.9	3.2	4.6	12.6	< 0.01	0.83	0.54	0.44	0.43	0.46	0.89
CH_SNCSat_CH_Metv15	pm25_CH_SNCSat_2010	19363	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_CH_Metv15_2010	19363	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_diff2010_CH_SNCSat_CH_Metv15	19363	5.3	3.2	0.0	4.6	-3.8	2.9	4.8	7.5	14.1	< 0.01	0.44	0.18	-0.18	-0.19	-0.16	0.00
CH_Sap3LUR_CH_Metv15	pm25_CH_Sap3LUR	11357	12.4	3.7	0.0	1.8	0.0	12.1	13.1	13.9	26.6							
	pm25_CH_Metv15_mean_11_12	11357	12.0	3.2	0.0	2.1	3.2	11.4	12.9	13.4	21.5							
	pm25_diff2011_12_CH_Sap3LUR_CH_Metv15	11357	0.4	1.1	0.0	1.0	-4.0	-0.1	0.5	0.9	5.5	< 0.01	0.96	0.95	0.95	0.94	0.95	0.94

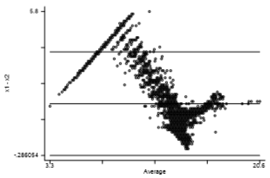
pm25_diff2010_EUR_Sat_CH_Metv15



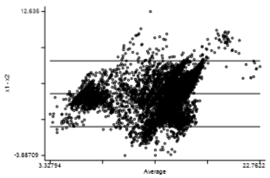
pm25_diff2010_CH_SapPollu_CH_Metv15



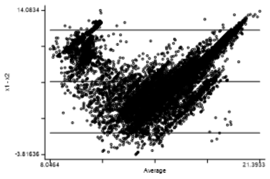
pm25_diff2010_CH_Pollu_CH_Metv15



pm25_diff2010_EUR_ElapseSat_CH_Metv15



pm25_diff2010_CH_SNCSat_CH_Metv15



pm25_diff2011_12_CH_Sap3LUR_CH_Metv15

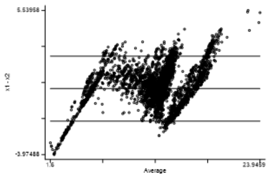


Figure A 48: BA plots of $PM_{2.5}$ models vs. CH_Metv15 / SAP3. Bland-Altman plots corresponding to Table A 61

Table A 62: $PM_{2.5}$ models vs EUR_Sat model / SAP3. Comparison of all $PM_{2.5}$ models vs. European Satellite model (EUR_Sat) for SAP3 (sorted by descending CCC)

PM2.5 S3 / EUR_Sat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_ElapseSat_EUR_Sat	pm25_EUR_ElapseSat_2010	19155	15.5	3.4	0.0	3.5	3.3	14.5	15.8	18.1	25.9							
	pm25_EUR_Sat_2010	19155	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_diff2010_EUR_ElapseSat_EUR_Sat	19155	1.4	0.8	0.0	1.3	-2.7	0.7	1.3	2.1	7.3	< 0.01	0.97	0.90	0.89	0.89	0.89	0.93
CH_Metv15_EUR_Sat	pm25_CH_Metv15_2010	19138	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_EUR_Sat_2010	19138	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_diff2010_CH_Metv15_EUR_Sat	19138	-1.8	1.8	0.0	2.6	-10.1	-3.2	-1.9	-0.6	5.8	< 0.01	0.86	0.74	0.72	0.71	0.73	0.90
CH_Pollu_EUR_Sat	pm25_CH_Pollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_EUR_Sat_2010	19132	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_diff2010_CH_Pollu_EUR_Sat	19132	0.1	2.3	0.0	3.8	-7.5	-1.8	-0.3	2.0	8.1	< 0.01	0.79	0.68	0.68	0.67	0.69	0.70
CH_SapPollu_EUR_Sat	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_EUR_Sat_2010	19132	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_diff2010_CH_SapPollu_EUR_Sat	19132	0.1	2.3	0.0	3.8	-7.5	-1.8	-0.3	2.0	8.1	< 0.01	0.79	0.68	0.68	0.67	0.69	0.70
CH_SNCSat_EUR_Sat	pm25_CH_SNCSat_2010	19083	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_EUR_Sat_2010	19083	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_diff2010_CH_SNCSat_EUR_Sat	19083	3.5	3.4	0.0	4.9	-10.2	1.0	3.0	5.9	17.9	< 0.01	0.49	0.31	0.17	0.16	0.18	0.00

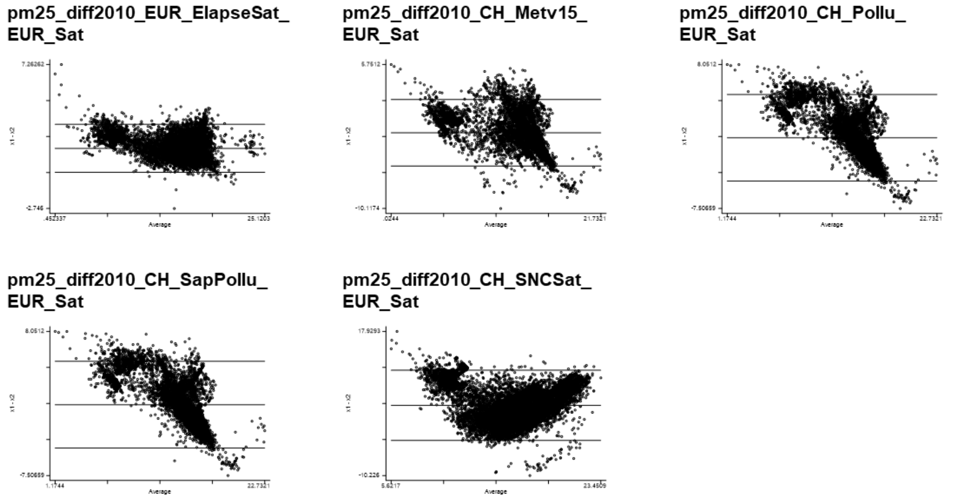


Figure A 49: BA plots of $PM_{2.5}$ models vs EUR_Sat / SAP3. Bland-Altman plots corresponding to Table A 62

 Swiss TPH

Table A 63: $PM_{2.5}$ models vs. EUR_ElapseSat / SAP3. Comparison of all $PM_{2.5}$ models vs. European Elapse Satellite model (EUR_ElapseSat) for SAP3 (sorted by descending CCC)

PM2.5 S3 / EUR_ElapseSat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_Sat_EUR_ElapseSat	pm25_EUR_Sat_2010	19155	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_EUR_ElapseSat_2010	19155	15.5	3.4	0.0	3.5	3.3	14.5	15.8	18.1	25.9							
	pm25_diff2010_EUR_Sat_EUR_ElapseSat	19155	-1.4	0.8	0.0	1.3	-7.3	-2.1	-1.3	-0.7	2.7	< 0.01	0.97	0.90	0.89	0.89	0.89	0.93
CH_Pollu_EUR_ElapseSat	pm25_CH_Pollu_2010	19429	14.2	2.1	0.0	1.4	4.2	13.8	14.5	15.2	21.6							
	pm25_EUR_ElapseSat_2010	19429	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_diff2010_CH_Pollu_EUR_ElapseSat	19429	-1.3	2.2	0.0	3.5	-9.1	-3.2	-1.4	0.3	6.0	< 0.01	0.78	0.63	0.61	0.60	0.62	0.75
CH_SapPollu_EUR_ElapseSat	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_EUR_ElapseSat_2010	19132	15.4	3.4	0.0	3.5	3.3	14.5	15.8	18.1	25.9							
	pm25_diff2010_CH_SapPollu_EUR_ElapseSat	19132	-1.3	2.2	0.0	3.5	-9.1	-3.2	-1.4	0.3	6.0	< 0.01	0.78	0.63	0.61	0.60	0.62	0.75
CH_Metv15_EUR_ElapseSat	pm25_CH_Metv15_2010	19435	12.2	2.9	0.0	2.0	2.4	11.9	13.4	13.9	19.6							
	pm25_EUR_ElapseSat_2010	19435	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_diff2010_CH_Metv15_EUR_ElapseSat	19435	-3.2	1.9	0.0	2.7	-12.6	-4.6	-3.2	-1.9	3.9	< 0.01	0.83	0.54	0.44	0.43	0.46	0.89
CH_SNCSat_EUR_ElapseSat	pm25_CH_SNCSat_2010	19379	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_EUR_ElapseSat_2010	19379	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_diff2010_CH_SNCSat_EUR_ElapseSat	19379	2.1	3.3	0.0	4.9	-12.1	-0.3	1.9	4.6	12.6	< 0.01	0.47	0.39	0.34	0.32	0.35	0.00

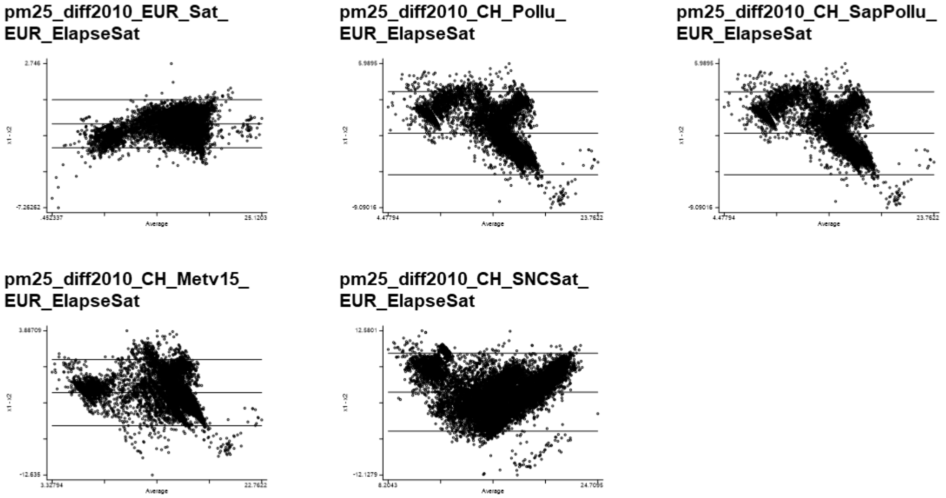


Figure A 50: BA plots of $PM_{2.5}$ models vs. EUR_ElapseSat / SAP3. Bland-Altman plots corresponding to Table A 63

Table A 64: PM2.5 models vs. CH_SNCSat / SAP3. Comparison of all PM2.5 models vs. Swiss SNC Satellite model (CH_SNCSat) for SAP3 (sorted by descending CCC)

PM2.5 S3 / CH_SNCSat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
EUR_ElapseSat_CH_SNCSat	pm25_EUR_ElapseSat_2010	19379	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_CH_SNCSat_2010	19379	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_diff2010_EUR_ElapseSat_CH_SNCSat	19379	-2.1	3.3	0.0	4.9	-12.6	-4.6	-1.9	0.3	12.1	< 0.01	0.47	0.39	0.34	0.32	0.35	0.00
EUR_Sat_CH_SNCSat	pm25_EUR_Sat_2010	19083	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_CH_SNCSat_2010	19083	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_diff2010_EUR_Sat_CH_SNCSat	19083	-3.5	3.4	0.0	4.9	-17.9	-5.9	-3.0	-1.0	10.2	< 0.01	0.49	0.31	0.17	0.16	0.18	0.00
CH_Pollu_CH_SNCSat	pm25_CH_Pollu_2010	19357	14.1	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_CH_SNCSat_2010	19357	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_diff2010_CH_Pollu_CH_SNCSat	19357	-3.3	3.0	0.0	4.0	-13.8	-5.3	-3.0	-1.3	5.7	< 0.01	0.41	0.21	-0.01	-0.03	0.00	0.00
CH_SapPollu_CH_SNCSat	pm25_CH_SapPollu_2010	19066	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_CH_SNCSat_2010	19066	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_diff2010_CH_SapPollu_CH_SNCSat	19066	-3.3	3.0	0.0	4.0	-13.8	-5.3	-3.0	-1.3	5.7	< 0.01	0.41	0.21	-0.01	-0.03	0.00	0.00
CH_Metv15_CH_SNCSat	pm25_CH_Metv15_2010	19363	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_CH_SNCSat_2010	19363	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_diff2010_CH_Metv15_CH_SNCSat	19363	-5.3	3.2	0.0	4.6	-14.1	-7.5	-4.8	-2.9	3.8	< 0.01	0.44	0.18	-0.18	-0.19	-0.16	0.00

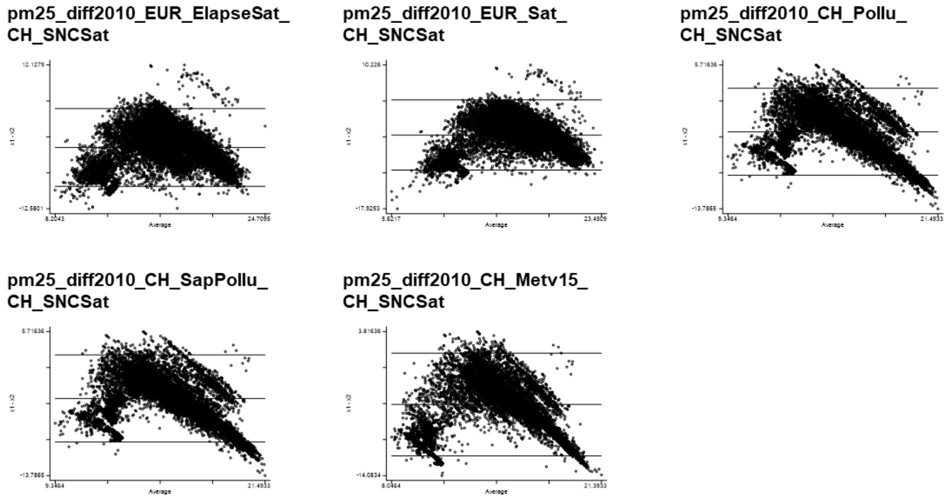


Figure A 51: BA plots of PM2.5 models vs. CH_SNCSat / SAP3. Bland-Altman plots corresponding to Table A 64

Table A 65: $PM_{2.5}$ models vs. CH_Pollu / SAP3. Comparison of all $PM_{2.5}$ models vs. PolluMap model (CH_Pollu) for SAP3 (sorted by descending CCC)

PM2.5 S3 / CH_Pollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_SapPollu_CH_Pollu	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_CH_Pollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_SapPollu_CH_Pollu	19132	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 0.01	1.00	1.00	1.00	0.00	0.00	1.00
CH_Metv15_CH_Pollu	pm25_CH_Metv15_2010	19428	12.2	2.9	0.0	2.0	2.4	11.9	13.4	13.9	19.6							
	pm25_CH_Pollu_2010	19428	14.2	2.1	0.0	1.4	4.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_Metv15_CH_Pollu	19428	-1.9	1.1	0.0	0.8	-5.8	-2.1	-1.6	-1.3	0.0	< 0.01	0.96	0.71	0.67	0.66	0.68	0.66
EUR_Sat_CH_Pollu	pm25_EUR_Sat_2010	19132	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_CH_Pollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_EUR_Sat_CH_Pollu	19132	-0.1	2.3	0.0	3.8	-8.1	-2.0	0.3	1.8	7.5	< 0.01	0.79	0.68	0.68	0.67	0.69	0.70
EUR_ElapseSat_CH_Pollu	pm25_EUR_ElapseSat_2010	19429	15.4	3.4	0.0	3.6	3.3	14.5	15.8	18.1	25.9							
	pm25_CH_Pollu_2010	19429	14.2	2.1	0.0	1.4	4.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_EUR_ElapseSat_CH_Pollu	19429	1.3	2.2	0.0	3.5	-6.0	-0.3	1.4	3.2	9.1	< 0.01	0.78	0.63	0.61	0.60	0.62	0.75
CH_SNCSat_CH_Pollu	pm25_CH_SNCSat_2010	19357	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_CH_Pollu_2010	19357	14.1	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_SNCSat_CH_Pollu	19357	3.3	3.0	0.0	4.0	-5.7	1.3	3.0	5.3	13.8	< 0.01	0.41	0.21	-0.01	-0.03	0.00	0.00

CH_Pollu = CH_SapPollu in 2010 (S3)

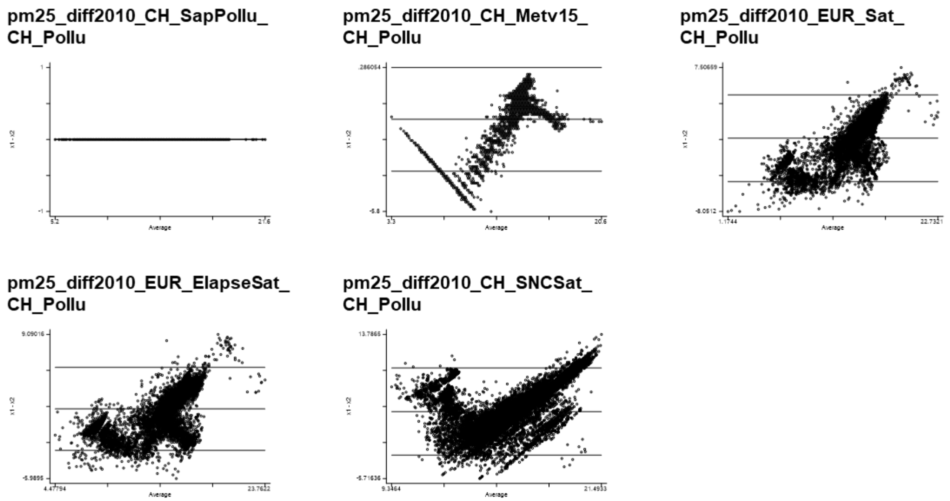


Figure A 52: BA plots of $PM_{2.5}$ models vs. CH_Pollu / SAP3. Bland-Altman plots corresponding to Table A 65

Table A 66: $PM_{2.5}$ models vs. CH_SapPollu / SAP3. Comparison of all $PM_{2.5}$ models vs. SAPALDIA Extrapolation of PolluMap model (CH_SapPollu) for SAP3 (sorted by descending CCC)

PM2.5 S3 / CH_SapPollu	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Pollu_CH_SapPollu	pm25_CH_Pollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_Pollu_CH_SapPollu	19132	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 0.01	1.00	1.00	1.00	0.00	0.00	1.00
CH_Metv15_CH_SapPollu	pm25_CH_Metv15_2010	19132	12.2	2.9	0.0	2.0	2.9	11.9	13.4	13.9	19.6							
	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_Metv15_CH_SapPollu	19132	-1.9	1.1	0.0	0.8	-5.8	-2.1	-1.6	-1.3	0.0	< 0.01	0.96	0.71	0.67	0.66	0.68	0.67
EUR_Sat_CH_SapPollu	pm25_EUR_Sat_2010	19132	14.0	3.6	0.0	3.0	-2.9	13.4	14.7	16.4	24.6							
	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_EUR_Sat_CH_SapPollu	19132	-0.1	2.3	0.0	3.8	-8.1	-2.0	0.3	1.8	7.5	< 0.01	0.79	0.68	0.68	0.67	0.69	0.70
EUR_ElapseSat_CH_SapPollu	pm25_EUR_ElapseSat_2010	19132	15.4	3.4	0.0	3.5	3.3	14.5	15.8	18.1	25.9							
	pm25_CH_SapPollu_2010	19132	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_EUR_ElapseSat_CH_SapPollu	19132	1.3	2.2	0.0	3.5	-6.0	-0.3	1.4	3.2	9.1	< 0.01	0.78	0.63	0.61	0.60	0.62	0.75
CH_SNCSat_CH_SapPollu	pm25_CH_SNCSat_2010	19066	17.5	3.1	0.0	4.3	9.5	15.2	16.9	19.4	28.4							
	pm25_CH_SapPollu_2010	19066	14.2	2.1	0.0	1.4	5.2	13.8	14.5	15.2	21.6							
	pm25_diff2010_CH_SNCSat_CH_SapPollu	19066	3.3	3.0	0.0	4.0	-5.7	1.3	3.0	5.3	13.8	< 0.01	0.41	0.21	-0.01	-0.03	0.00	0.00

CH_SapPollu = CH_Pollu in 2010 (S3)

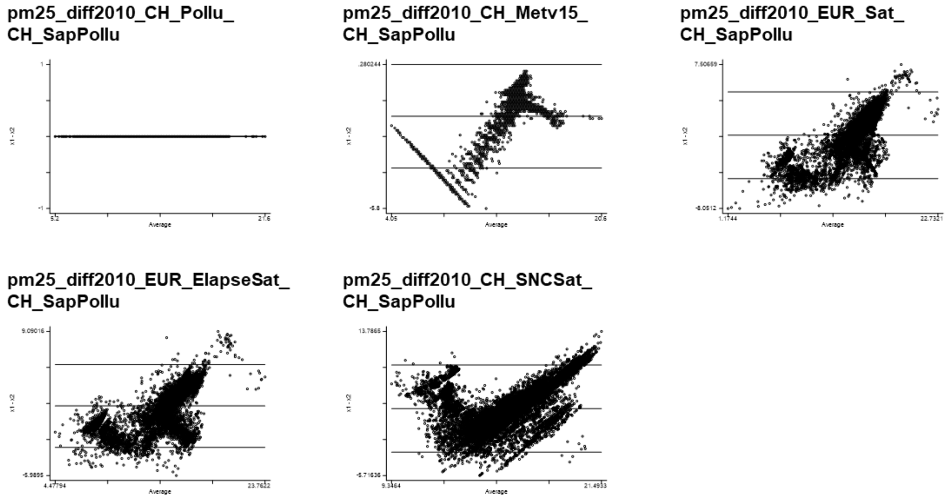


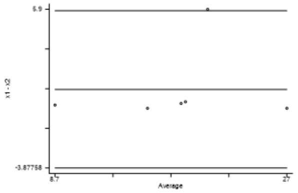
Figure A 53: BA plots of $PM_{2.5}$ models vs. CH_SapPollu / SAP3. Bland-Altman plots corresponding to Table A 66

A.3.4.3. SAPALDIA 2

Table A 67: $PM_{2.5}$ IDB measurements and model vs. CH_Metv15 / SAP2. Comparison of $PM_{2.5}$ IDB measurements and model vs. Meteotest model (CH_Metv15) for SAP2 (sorted by descending CCC)

PM2.5 S2 / CH_Metv15	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
IDB_CH_Metv15	PM25_IDB_2002	6	18.8	6.3	2.6	7.8	8.7	15.9	18.9	23.7	26.9							
	pm25_CH_Metv15_2002	6	17.9	5.9	2.4	2.8	8.7	16.1	18.2	18.9	27.1							
	pm25_diff2002_IDB_CH_Metv15	6	1.0	2.4	1.0	0.4	-0.2	-0.2	0.1	0.2	5.9	0.37	0.92	0.91	0.92	0.61	0.99	1.00
CH_SapPollu_CH_Metv15	pm25_CH_SapPollu_2002	19131	16.7	4.1	0.0	4.1	4.9	14.8	16.7	18.9	26.4							
	pm25_CH_Metv15_2002	19131	17.3	4.7	0.0	2.9	4.2	16.1	18.0	19.0	35.0							
	pm25_diff2002_CH_SapPollu_CH_Metv15	19131	-0.6	1.4	0.0	2.2	-9.2	-1.6	-0.8	0.6	4.7	< 0.01	0.96	0.94	0.94	0.94	0.94	0.86

pm25_diff2002_IDB_CH_Metv15



pm25_diff2002_CH_SapPollu_CH_Metv15

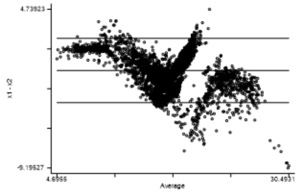


Figure A 54: BA plots of $PM_{2.5}$ IDB measurements and model vs. CH_Metv15 / SAP2. Bland-Altman plots corresponding to Table A 67

A.3.4.4. Other times

Table A 68: Comparison $PM_{2.5}$ Bayesian model 20016. IDB $PM_{2.5}$ measurements and Meteotest model (CH_Metv15) vs. Bayesian model (EUR_BayesSat) / 2016

PM2.5 2016 / EUR_BayesSat	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	pm25_v15_2016	11	9.3	2.8	0.8	2.4	3.7	8.3	10.1	10.7	12.9							
	pm25_IDB_2016	11	10.0	2.4	0.7	4.0	4.8	8.1	10.4	12.1	12.7							
	pm25_diff2016_IDB_CH_Metv15	11	-0.7	1.3	0.4	1.3	-3.5	-1.2	-0.1	0.1	0.2	0.10	0.88	0.84	0.85	0.55	0.96	0.81
IDB_EUR_BayesSat	pm25_IDB_2016	11	10.0	2.4	0.7	4.0	4.8	8.1	10.4	12.1	12.7							
	pm25_EUR_BayesSat_2016	11	10.3	2.8	0.8	2.0	5.6	9.6	10.1	11.6	15.4							
	pm25_diff2016_EUR_BayesSat_IDB	11	-0.3	1.5	0.4	2.1	-2.7	-1.5	0.0	0.6	2.1	0.51	0.85	0.83	0.85	0.55	0.96	0.61
CH_Metv15_EUR_BayesSat	pm25_v15_2016	21560	9.2	2.3	0.0	1.4	1.8	8.8	9.8	10.2	16.4							
	pm25_EUR_BayesSat_2016	21560	10.3	2.4	0.0	3.1	1.4	8.7	10.2	11.8	17.9							
	pm25_diff2016_EUR_BayesSat_CH_Metv15	21560	-1.0	1.1	0.0	1.9	-5.8	-2.0	-1.1	-0.1	3.3	< 0.01	0.89	0.81	0.80	0.79	0.80	0.56

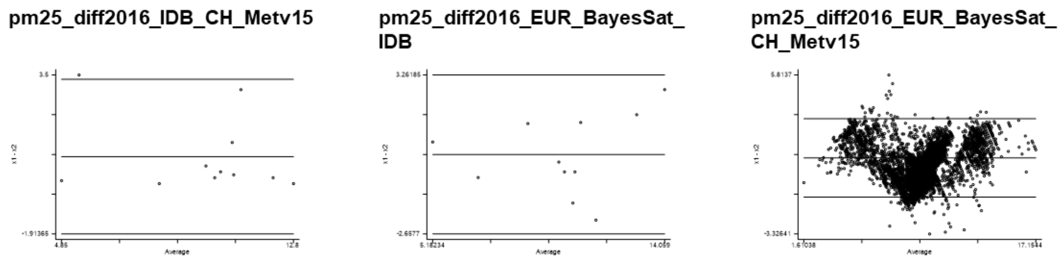


Figure A 55: BA plots of $PM_{2.5}$ Bayesian model comparison 20016. Bland-Altman plots corresponding to Table A 68

Table A 69: Comparison $PM_{2.5}$ Escape model 2009. $PM_{2.5}$ IDB Measurements and all models vs. Escape model (EUR_EscapeLUR) / 2009

PM2.5 2009 / EUR_EscapeLUR	Var	N	Mean	SD	SE	IQR	Min	p25	p50	p75	Max	p (t-test)	r (Pearson)	CCC	ICC	95% CI_lb (ICC)	95% CI_ub (ICC)	Kappa
CH_Metv15_IDB	pm25_CH_Metv15_2009	4	12.1	3.4	1.7	3.8	7.0	10.2	13.7	14.0	14.0							
	pm25_IDB_2009	4	12.9	4.7	2.4	6.6	7.1	9.6	13.0	16.2	18.6							
	pm25_diff2009_CH_Metv15_IDB	4	-0.8	2.6	1.3	3.0	-4.6	-2.4	0.0	0.7	1.2	0.57	0.85	0.78	0.83	0.04	0.99	1.00
CH_SapPollu_EUR_EscapeLUR	pm25_CH_SapPollu_2009	886	17.1	1.1	0.0	1.9	14.5	16.2	17.3	18.1	19.2							
	pm25_EUR_EscapeLUR_2009	886	16.9	1.8	0.1	1.7	12.3	16.1	16.9	17.8	23.7							
	pm25_diff2009_CH_SapPollu_EUR_EscapeLUR	886	0.2	1.5	0.1	1.8	-6.2	-0.5	0.8	1.3	3.6	< 0.01	0.54	0.48	0.48	0.43	0.53	
CH_Metv15_EUR_EscapeLUR	pm25_CH_Metv15_2009	886	16.4	0.9	0.0	1.3	11.5	15.8	16.7	17.1	18.0							
	pm25_EUR_EscapeLUR_2009	886	16.9	1.8	0.1	1.7	12.3	16.1	16.9	17.8	23.7							
	pm25_diff2009_CH_Metv15_EUR_EscapeLUR	886	-0.5	1.5	0.0	1.6	-6.8	-1.1	0.0	0.4	3.1	< 0.01	0.59	0.43	0.42	0.36	0.47	
CH_SNCSat_EUR_EscapeLUR	pm25_CH_SNCSat_2009	886	16.6	1.9	0.1	2.0	11.8	15.4	16.4	17.4	24.2							
	pm25_EUR_EscapeLUR_2009	886	16.9	1.8	0.1	1.7	12.3	16.1	16.9	17.8	23.7							
	pm25_diff2009_CH_SNCSat_EUR_EscapeLUR	886	-0.3	2.1	0.1	2.6	-6.7	-1.7	-0.4	0.9	9.1	< 0.01	0.34	0.34	0.34	0.28	0.39	

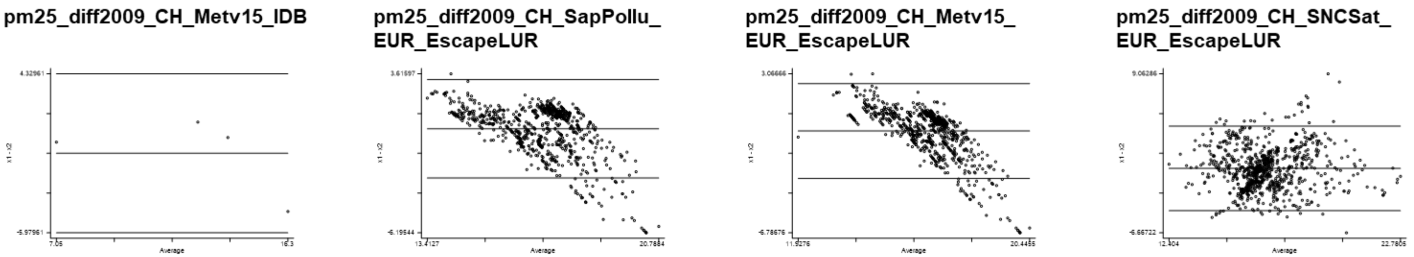


Figure A 56: BA plots of $PM_{2.5}$ Escape model comparison 2009. Bland-Altman plots corresponding to Table A 69

Appendix B: Temporal Adjustment

B.1 Ratio Method

The temporal adjusted concentration at site i and time period t was calculated by multiplying the unadjusted concentration at site i and time period t with the ratio between the annual average concentration and the concentration measured during the time t at the reference site:

$$adjusted\ conc_{i,t} = unadjusted\ conc_{i,t} \times \frac{ref\ site\ conc_{annual\ avg}}{ref\ site\ conc_{t}}$$

The adjusted annual mean at site i was then calculated with the arithmetic mean of the adjusted concentrations:

$$annual\ adjusted\ conc_{i} = \frac{\sum_{t=1}^{n} adjusted\ conc_{i,t}}{n}$$

B.2 Difference Method

The temporal adjusted concentration at site i and time period t was calculated by subtracting the difference at the reference site for the time period t from the unadjusted concentration at site i and time period t:

$$adjusted\ conc_{i,t} = unadjusted\ conc_{i,t} - diff\ ref\ site\ conc_{t}$$

where the difference at the reference site for the time period t was calculated by subtracting the annual average concentration from the concentration measured during the time t at the reference site:

$$diff\ ref\ site\ conc_{t} = ref\ site\ conc_{t} - ref\ site\ conc_{annual\ avg}$$

The adjusted annual mean at site i was then calculated with the arithmetic mean of the adjusted concentrations:

$$annual\ adjusted\ conc_{i} = \frac{\sum_{t=1}^{n} adjusted\ conc_{i,t}}{n}$$

Appendix C: Workshops

C.1 Agenda of Air Pollution Workshop – Swiss TPH, BAFU, Meteotest & Infras, April 11 2016, Villa Crescenda, Basel

Challenges of model inflation for SAPALDIA and other Swiss studies

09:15 **Setting the stage** (Nino Künzli, Swiss TPH)
09:25 **Overview of available Swiss models at Swiss TPH** (Regina Ducret, Swiss TPH)
09:35 **LUR model examples from SAPALDIA 3** (Regina Ducret, Swiss TPH)

PolluMap and BAFU maps

09:40 M**odeling needs and strategies of BAFU** (Ruedi Weber, BAFU)
09:50 **PolluMap and BAFU maps: Approach, model differences and future method or emission changes** (Thomas Künzle, Meteotest / Jürg Heldstab, Infras)

Short insight in current modeling activities at Swiss TPH

10:10 **Swiss NO_2 Model using all available passive sampler data** (Harris Héritier, Swiss TPH)
10:20 **Further modeling developments using satellite data** (Kees de Hoogh, Swiss TPH)

Concrete example of the challenges of "model inflation" in Epidemiology

10:30 **The SAPALDIA – Lung function example: Impact of model changes on results in epidemiologic studies** (Christian Schindler, Swiss TPH)

10:35 *Coffee break*

Discussion of open questions

10:50 – 12:00

1. Do we have common views about the rationale for the derivation of new models? Does it depend on the purpose (e.g. epidemiology; impact assessment; air quality communication (BAFU))?
2. Do we have a common view about what constitutes the "best" future model, thus, what input data to use and to need in the future?
   a. Do we need own measurement campaigns for modelling purposes? Can we use "default monitoring data"? Should monitoring network be adapted to serve the modeling needs (finer temporal / spatial resolution)? Which pollutants should be used?
   b. Are satellite data combined with routine monitoring data sufficient?
   c. Can all passive sampler data (cantonal / federal) be regularly integrated in future modeling strategies?
   d. Should we include population movement / commuter behaviors into the models?
3. How can we deal with the model inflation? Which model is "the best"? What are the rationales to ask for an update of already existing models?
4. Possibility to use newest BAFU model for retrospective calculation? – Emission input?

C.2 Agenda of Air Pollution Workshop – Swiss TPH, BAFU, Meteotest & Infras, October 22 2019, Swiss TPH, Basel

Welcome and Introduction

15.00 **Opening and Welcome**: Nicole Probst-Hensch, Swiss TPH
15.05 **Intro/State of Project**: Nino Künzli, Swiss TPH

Comparison of Models

15.10 **Models and Comparison Method**: Regina Ducret, Swiss TPH
15.25 **Results NO_2**: Regina Ducret, Swiss TPH
15.40 **Daily NO_2 Model**: Kees de Hoogh, Swiss TPH
15.50 ***Discussion NO_2***

Coffee break

16.05 **Results PM_{10} & $PM_{2.5}$**: Regina Ducret, Swiss TPH
16.25 **Daily $PM_{2.5}$ Model**: Kees de Hoogh, Swiss TPH
16.35 **Bayesian Modeling**: Penelope Vounatsou or Anton Beloconi, Swiss TPH
16.45 ***Discussion PM_{10} & $PM_{2.5}$***

Open questions & Outlook

17.00 **Summary: What is working, what not**: Regina Ducret, Swiss TPH
17.05 **Updating Models: further Developments of PolluMap**: Jürg Heldstab, Infras
17.20 **Future Modeling: What are the different Needs** (eg. Monitoring & Evaluation; Health Impact Assessment; Research): Nino Künzli, Swiss TPH
General Discussion
17.50 **Application to Health Analysis, Decisions, Closing Remarks**: Nicole Probst-Hensch, Swiss TPH