Experience from the Partnership with China on Space Data (PANDA) Project

Ming Chang, Xuemei Wang, Michael Gauss

2017.04.19

Outline

- **Introduction**
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- **Learn from PANDA**
  - Boundary and Initial Conditions
  - Emissions (Natural, Anthropogenic)
  - Representation of PBL Processes
  - Input Data Change
- **Experience**
  - Cooperation Dissemination
  - Capacity Building
  - Challenges

Objective of the PANDA Project

- ***To establish a team of European and Chinese scientists who will jointly use space observations and in-situ data as well as advanced numerical models to monitor, analyse and forecast global and regional air quality.***

- PANDA disseminated methodologies, tools and data to a variety of users.

PANDA 熊貓

PArtnership with ChiNa on space DAta

The PANDA Project

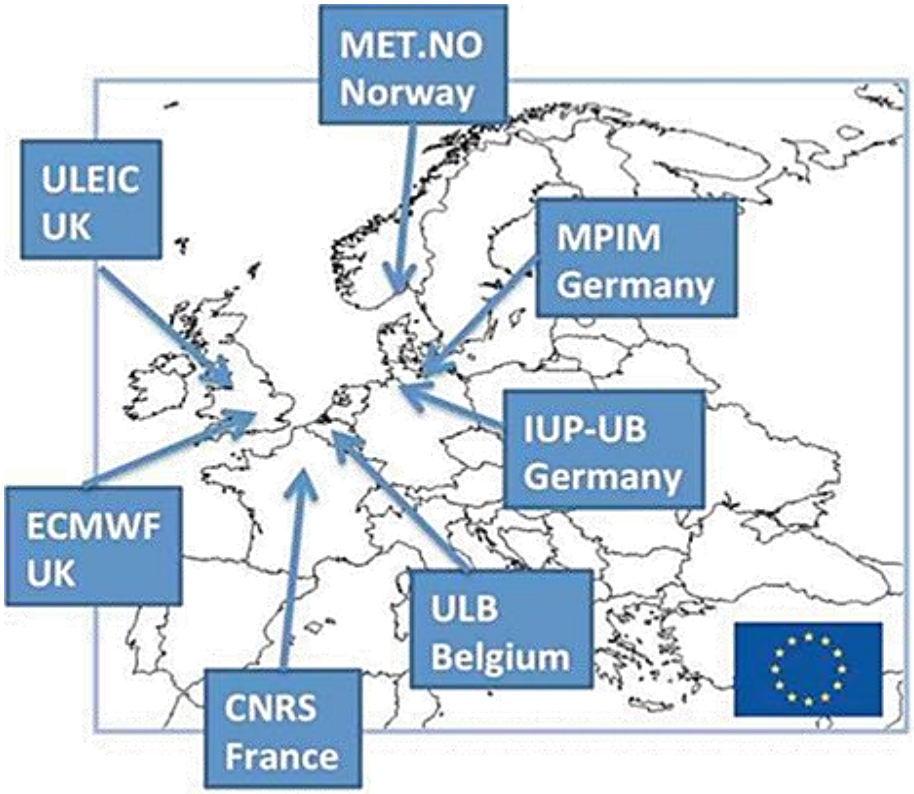
Coordinator: Guy Brasseur

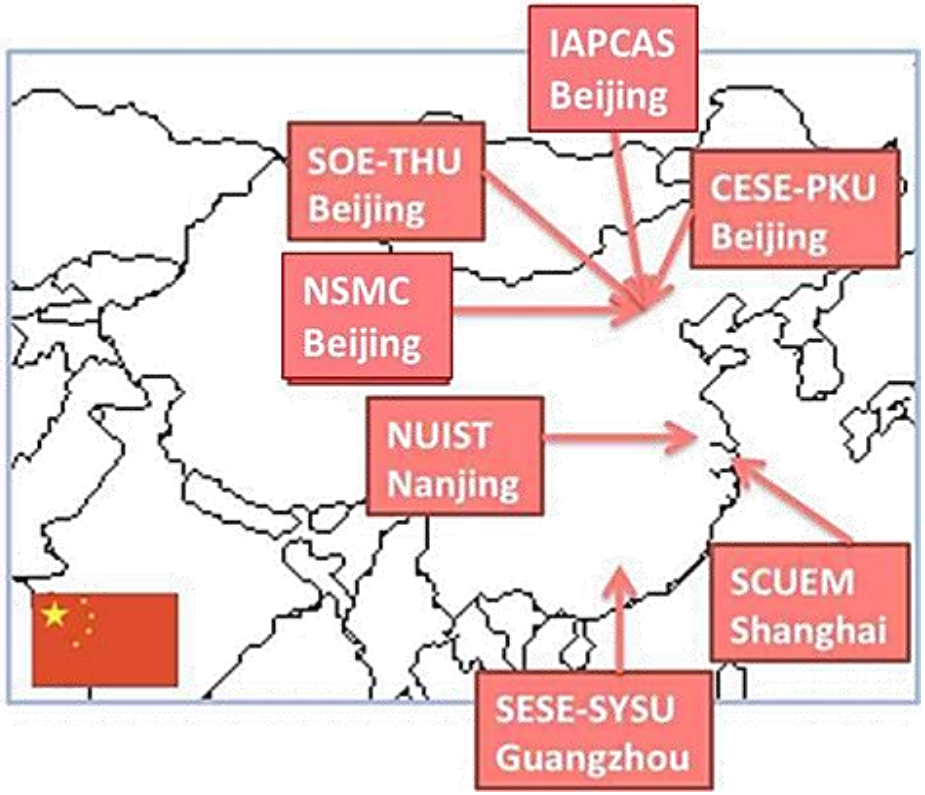
Deputy Coordinator: Prof. Xuemei Wang

Period: Jan 2014 - Dec. 2016

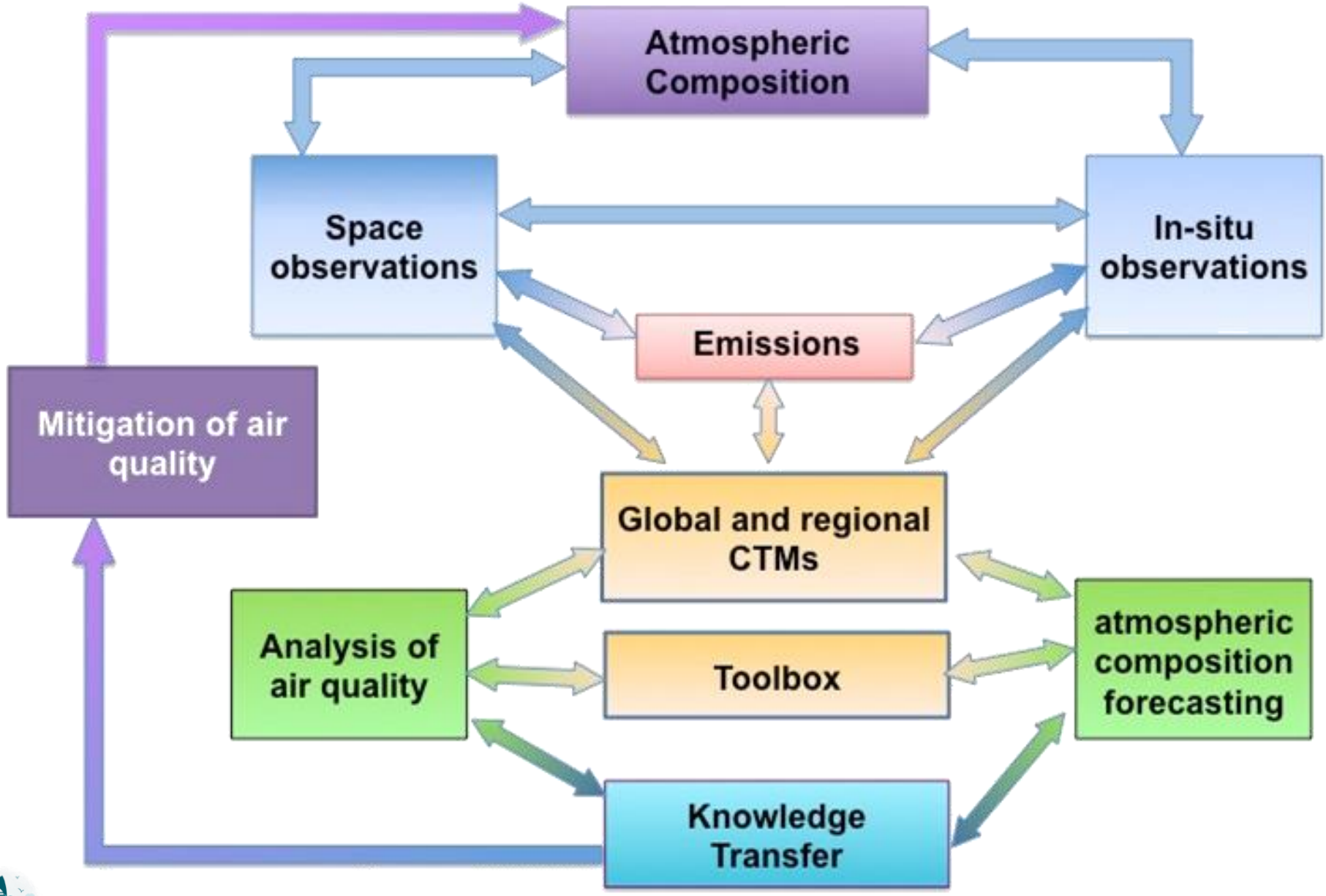
Budget: 2 Millions Euros

SEVENTH FRAMEWORK PROGRAMME





PANDA Roadmap

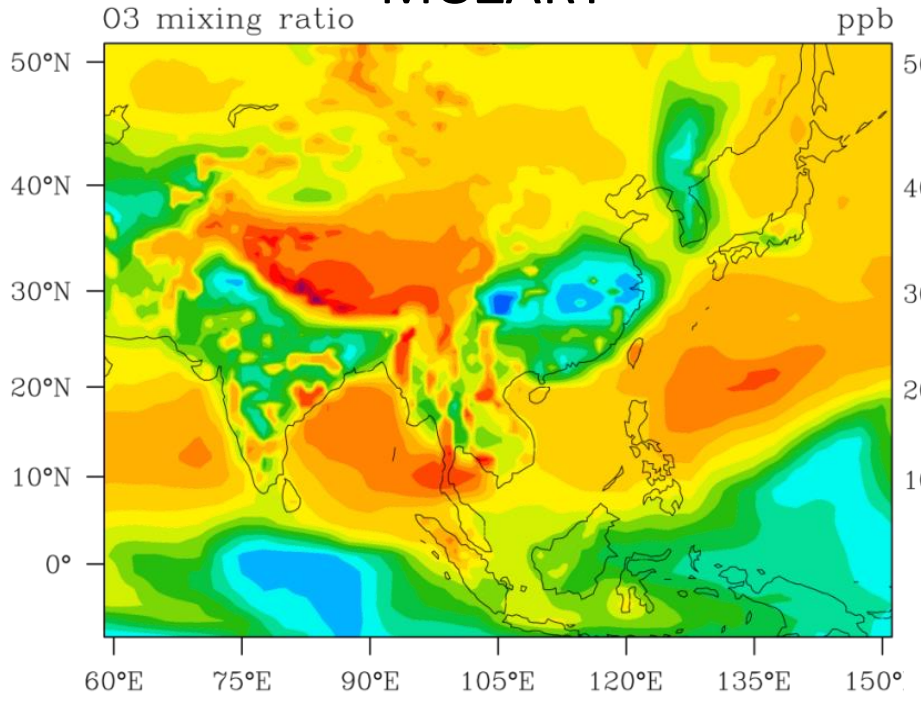


Learn from PANDA project

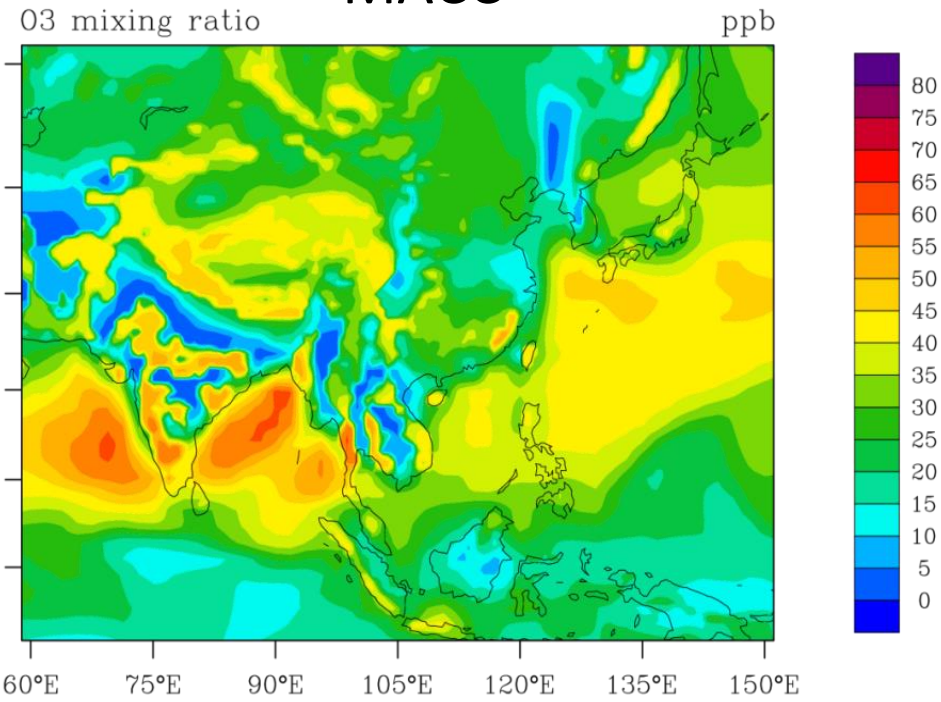
- Boundary and Initial Conditions
- Emissions (Natural, Anthropogenic)
- Representation of PBL Processes
- Input Data Change

Initial and Boundary Conditions

MOZART

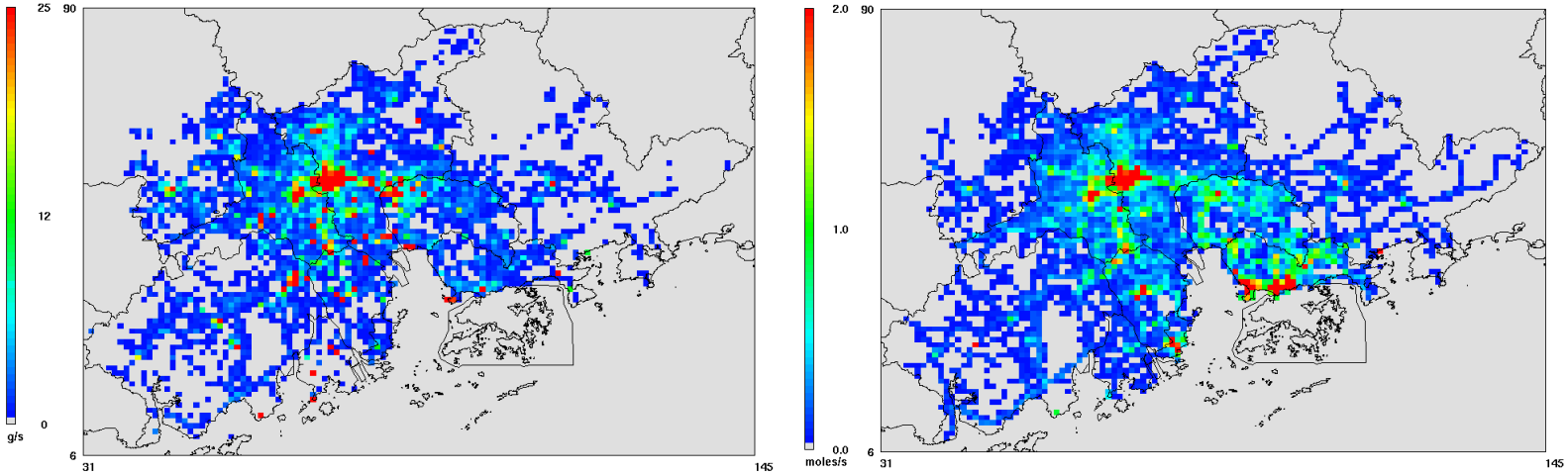


MACC



Monthly mean surface O_3 concentrations for January 2010 simulated by WRF-Chem using MOZART (left) and MACC (right) initial and boundary conditions.

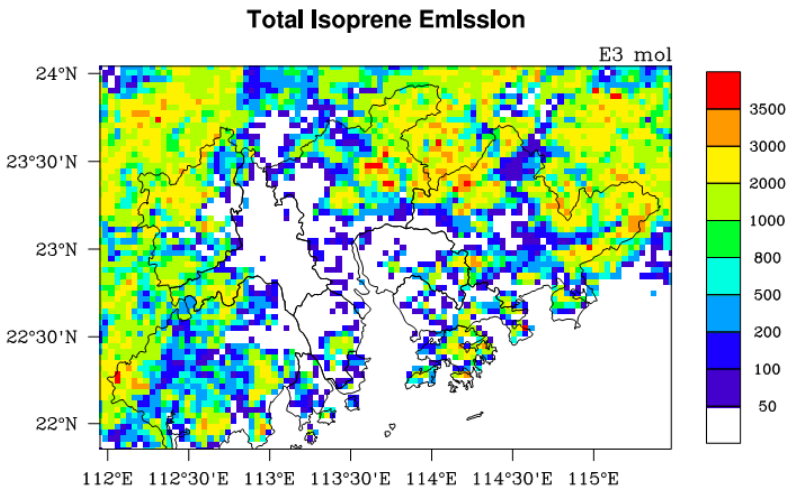
Anthropogenic Emission Inventories

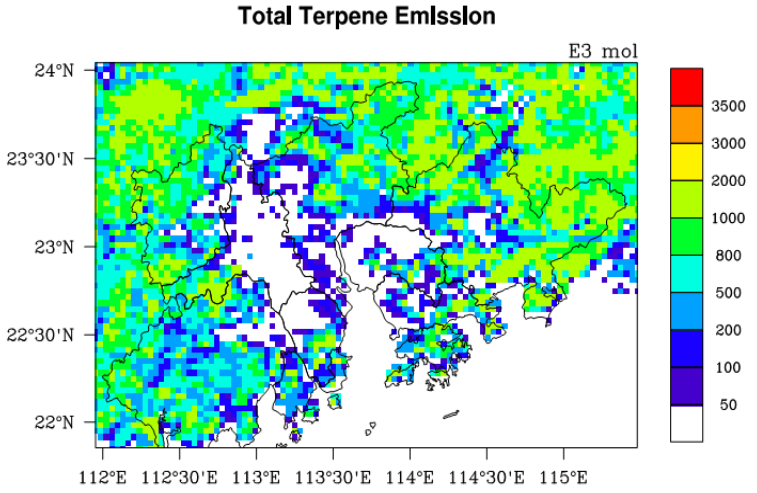


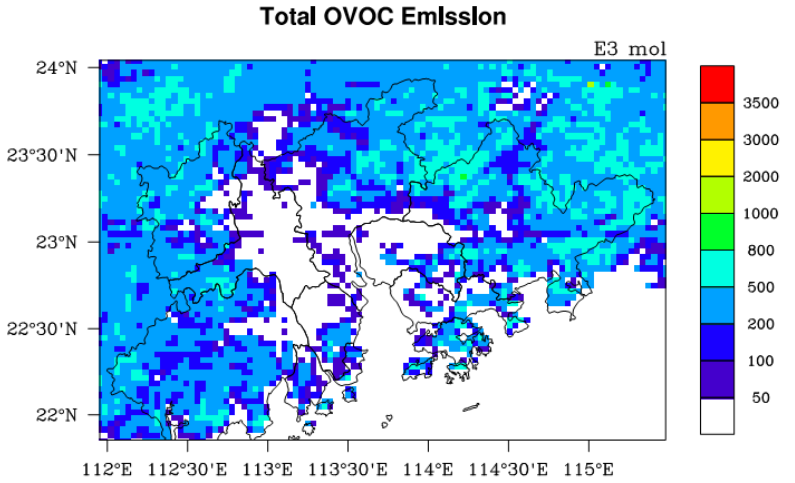
PRD dynamic EI examples (left : PM_{10}; right : VOC)

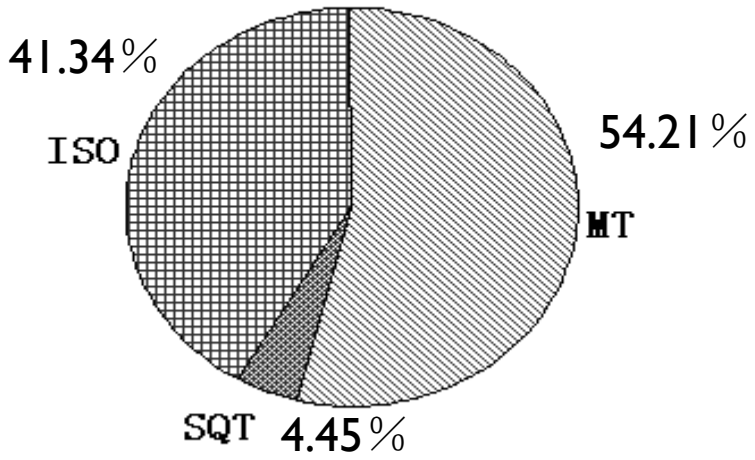
- **EI gridding**：EI + SMOKE model + meteorological field
- **Local IE**：Power plants, industry source, on road mobile source, non-road mobile source, dust source, VOCs product-source, biogenic and others (Zheng et al, 2009)
- **Background IE**： From David Streets （INTEX-B Asia EI, 2006 ）

BVOCs Emissions in PRD

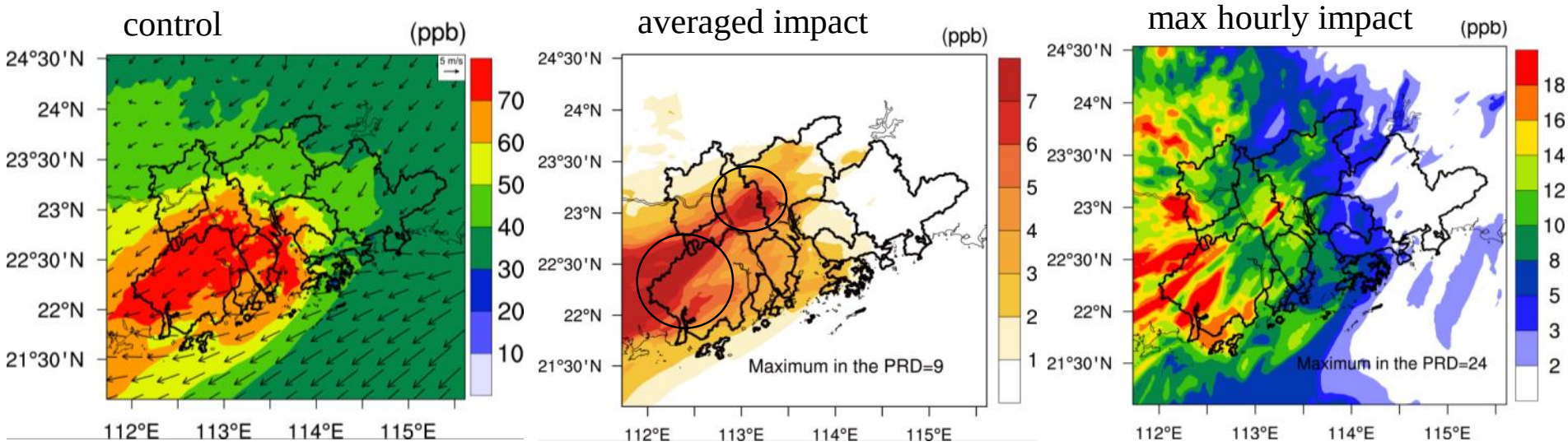








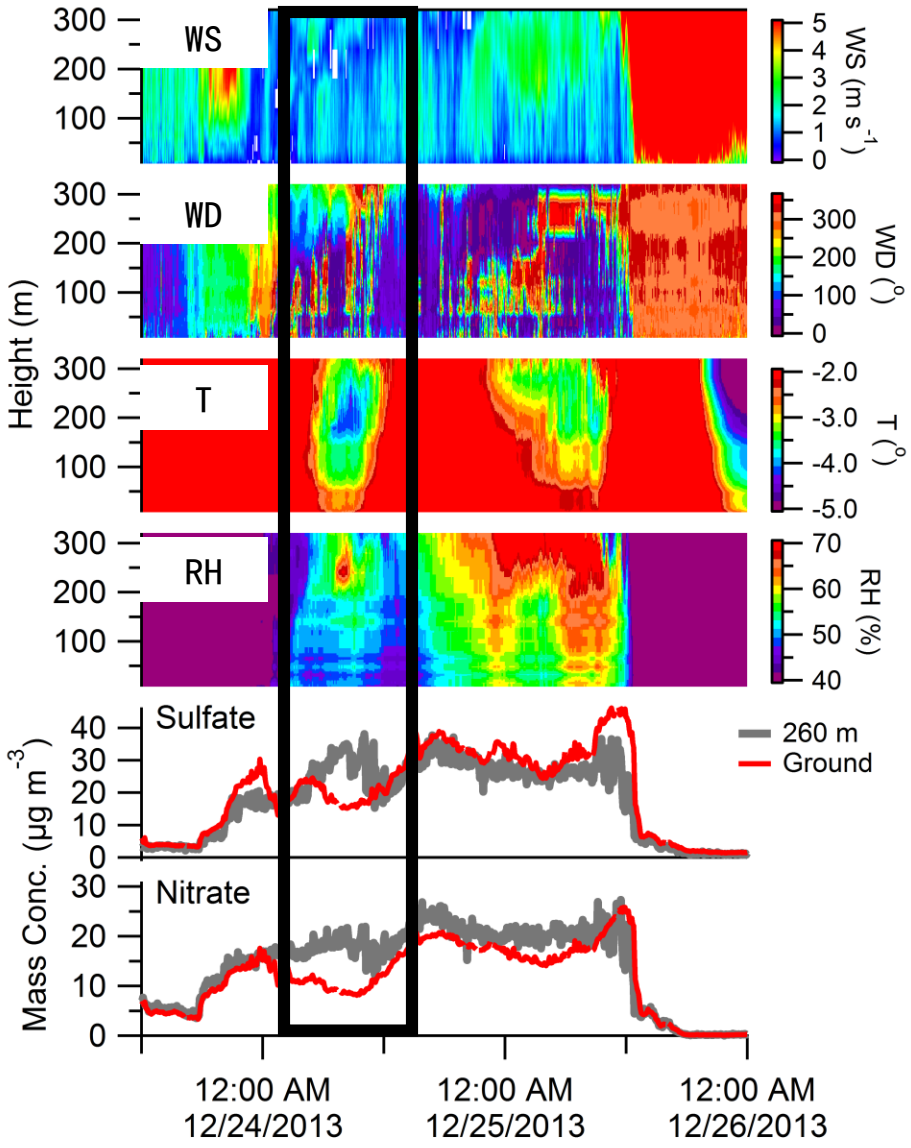
Impacts of BVOCs Emissions on Surface Ozone

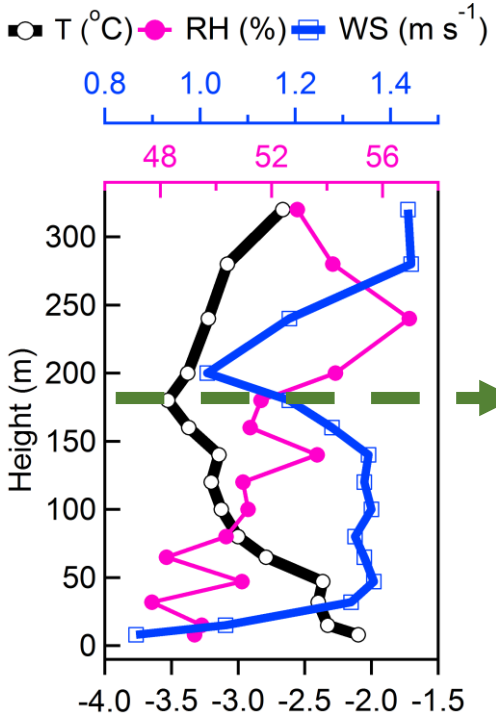


- The surface ozone in the urban area and in the downwind area were most sensitive to the BVOCs emissions in November
- The max hourly impacts varies between 10 and 24 ppb in the urban area and the downwind area
- The impacts change by a factor of 1.5 if the emission factors change by a factor of 3

Situ S.P., et al., ACP, 2014

Boundary Layer (PBL) Structure



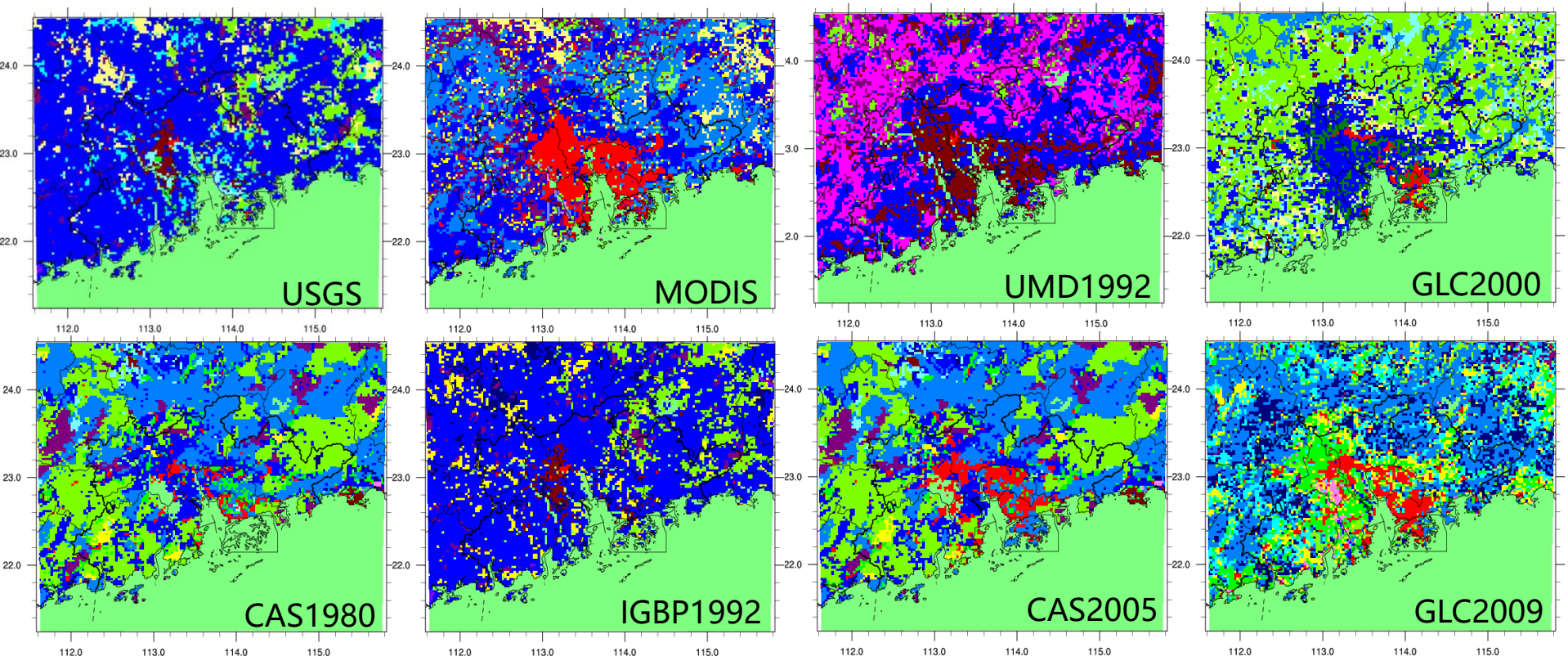


180m
- Inversion Layer
- Low Wind Speed
- High RH

The change of boundary layer structure

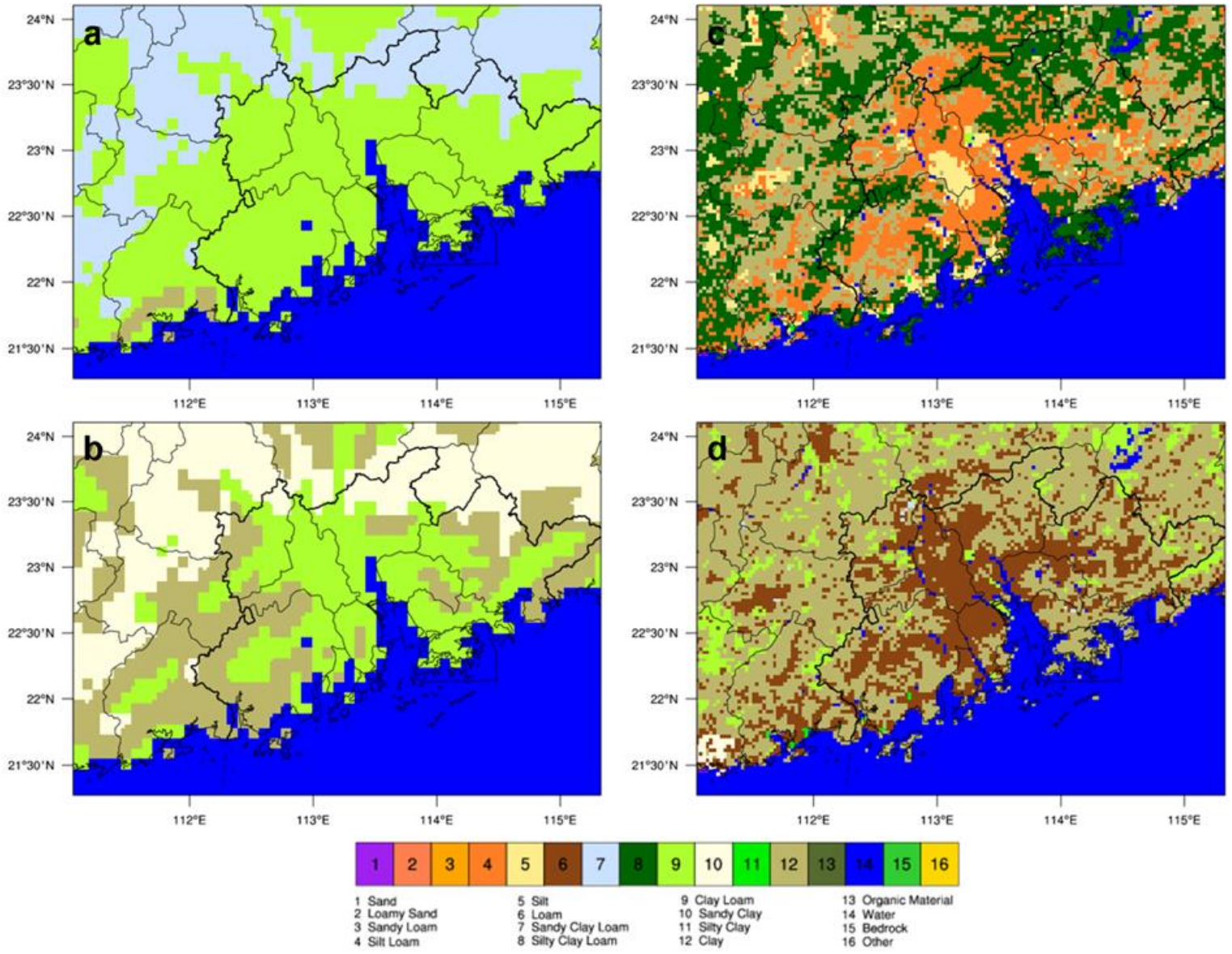
Sun et al., EST, 2015

Land Use Input Data Change



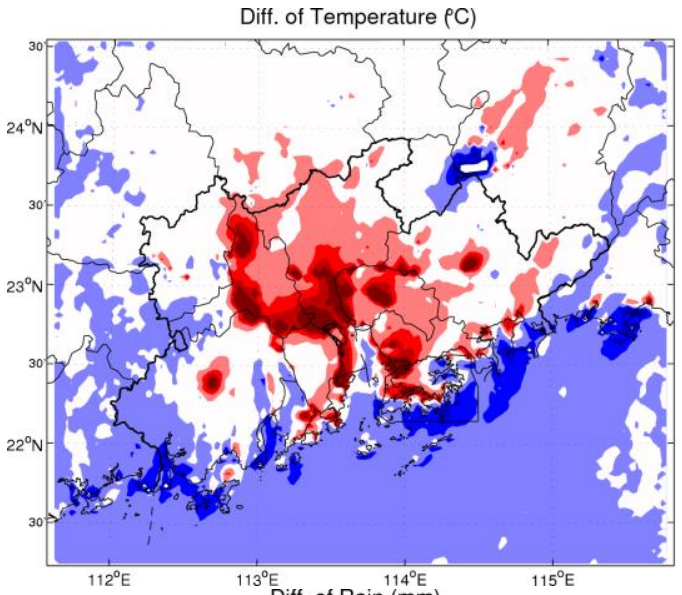
1 Urban and Built-Up
2 Dryland Cropland&Pasture
3 Irrigated Cropland&Pasture
4 Mixed Cropland and Pasture
5 Cropland/Grassland Mosaic
6 Cropland/Woodland Mosaic
7 Grassland
8 Shrubland
9 Mixed Shrubland/Grassland
10 Savanna
11 Deciduous Broadleaf
12 Deciduous Needleleaf
13 Evergreen Broadleaf
14 Evergreen Needleleaf
15 Mixed Forest
16 Water Bodies
17 Herbaceous Wetland
18 Wooded Wetland
19 Barren/Sparsely Vegetated
20 Herbaceous Tundra
21 Wooded Tundra
22 Mixed Tundra
23 Bare Ground Tundra
24 Snow or Ice

Soil Input Data change

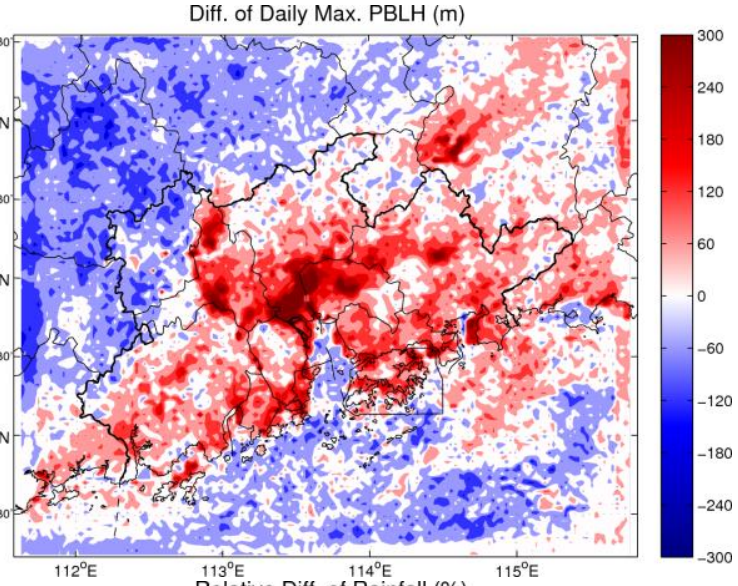


Effect of Land Use Data Change

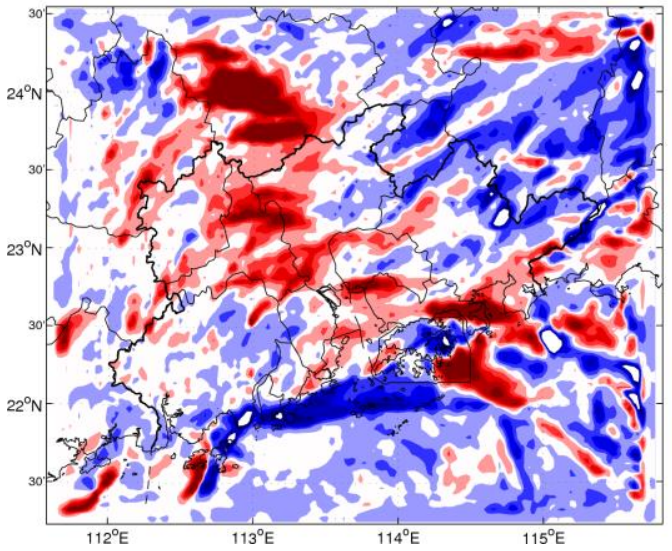
0.55 ℃

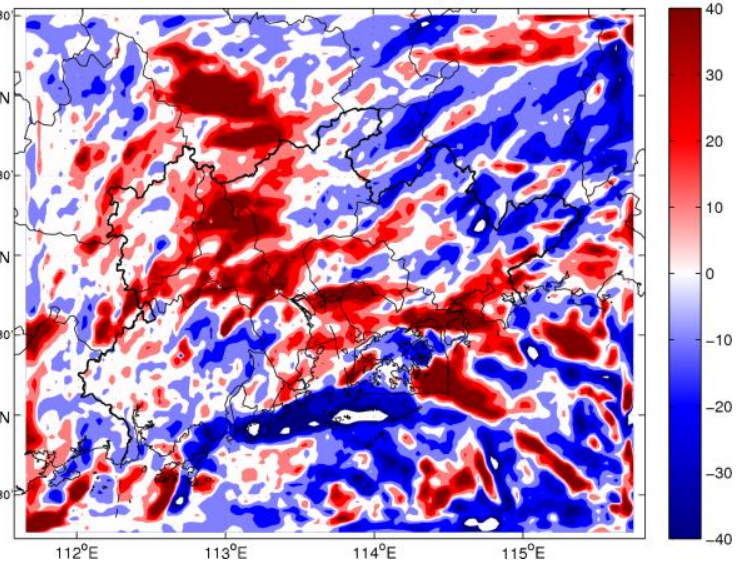


88 m
(8.2%)



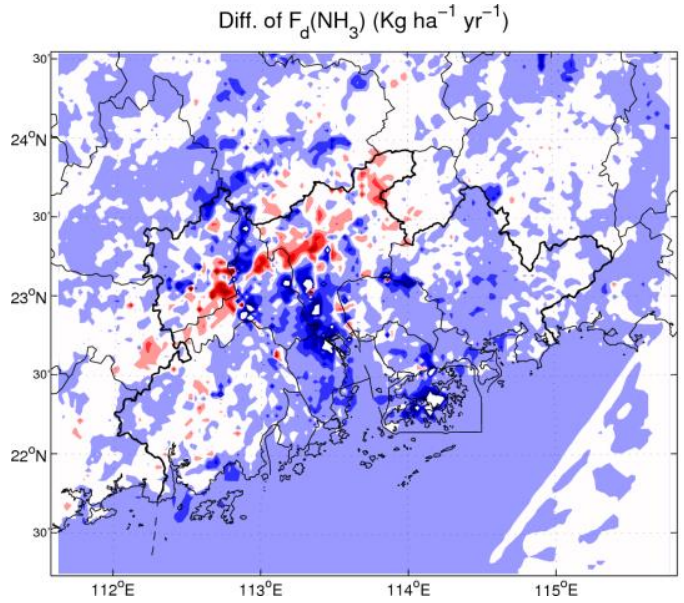
135 mm
(9.4%)

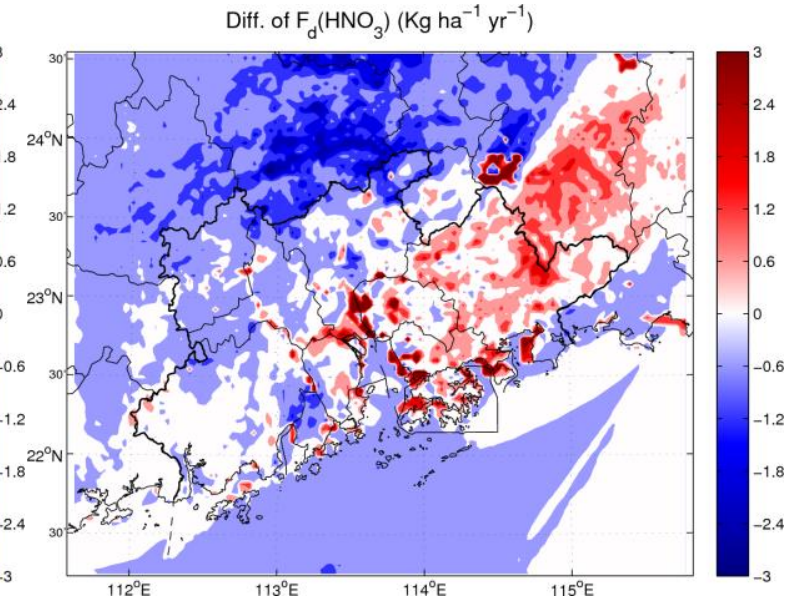




Effect to N Dry Deposition

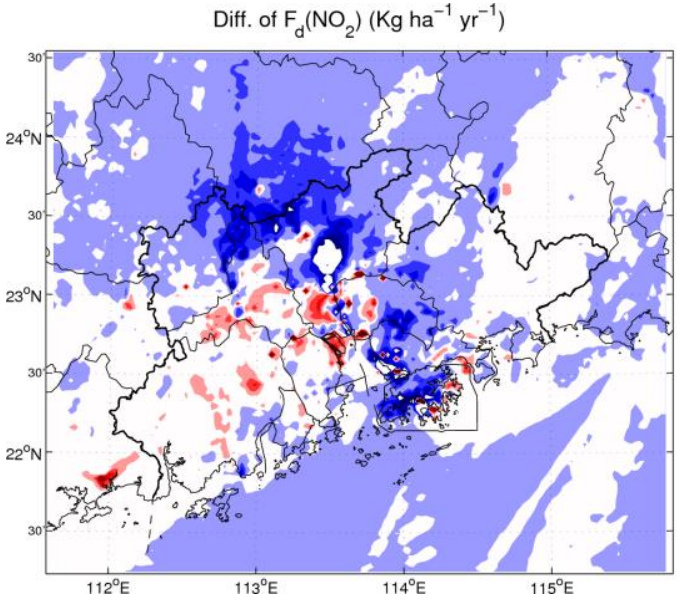
-1.1%

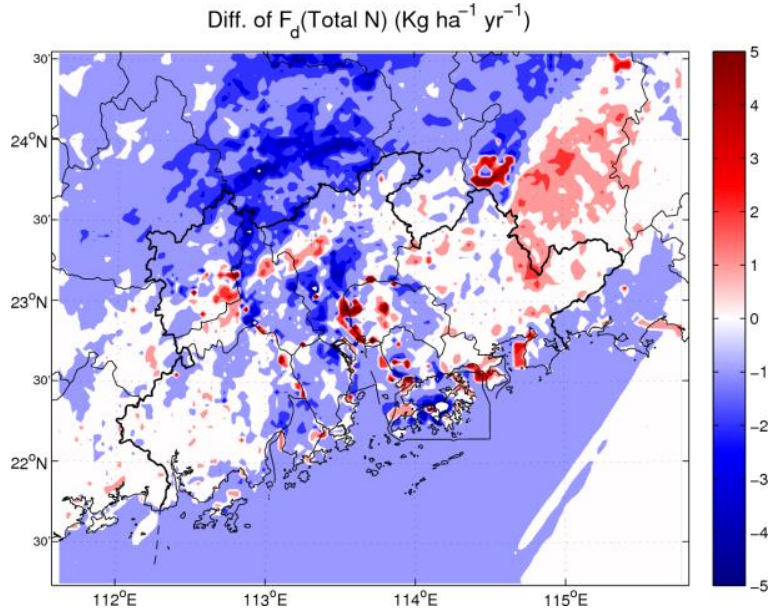




4.5%

-1.7%



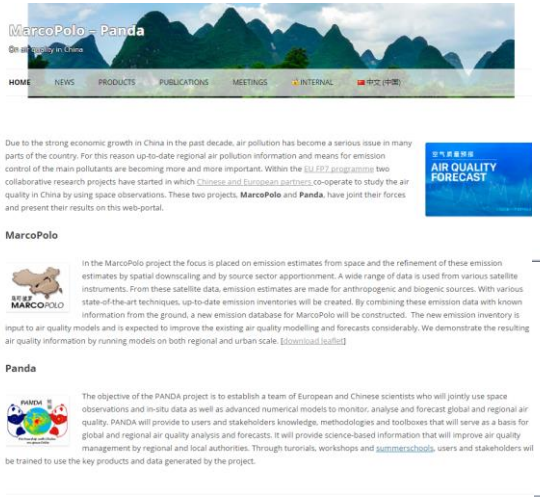


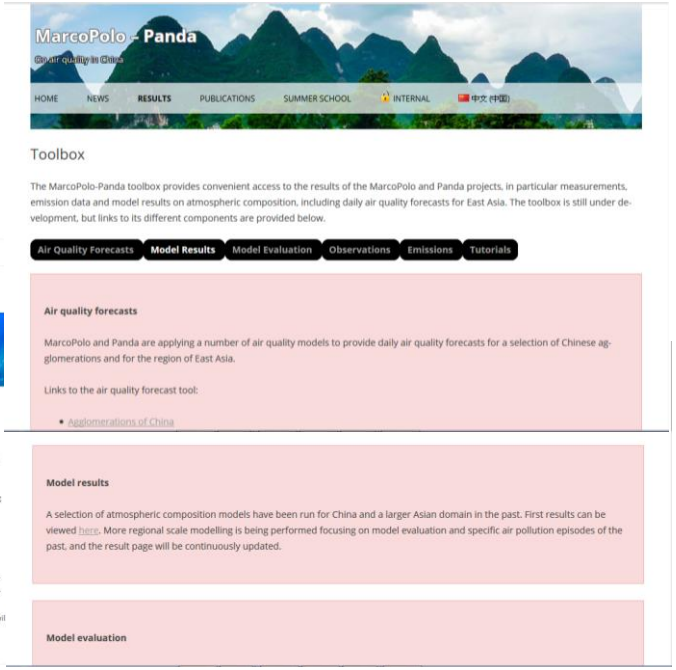
1.2%

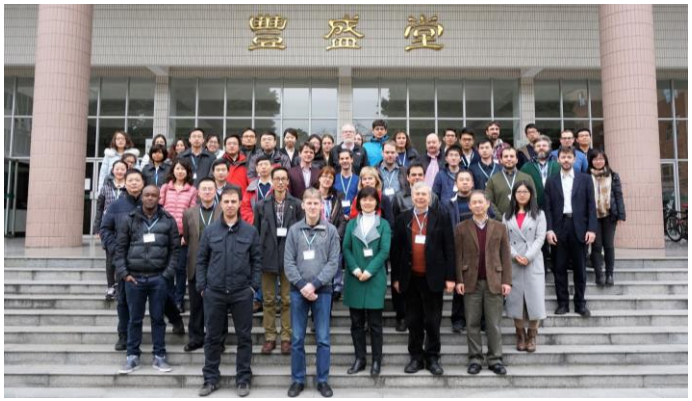
Capacity Building

- Service
  - Website
  - Toolbox
- Education
  - Workshop
  - Summer School

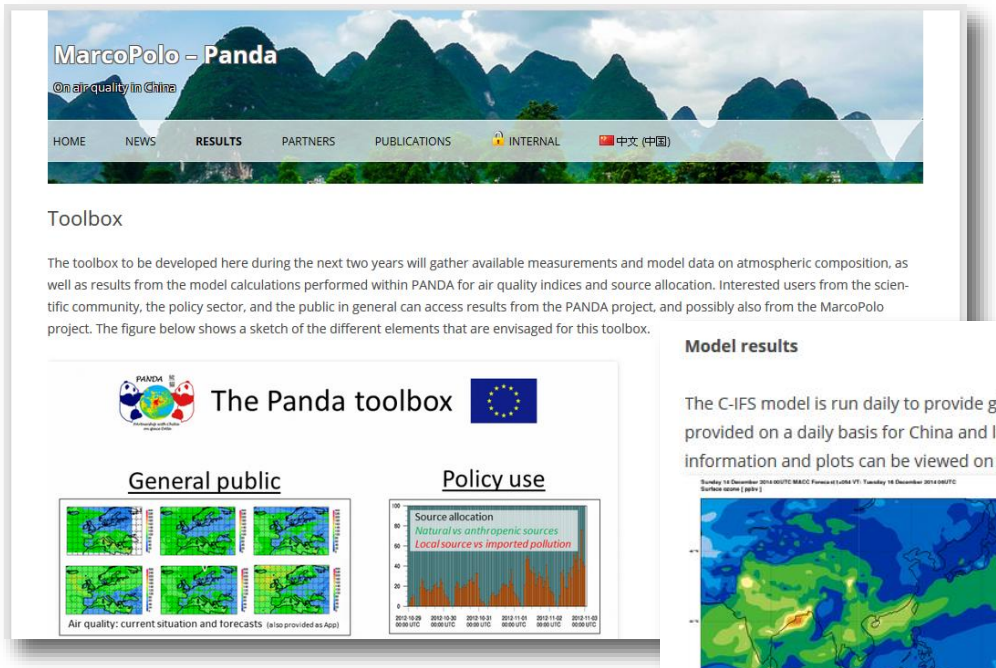
www.marcopolo-panda.eu







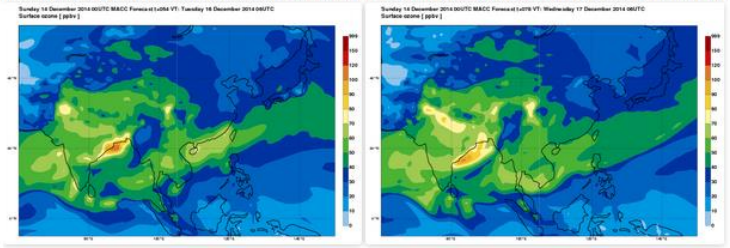
The PANDA Toolbox



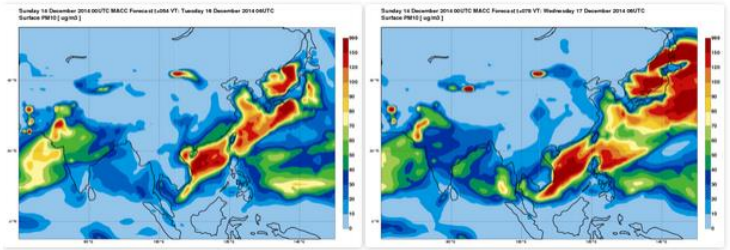
- 'Delivered' in December 2014 as D5.1
- To be further developed during the lifetime of PANDA!

Model results

The C-IFS model is run daily to provide global atmospheric composition forecasts. For the PANDA project, ozone, PM2.5 and PM10 forecasts are provided on a daily basis for China and large areas of South and Southeast Asia. In the images below, 1-day and 2-day forecasts are shown. More information and plots can be viewed on the MACC page of C-IFS forecasts for the PANDA project.



Ozone forecast for tomorrow (left) and the day after tomorrow (right), 2pm CST (UTC+8). Click images to enlarge.



PM10 forecast for tomorrow (left) and the day after tomorrow (right), 2pm CST (UTC+8). Click images to enlarge.

- Currently located at http://www.marcopolo-panda.eu/ under menu item RESULTS
- Possible collaboration between MarcoPolo and PANDA (→ the Panda-MarcoPolo toolbox?)

Education

- Summer School in Guangzhou, about 80 young scientists from 20 universities attended.

Education

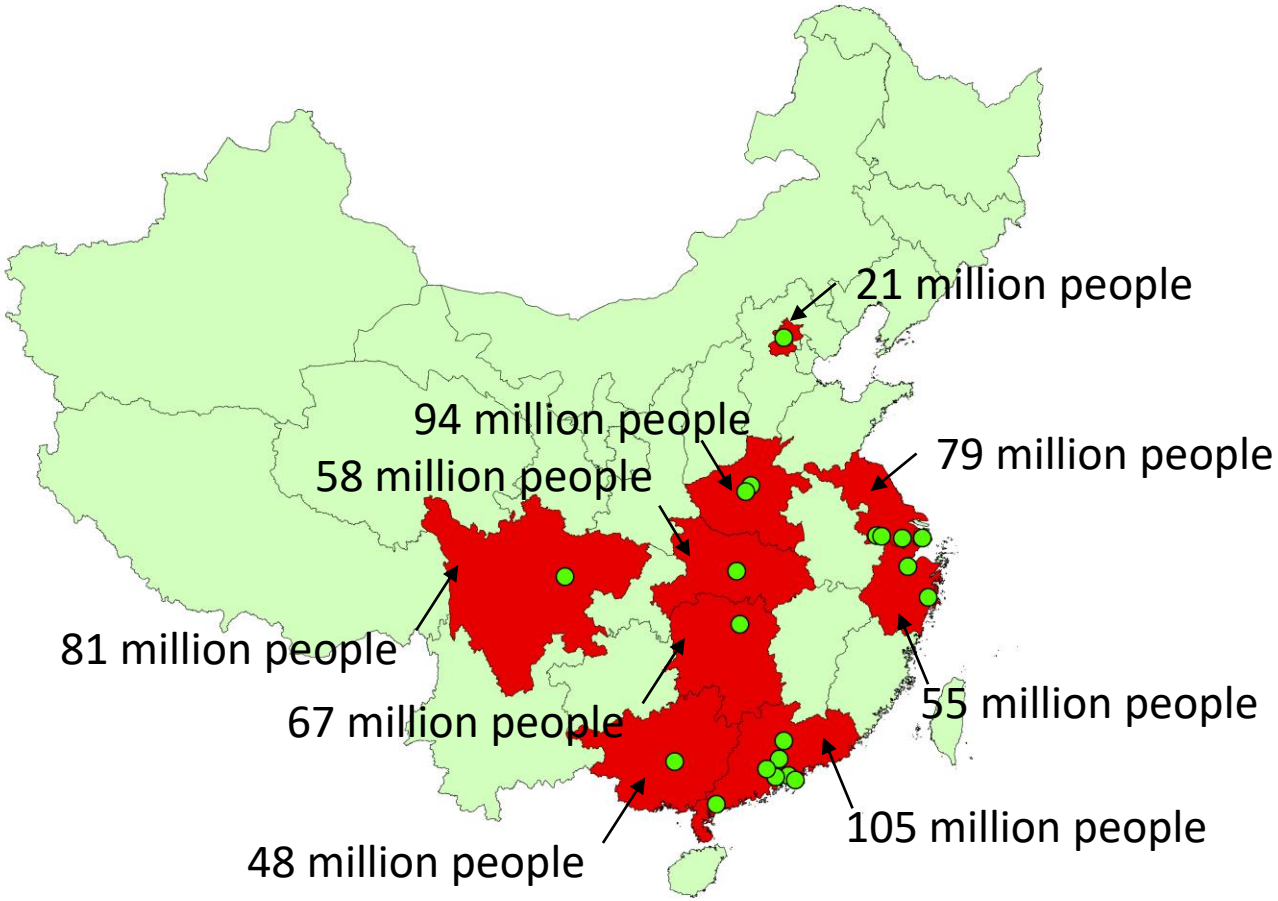
Visit Guangzhou Meteological Satellite Station

Visit Guangdong Atmospheric Supersite of China

Training Workshop To Users

Policy Makers, Government Officers, Monitoring Site Engineers…

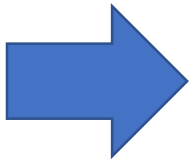
PANDA's results are used in 9 provinces and 18 cities in China,



Challenges: Lacks in air quality studies in China

Tools to obtain fast changes in

- Air pollutants distribution
- Emission inventories
- Air quality prediction



High Resolution Model Results

Thank You

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