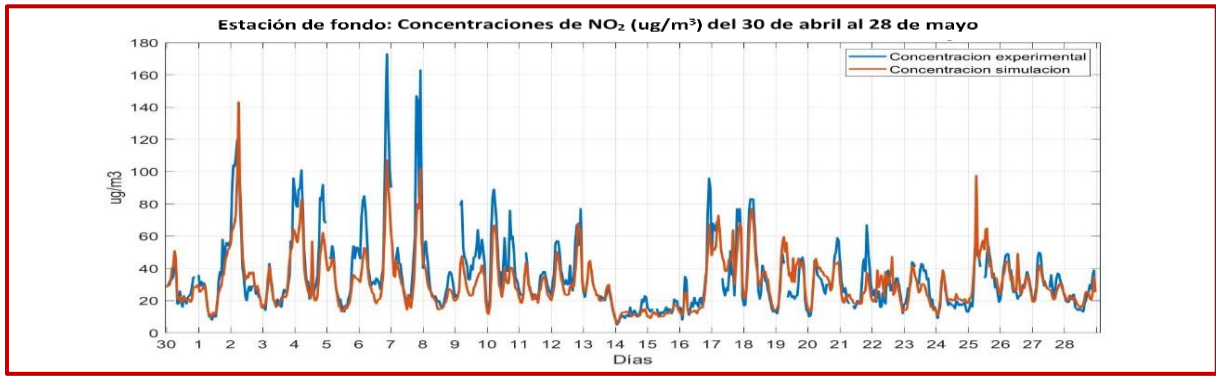
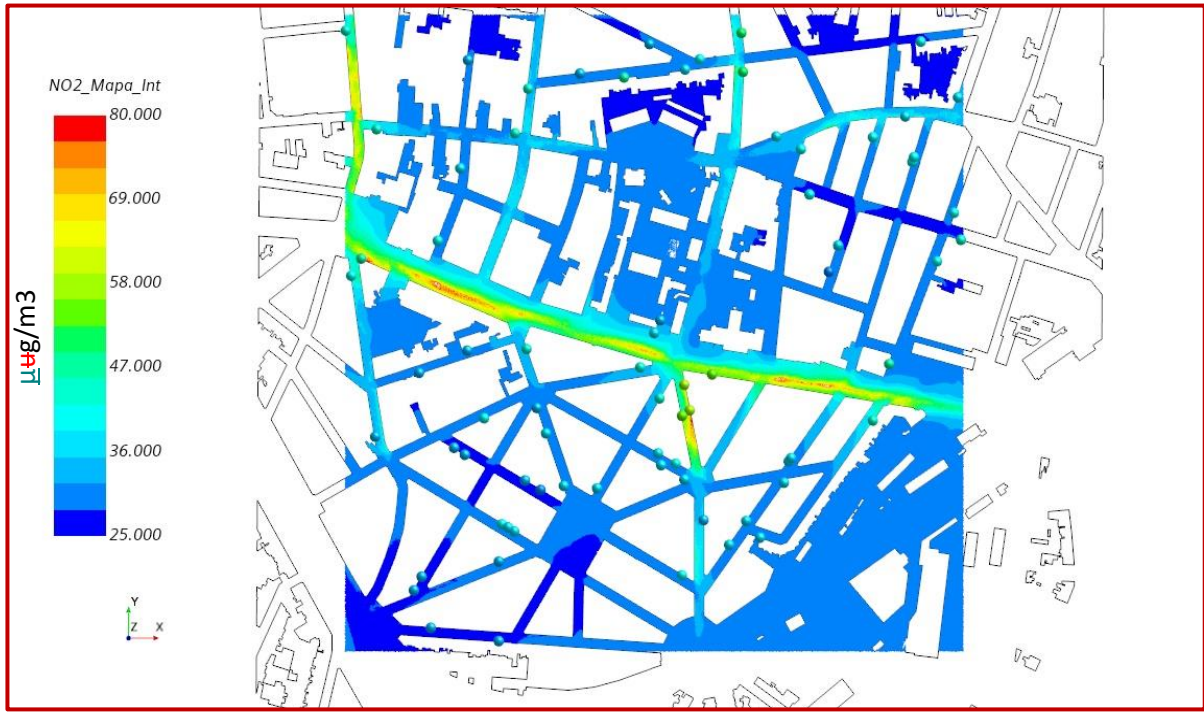
CT4 Intercomparison exercise. Step 2.2

To compute averages (concentration maps) for the complete campaign period (April 30 – May 28) applying the methodologies of each group.

1. *Comparison with passive samplers' data and AQ station data*
2. *Intercomparison among models results (2D maps).*



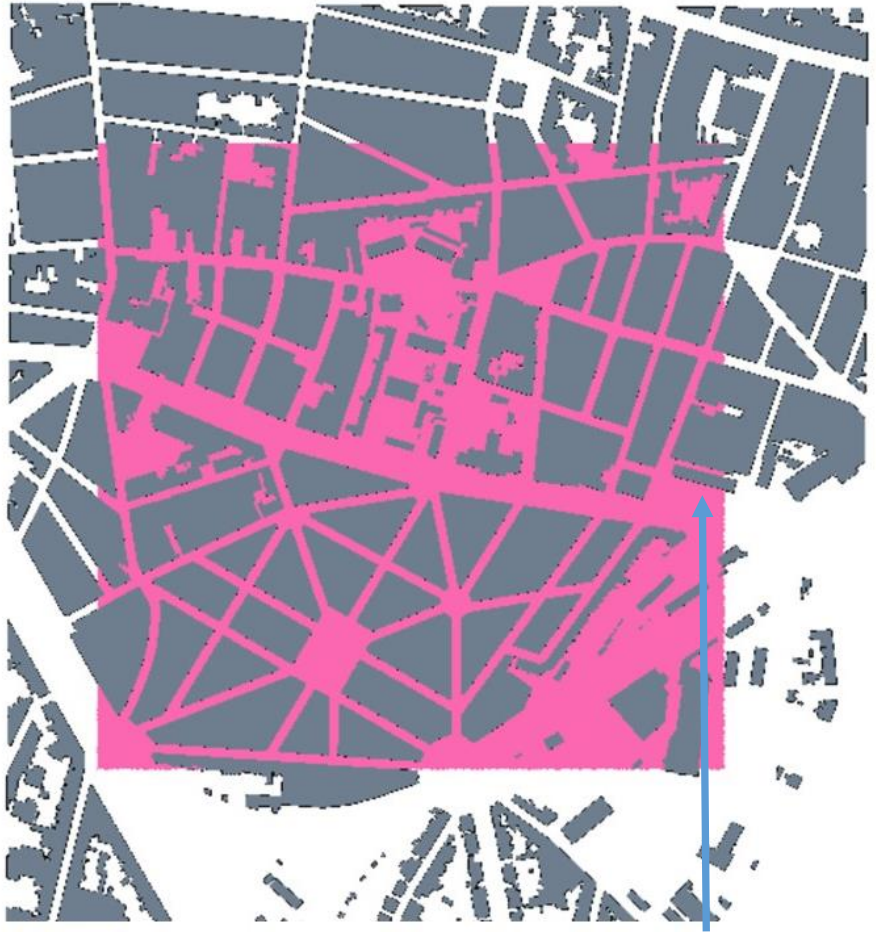


CT4 Intercomparison exercise. Step 2.2

Real buildings and Passive Samplers

Average height of buildings= 15 m approximately

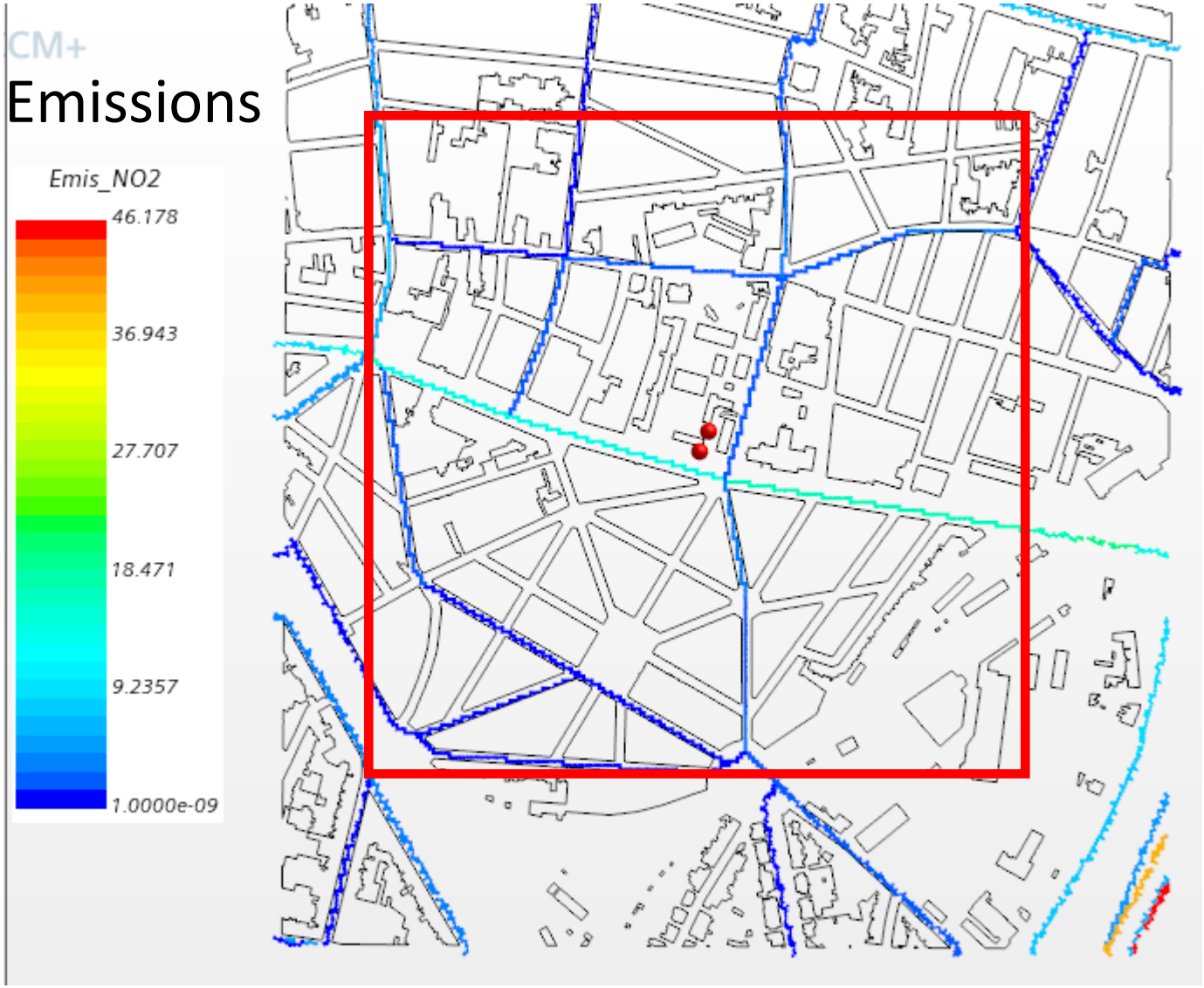
Numerical Domain

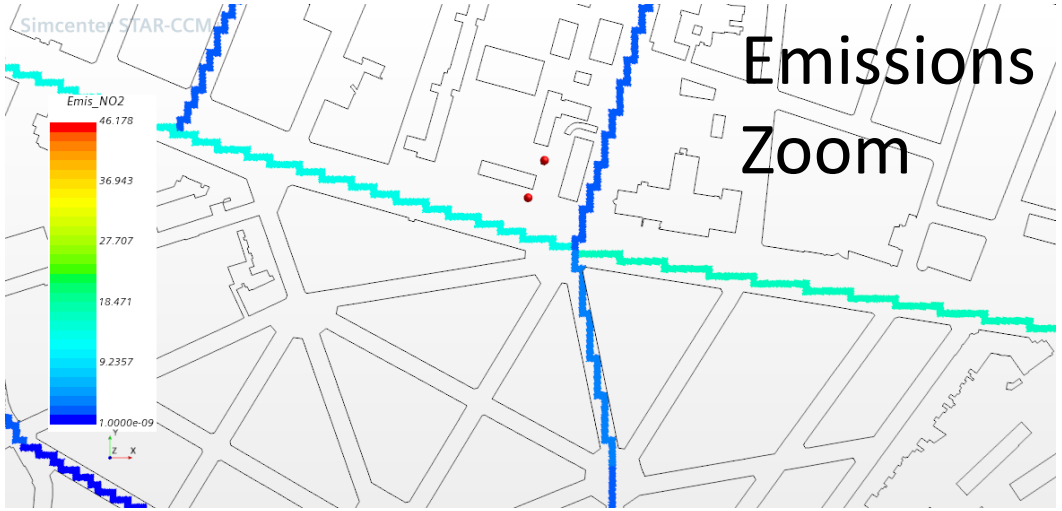


Height of the tallest building= 43 m

CT4 Intercomparison exercise. Step 2.2

Emissions



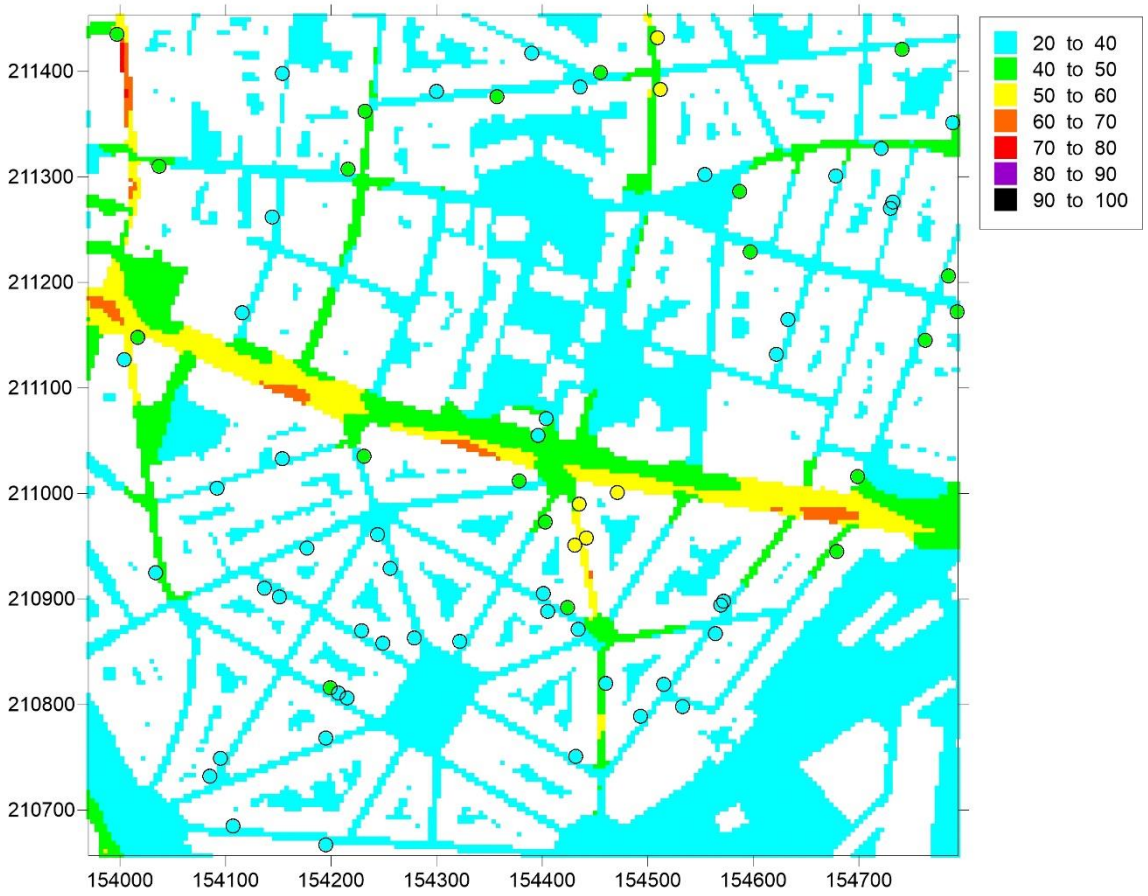


Emissions Zoom

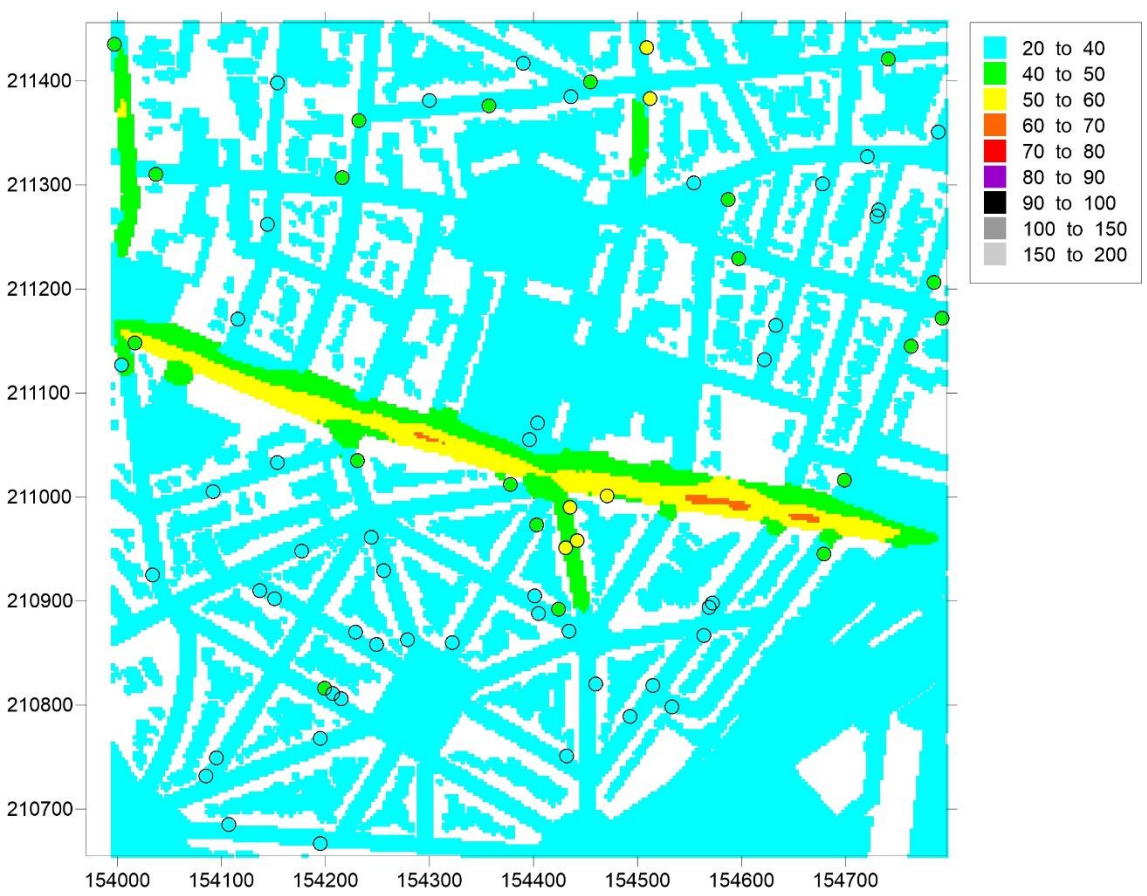
Error in distance between emissions and stations: Possible reason of underestimation of concentration at stations

Step 2.2. Concentration maps vs Samplers

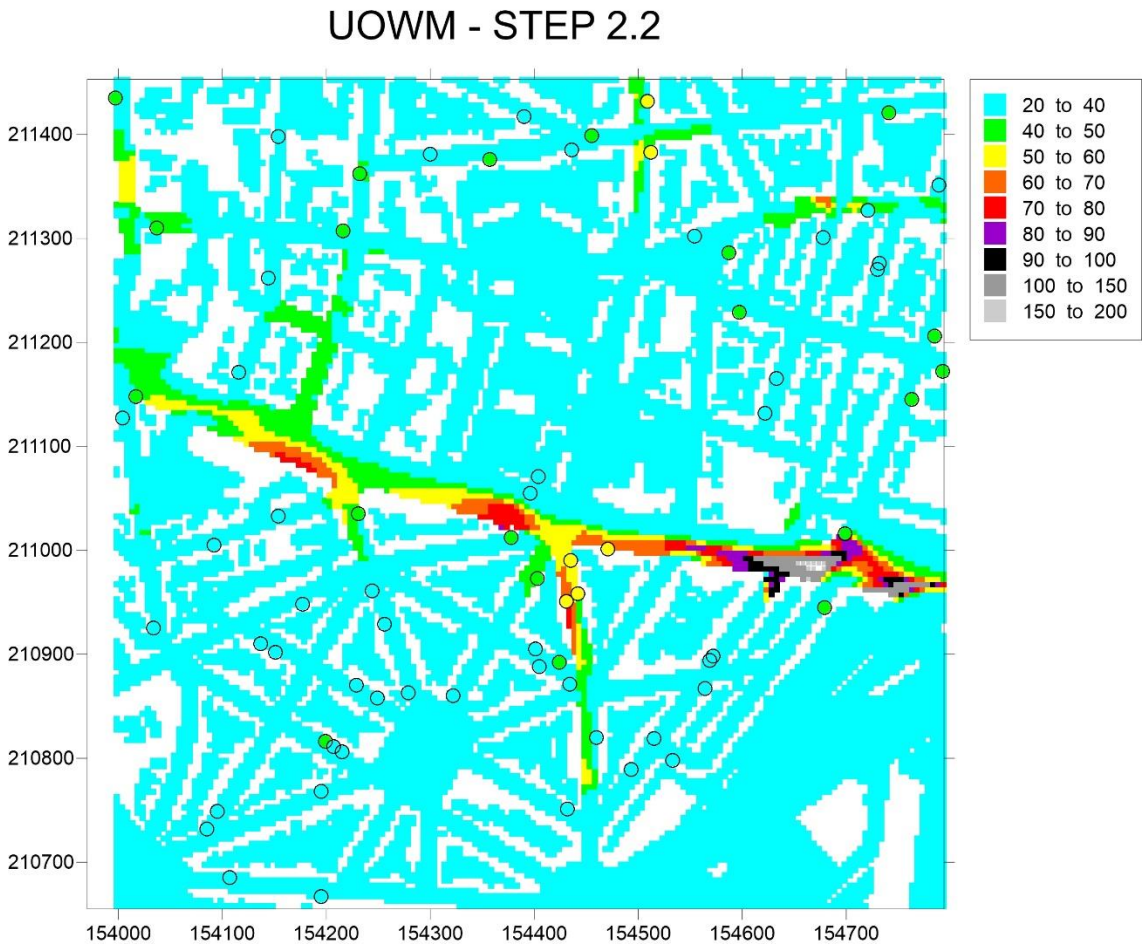
SZE - STEP 2.2

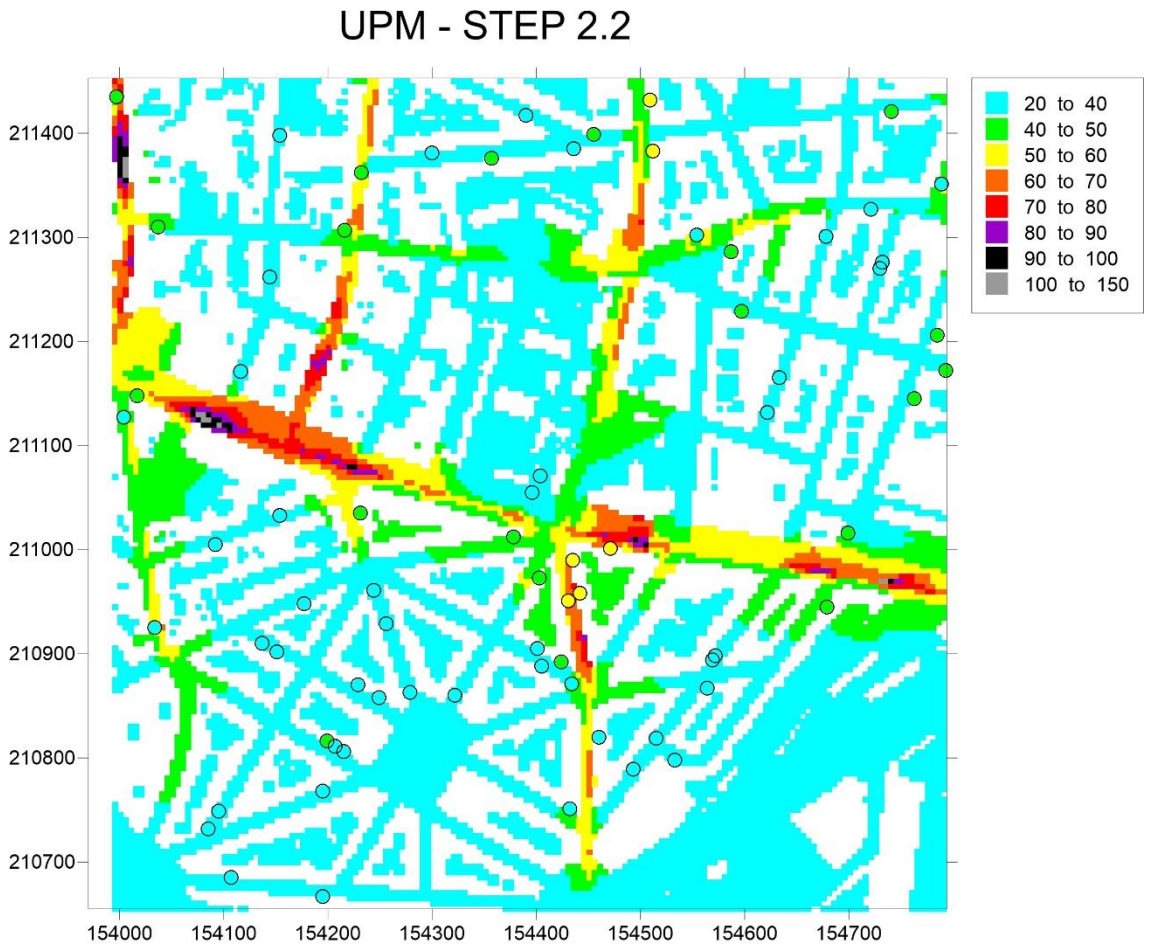


ENEA - STEP 2.2



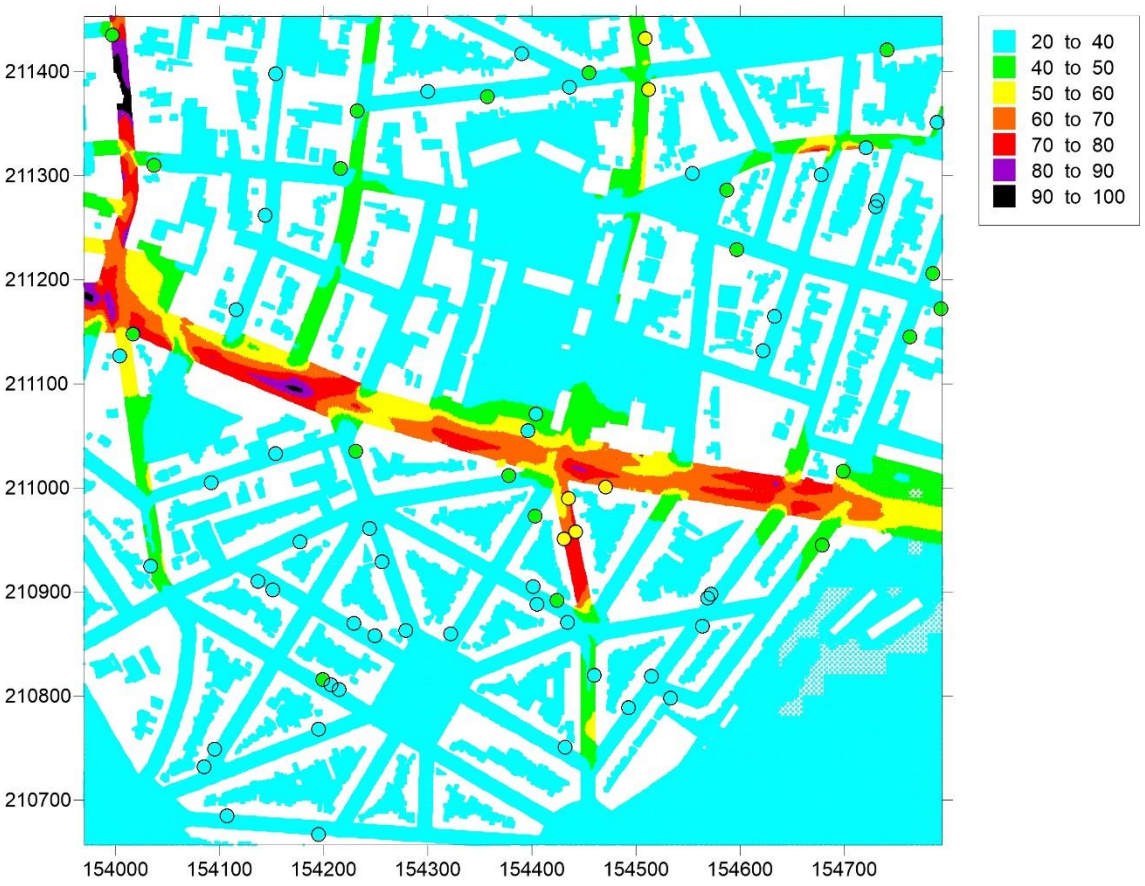
Step 2.2. Concentration maps vs Samplers



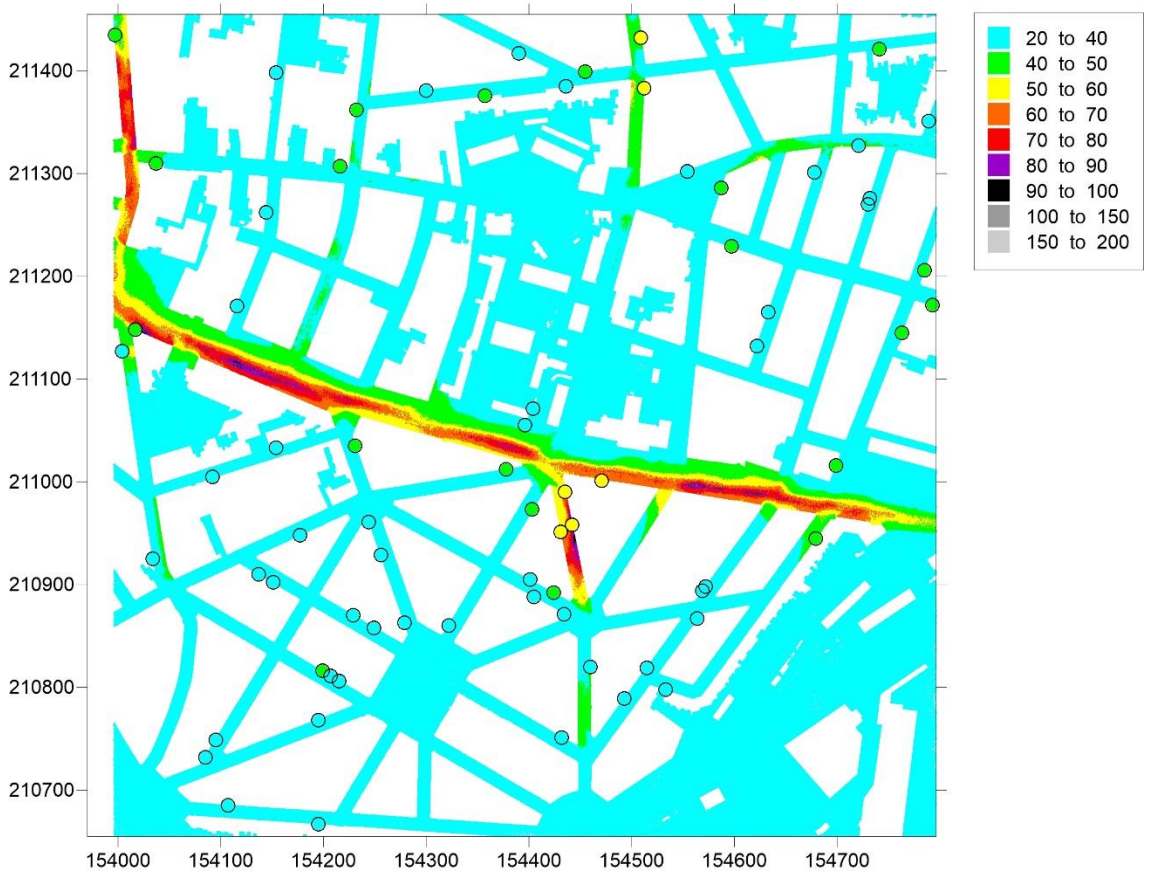


Step 2.2. Concentration maps vs Samplers

VITO-OPENFOAM - STEP 2.2

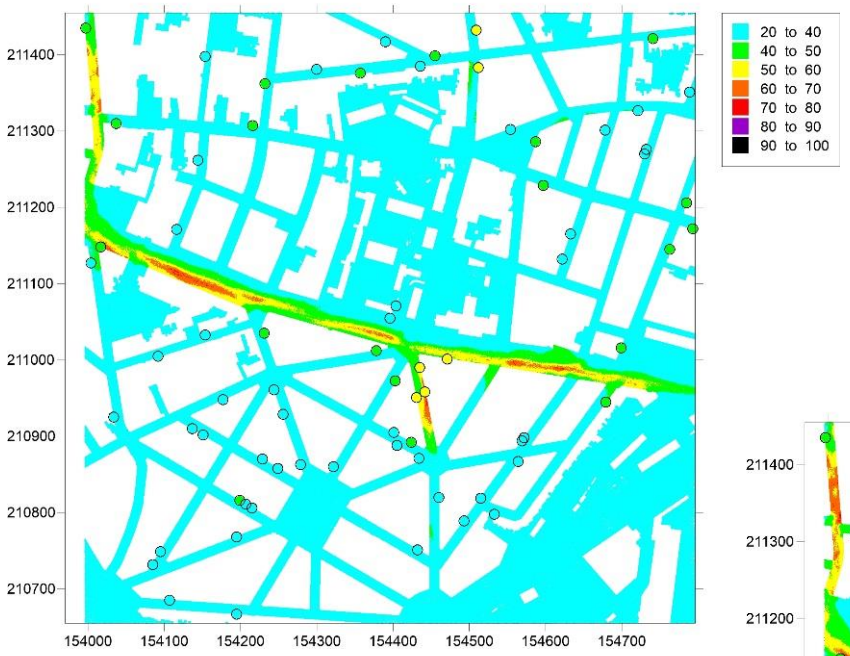


CERC-CIEMAT - STEP 2.2

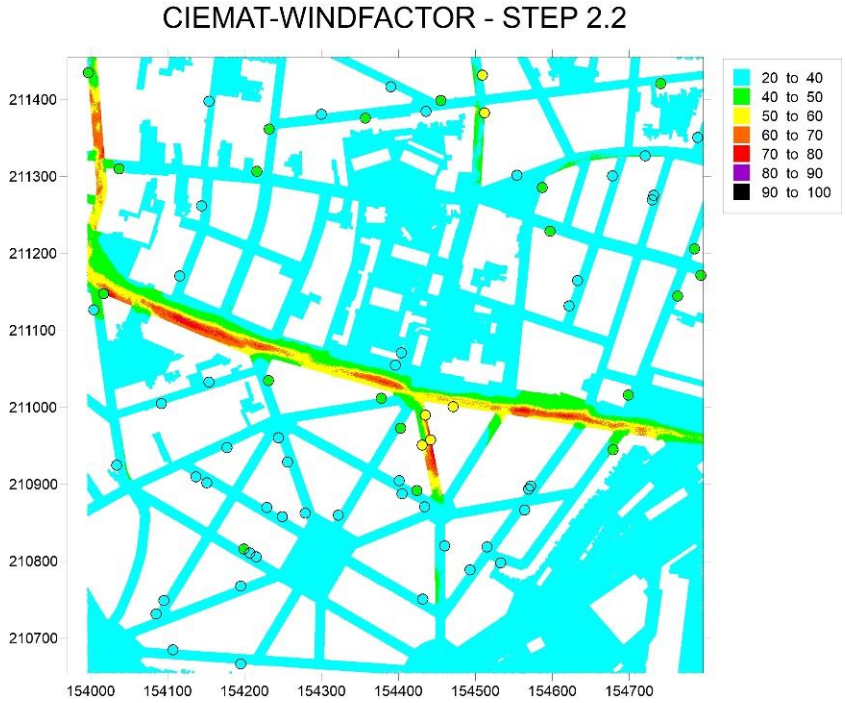


Step 2.2. Concentration maps vs Samplers

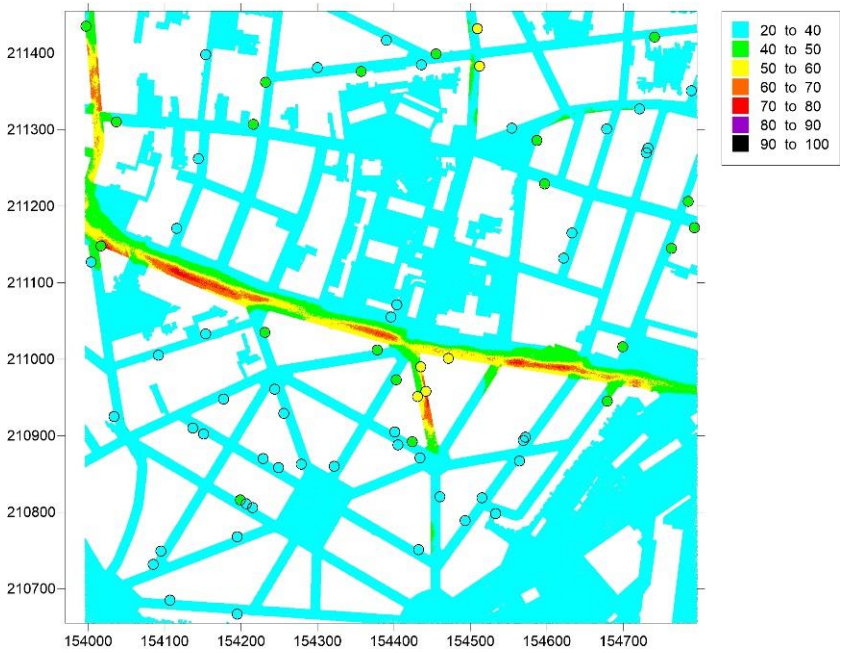
CIEMAT-SIMPLE - STEP 2.2



CIEMAT-WINDFACTOR - STEP 2.2

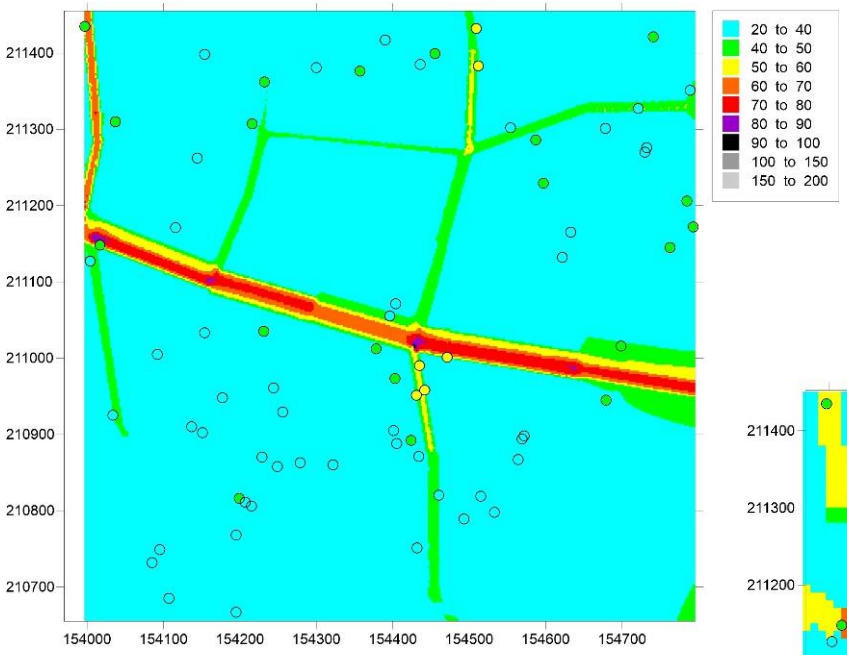


CIEMAT-DETAILED - STEP 2.2

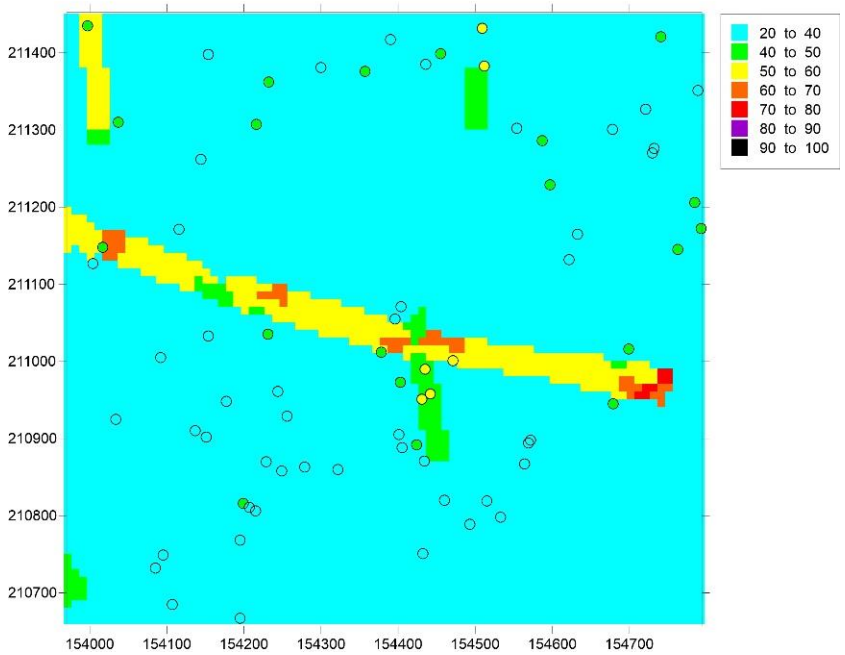


Step 2.2. Concentration maps vs Samplers

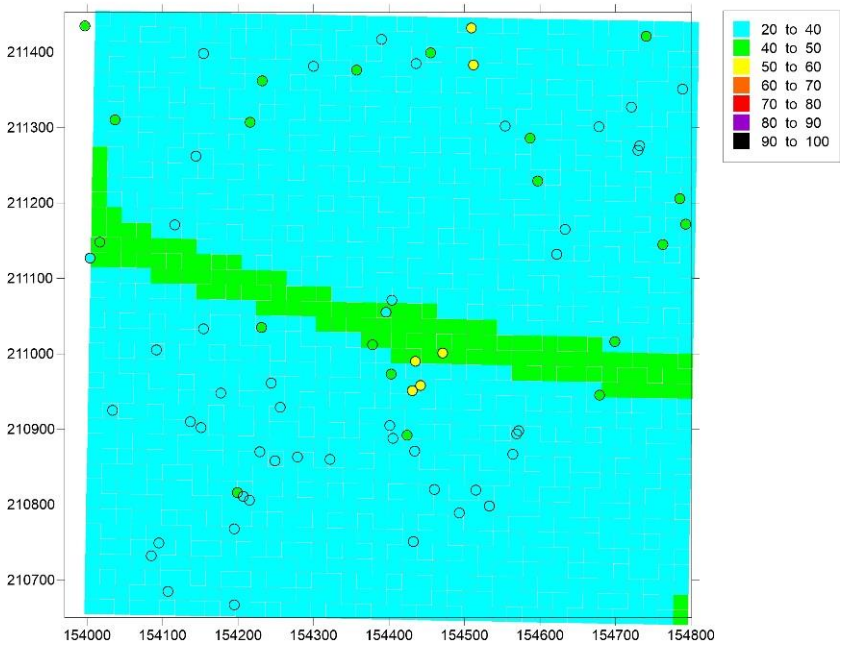
CERC-ADMS - STEP 2.2



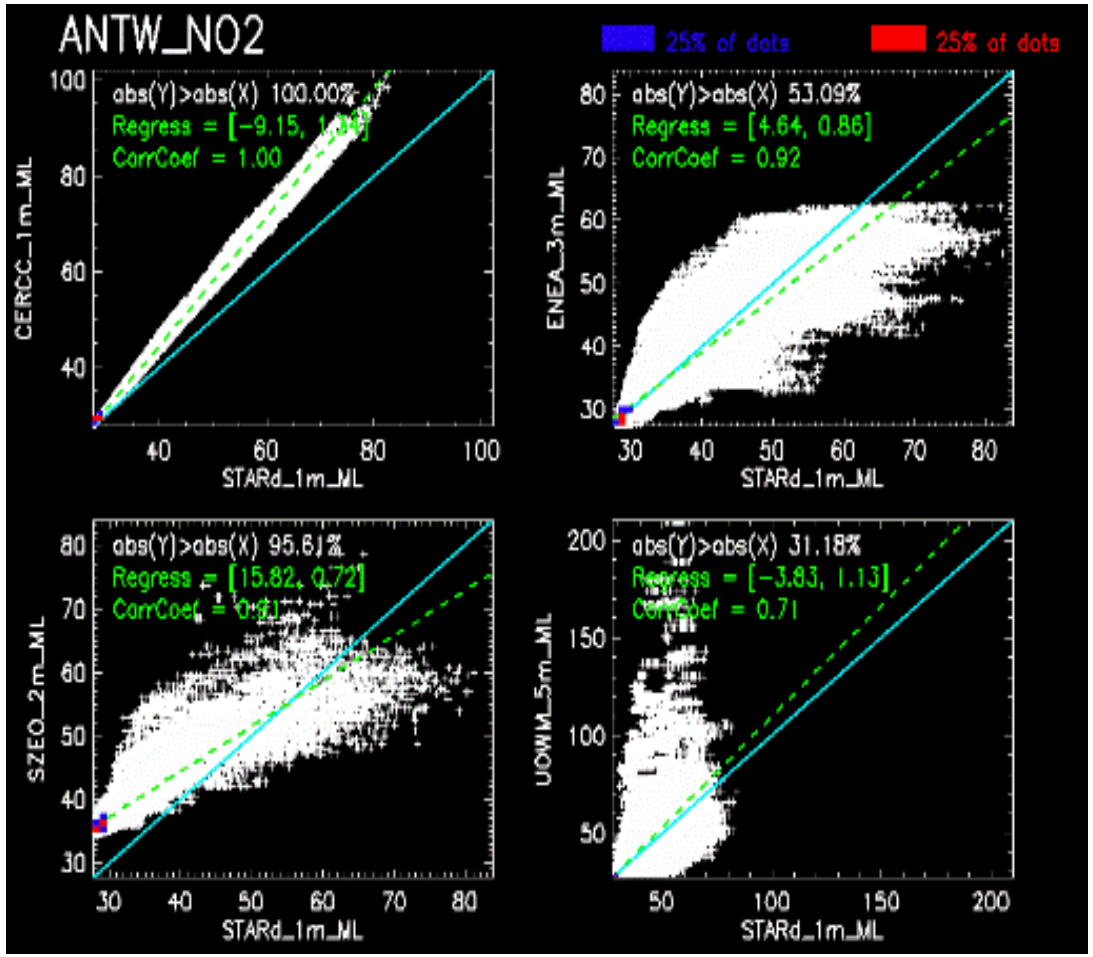
VITO-ATMOSTREET - STEP 2.2



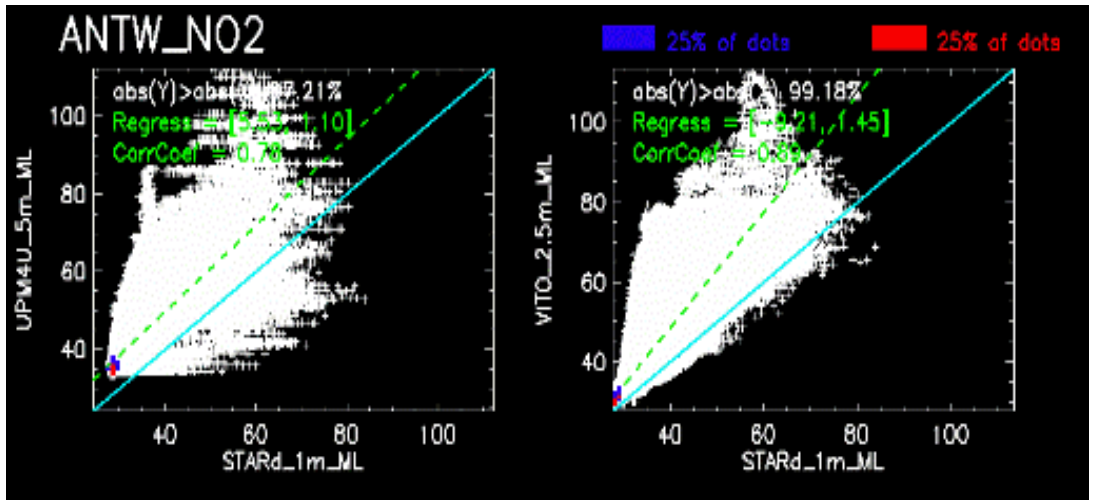
NILU - STEP 2.2



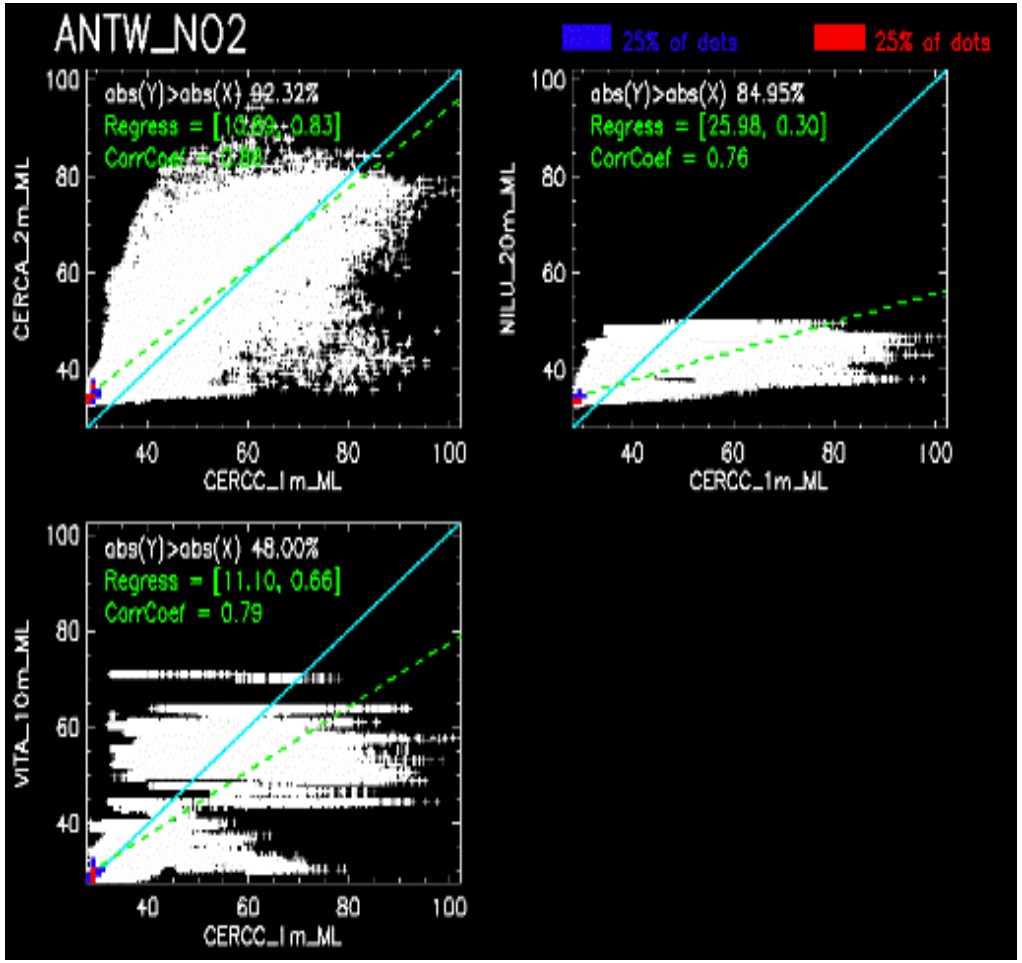
Step 2.2. Concentration maps vs Samplers



- High correlation CERC-CIEMAT, ENEA, SZE and VITO-OPENFOAM with CIEMAT-DETAILED
- Slope close to 1 for CERC-CIEMAT, ENEA, SZE and UPM



Step 2.2. Concentration maps vs Samplers



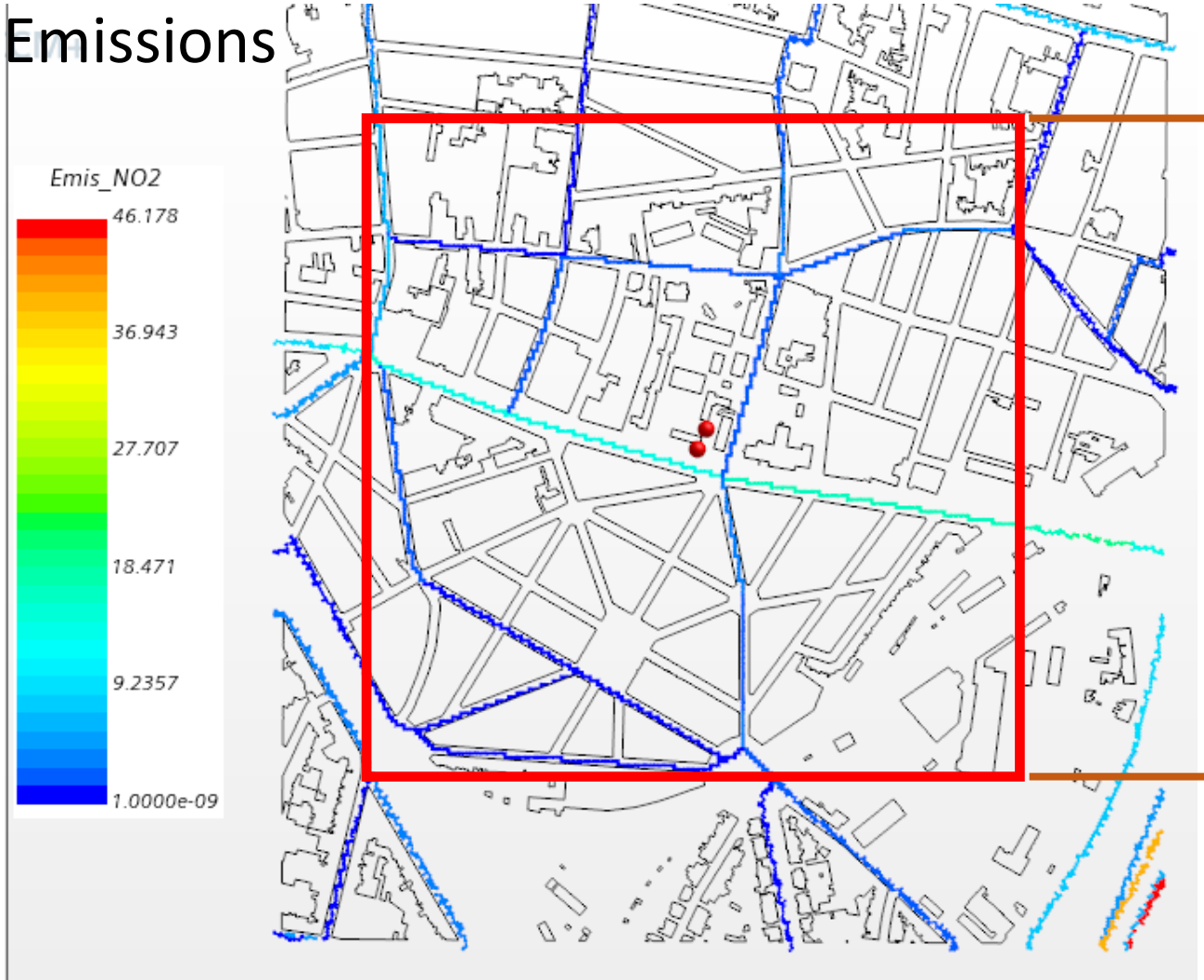
High correlation CERC-ADMS with CERC-CIEMAT with slope close to 1

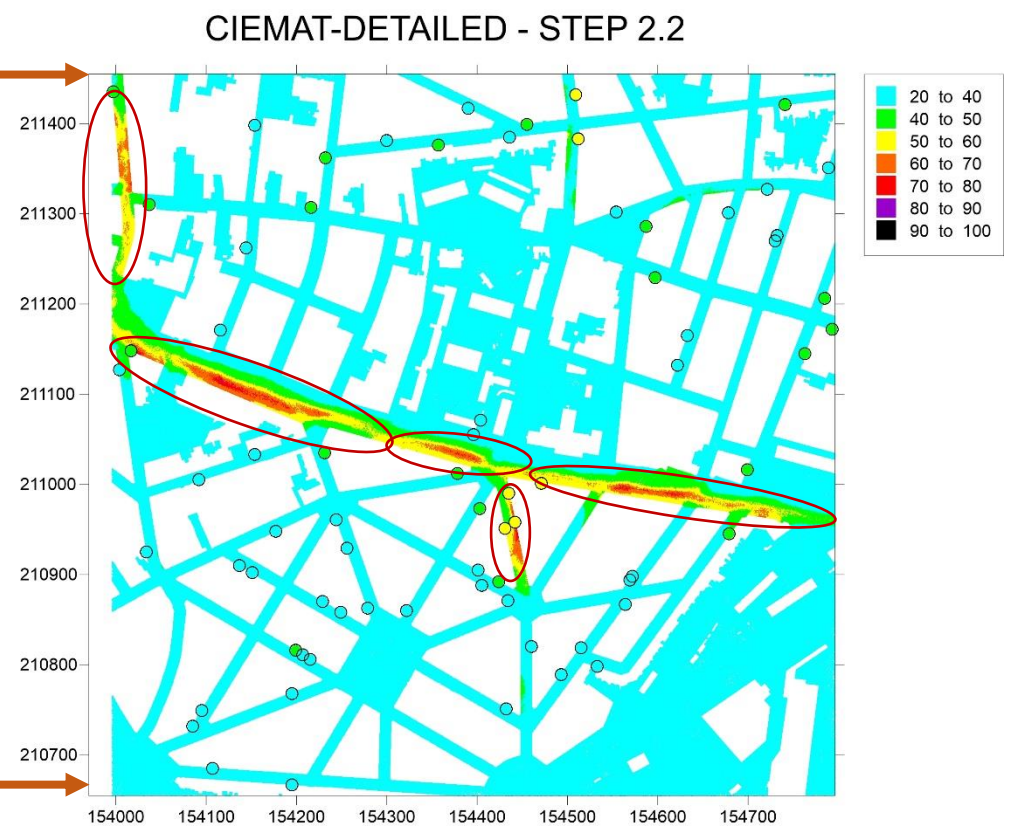
Step 2.2. Concentration maps vs Samplers

- Results seems to be quite coherent among most of the models
- Most of the models seems to fit quite well the measured concentrations at samplers' points. However, there is no measurements at very most areas where models predict high concentrations (maxima)
- There are notable differences in the magnitude of the predicted concentrations.
- More detailed maps for CFD or Lagrangian model techniques seem to simulate better the Street-Canyon effects as maximum concentrations areas are shifted to a sidewalk but emissions are also shifted.
- Parametric or Gaussian models provide simpler concentration maps (especially NILU) with weak gradients and/or maximum concentrations areas centered in the street axis.
- VITO-ATMOSTREET and CERC-ADMS predict maxima at the street crossings, while CFD models many times have no maxima due to the higher ventilation at them.

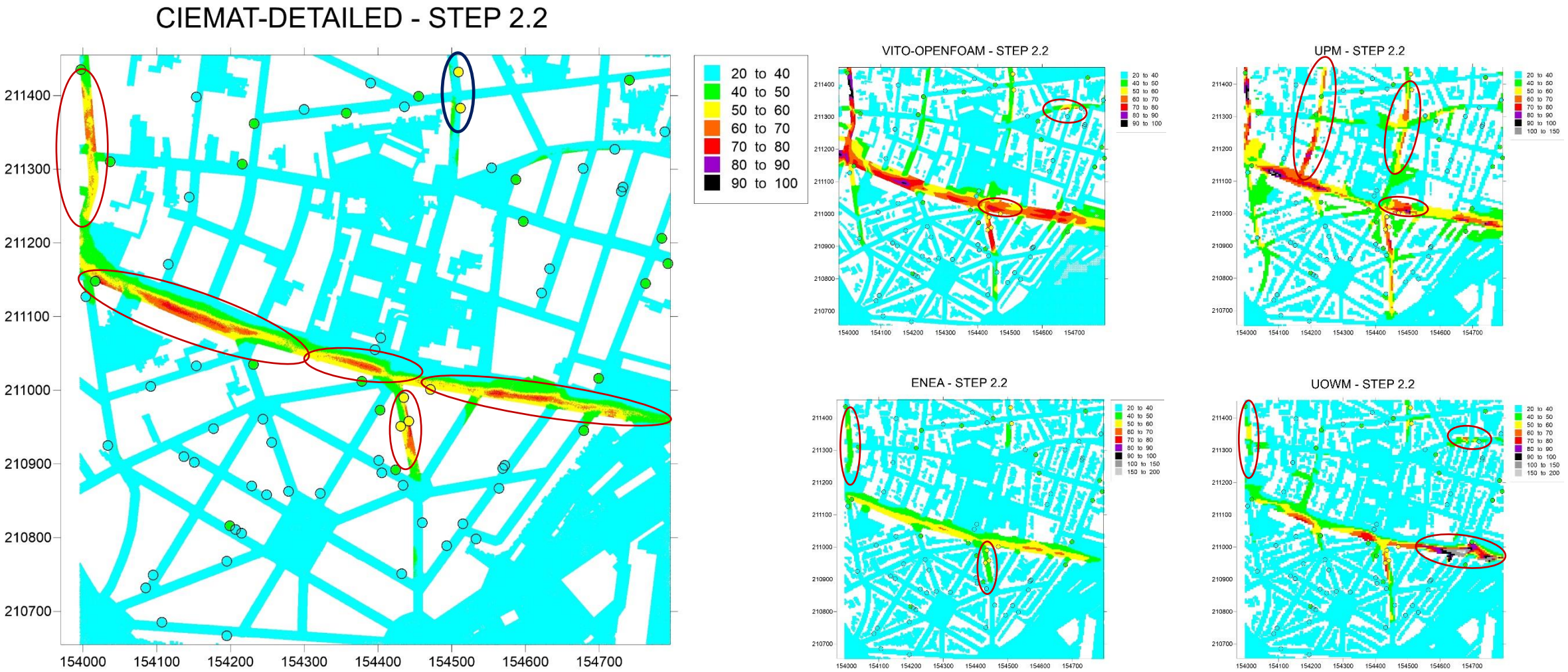
Step 2.2. Maximum monthly concentration areas

Emissions

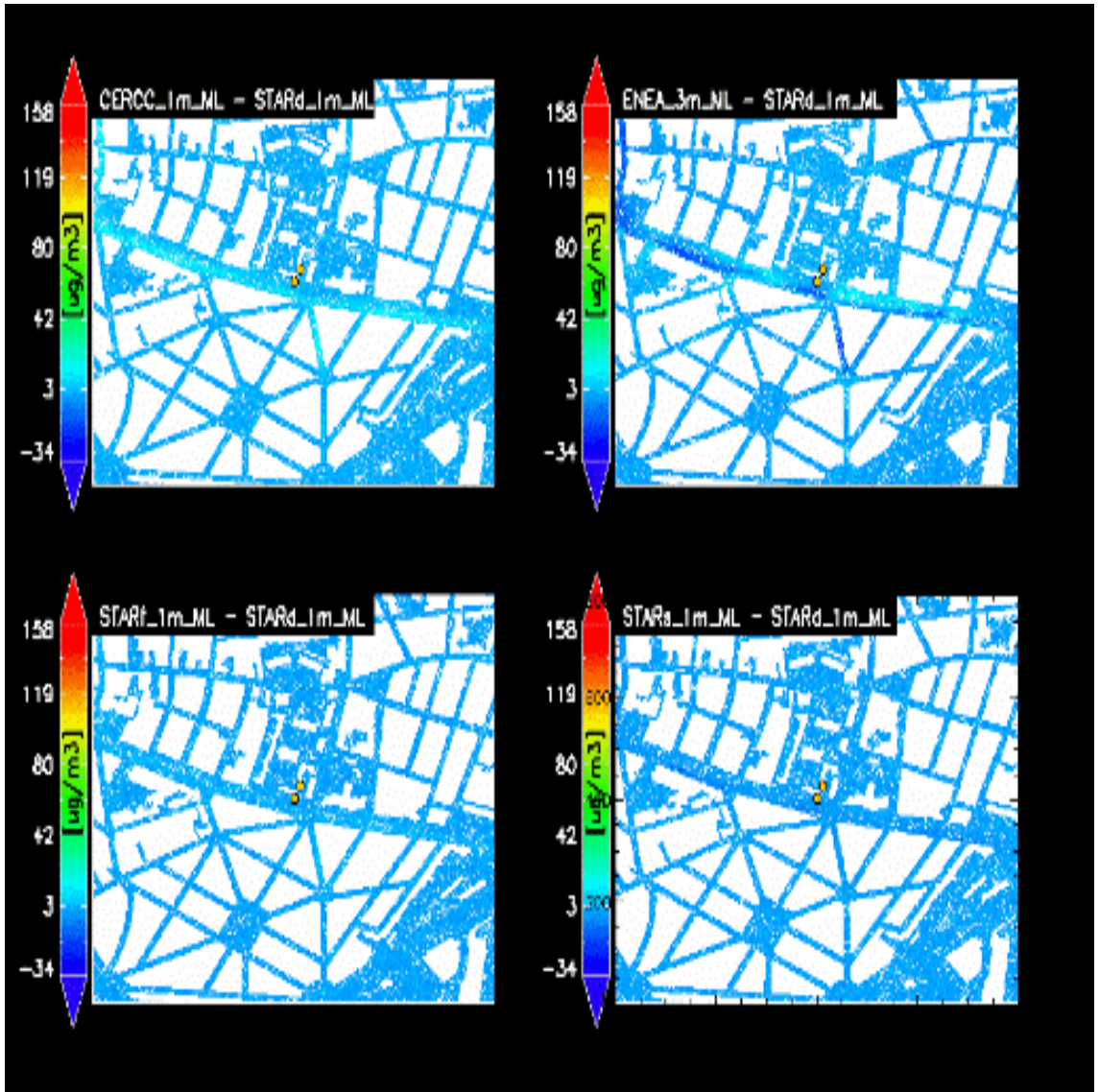


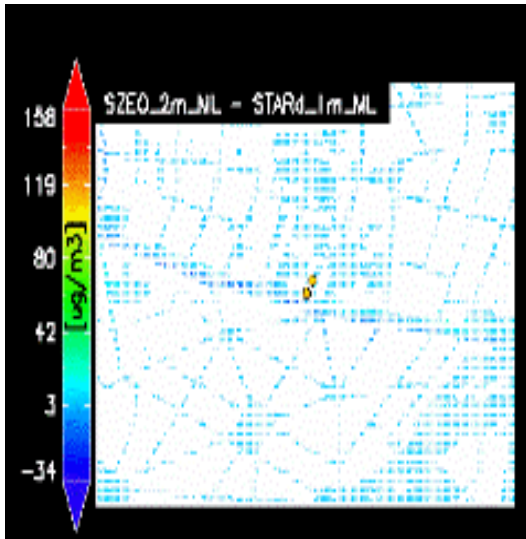


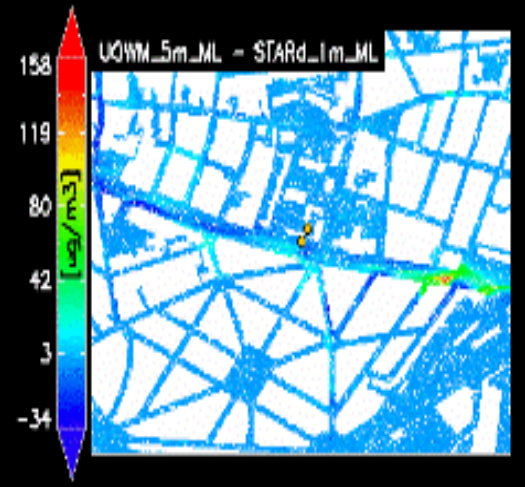
Step 2.2. Maximum monthly concentration areas

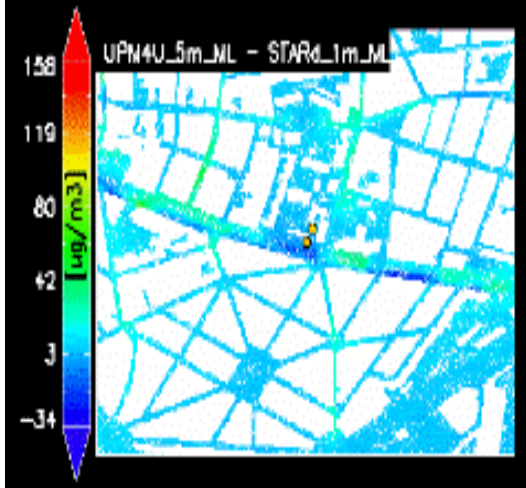


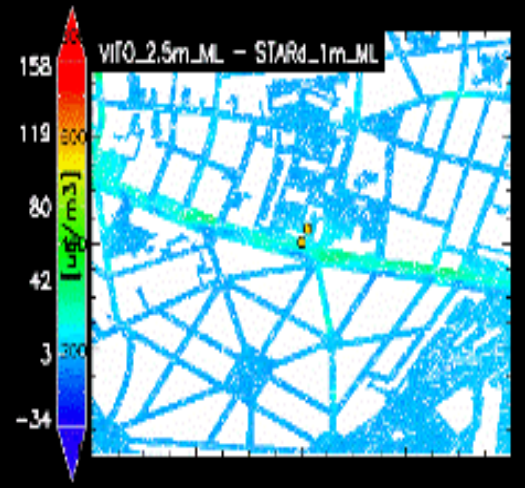
Step 2.2. Differences of monthly concentration. CFD – CIEMAT-DETAILED



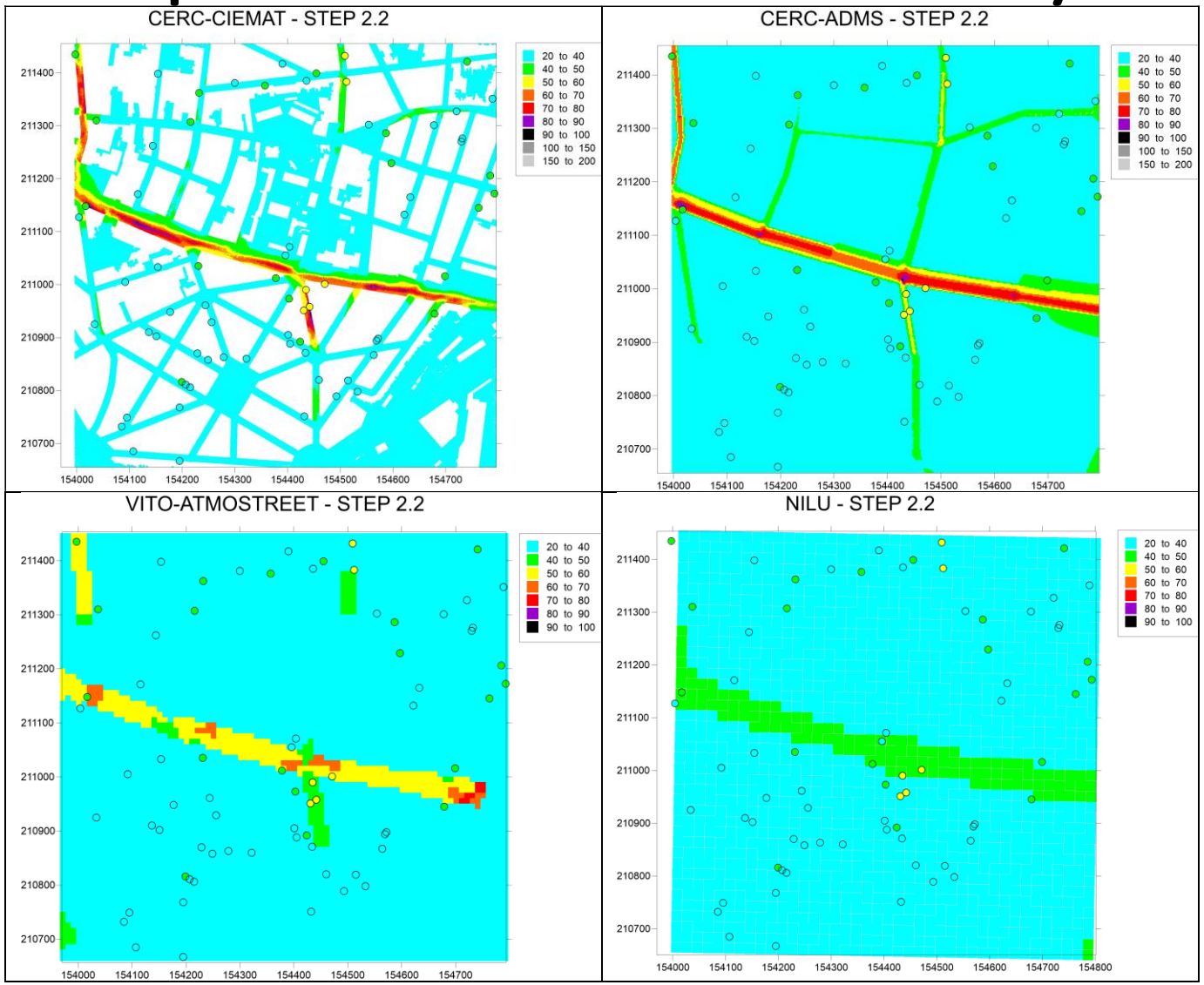






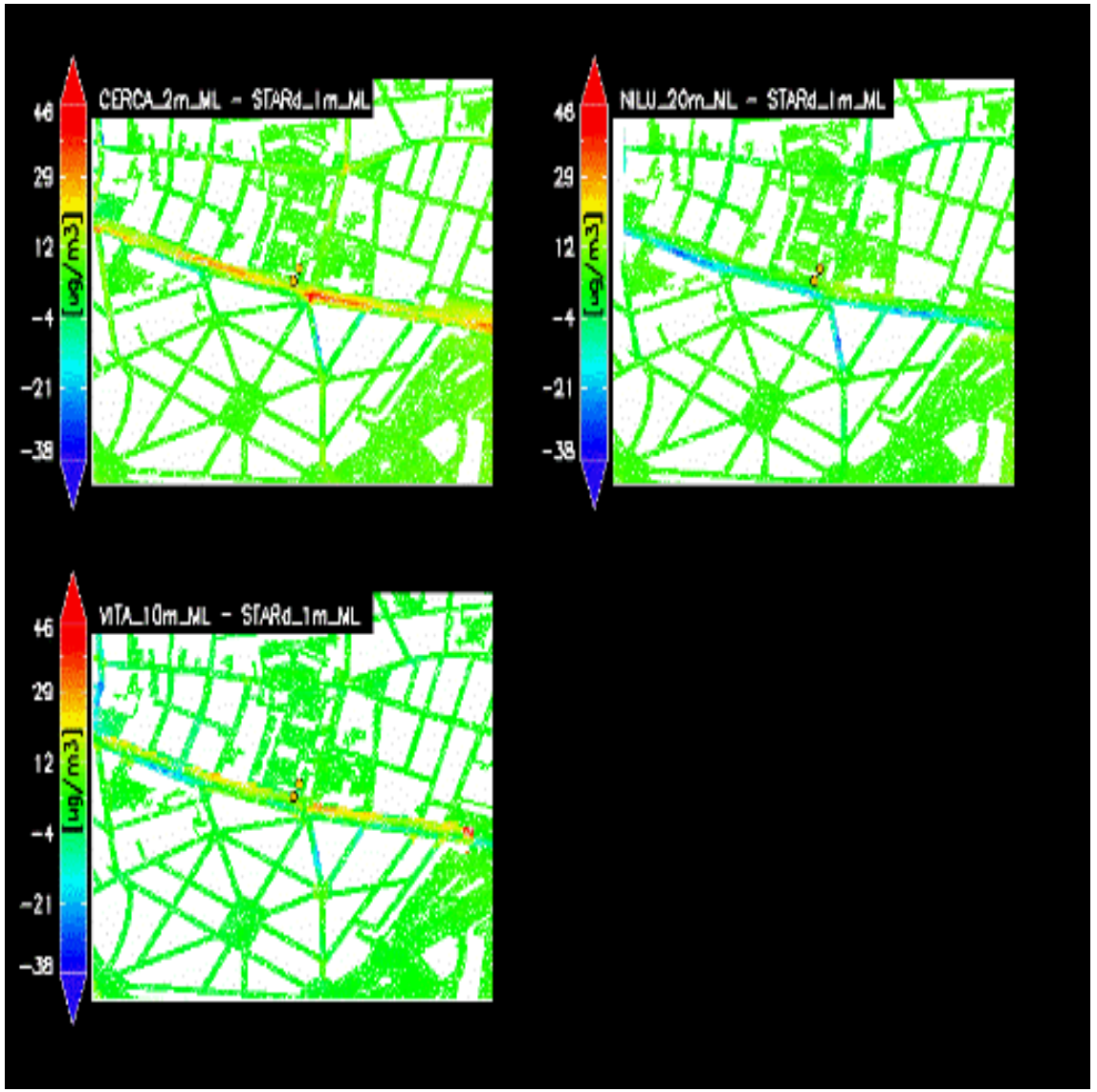


Step 2.2. Maximum monthly concentration areas



- VITO-Atmostreet and specially CERC-ADMS predict maxima of similar magnitude to the CFD models but at different sites.
- NILU predicts a quite smoothed concentration map

Step 2.2. Differences of monthly concentration. NoCFD – CIEMAT DETAILED



Step 2.2. Concentration maps vs Samplers

- There are also significant differences in the magnitude of the maxima in the CFD results. The higher ones are UOWM, UPM and VITO-OPENFOAM, whereas ENEA and SZE predicts lower magnitude for the maxima (CIEMAT predictions are in the middle, with higher values for CIEMAT-WINDFACTOR). It could be due to:
  - some particular features or parameter configuration of the CFD models?
  - the way how the emission data were processed to input the models?
  - the numerical methodology for post-processing the monthly average concentrations?
- Most of the areas with maxima concentration are common to the CFD models, but there are some areas, which appear in some models but not in others. It could be due to:
  - how the emission data were processed to input the models?
  - the numerical methodology for post-processing the monthly average concentrations?
- Gaussian models (except CERC-ADMS) predict lower maxima than CFD models