URBAN MODELLING INTERCOMPARISON EXERCISE

FAIRMODE / WG4 / ATHENS, 4-6TH OCTOBER 2023

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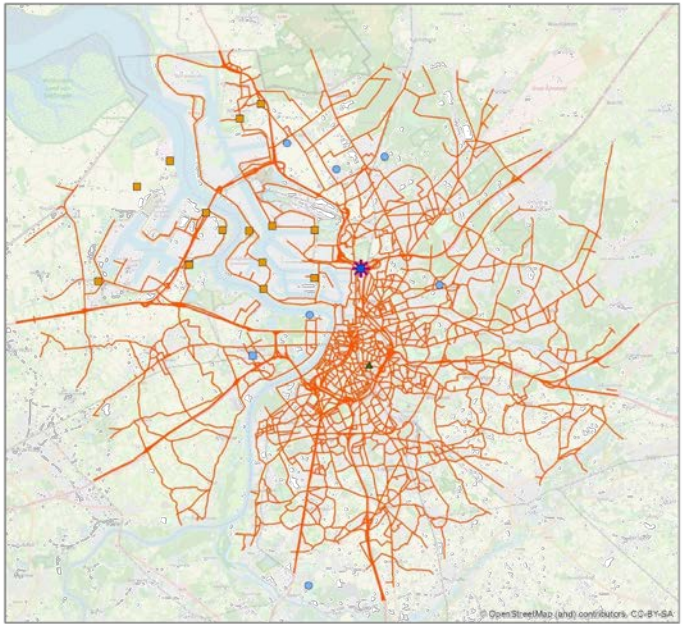
Context and Objectives

2d Intercomparison Exercise

Context : Part of the QA national framework
Mandatory (decree of April 16, 2021 on Air quality assessment)

Objectives : Estimate the variability of modeled concentrations - Harmonize practices - improve QA framework



Antwerp setup provided by Vito:

- ✓ Year 2012
- ✓ 2 different street network proposed : 8623 road sections or 2906 (smoothed network)
- ✓ Emission inventory is gridded except for trafic emission.
- ✓ Boundary Conditions : from observations OR from regional modelling (Chimere)
- ✓ Pollutants : NO2, PM10, PM2.5, O3

Phase 1

- ✓**Blind exercise** (no information on obs except 4 stations)
  -> no correction of model outputs

Phase 2

- ✓**Some of the observations were provided**
- ✓Exercise focus on the way to correct model.

2 days Workshop on harmonization

Overview

Quick Overview:

- 14 participants (including one group of AASQA and the LCSQA)
- ADMS Urban: 6 AASQA + DROM-CORSE group
- SIRANE : 6 AASQA + LCSQA
- Half of the participants used Chimere concentrations as BC (all or part): 6/14
- 3 AASQA used the smoothed network

RESULTS (focus on NO2)

- **Grid:** All Grid results were interpolated on a common **10m by 10m grid**.

- **Receptors:** Receptor point results in Delta Tool format,
- Indicators : Target plot, Taylor Diag
  Dynamic Evaluation (temporal indicators): Day-Night, WeekDays – WeekEnd, Summer – Winter.

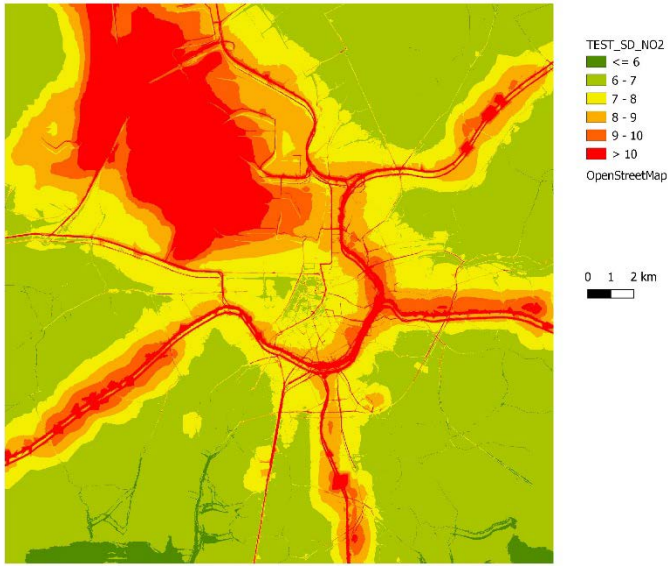
Grid Results: NO2 Annual mean

GRID : NO2 ALL SD

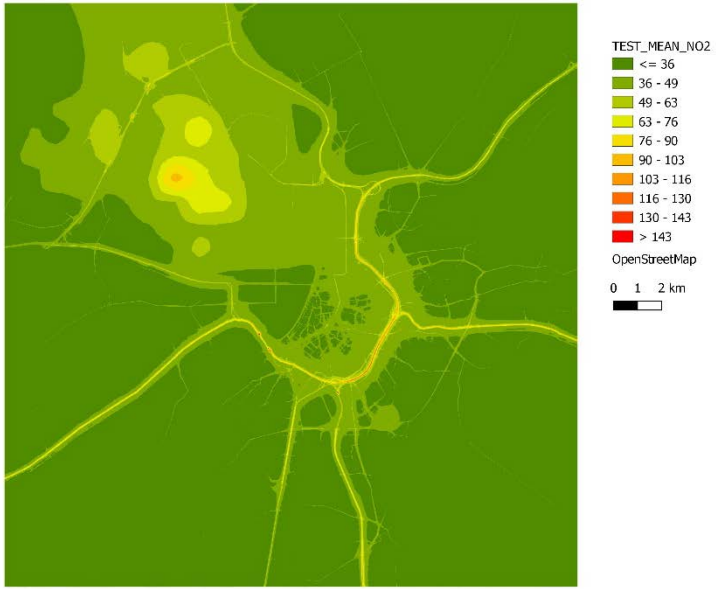
Zoom on small values.

⇒ **Significant differences on primary road network and for the industrial area.**

⇒ Smaller differences are on the **borders of the domain (but still 6 µ/m³ which illustrate some differences in the treatment of the boundary conditions.**



SD of all the simulations (NO2 Annual Mean)



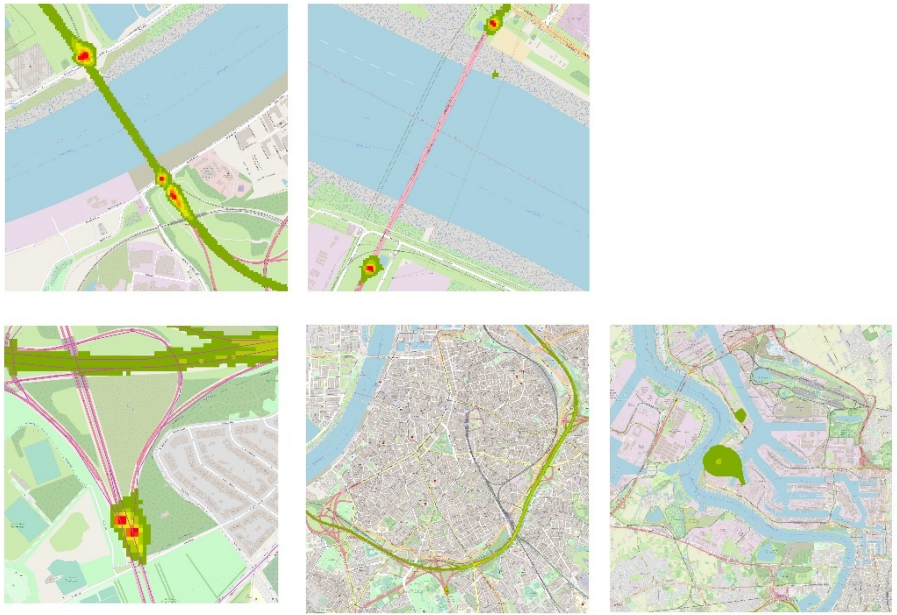
Average of all the simulations (NO2 Annual mean)

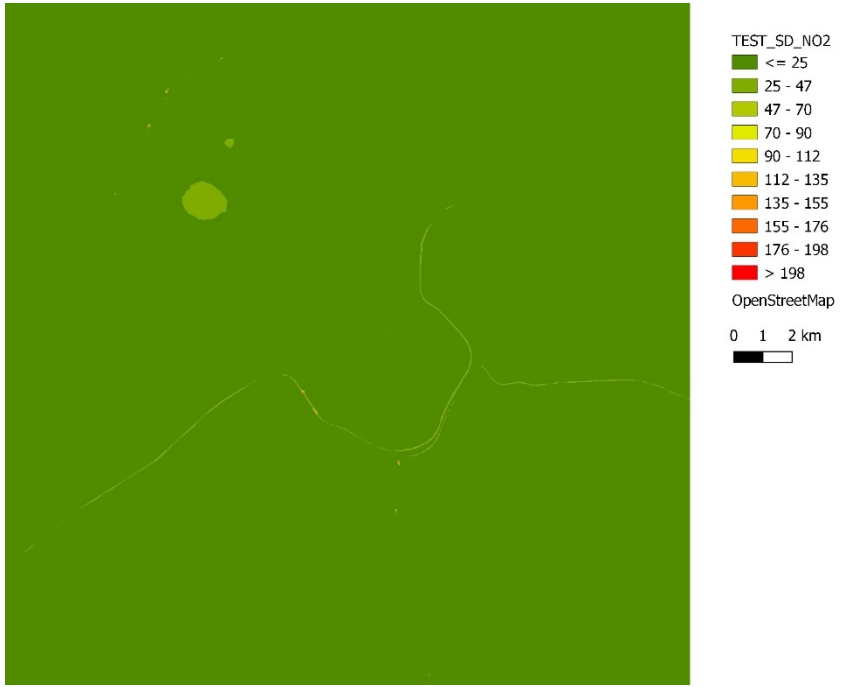
Grid Results: NO2 Annual mean

GRID : NO2 ALL SD

At local level => zoom in on major differences

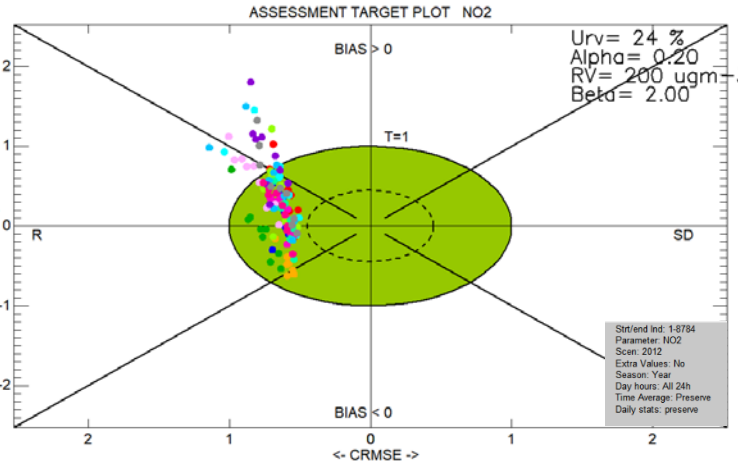
⇒ Significant differences observed where concentrations are highest:
Tunnels, roundabout & highway access, highways, industrial area

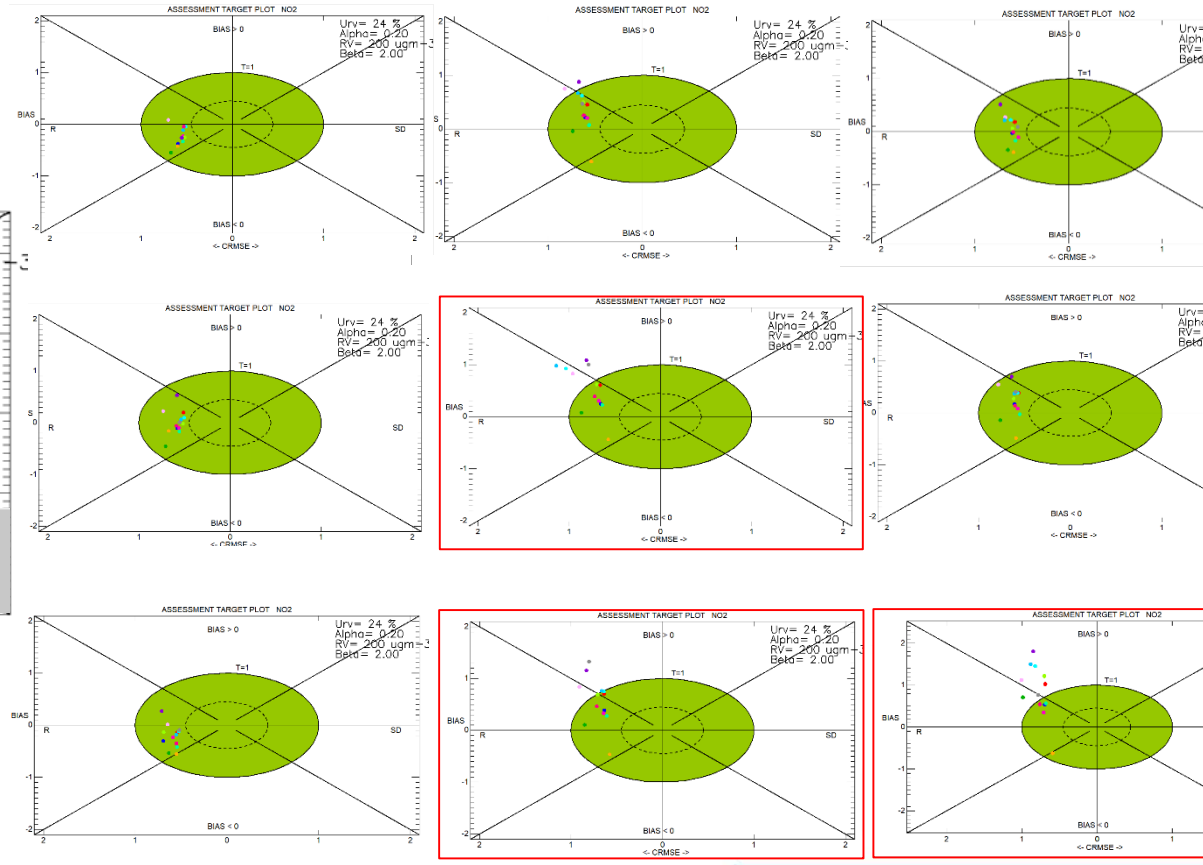




Receptors – Target Plot NO2

RECEPTORS : Delta tool Target Plot AASQA same color.



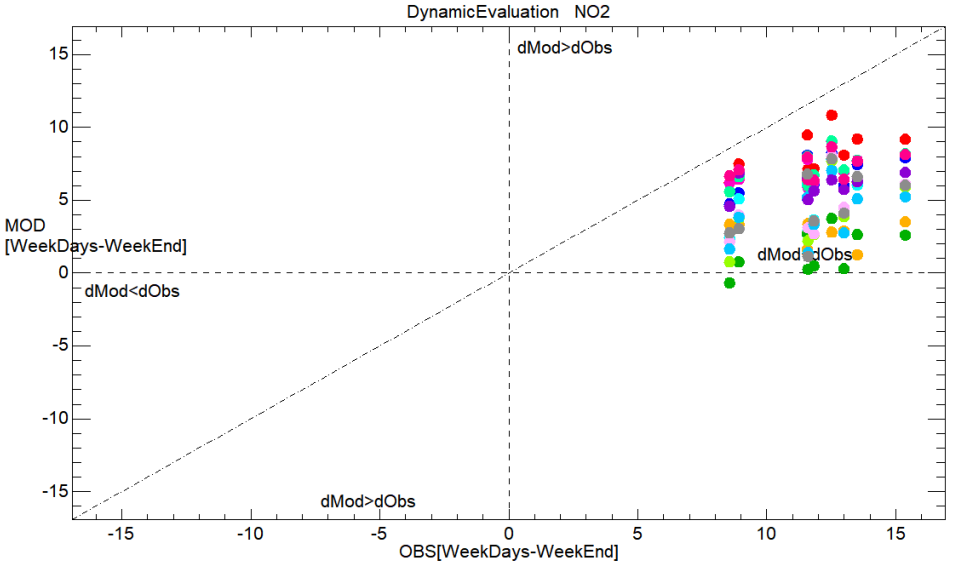


⇒ **MQI not always < 1**

⇒ **MQI lower for 3 stations (industrials)**

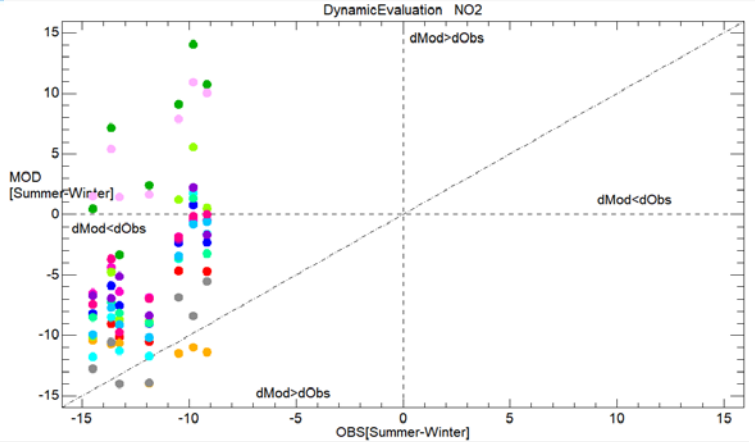
Récepteurs – dynamic evaluation NO2

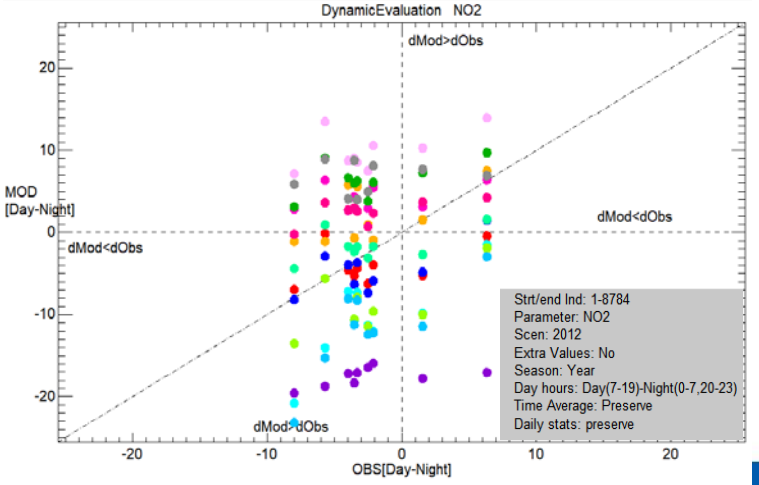
RECEPTORS : dynamic evaluation (temporal) : WD-WE, S-W, D-N,



⇒ **Too much weight on WE or not enough on WD**

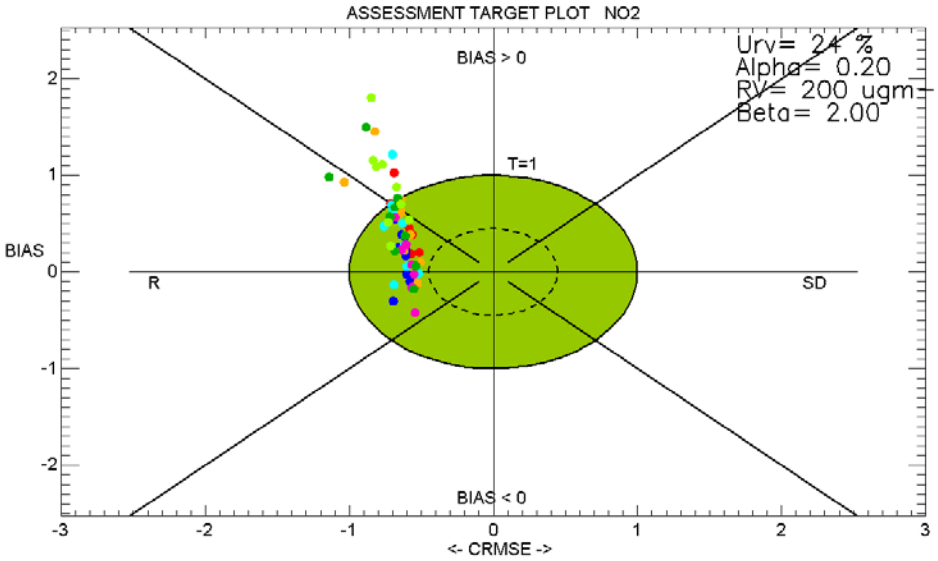
⇒ **Too much weight in summer or not enough in winter**



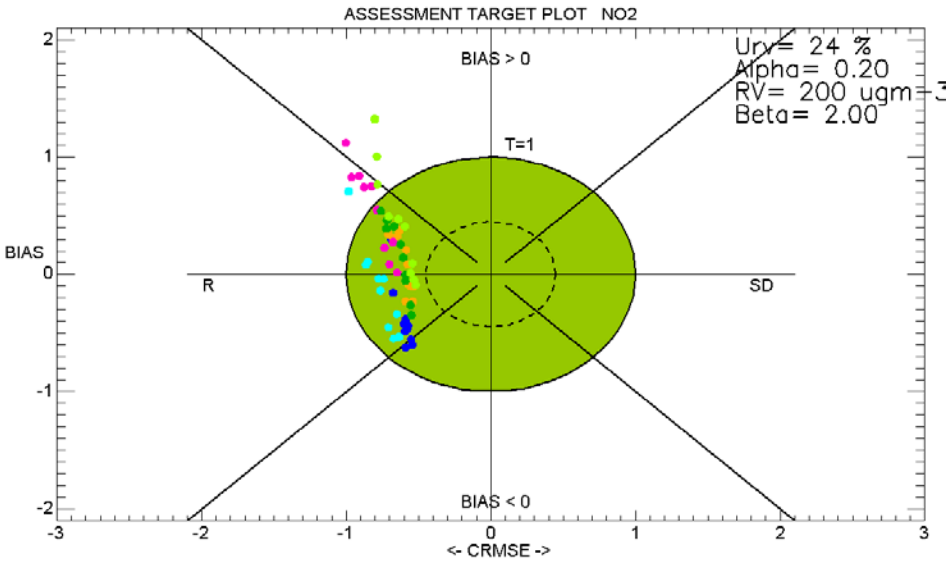


ADMS Urban VS SIRANE

RECEPTORS : ADMS Urban VS Sirane NO2 Delta tool target plot



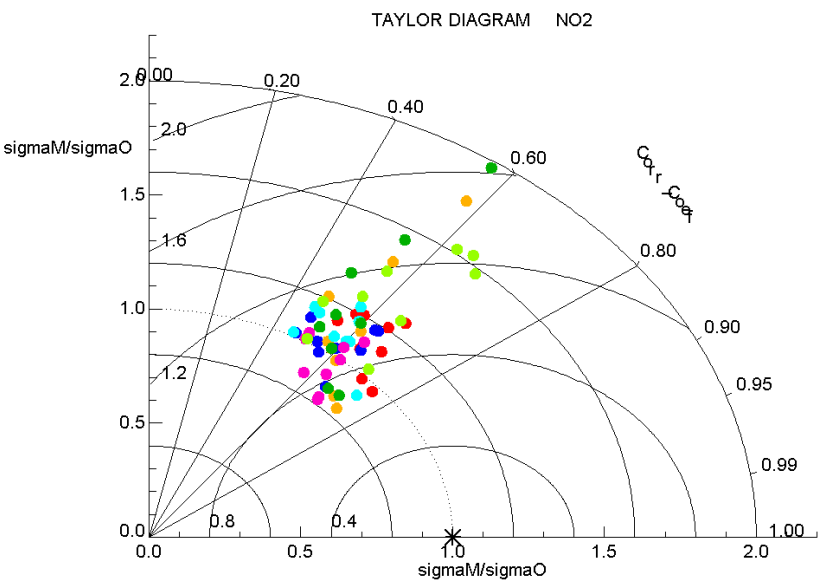
ADMS Urban



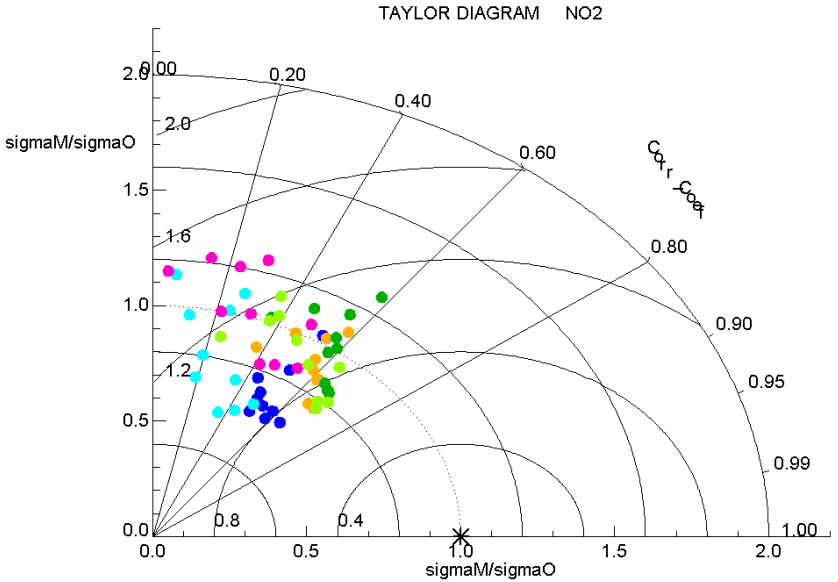
SIRANE

ADMS Urban VS SIRANE

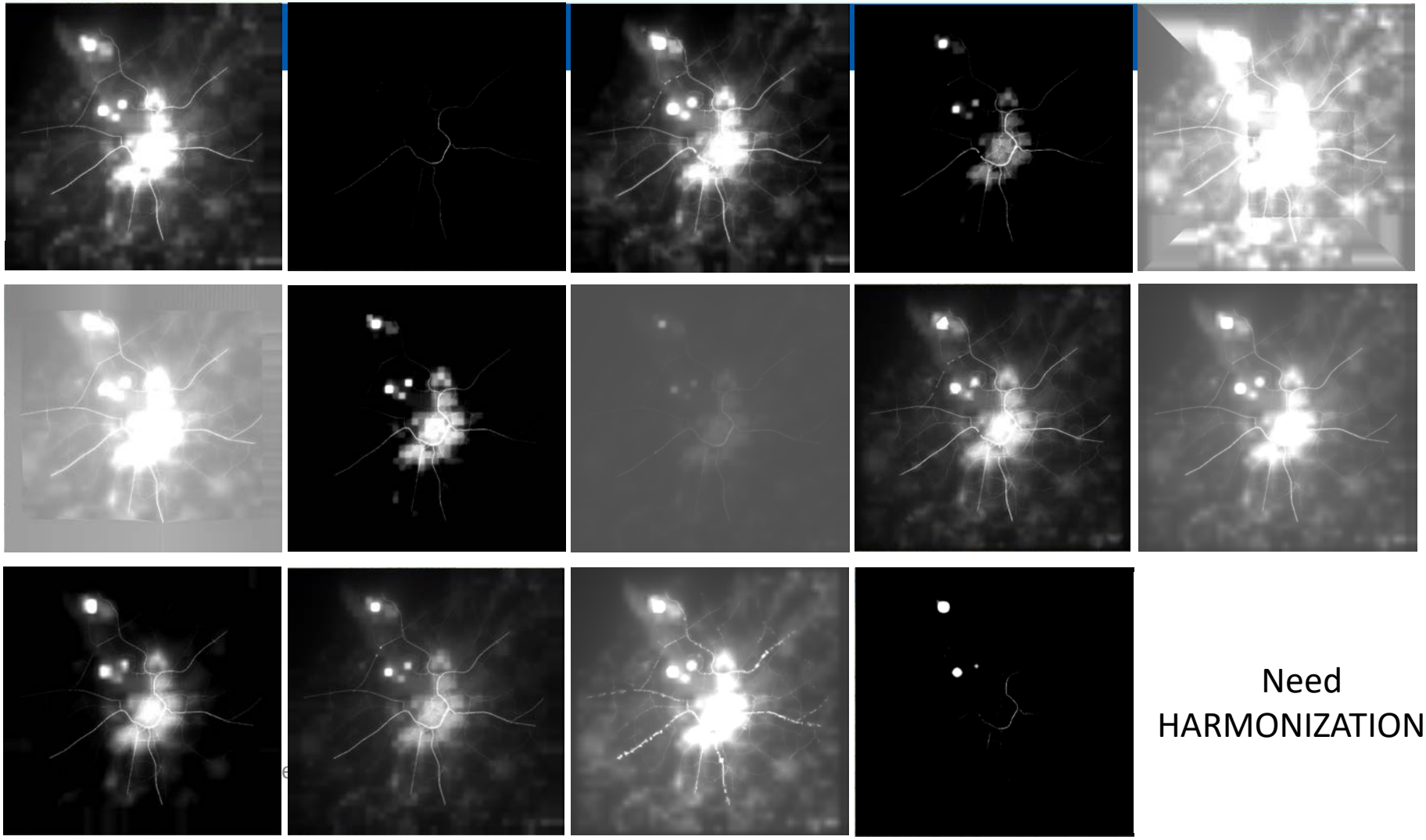
RECEPTORS : ADMS Urban VS Sirane NO2 Delta tool Taylor Diagram



ADMS Urban



SIRANE



Need
HARMONIZATION !

WORKSHOP How to improve harmonization

Objective: toward more harmonization

ITEMS	TECHNICAL RECOMENDATIONS
Models and versions	Fine-scale operational modeling systems shall implement the latest major software versions **no later than year n+2**.
Boundary conditions	From regional modelling : minimum **4 points according to the wind direction** From observation : considering wind direction when possible.
SIRANE setup	Technical recommendation on : building height computation, displacement height, meteo grid, ratio between meteo grid and dispersion grid, …
ADMS Urban setup	Technical recommendation on : met parameters of dispersion site VS met site, …
Domain parameters & spatial distribution of emission	Lanes width, canyon criteria, subdomain and buffer used to compute the average height of the buildings, albedo, roughness, Priesley Taylor coefficient, …
Temporal profile for Emission	Include systematically degree days in daily temporal profiles, …
Meteorology	LMO Min, BLH, Cloud cover VS incident radiation, …

Conclusion : Improving QA framwork

And after ?

Recommendations → **LCSQA Report** → **Technical Referential**

AASQAs are controlled **every 4 years through technical audits** which report nonconformities to the Ministry.
If a nonconformity is reported, then an action plan must be proposed by the AASQA.
LCSQA will follow the application of the action plan every 2 years.

Perspectives : Spatial Representativeness Area study and ELV.

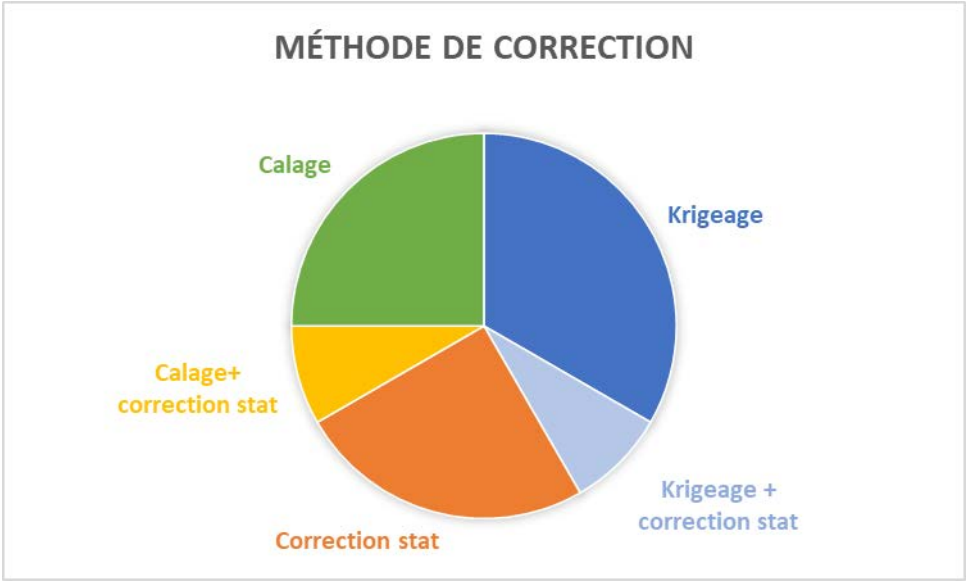
Thank you for your attention

Annexe

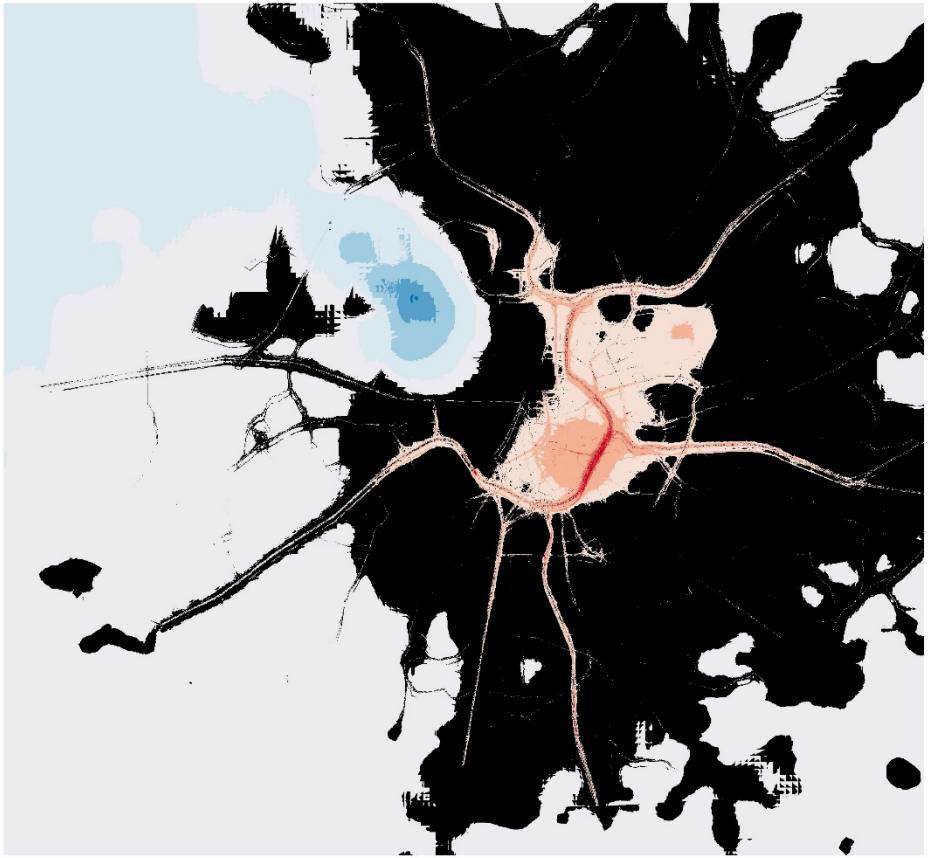
Overview

Overview - use of observation data to correct Phase 1 modeling results.

- 12 corrections to results
- 4 post-processing of concentrations using kriging
- 1 post-processing combining kriging and statistical correction
- 3 post-processing using a statistical correction procedure for concentrations
- 1 study combining calibration and statistical correction
- 3 clibration



Overview: ALL MEAN PHASE2 – ALL MEAN PHASE1 NO2

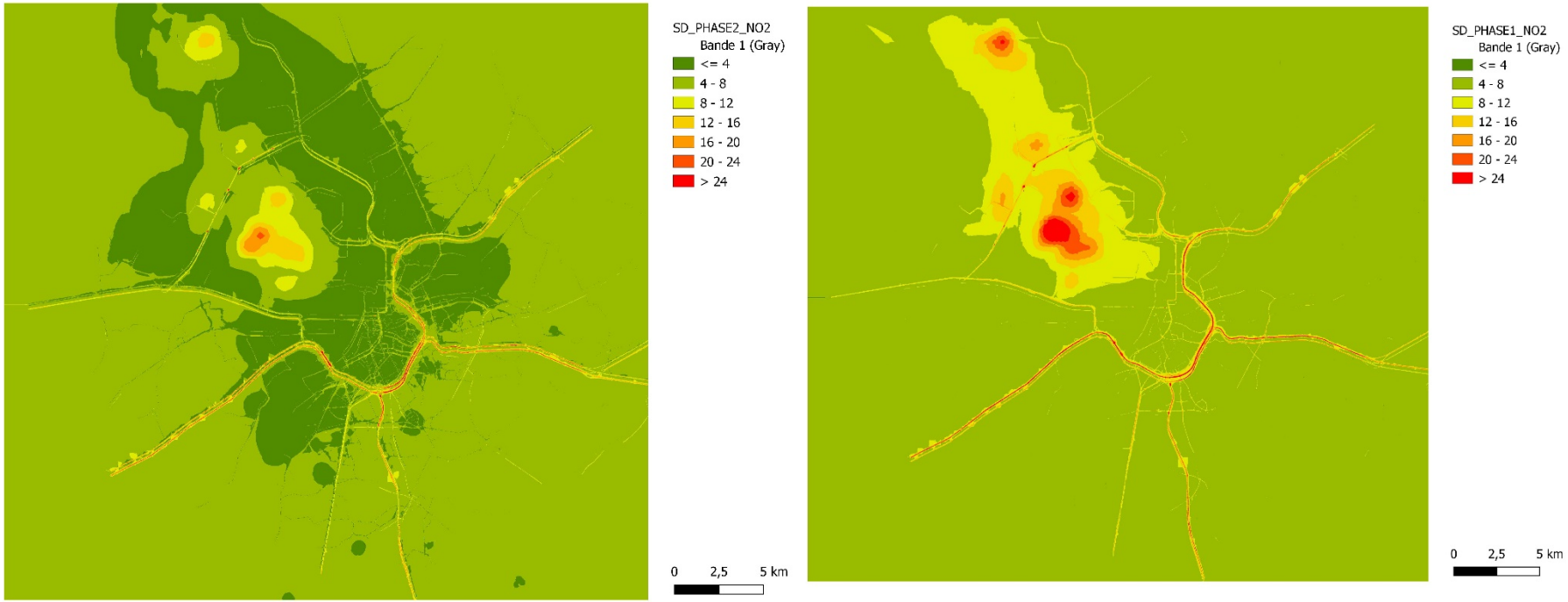


Average difference in annual NO2 concentrations (PHASE2 - PHASE1):

- Réduction of concentrations in the industrial area
- Increased concentrations in city centers, especially on main roads

Overview: SD PHASE1 vs SD PHASE2 (NO2)

Standard deviation between all NO2 concentrations



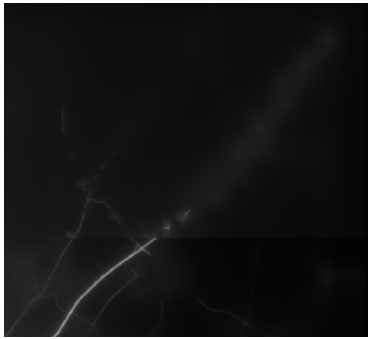
Standard deviation is logically lower after PHASE 2 corrections => results are more homogeneous

Erreurs de positionnement

Quelques petites erreurs …

1)Positionnement du cadastre (1)

2)Décalage du réseau (1)



3)Double comptage réseau + cadastre Snap07 (1)

Grid Results: NO2 Exceedances

GRID : Hourly NO2 exceedances

⇒ **Not much outside the main roads**

⇒ **But differences may be significant**