

EVALUATION OF SURFACE AQ FORECASTS

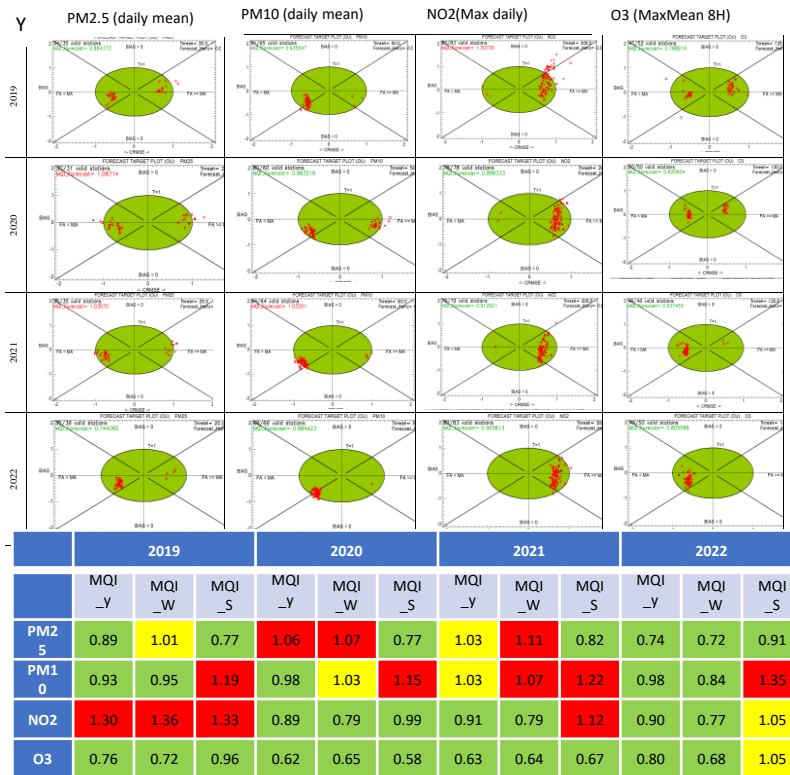
ARPA LOMBARDIA

WG3 - EXERCISE

MAIN AIM OF THE EXERCISE (1):

Practical use of the Delta application

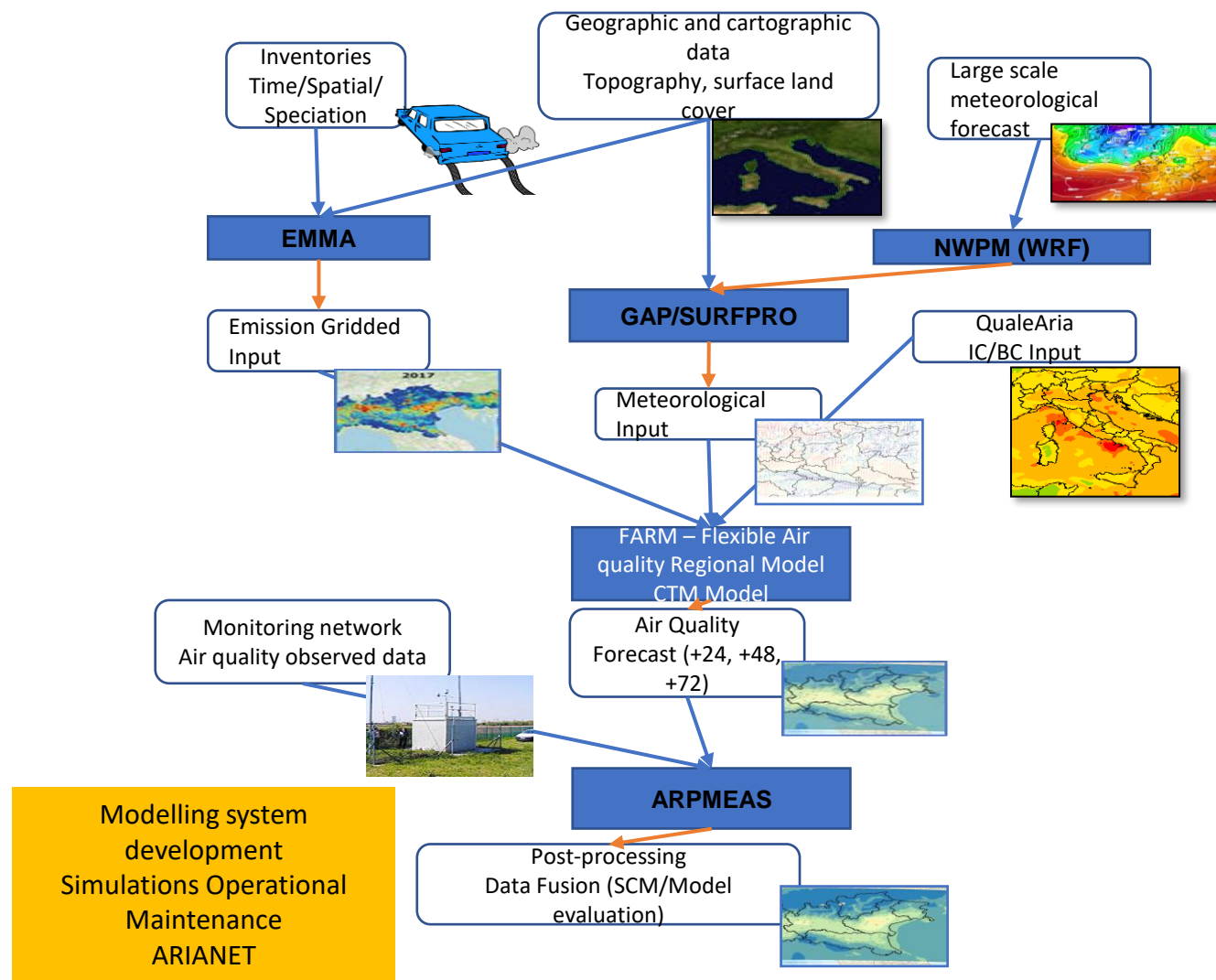
- to improve the model application by using a long time series of mod vs obs (from 2019 to 2022)
- to use output for reporting (i.e. Assessment) and for dissemination (i.e. publications)
 - ✓ Some comments on the results: NO2_MQI is ameliorated from 2019 due to a new emission inventory.
 - ✓ In the plot, a legend with a symbol indicating the kind of stations could help interpretation (local behaviour, spatial resolution etc.)



LOMBARDY REGIONAL MODEL SYSTEM

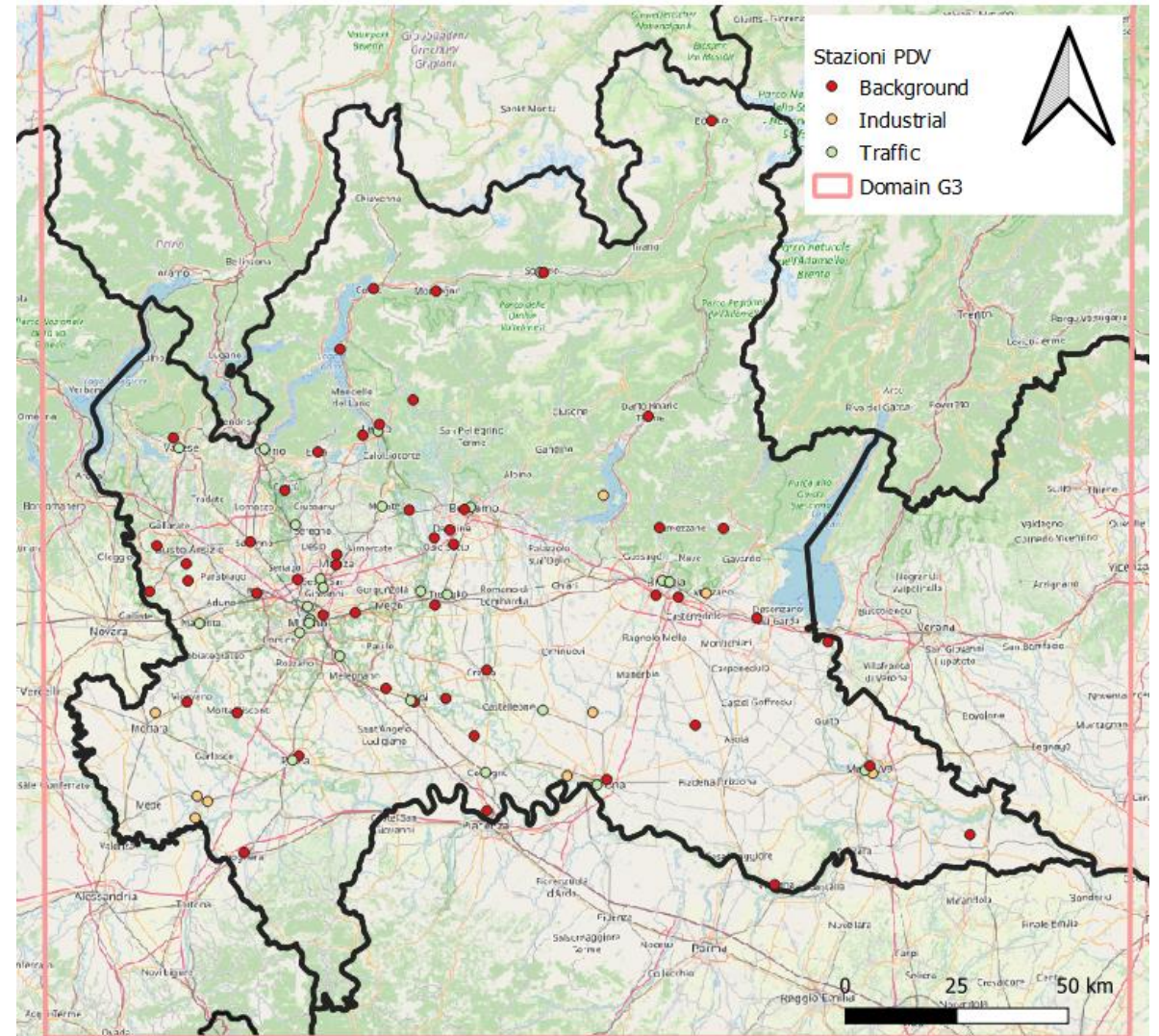
• CONFIGURATION OF THE MODELING APPLICATION

	SMAL-LO
CTM	FARM v4.13
Operator	ARPA Lombardia
Vertical layers	16 levels up to 5000 m a.s.l.
Depth of the first vertical layer	20 m
Horizontal extension	Lon: ~ 8.0° - 11° Lat: ~ 44° - 46°
Horizontal resolution	Lon: ~ 0.01° Lat: ~ 0.01°
Meteorological driver	WRF-ARW
Chemical boundary conditions	QualeAria forecast system
Advection scheme	Finite elements method based on Blackman cubic polynomials (Yamartino, R.J. et al. 1993)
Vertical diffusion	Vertical diffusion coefficient (Kz) approach following RDM model. (Lange, R.. 1989, Nasstrom, J.S. et al. 1995) Hybrid semi-implicit/fully-implicit scheme. (Yamartino, R.J. et al. 1992)
Gas-phase chemistry	SAPRC-99_POPS-Hg
Aerosol model	AERO0 (Emep_report_1_part1_2003.Pdf)
Ammonium nitrate equilibrium	ISORROPIA II (Fountoukis, C. et al.. 2009)
SOA formation	SORGAM (Schell, B et al. 2001)



LOMBARDY REGIONAL SYSTEM EVALUATION

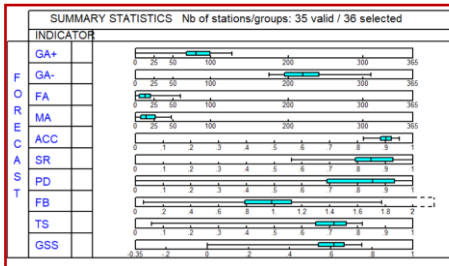
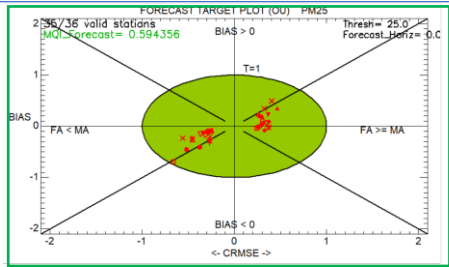
- Evaluation considering all stations in air quality monitoring network
- Evaluation for PM10 ($50 \mu\text{g}/\text{m}^3$), PM2.5 ($25 \mu\text{g}/\text{m}^3$), MM8H Ozone ($120 \mu\text{g}/\text{m}^3$), and MAXH NO2 ($200 \mu\text{g}/\text{m}^3$),
- Evaluation of +24 forecast (yearly and seasonality)
- Time period 2019 to 2022



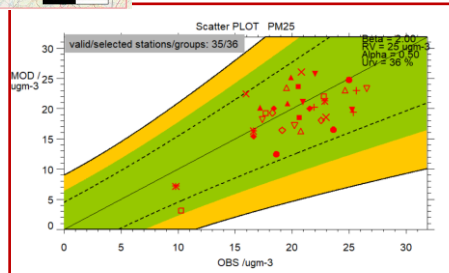
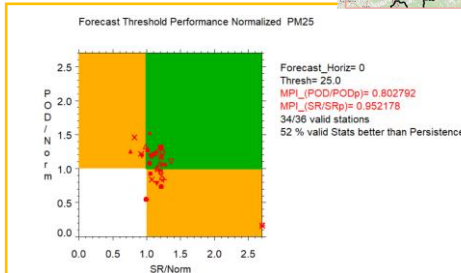
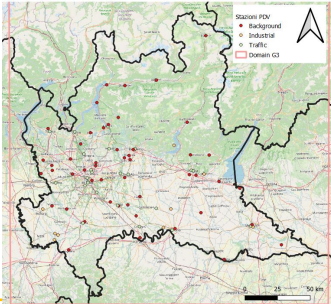
MAIN AIM OF THE EXERCISE (2):

Practical use of the Delta application

- We test/analyze all the plots available into the suite after training session with following hypothesis:
 - ✓ PM10 (50 $\mu\text{g}/\text{m}^3$), PM2.5 (25 $\mu\text{g}/\text{m}^3$), MM8H Ozone (120 $\mu\text{g}/\text{m}^3$), and MAXH NO2 (200 $\mu\text{g}/\text{m}^3$)
 - ✓ By using all stations in air quality monitoring network
 - ✓ Only +24 forecast (yearly and seasonality indexes)
- The most useful plots for our purposes are:
 - FORECAST TARGET PLOT, SUMMARY REPORT, FORECAST THRESHOLD PERFORMANCE NORMALIZED, SCATTER PLOT
- Some remarks: forecast target plot could be useful also for 1 month, 3 month etc. (but the coefficients are on a yearly basis)

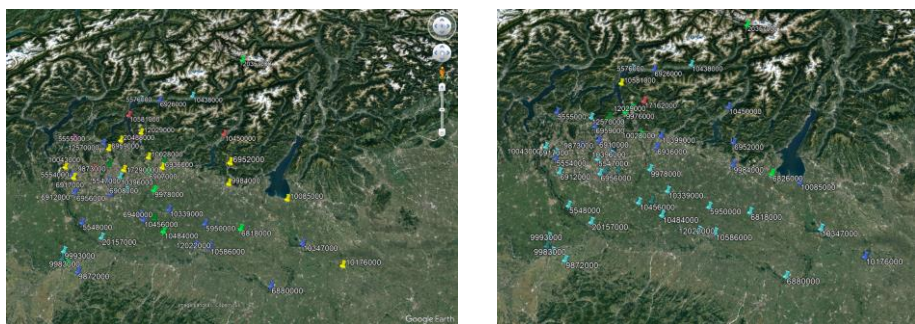


PM2.5 2022



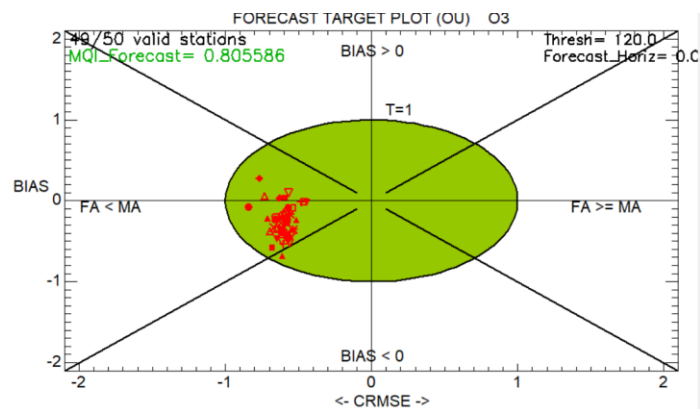
MAIN AIM OF THE EXERCISE (3):

Practical use of the Delta application



OBS

MOD

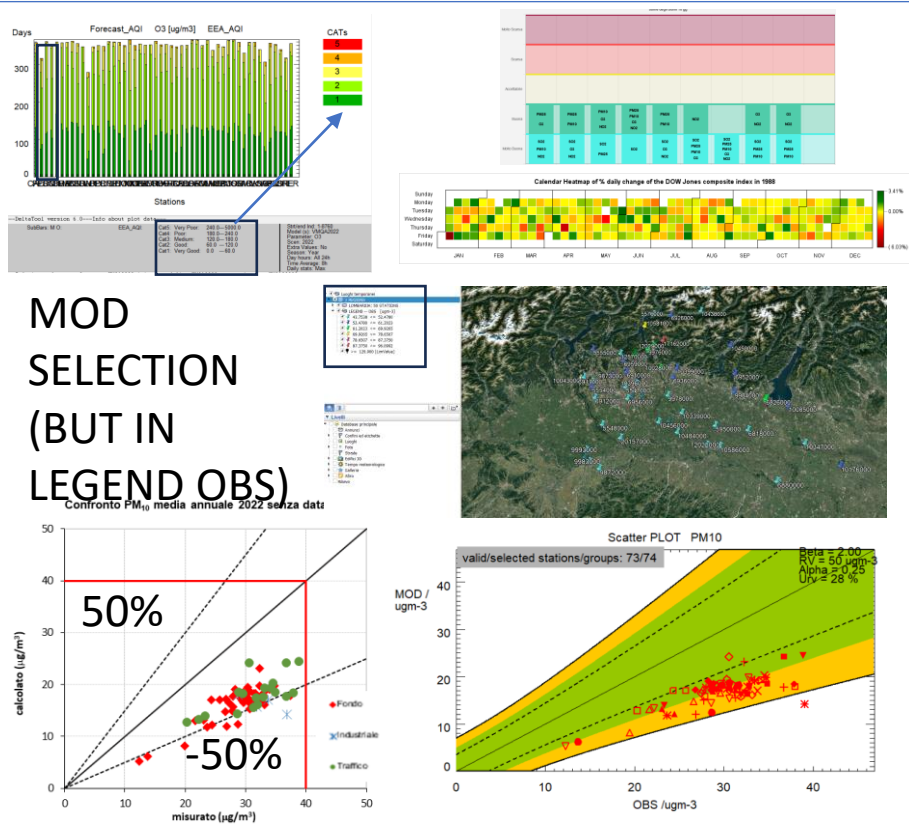


- outputs clear for a technician
- outputs not so fair for stakeholders
 - ✓ indicators are not clear immediately (guideline is essential)
 - ✓ many plots for a basic user
- Some comment on the results: Are indicators really useful for understand the model dynamic? (i.e. MQI could be less than 1, but forecast model map under estimates observations?)

SOME SUGGESTIONS:

- AQI bars: what is obs and model bar? Legend near color? Multitable with all contaminants or yearly heat-map with colour based on AQI?
- google maps: issue on representation of model vs obs into the legend
- possibility to plot more than one forecast in the same target plot with each MQI
- possibility to plot more than one model in the same target plot with each MQI
- scatter plot forecast with uncertainties lines choice (i.e. D.LGS 155/2010)

Practical use of the Delta application



THANKS FOR YOUR ATTENTION