FAIRMODE WG4 Microscale Modelling
Paper B

Tentative title

"Comparison of estimates of the air quality standards exceedances areas and spatial representativeness of air quality stations in an urban area computed by different modelling-based methodologies"

Paper B. Contents.

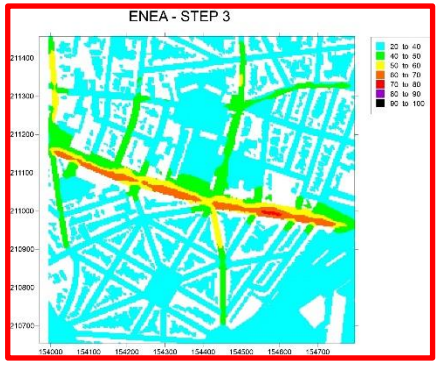
1. Comparison of annual NO2 maps.
2. Comparison of Limit Value Exceedance Area (LVEA).
3. Comparison of Spatial Representativeness Area.

Comparison of annual NO2 maps

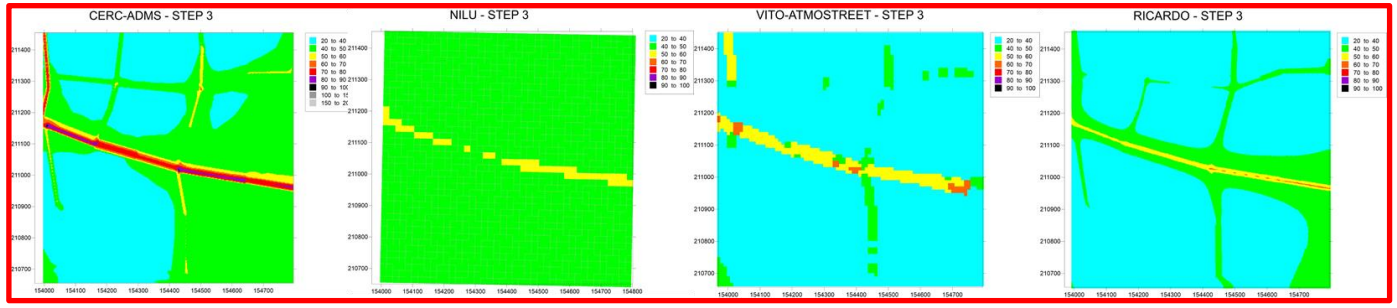
- Analysis following the same scheme than for monthly maps in paper A?
  - Grouping by model types?

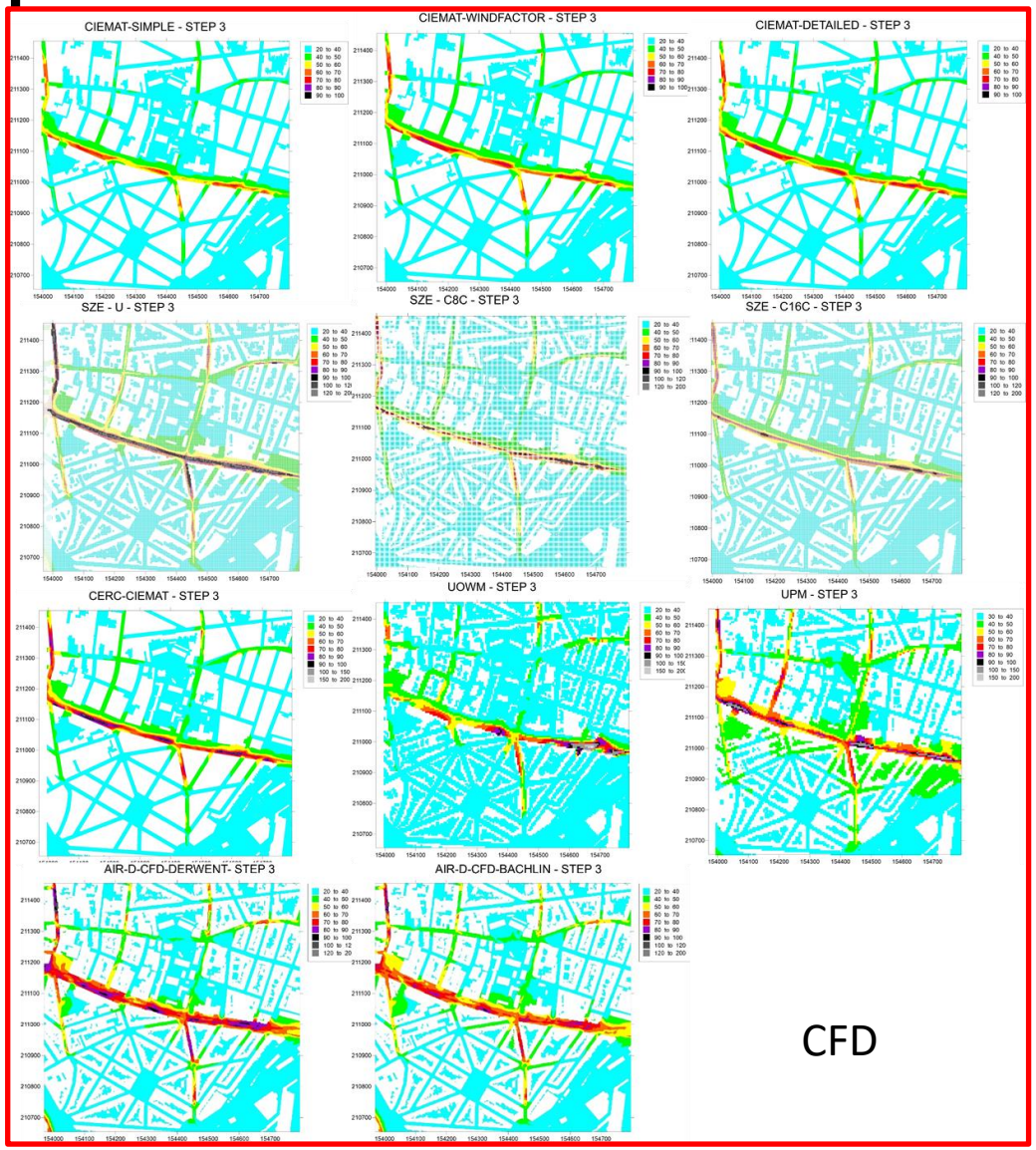
AI

LAGRANGIAN



GAUSSIAN





CFD

Comparison of annual NO2 maps

- Any additional analysis?:
  - Not possible to compare with observations except with NO2 annual average data at AQ station traffic and background (only two data!!). Is it worth?
  - Comparison with monthly results?
    - Differences or ratios (annual/monthly) concentrations?
    - Is the spatial distribution kept?
    - Are there a constant bias?

Comparison of LVEA

- Present LV (40 ug/m3)
- Future LV (20 ug/m3)? In this case, all the domain is in exceedance because the lowest concentration is 27-30 ug/m3. No make sense, but include a comment in the document!

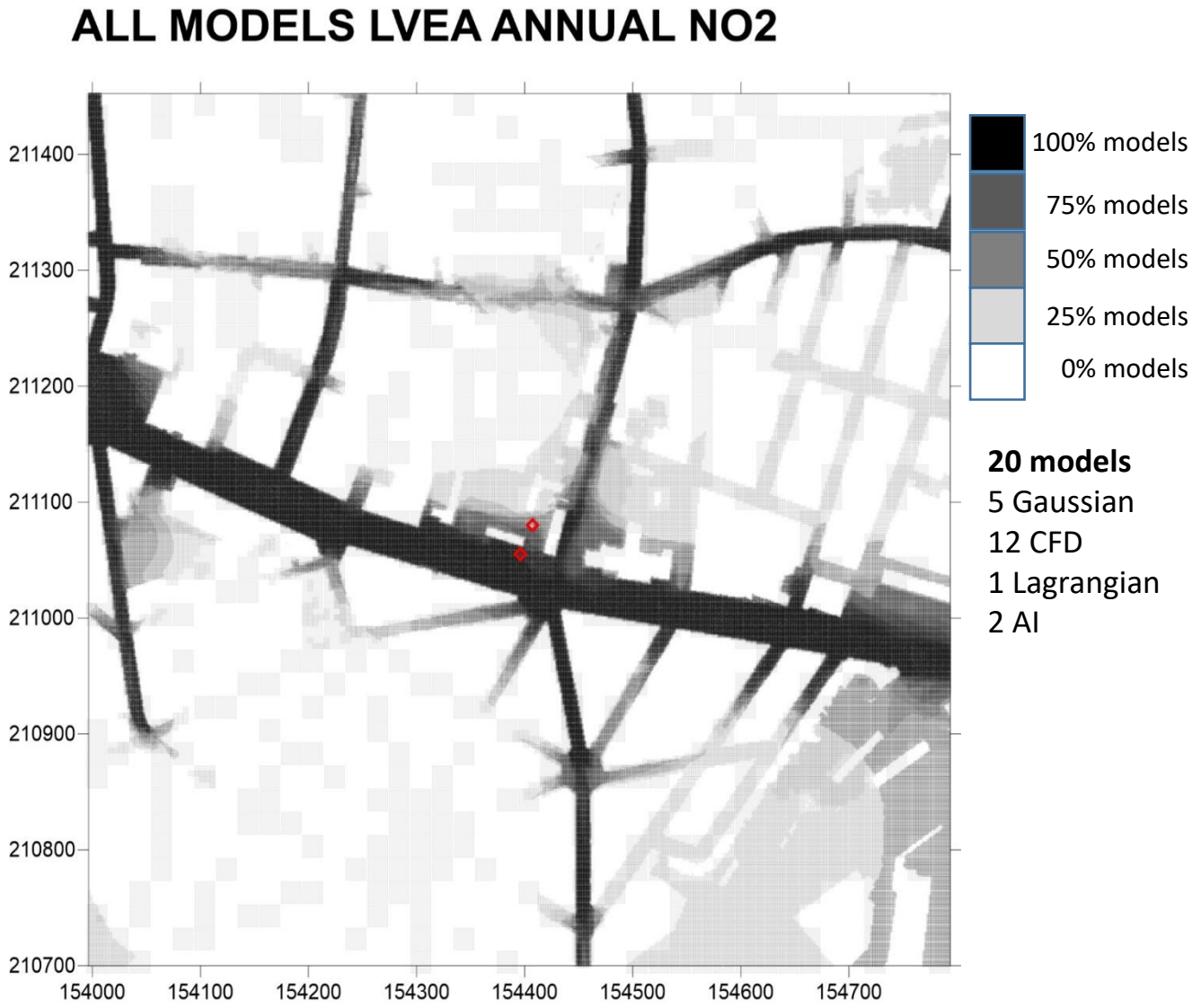
Comparison of LVEA

- Discussion of model results.
  - Comparison size and shape. How different are LVEA?
  - Are there significant differences when using different types of models?
  - Dependency on model resolution?
  - Could be good to compute LVEA using normalized concentrations maps (using data from AQ station)?
  - Compute an average of model results (all models or by groups CFD, Gaussian, AI) of annual concentration and then, compute the LVEA?

Comparison of LVEA

Comparison size and shape. How different are LVEA?

All models coincide, exceeding VL on main streets, but there are differences in shape and size of LVEA.

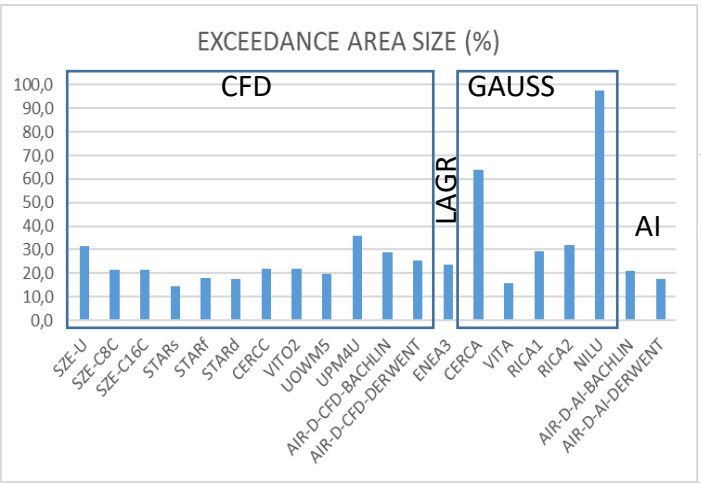


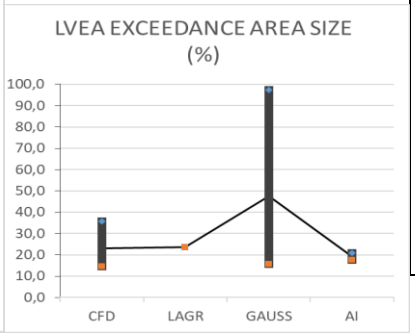
Comparison of LVEA

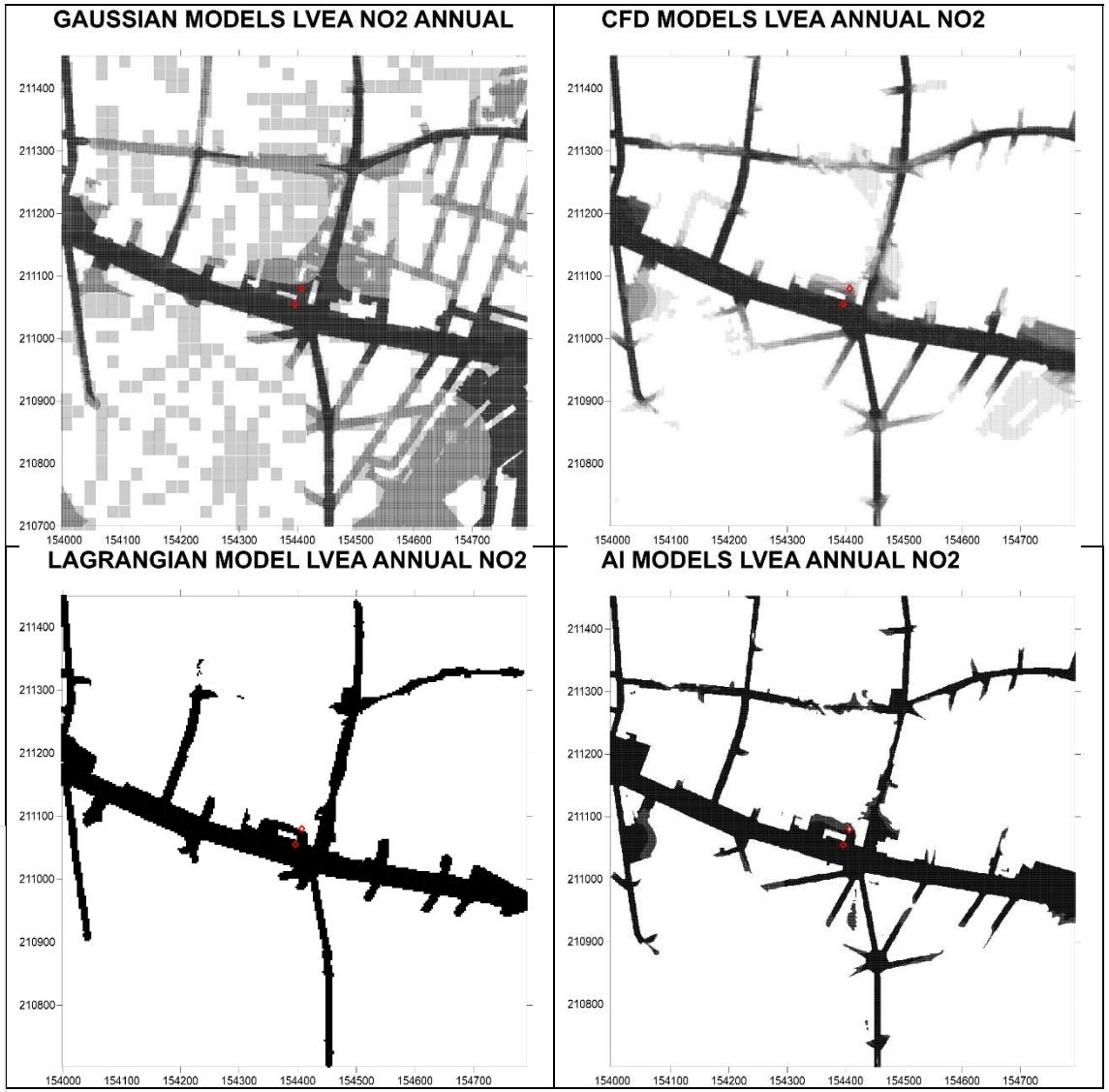
Are there significant differences when using different types of models?

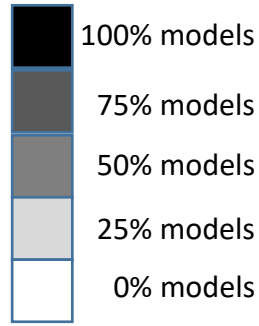
Larger LVEA for most of Gaussian models, but strong variability (highest for EPISODE-NILU).

Size and shape of LVEA for CFD, Lagrangian and AI models rather similar, but some variability for CFD (higher for PALM4U and OPEN FOAM unsteady full-year simulation from SZE).









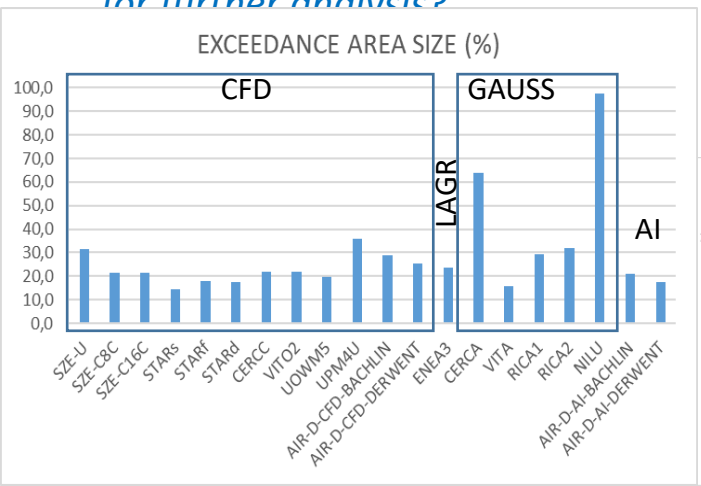
20 models
5 Gaussian
12 CFD
1 Lagrangian
2 AI

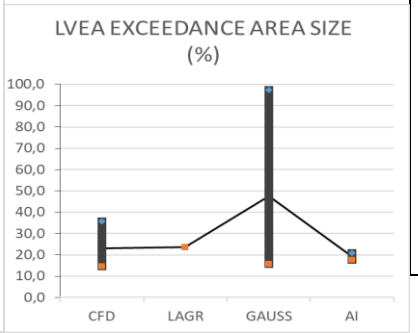
Comparison of LVEA

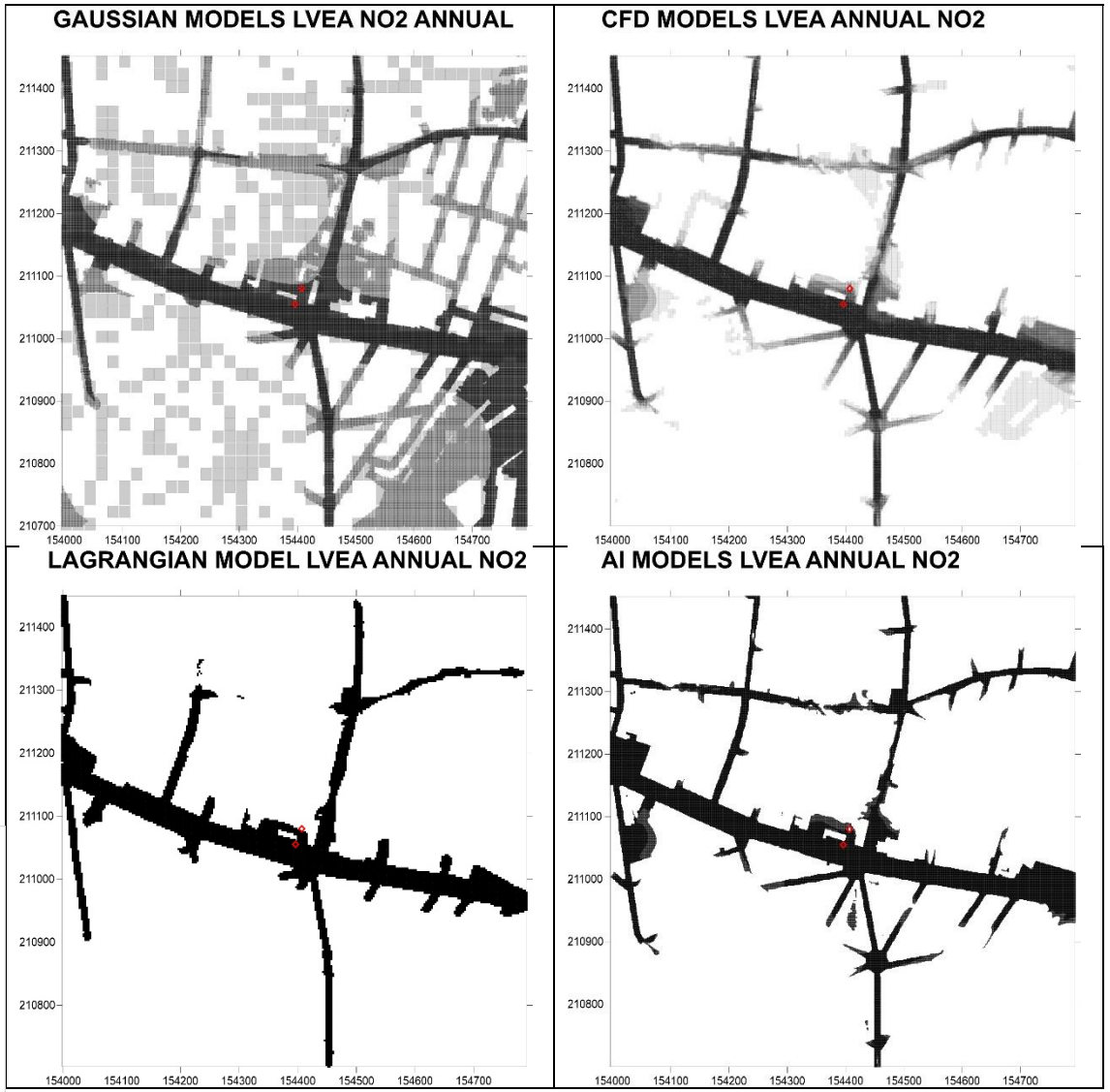
Are there significant differences when using different types of models?

Need for further analysis?

- *Differences between Gaussian models.*
- *Differences between AI results using different NO2/NOx formulation.*
- *Some "little" differences when using same CFD model (STARs, STARf, STARd, CERCC) but different methodologies for retrieving long-term average concentrations?*
- *Explore for differences when using same CFD model & methodology but different number of scenarios? Need for further analysis?*







100% models

75% models

50% models

25% models

0% models

20 models

5 Gaussian

12 CFD

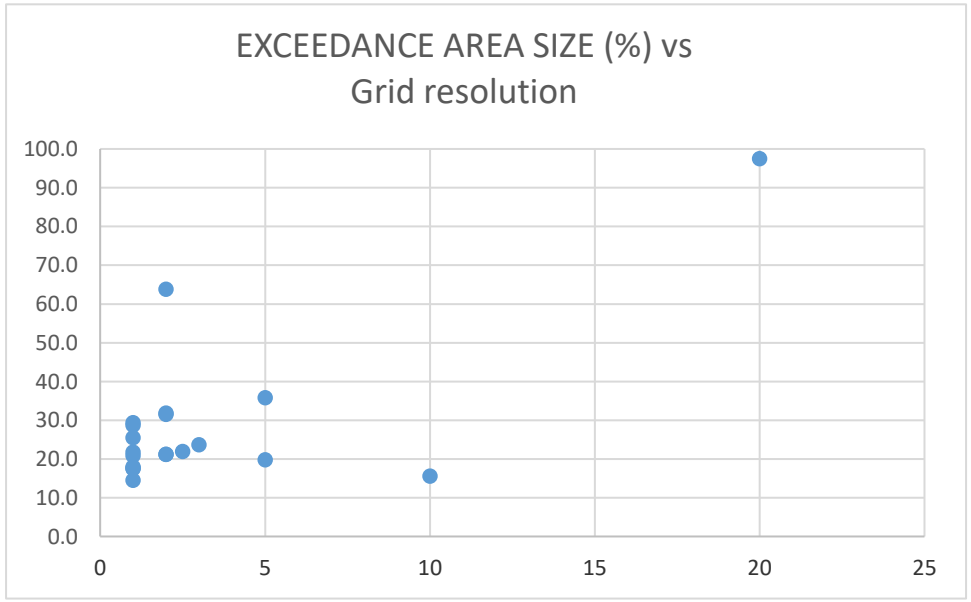
1 Lagrangian

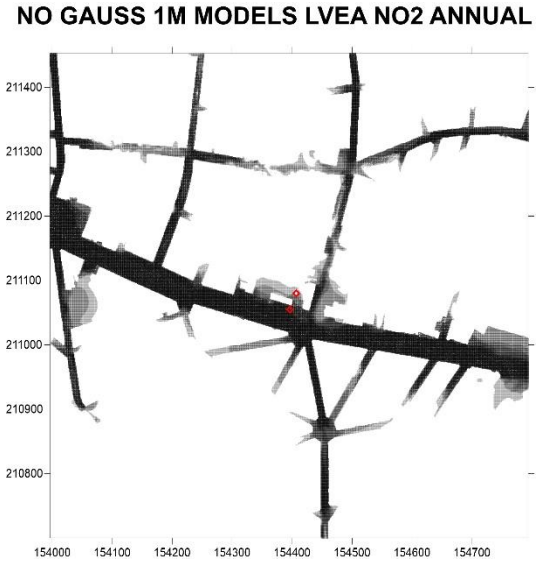
2 AI

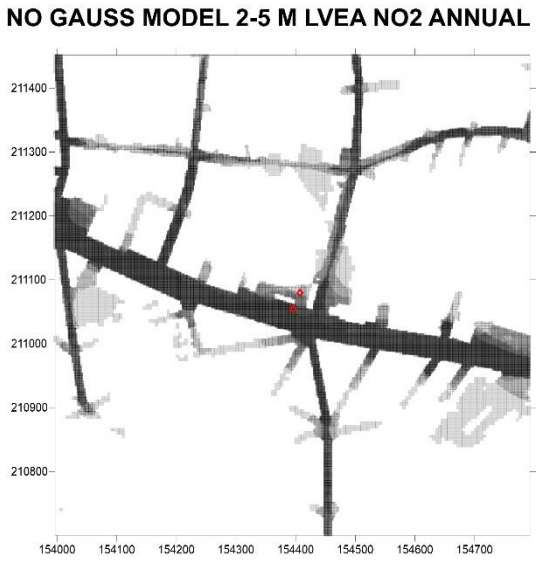
Comparison of LVEA

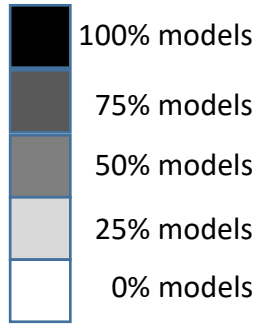
Dependency on model resolution?

LVEA size seems to not significantly depend on grid resolution.









Comparison of LVEA

Further analysis?

- Compute an average of all model concentration results of annual concentration and then, compute the LVEA?
  - all models or
  - by groups model (CFD, Gaussian, AI)
- Could be good to compute LVEA using normalized concentrations maps (using data from one of (or both) AQ station)?

Comparison of SRA

- Are there significant differences when using different types of models?
- What tolerance should be suitable (10% or 20%)? Try 15%? Others?
- Dependency on model resolution?
- Dependency on concentration at station grid cell?
- Compute an average of model results (all models or by groups CFD, Gaussian, AI) of annual concentration and then, compute the SRA and SRA2?
- Analysis for SRA depending on methodologies and the number of scenarios.

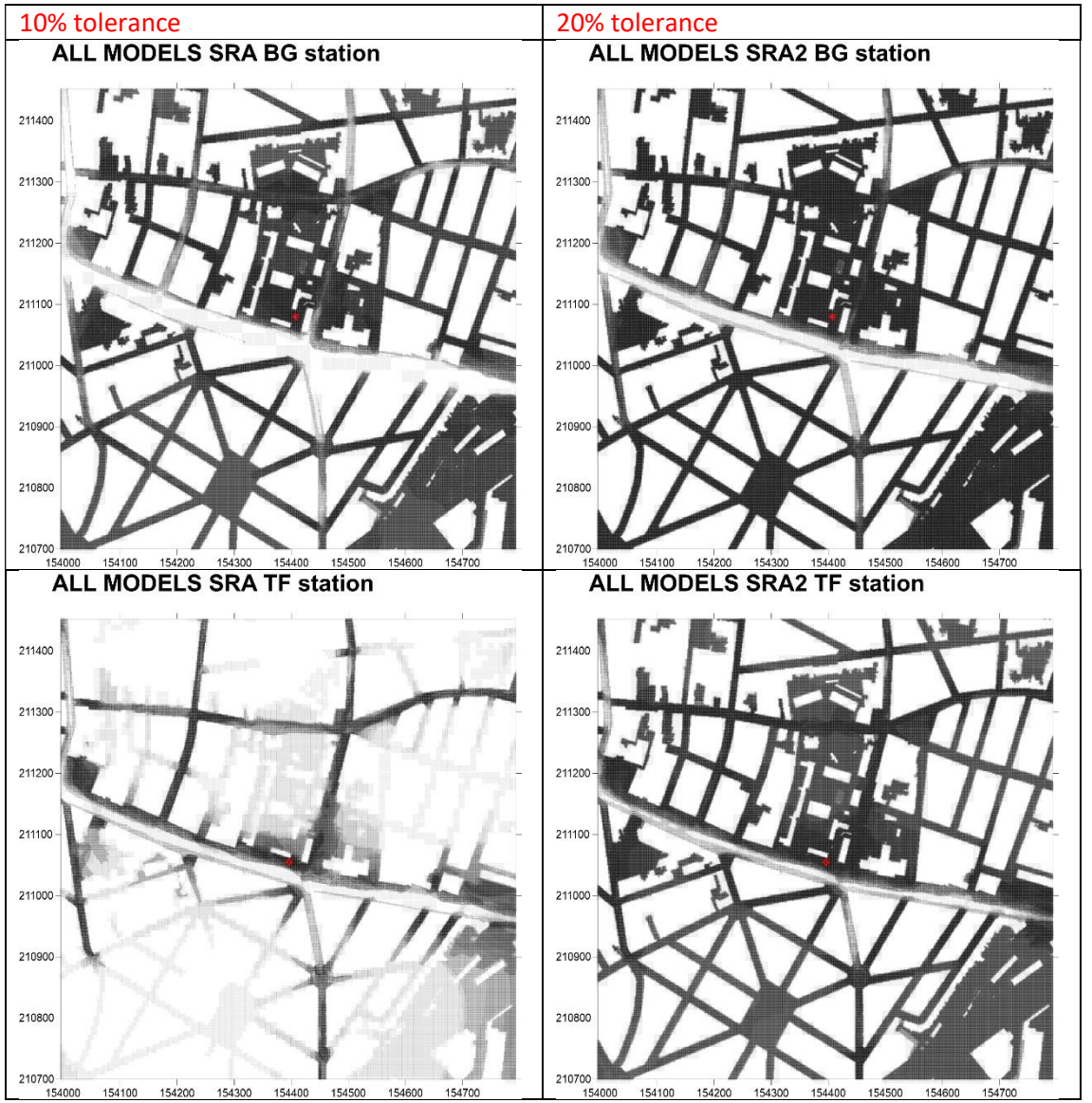
Comparison of SRA

Comparison size and shape. How different are SRA?

SRA are larger for the background station than for the traffic one.

20% tolerance provides much larger SRA (SRA2) than when using 10% tolerance (SRA).

The highest increases for the traffic station.



100% models

75% models

50% models

25% models

0% models

20 models

5 Gaussian

12 CFD

1 Lagrangian

2 AI

Two tolerances:

10% SRA

20% SRA2

Comparison of SRA

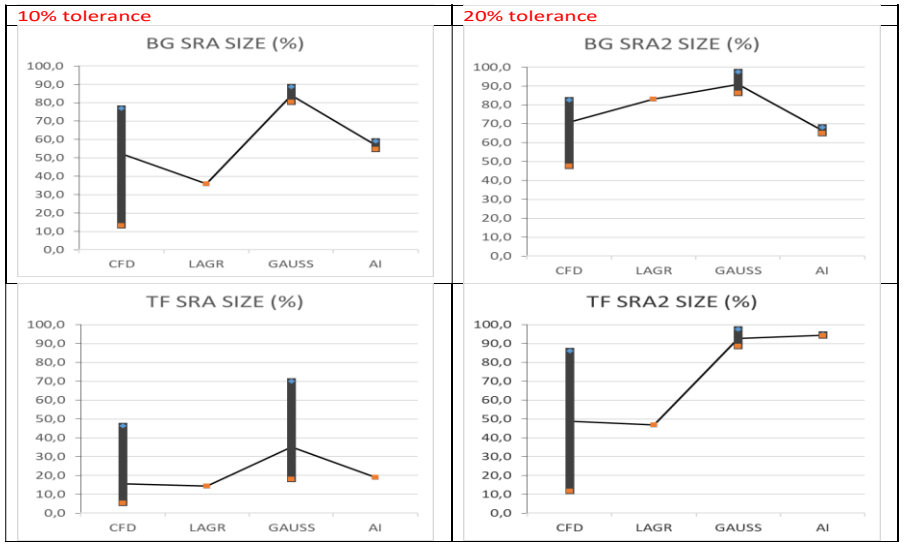
Comparison size and shape. How different are SRA depending on model type?

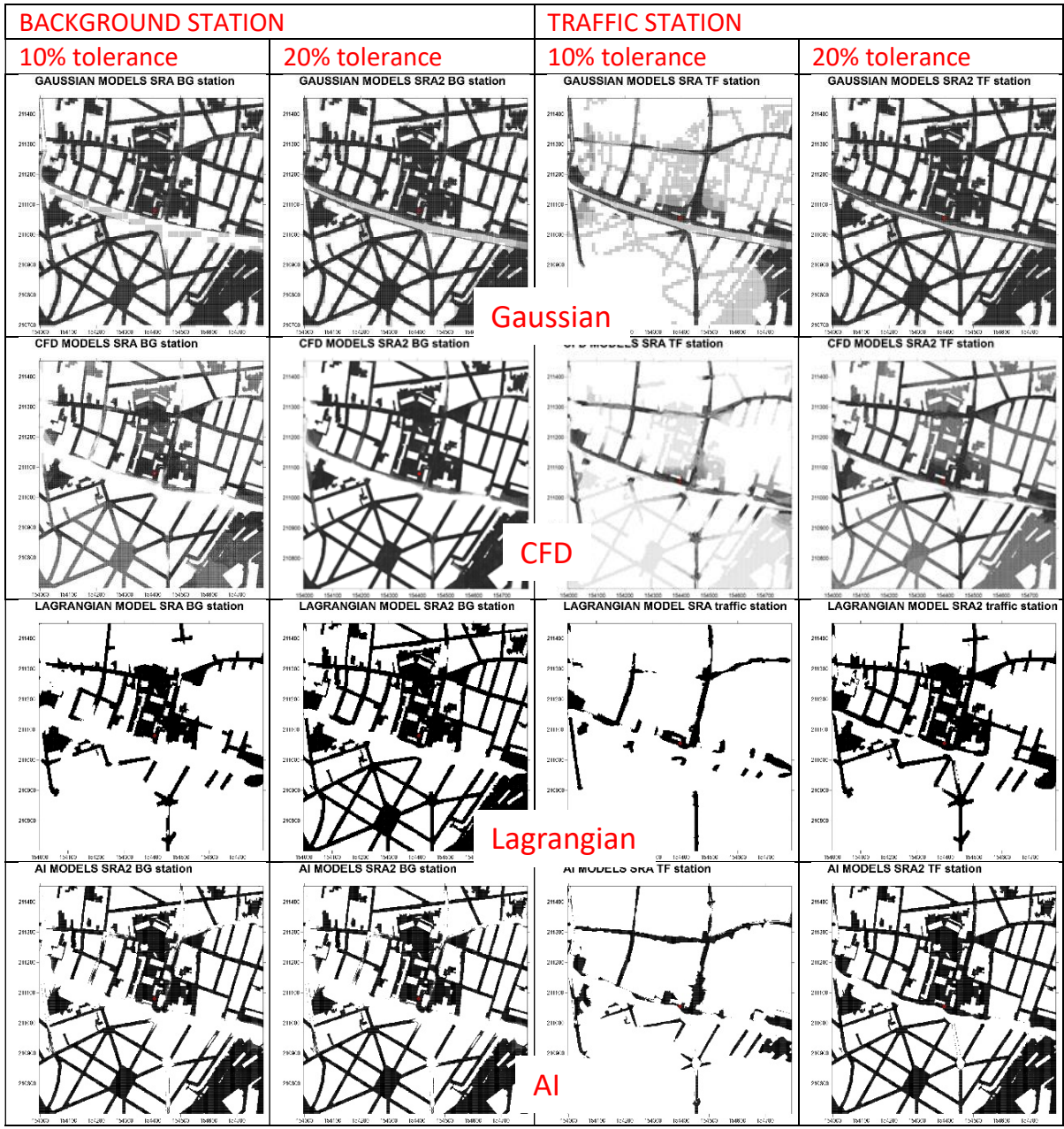
Larger SRA (10% tolerance) and SRA2 (20% tolerance) for most of Gaussian models, but strong variability among models (highest SRA for EPISODE).

High variability of SRA computed with Gaussian models for the traffic station, not for background station or 20% tolerance.

Strong variability of SRA and SRA2 computed with CFD models specially for the traffic station.

Except for one (EPISODE) of the Gaussian models, SRAs of both stations do not include most part of the main street (inside the LVEA).





Comparison of SRA

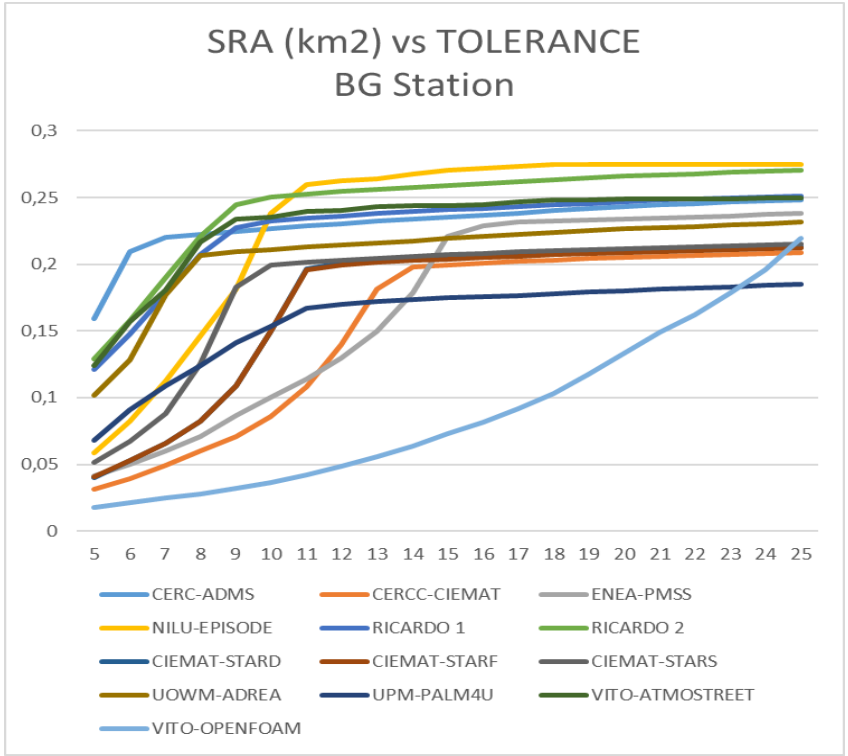
How different are SRA depending percentage of tolerance?

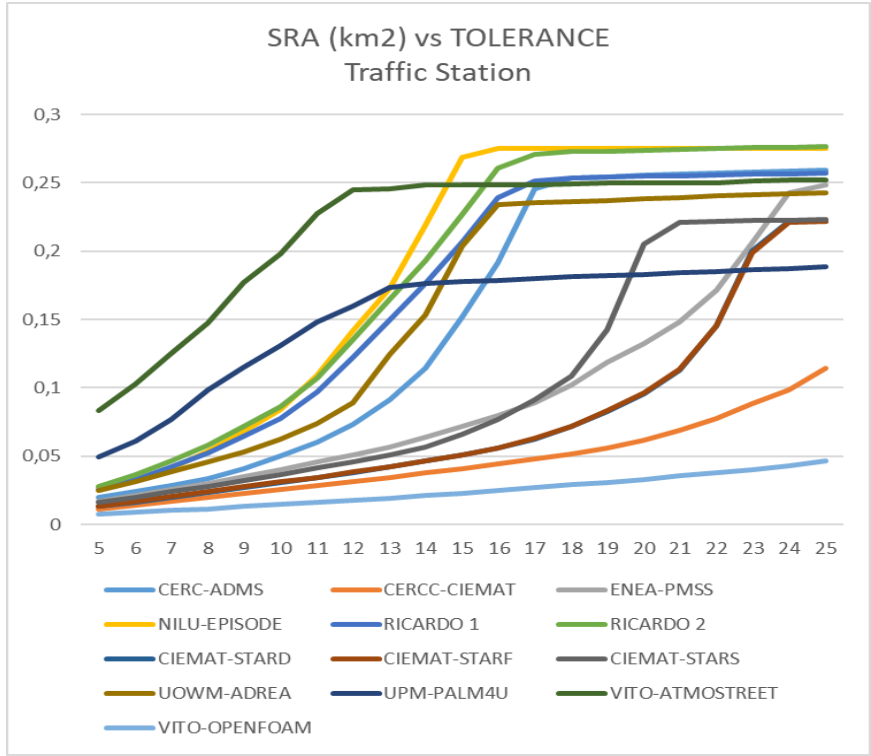
SRA sizes increase strongly as tolerance increase but up to some critical tolerance and then, the increasing is very low.

Critical tolerance is different for each station (higher for the traffic station).

Critical tolerance is different for each model.

Is it a limit for tolerance? Is it worth to investigate this?



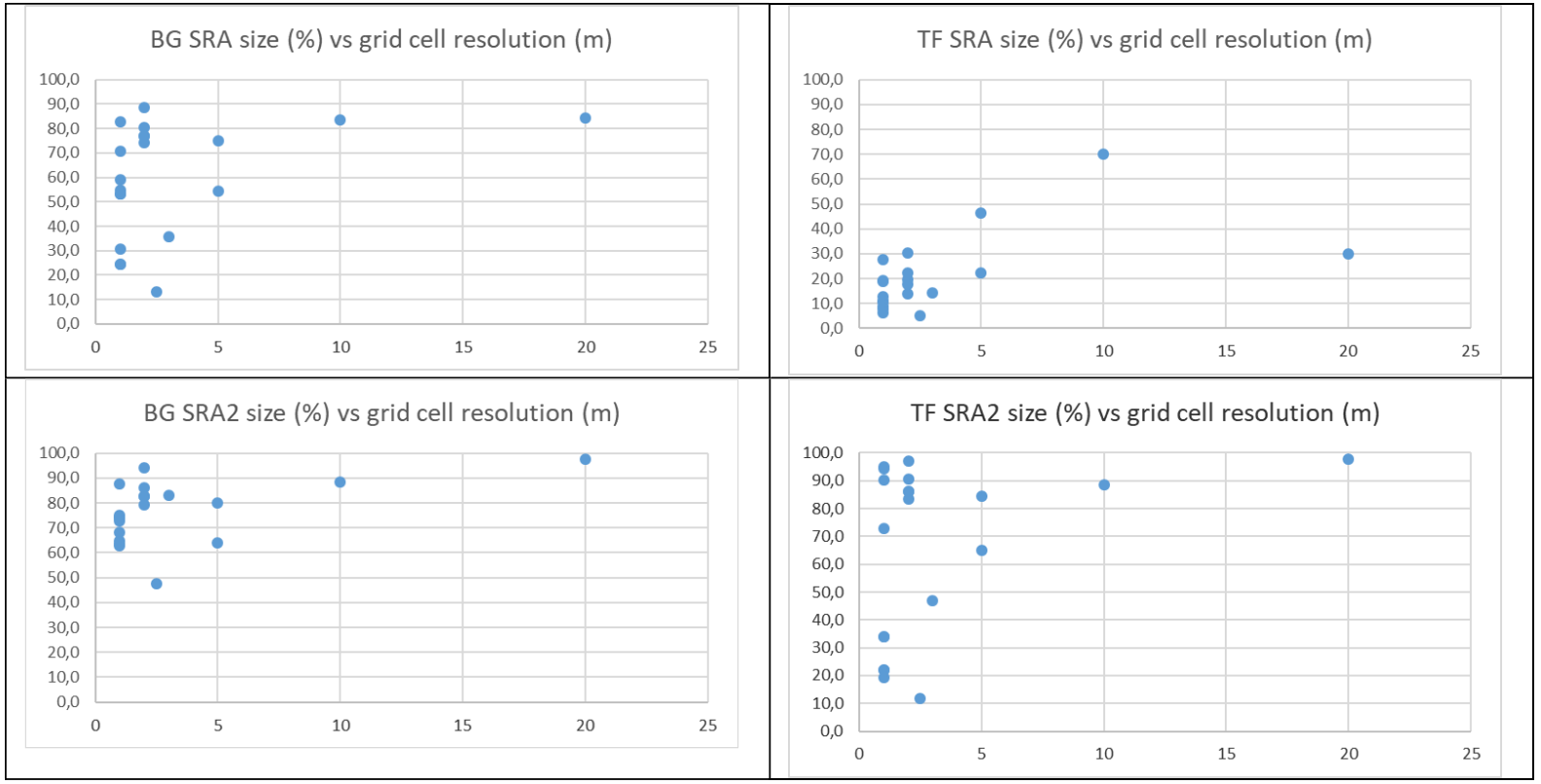


Comparison of SRA

How the SRA sizes changes with grid resolution?

It seems low grid resolution used to provide larger SRA, but high grid resolution can give large and small SRA.

Keep on investigating?



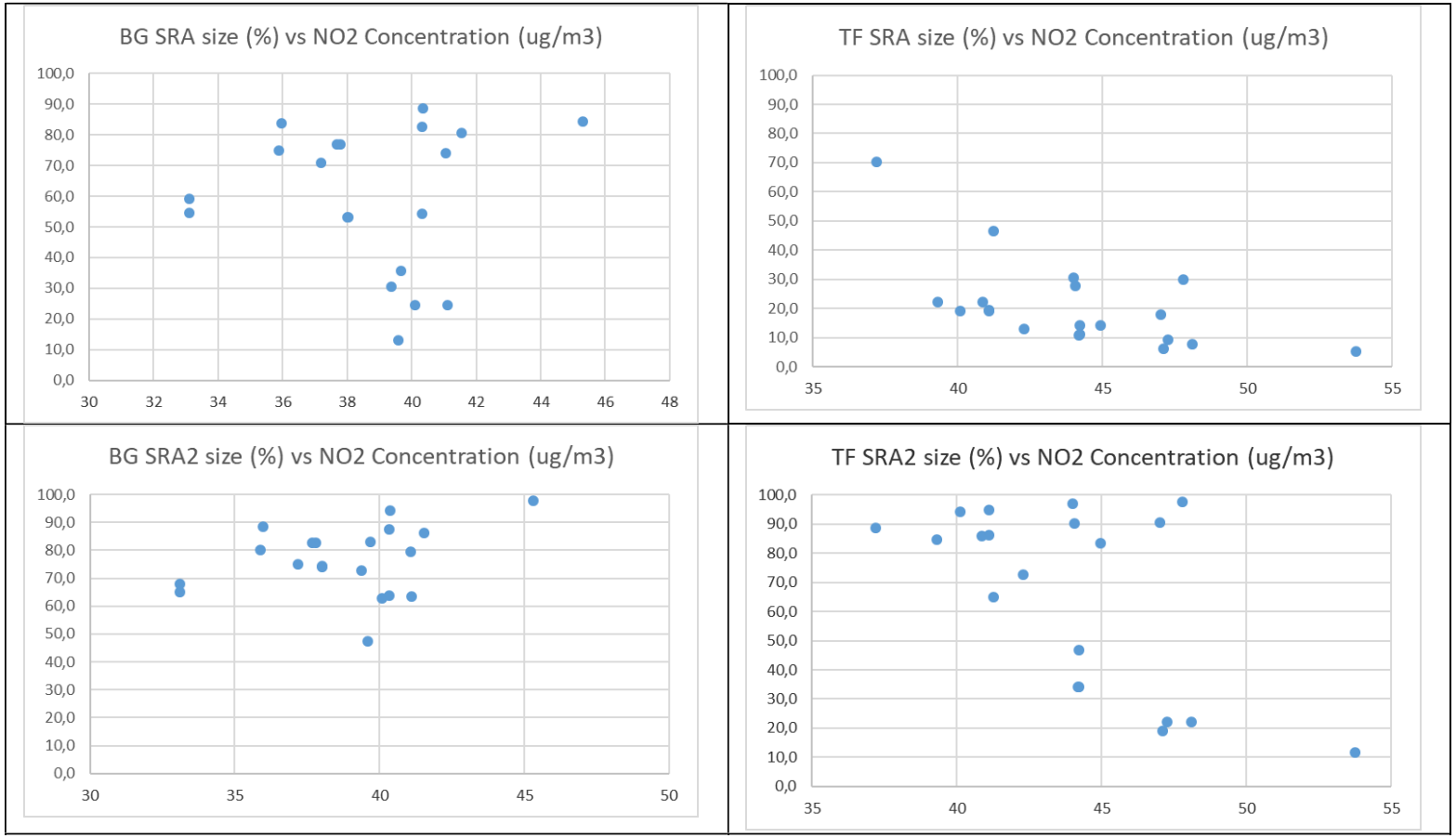
Comparison of SRA

How the SRA sizes changes with model concentration at the stations cells?

There seems to be some relation with station concentration for the traffic station.

Not clear for background station.

Keep on investigating?



Comparison of SRA

- Try 15%? Others? Some work done…
- Compute an average of model results and then, compute the SRA?
  - all models or
  - by groups (CFD, Gaussian, AI)
- Analysis for SRA depending on methodologies and the number of scenarios.
  - Comparing CFD scenario simulations with OPEN FOAM unsteady full-year simulation from SZE. Now we have more results with different number of scenarios for different methodologies (CIEMAT, VITO, UOWM and SZE)!!
- To compute SRA with monthly model data and compare with *observed* SRA (using the campaign sampler data)?
- Compare monthly and annual SRA? Do it also for LVEA?