Tailoring Atmospheric Data from the Sentinel-4/5(p) Constellation in Support of Belgian Air Quality Policies

Tijl Verhoelst[1], Steven Compernolle[1], Jean-Christopher Lambert[1], Frans Fierens[2], Charlotte Vanpoucke[2]

(1) BIRA-IASB, Belgium (2) IRCEL-CELINE, Belgium

belspo

LEGO-BEL-AQ

- BELSPO BRAIN-be 2.0 project, 12/2019 – 3/2024
- BIRA-IASB and IRCEL-CELINE partnership
- Focus: NO_2 over Belgium

I. Spatio-temporal mapping and downscaling toolbox for satellite data sets

  Aggregation, interpolation, uncertainty propagation

II. Application to Sentinel-5p TROPOMI NO_2 data over Belgium and comparison to in-situ network data

  City-level maps and time series; comparison to in-situ and RIO-modelled surface concentrations
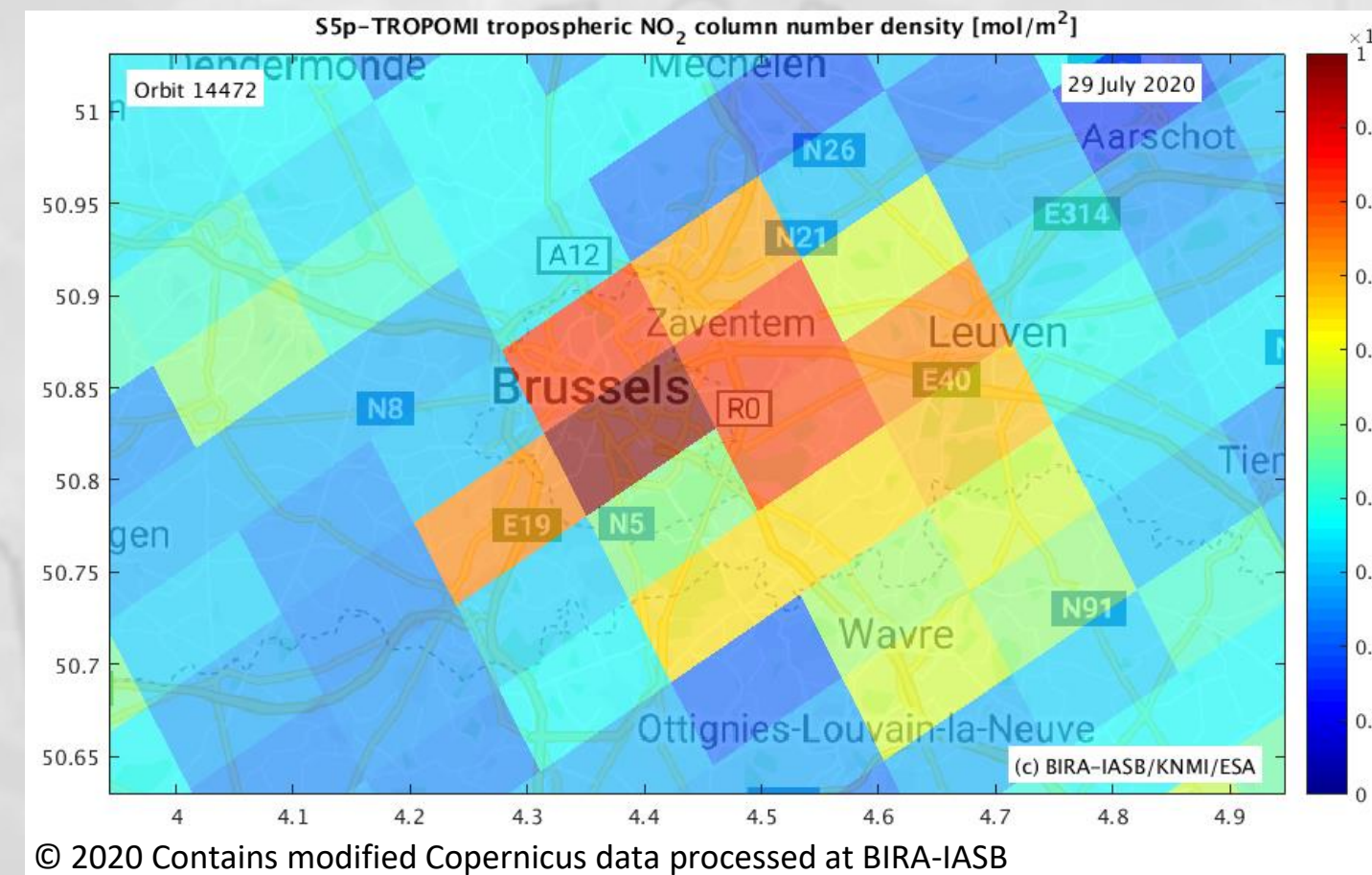
III. Developments for the specific viewing geometry of the geostationary sounders:

  3D LEO and GEO observation operators to assess spatial smearing and potential obscuration effects along the measured optical path + impact on perceived diurnal cycle
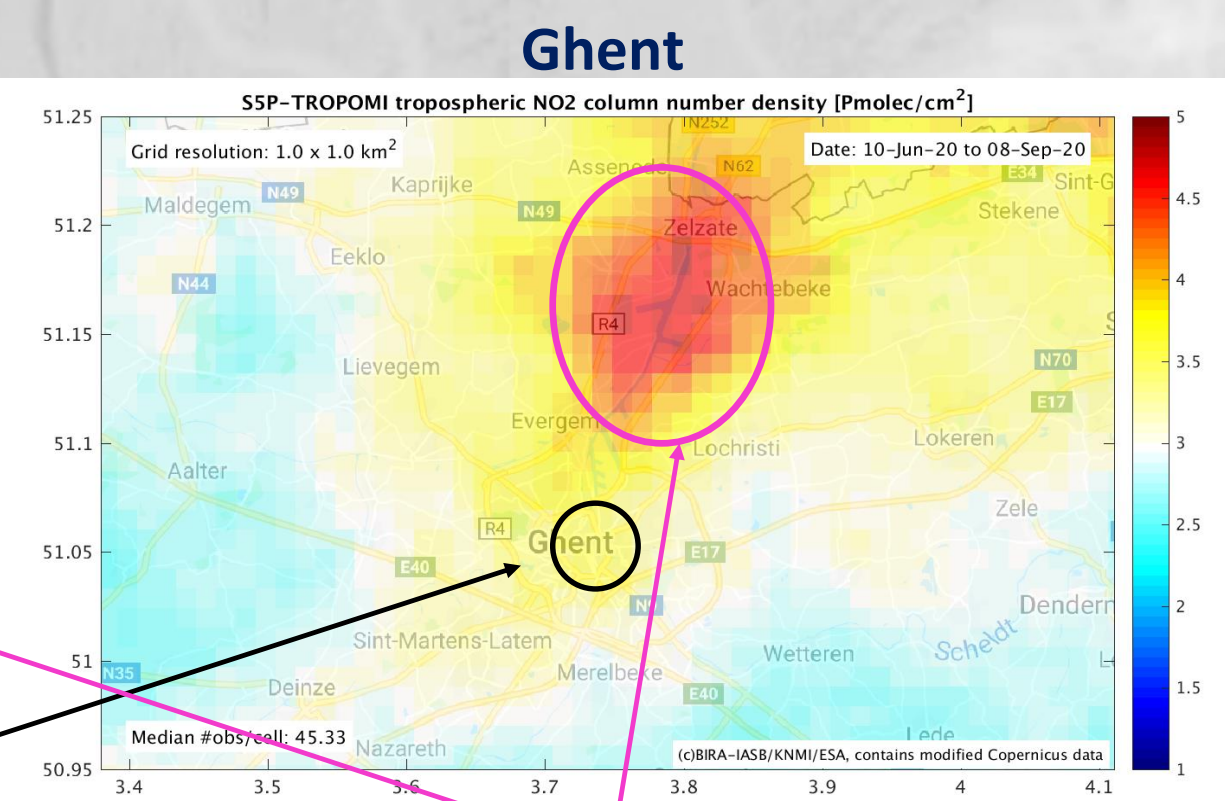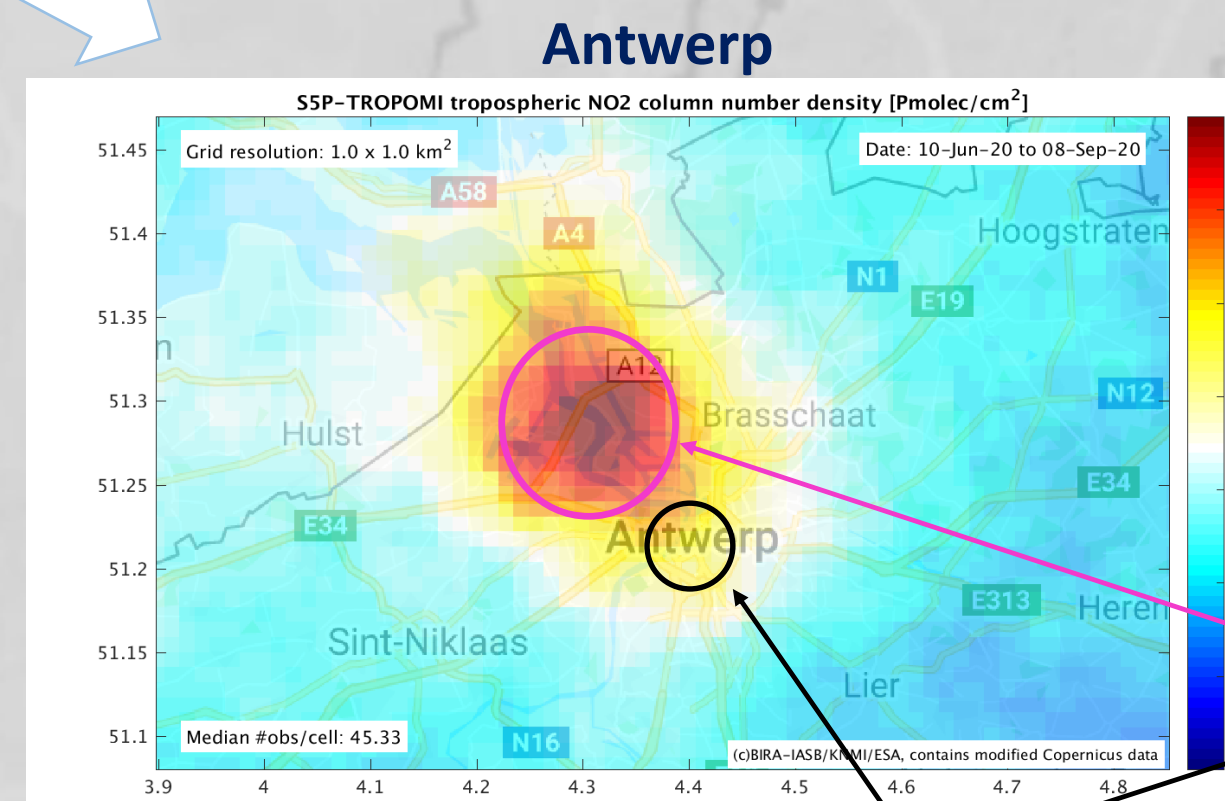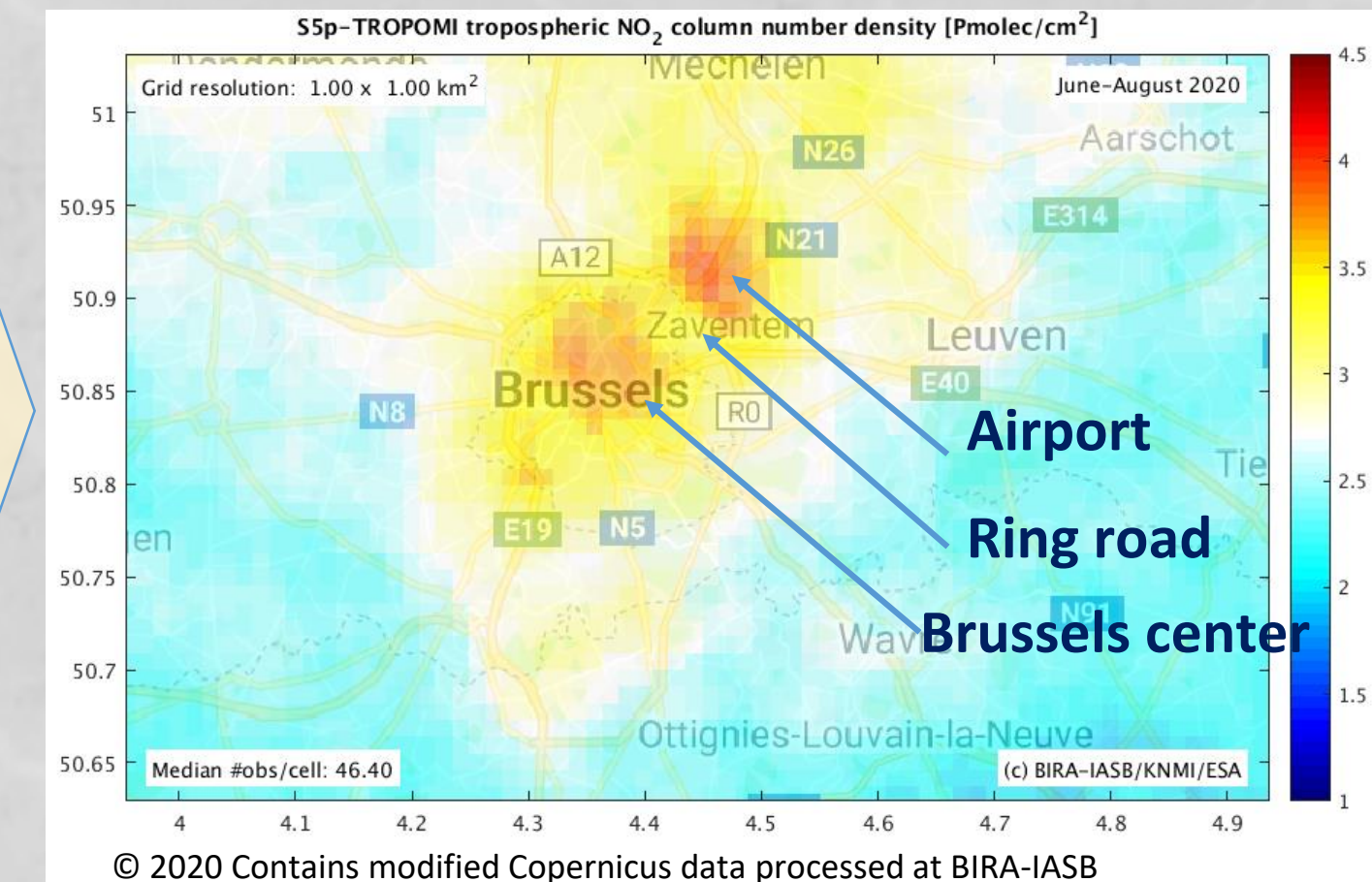
IV. Outreach and valorisation

  Liaison with identified stakeholders, both in AQ policy and in the data retrieval communities

Gain from downscaling (native S5P pixel size to 1x1km^2)

S5p-TROPOMI tropospheric NO_2 column number density [mol/m^2]
Orbit 14472   29 July 2020
(c) BIRA-IASB/KNMI/ESA
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- **Temporal aggregation** (from days to months, here: 3 months)
- **Filtering** (on quality, SZA, and winds)
- **Spatial oversampling** with area-overlap weighing
- **Uncertainty propagation**
- **Gap filling (clouds)** with Kriging

Summer 2020

S5p-TROPOMI tropospheric NO_2 column number density [Pmolec/cm^2]
Grid resolution: 1.00 x 1.00 km^2 June-August 2020
Median #obs/cell: 46.40
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Airport
Ring road
Brussels center

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Antwerp

S5P-TROPOMI tropospheric NO2 column number density [Pmolec/cm^2]
Grid resolution: 1.0 x 1.0 km^2 Date: 10-Jun-20 to 08-Sep-20
Median #obs/cell: 45.33
(c)BIRA-IASB/KNMI/ESA, contains modified Copernicus data

Ghent

S5P-TROPOMI tropospheric NO2 column number density [Pmolec/cm^2]
Grid resolution: 1.0 x 1.0 km^2 Date: 10-Jun-20 to 08-Sep-20
Median #obs/cell: 45.33
(c)BIRA-IASB/KNMI/ESA, contains modified Copernicus data

Both are cities with "Low emission zones" in their centres but harbours to their North.

Ongoing work:

- Compilation of catalogue for various aggregation criteria
- Operational production
- Comparison to in-situ measurements and regional models
- GEO developments (preparation for Sentinel-4)
- Stakeholder consultation