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FMI space-based air quality and climate studies

Iolanda Ialongo
Atmospheric Remote Sensing group

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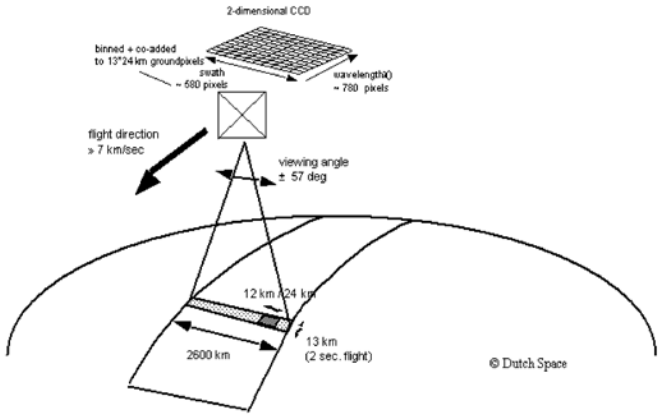
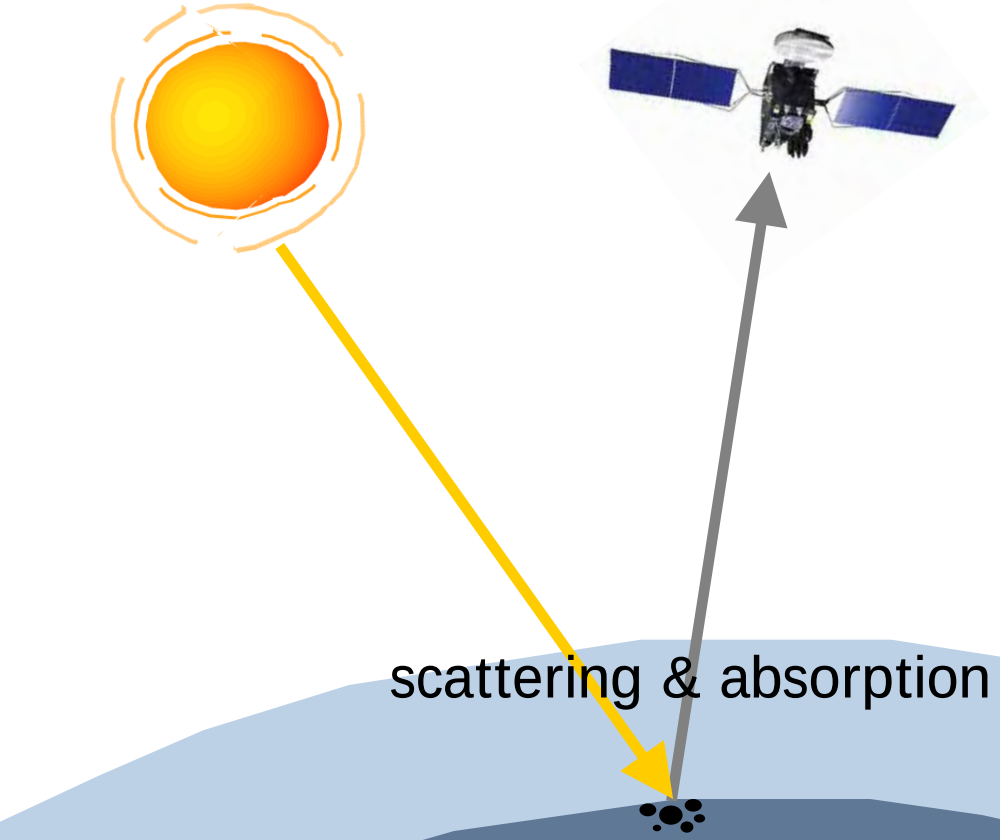
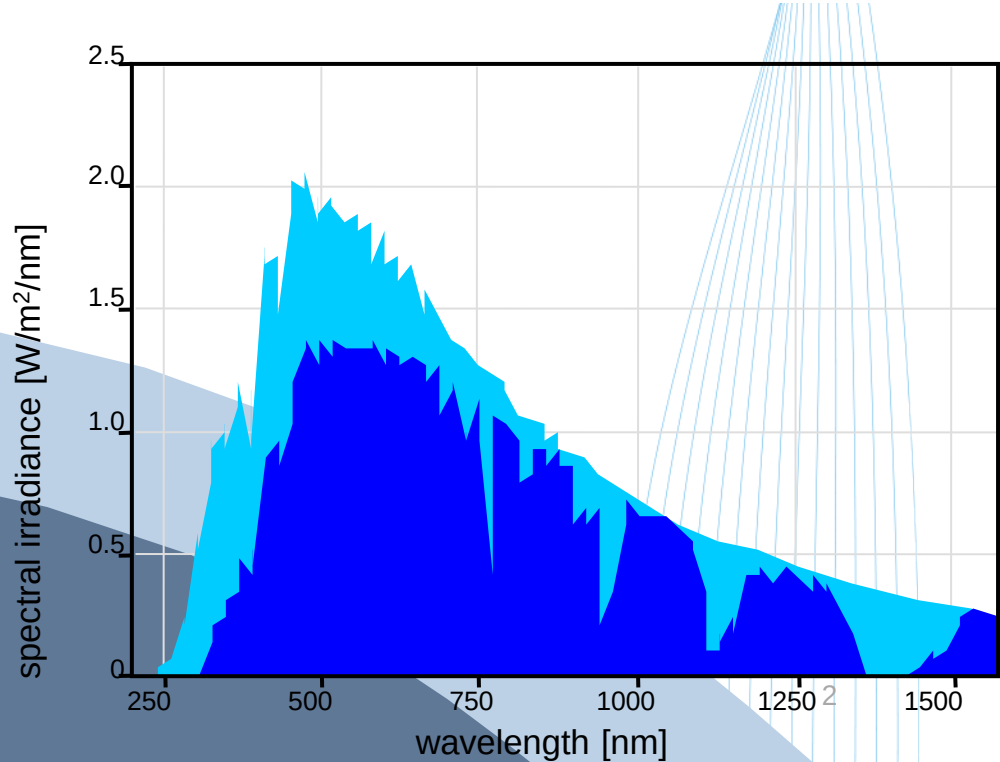
Ozone Monitoring Instrument

OMI







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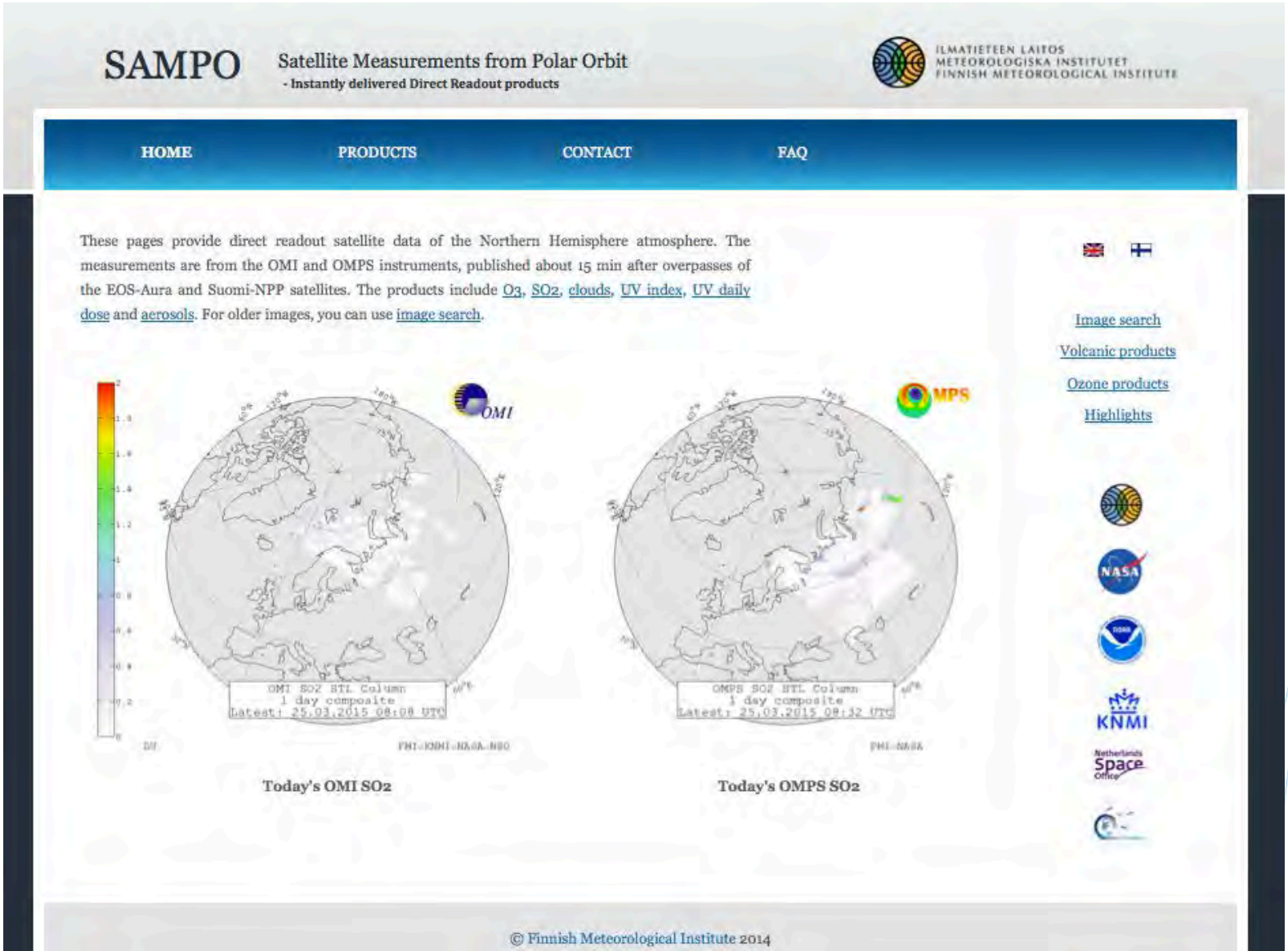
SAMPO/OMI VFD service



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OMI UV products

omi.fmi.fi

OMUVB products

Global Level 3 OMI Surface UV Irradiance and Erythemal Dose (OMUVBd)

Description:

OMUVBd is the primary Level 3 surface UV irradiance and erythemal dose product of the OMI Science Team. The "d" at the end of "OMUVBd" represents "daily". The gridded OMUVBd product file is created from three consecutive OMUVBG daily Level 2G gridded data product files. The adopted L3 grid is a 1.0° x 1.0° grid in longitude and latitude.

Documentation:

OMUVBd Format Specification Document (version 2.0, 18 May 2016)
OMUVBd Readme file

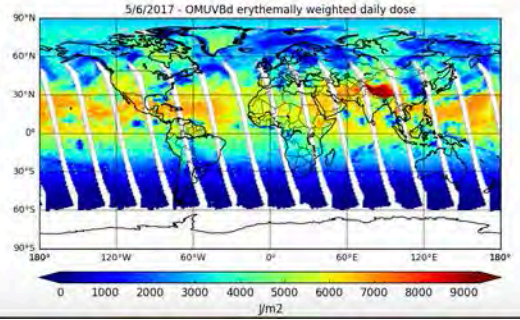
Download the data:

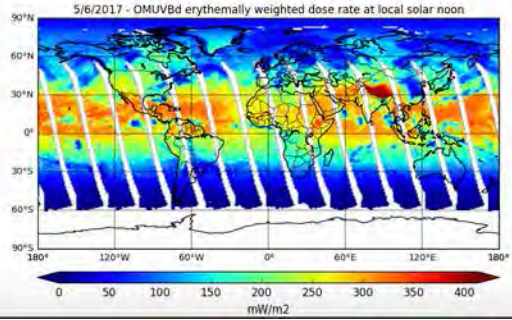
FTP server (FMI) (access requests: see contact info)
Mirador (NASA GES/DISC)

Availability:

1 Oct 2004 - present

Images of the latest OMUVBd products:





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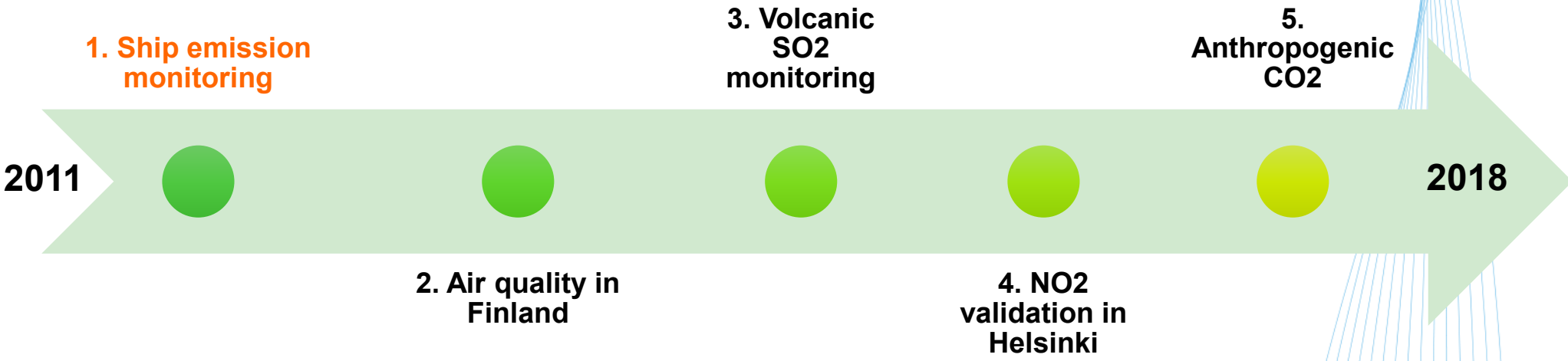
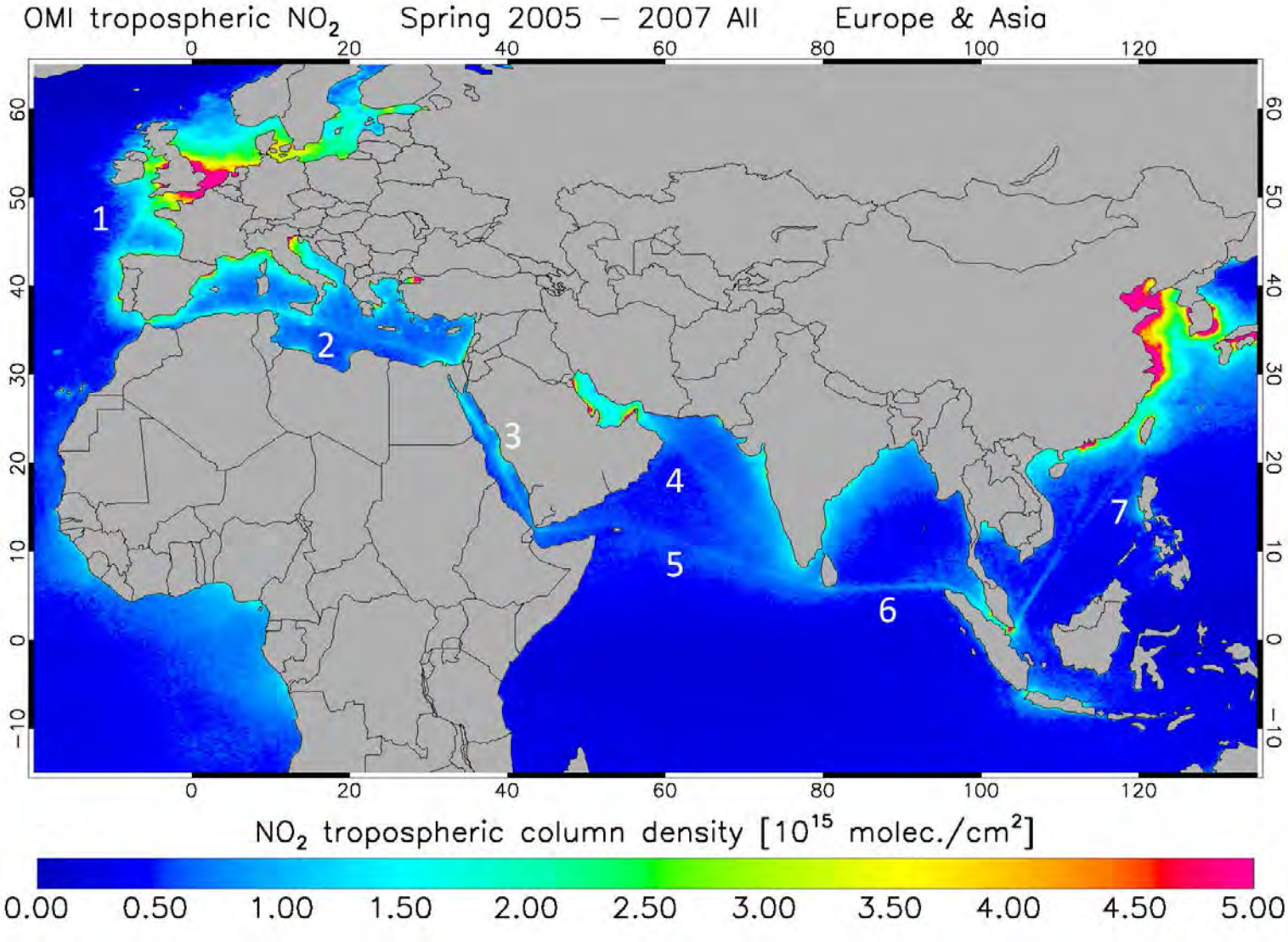
Data applications



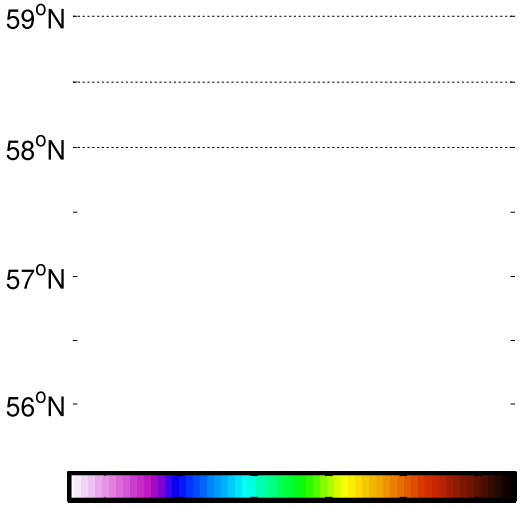
1. Ship emissions monitoring from OMI

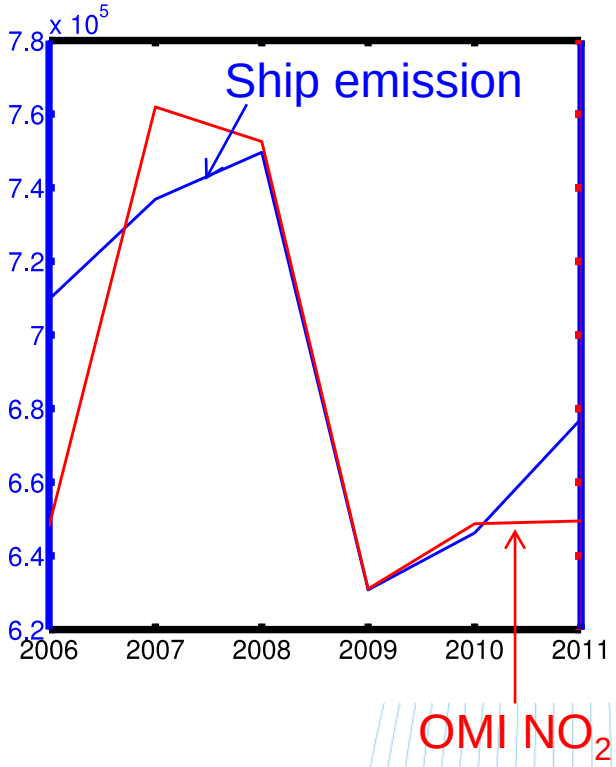


1. Ship emissions monitoring from OMI

STEAM NOx emission

OMI NO_2





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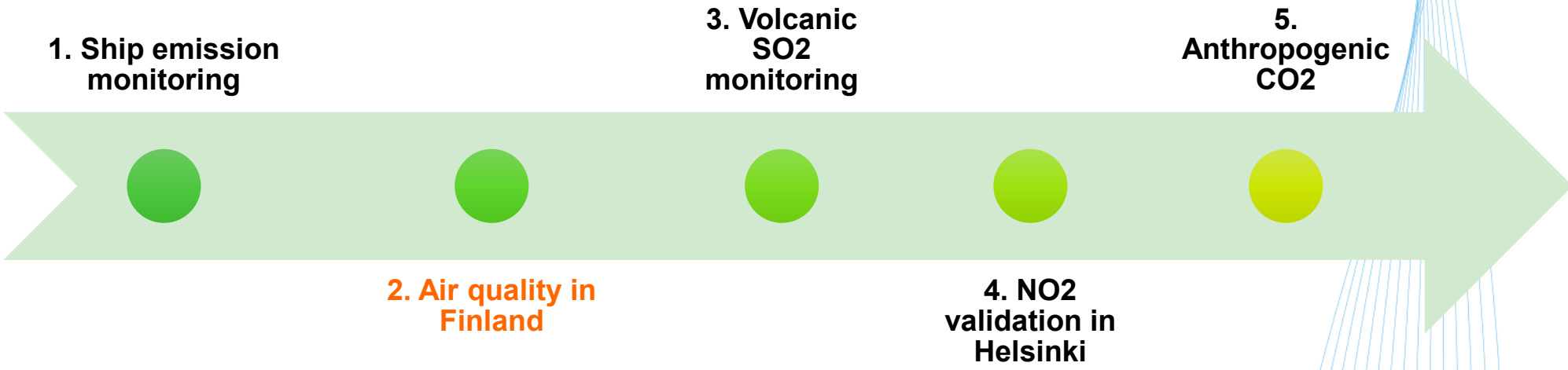
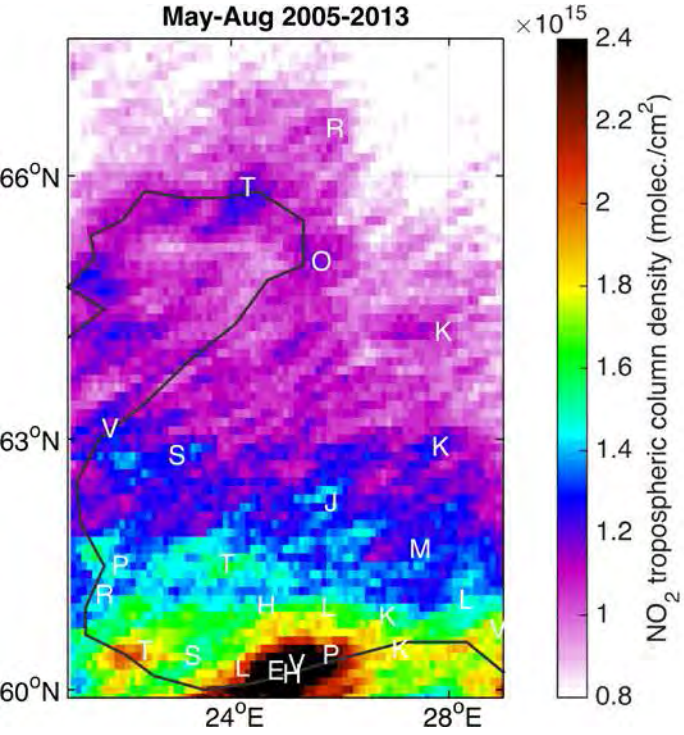
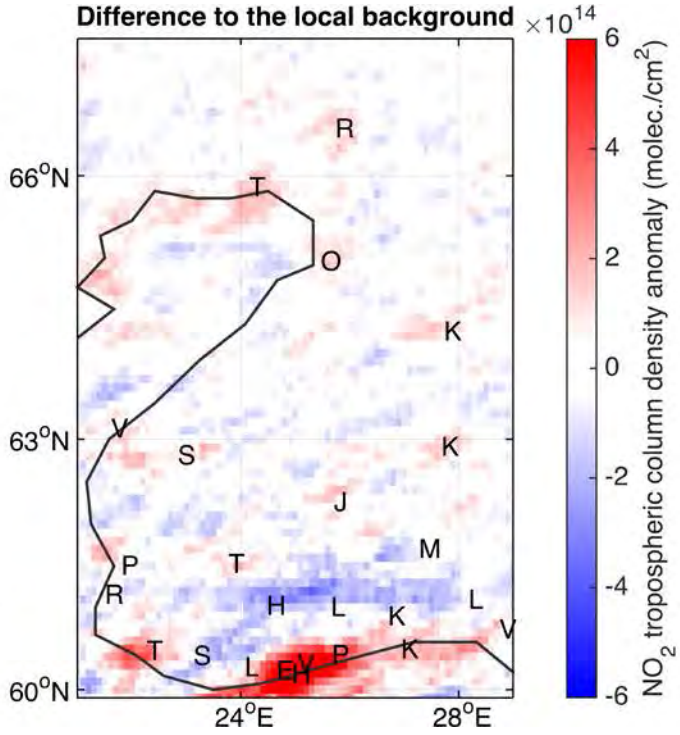
Data applications



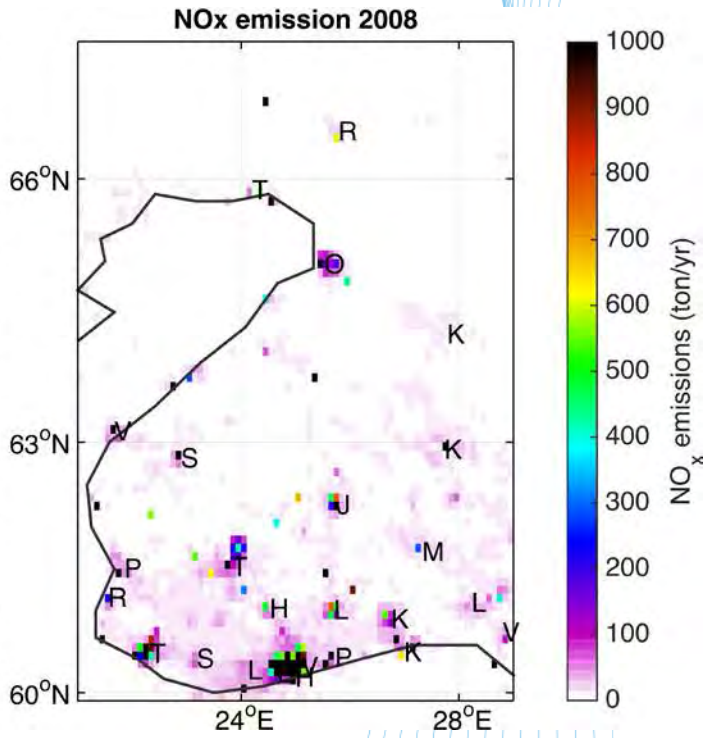
2. Air quality monitoring in Finland



OMI NO_2 fields with wind speed smaller than 5 m/s. The main cities are marked by their initial.

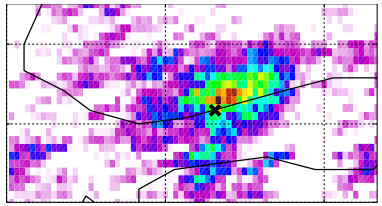


High-pass filter: Red pixels indicate NO_2 levels higher than the local background.



OMI NO_2 fields agree with emission inventory maps.

NO_2 emission estimation

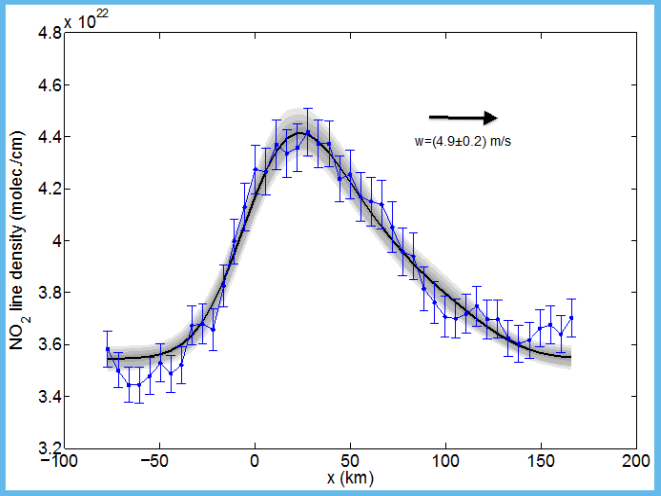


61°N

°N

NO_2 emission estimation

Fitting linear density



Fitting model $M(x) = E \cdot e \otimes G + B$

x distance from the city center
E burden parameter
e exponential function
with e-folding distance x_0
G Gaussian function
B background

***τ=x₀/w* lifetime**
(*w* = eastward mean wind speed)
E'=E/*τ* emission parameter

Life time: τ = (3.0 ± 0.5) h
Emission: E' = (1.5 ± 0.6) mol/s → EMEP database E' = (1.8 ± 0.3) mol/s

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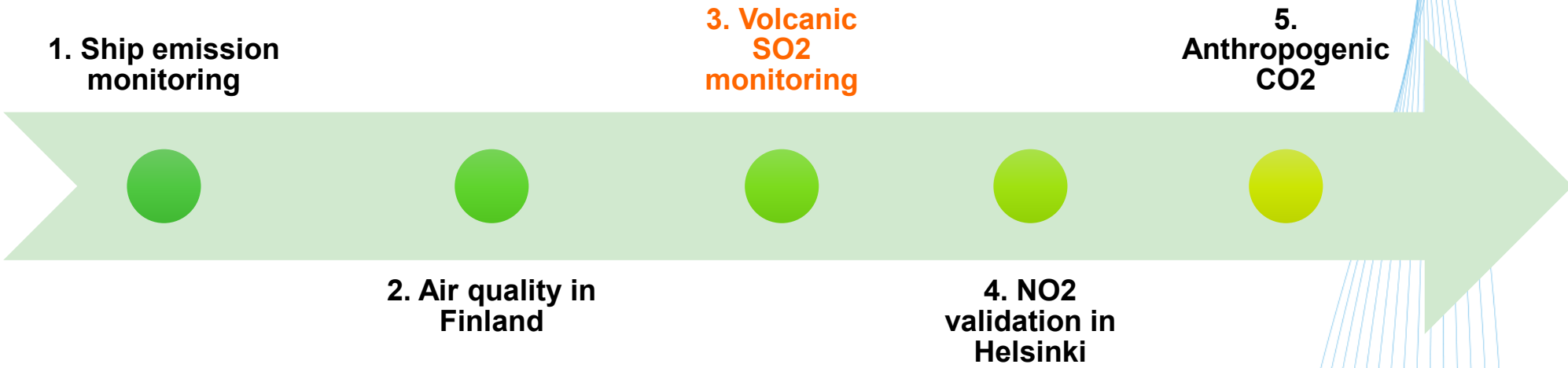
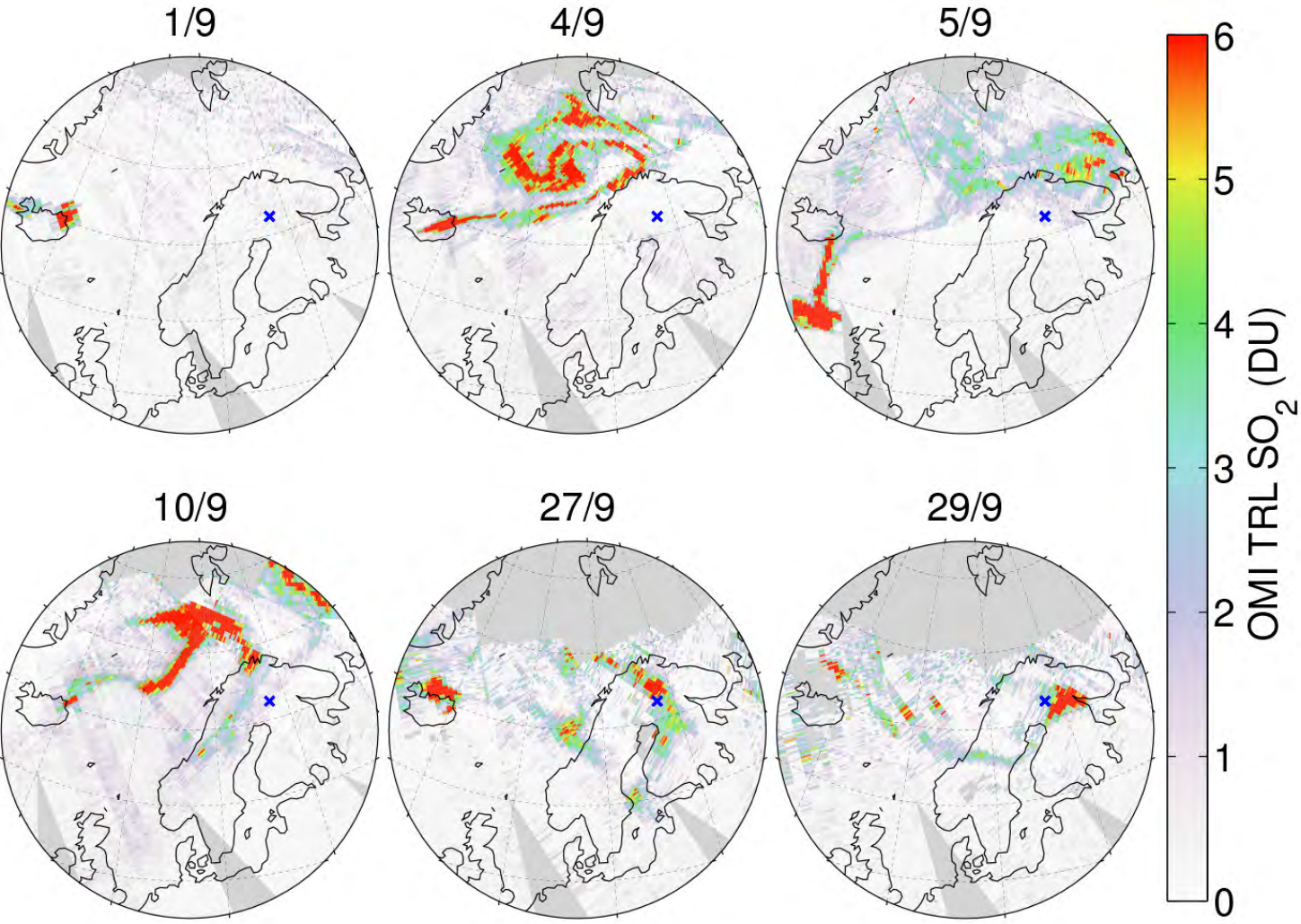
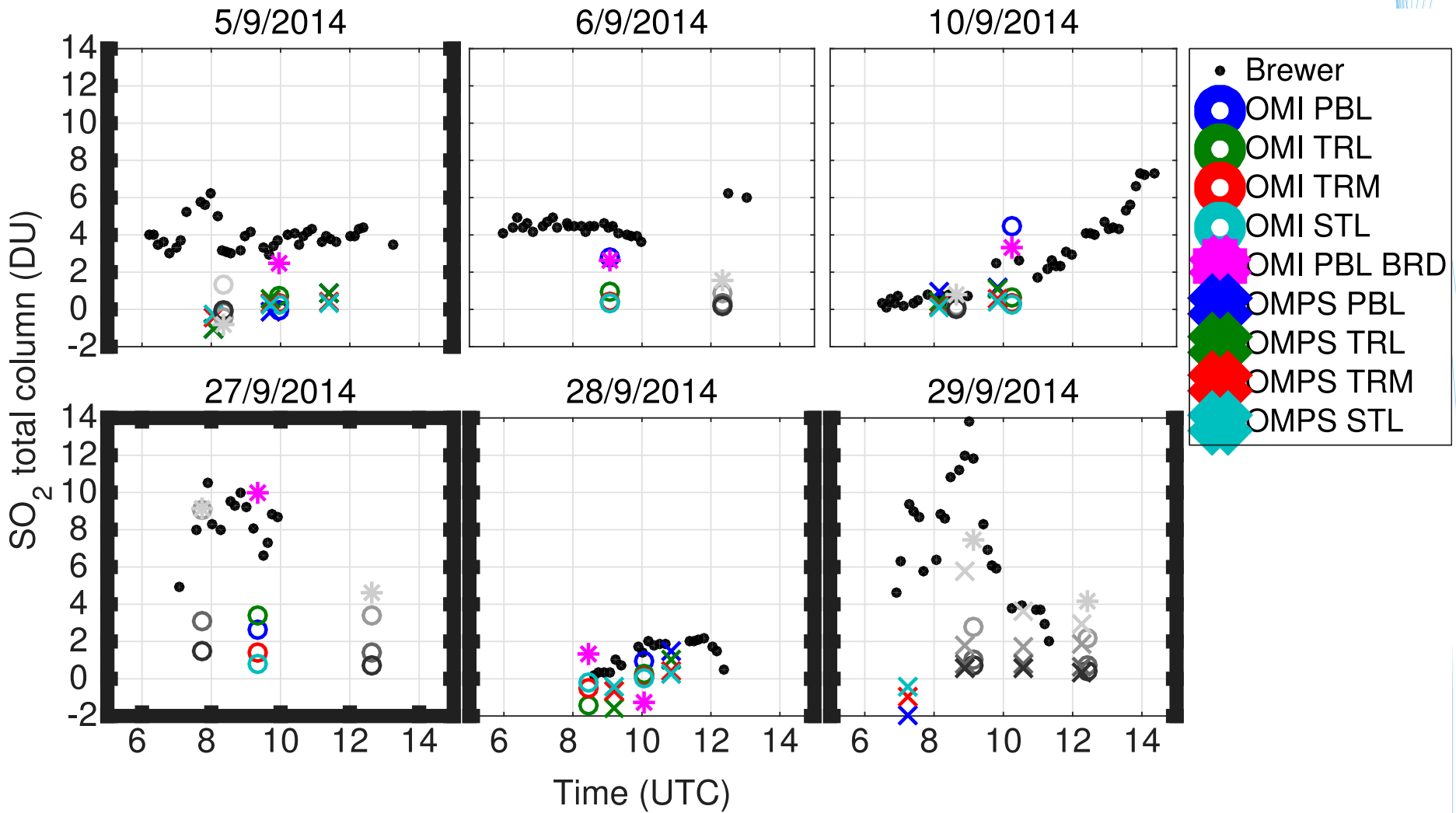
Data applications



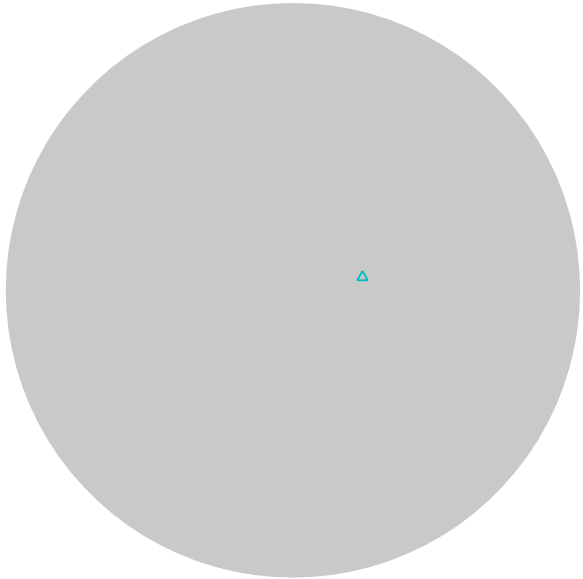
3. Volcanic SO_2 monitoring

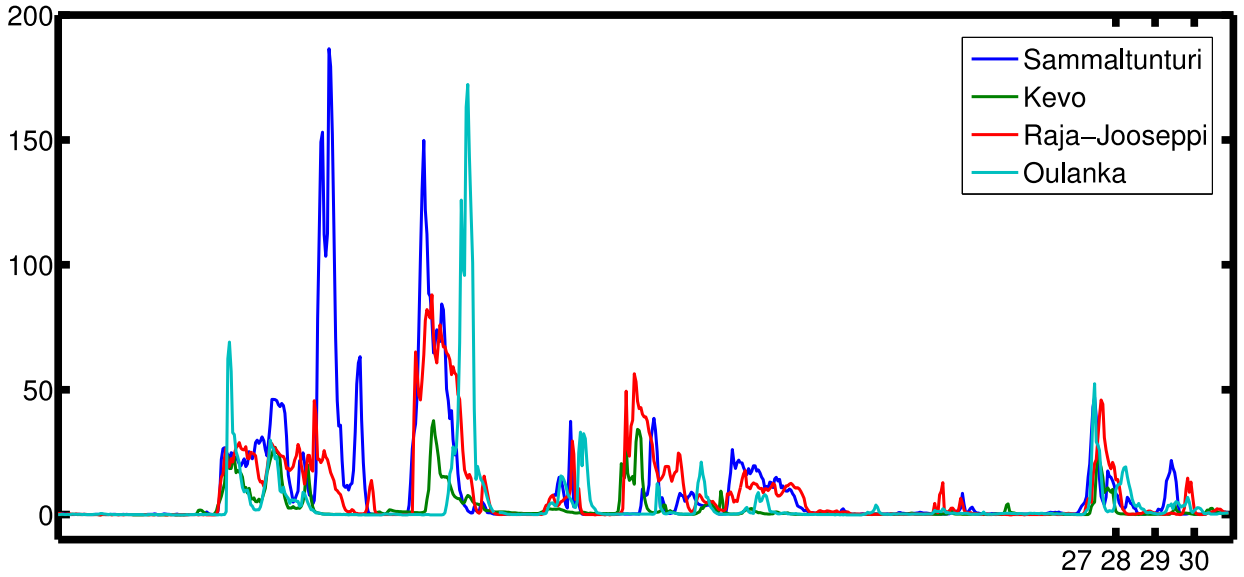


Comparison between satellite and Brewer SO_2 total column in Sodankylä

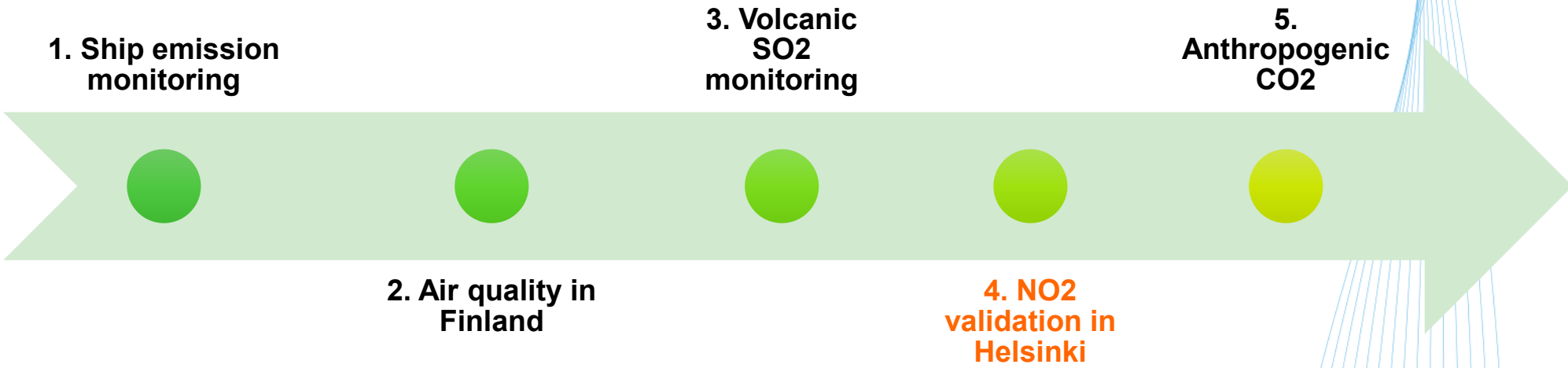


Impact on air quality in Lapland





Data applications



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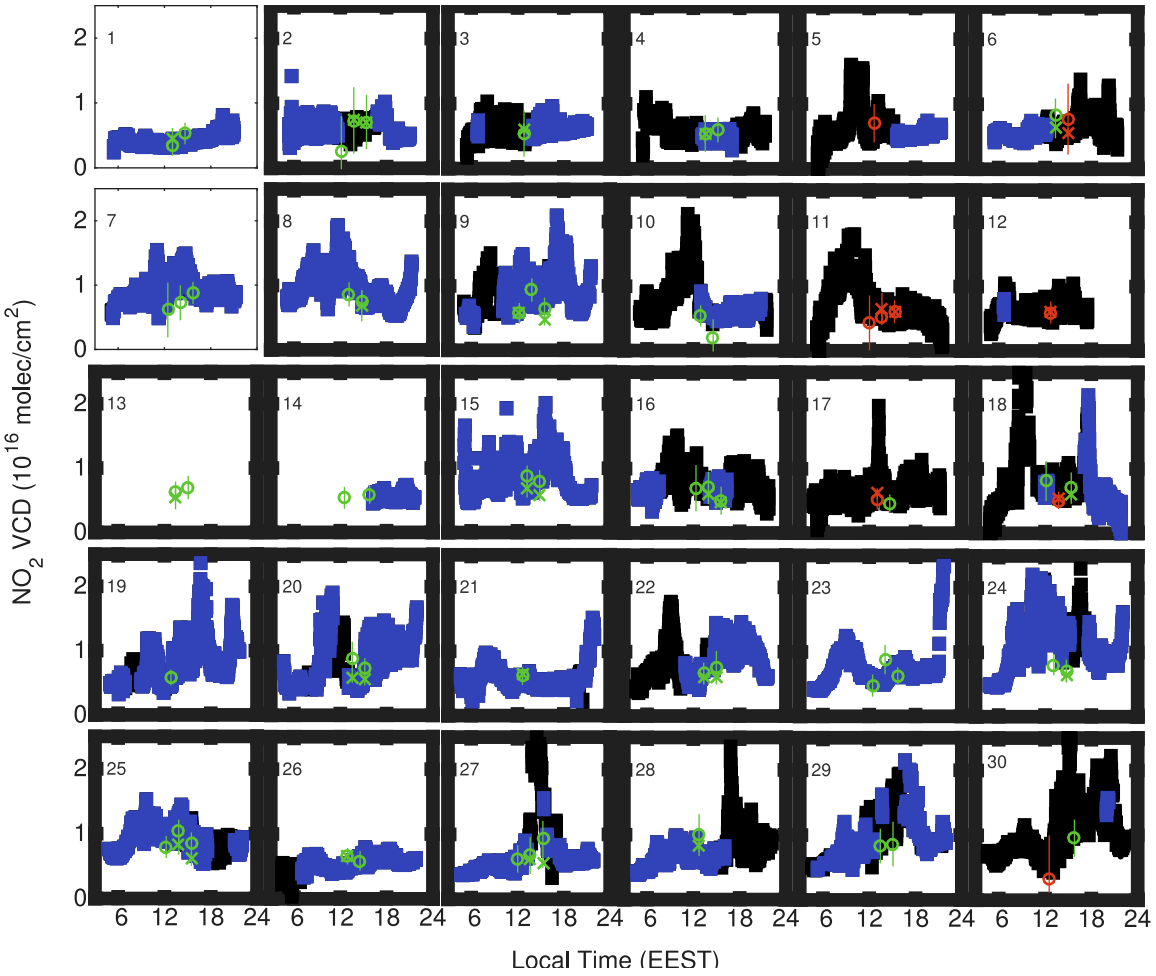
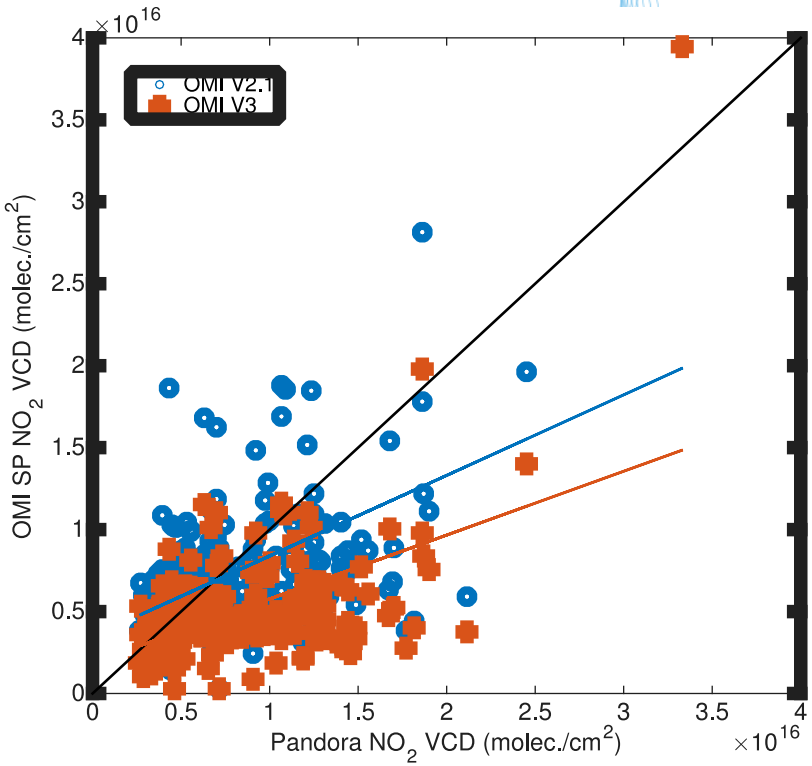
4. OMI NO_2 validation in Helsinki





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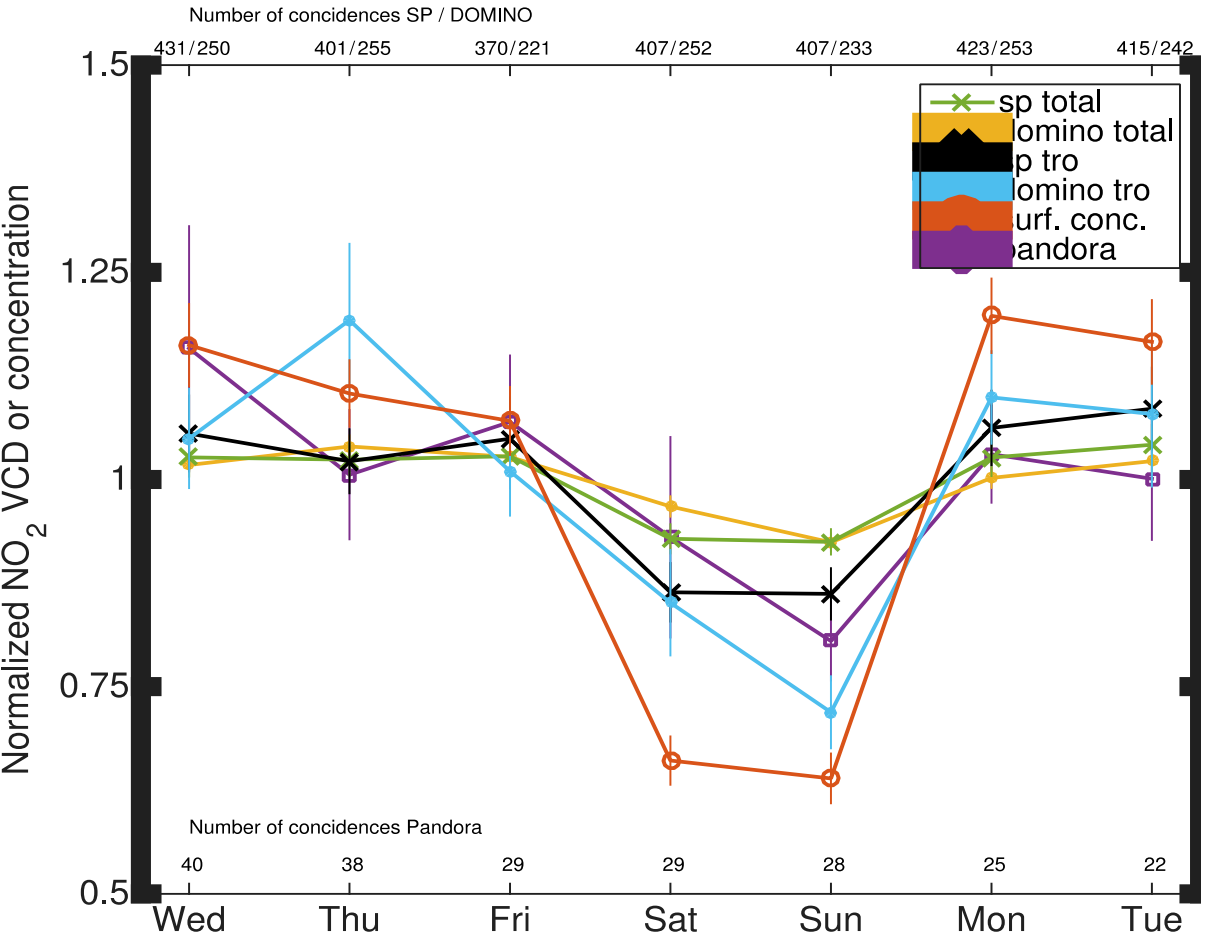
Weekly cycle



Satelliittihavainnotkin sen todistavat: Helsingissä on helpompi hengittää viikonloppuisin

Ilmatieteen laitoksen uusi Nasan kanssa yhteistyössä tehty satelliittitutkimus vahvistaa, että viikonloppun hiljentyvässä Helsingissä paranee ilmanlaatu.

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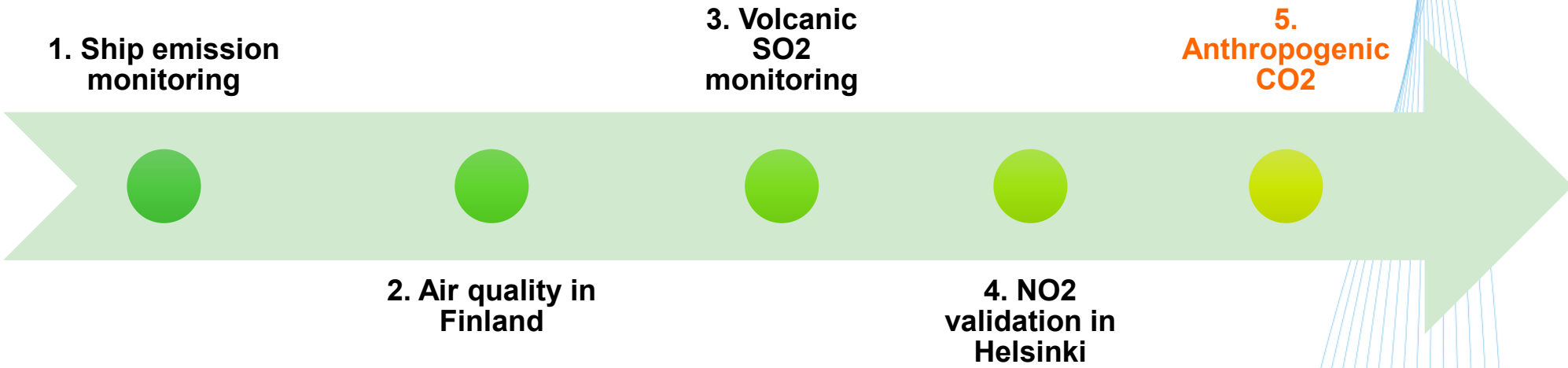
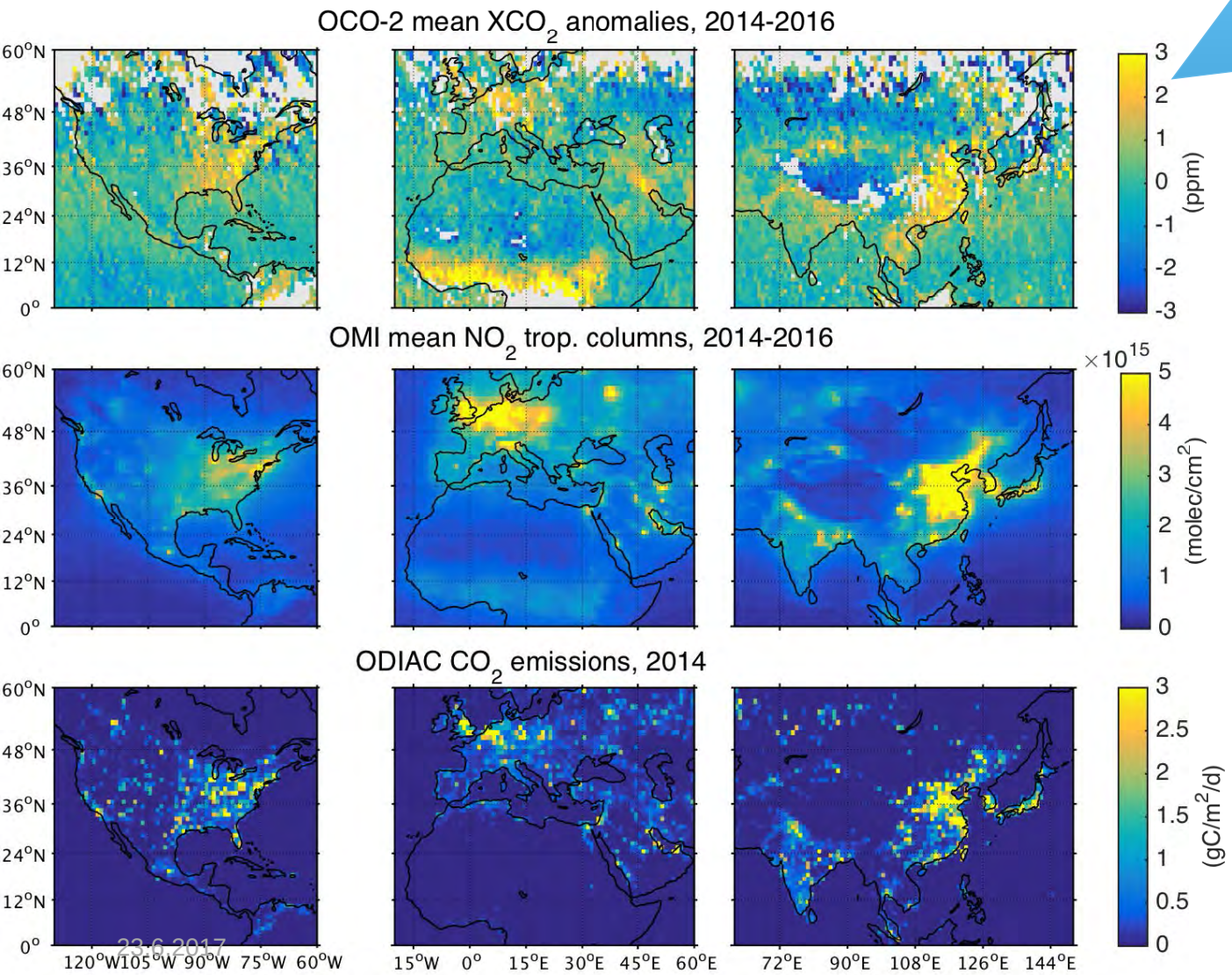
Data applications



OCO-2 CO_2 and OMI NO_2



The CO_2 anomalies are obtained deseasonalising and detrending OCO-2 data

XCO_2(anomaly) =
XCO_2(individual) − XCO_2(daily median)

REFERENCE: Hakkarainen, J., et al.: Direct space-based observations of anthropogenic CO_2 emission areas from OCO-2, Geophys. Res. Lett., in review, 2016.

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IWGGMS13 in Helsinki

13th International Workshop on Greenhouse Gas Measurements from Space

6-8 June, 2017, Helsinki, Finland

Welcome

Last modified: 05-Jun-2017

Welcome to the **13th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS)** which will be held on 6-8 June, 2017, at the University of Helsinki in Helsinki, Finland. The workshop is organised by the Finnish Meteorological Institute (FMI) with support from the University of Helsinki.

Important dates:

- Abstract submission opens: 16 January, 2017
- Registration opens: 2 February, 2017
- Abstract submission deadline: 27 March, 2017
- Registration deadline: 15 May, 2017
- **Workshop dates: 6-8 June, 2017**

Background. Success in space-based global measurement of greenhouse gases (GHGs), such as carbon dioxide and methane, is critical for advancing the understanding of carbon cycle. The recent developments in observations and in interpreting the data are very promising. Space-based greenhouse gas measurement, however, poses a wide array of challenges, many of which are complex and thus demand close international cooperation.

The goal of the workshop is to review the state of the art in remote sensing of CO_2, CH_4, and other greenhouse gases from space, including:

- Results from the Greenhouse gases Observing SATellite (GOSAT) and Orbiting Carbon

Meeting information

Welcome page
Workshop program
Guidelines for presentations
Map of lunch restaurants
Helsinki weather now
Venue and travelling
Accommodation
Registration (closed)
Abstract submission (closed)
Visit Helsinki, Visit Finland
Search #iwggms13 on Twitter

Part of the Finland 100 programme

Suomi Finland 100

The IWGGMS13 workshop is part of the programme for the centenary of Finland's independence in 2017

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Thank you

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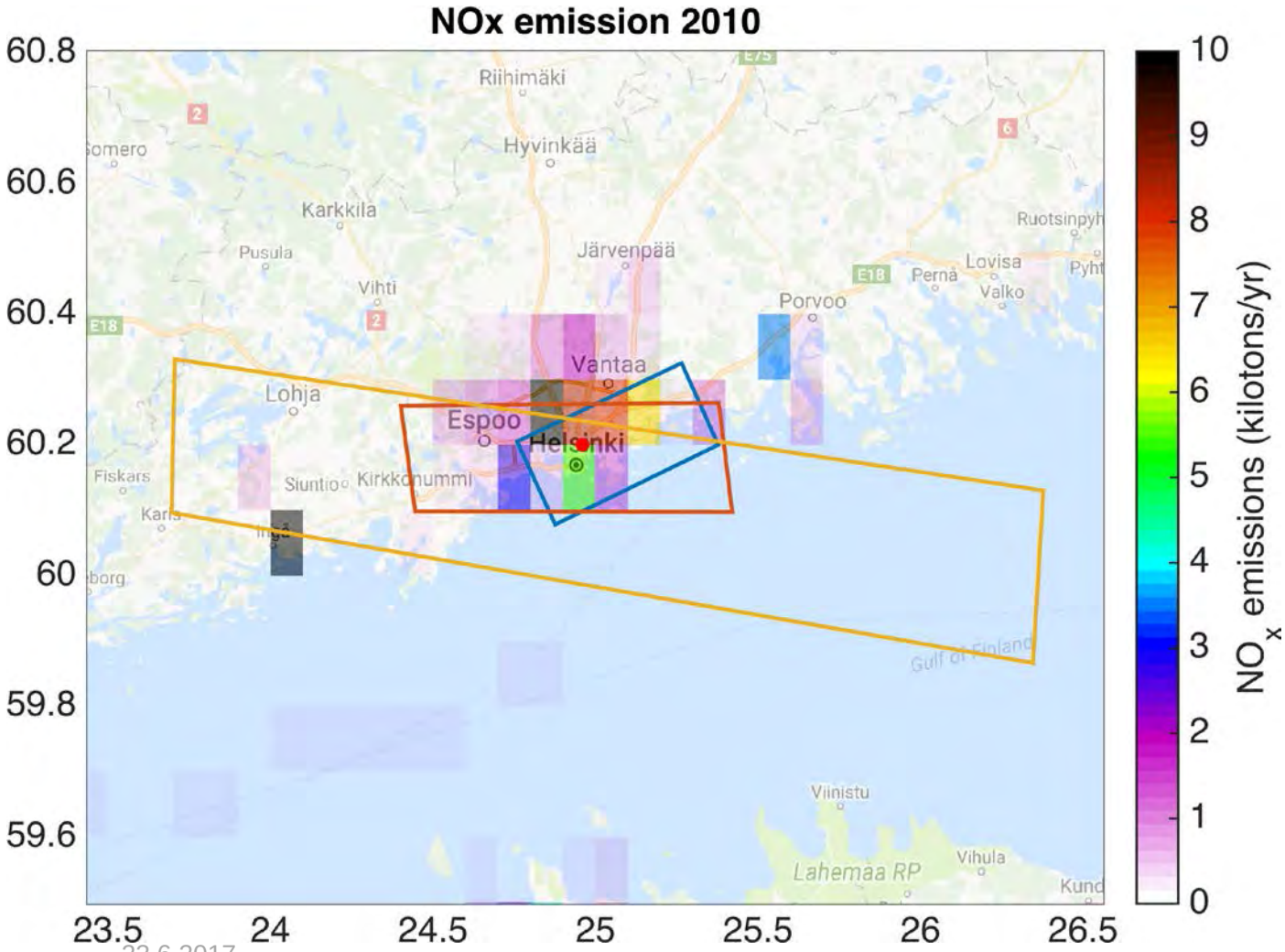
Twitter: @iolandaialongo

Blog: blog.fmi.fi/ILMApilot

WWW.FMI.FI

OMI pixel size



- When considering only small pixels (CTP 6-55), the difference is about 1% closer to zero then the whole dataset (-5% instead of -6%).
- The NOx emissions are about 20, 40 and 80% smaller than the value at the Pandora location (5 kTons/yr) for pixel 17, 53 and 60, respectively.
- Both pixel size and location with respect to Pandora station contribute to the inaccurate spatial representativeness of OMI pixel

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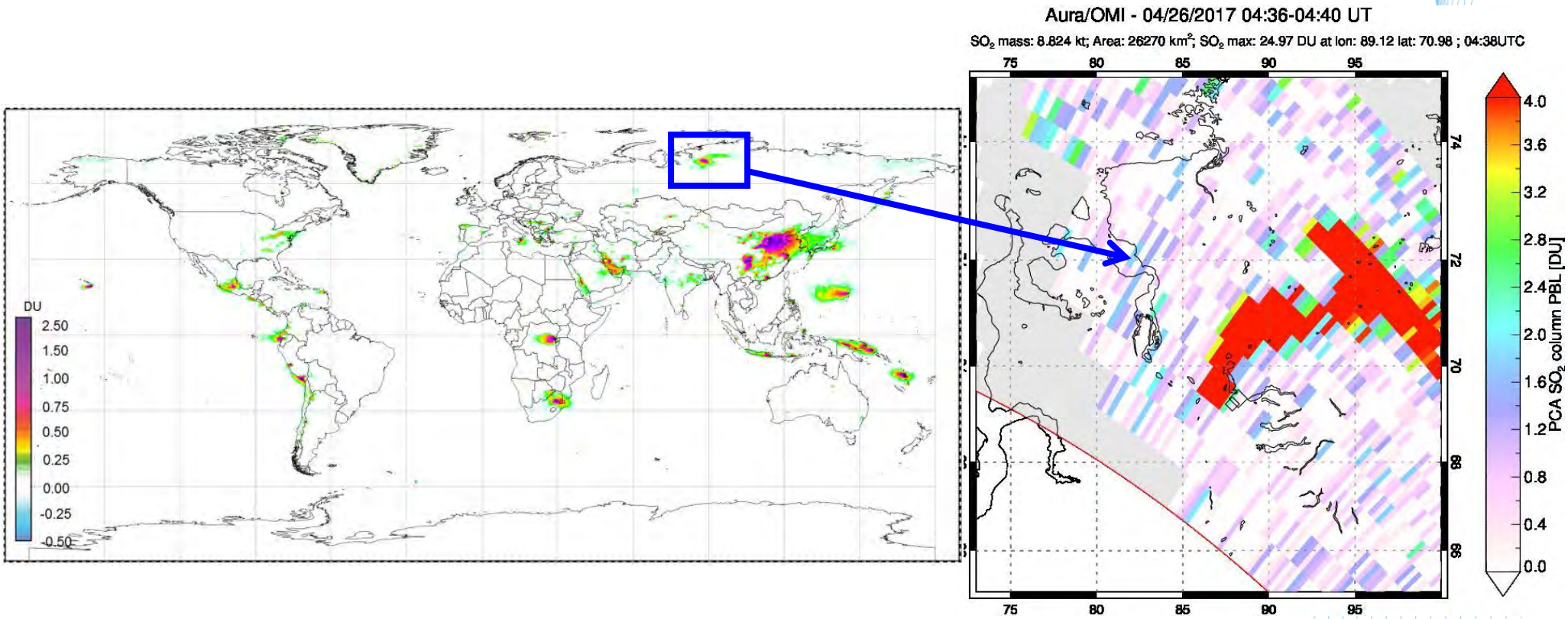
SO_2 pollution

NORILSK, Russia



SAMBA Project

Air quality in Finland

Holuhraun fissure eruption

ESA ILMA Living Planet fellowship

Anthropogenic CO2