# Application of HYSPLIT to simulate urban pollution plume generated by the megacity of St.Petersburg (Russia)

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HYSPLIT grid domain centered at St.Petersburg
(2nd largest megacity of Russia, 5 million population)
grid span 6.8º latitude × 14.1º longitude
grid spacing 0.05º latitude × 0.05º longitude
vertical grid of 10 levels, from 0 to 1500 meters altitude
input meteorology NCEP GFS 1º latitude × 1º longitude
NO_x emissions: generalised municipal inventory
CO_2 emissions: ODIAC dataset
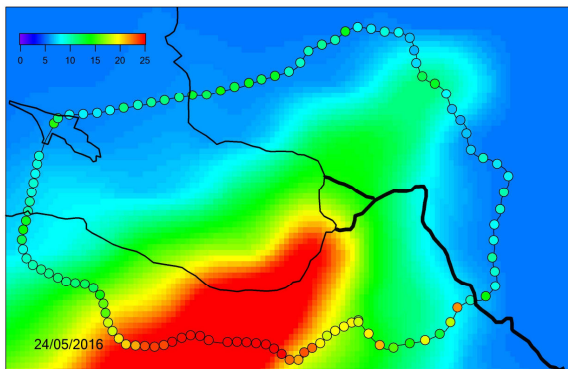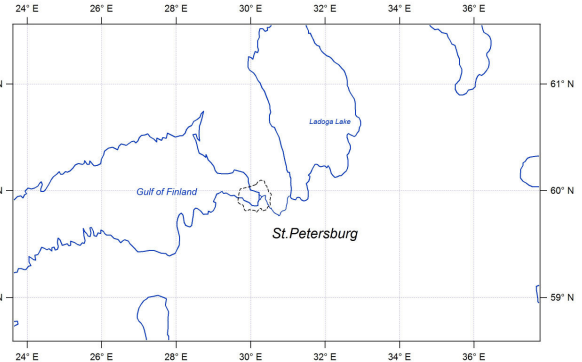
simulated column-averaged NO_2 plume (0-1500 m)
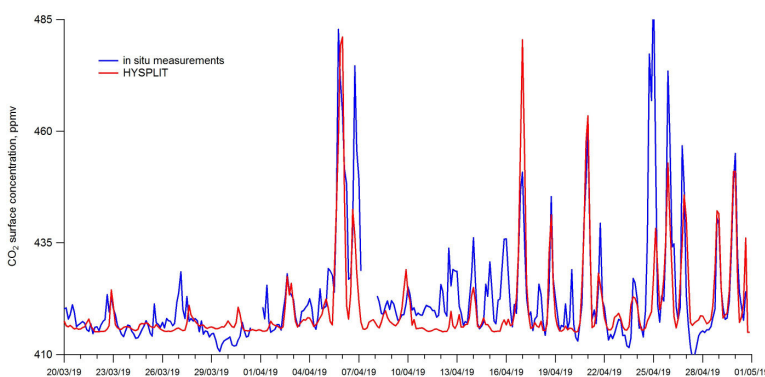compared to mobile DOAS measurements of tropo NO_2

HYSPLIT run reproduce observed structure of plume
and hepls to invert total NO_x emission from the data
of circular DOAS observations round the megacity

units of 10^{15} molecules/cm^2

tropospheric NO_2 on the same day as seen by OMI onboard EOS AURA satellite (left panel)
compared to HYSPLIT run convolved to OMI spatial resolution 13 km × 24 km (right panel):
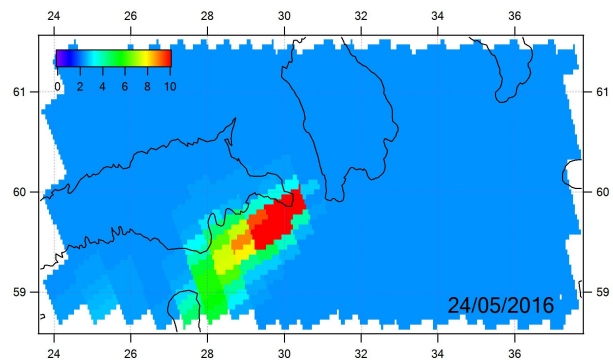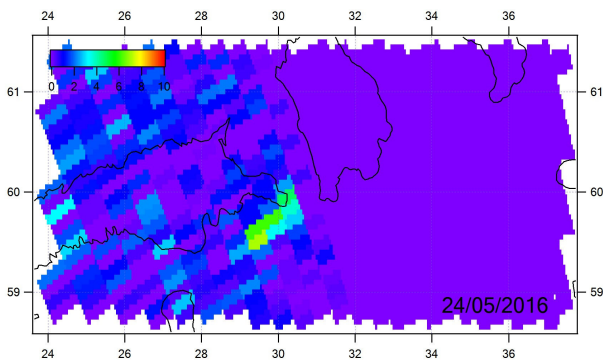
=> HYSPLIT reproduce large-scale plume structure as seen from space

simulated surface CO_2 compared to in situ data

key papers:

Ionov D.V. and Poberovskii A.V.: Observations of urban NO_x plume dispersion using the mobile and satellite DOAS measurements around the megacity of St. Petersburg (Russia), Int. J. Remote Sensing, 40, 719-733, https://doi.org/10.1080/01431161.2018.1519274), 2019.

Makarova M.V., Alberti C., Ionov D.V., et al.: Emission Monitoring Mobile Experiment (EMME): an overview and first results of the St. Petersburg megacity campaign-2019, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2020-87, in review, 2020.