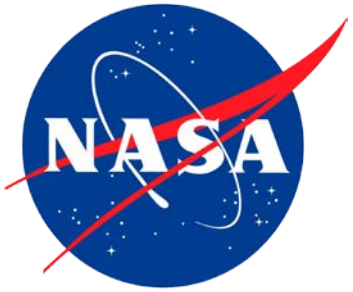
Ministry of Environment
National Institute of
Environmental Research



1 May – 14 June 2016

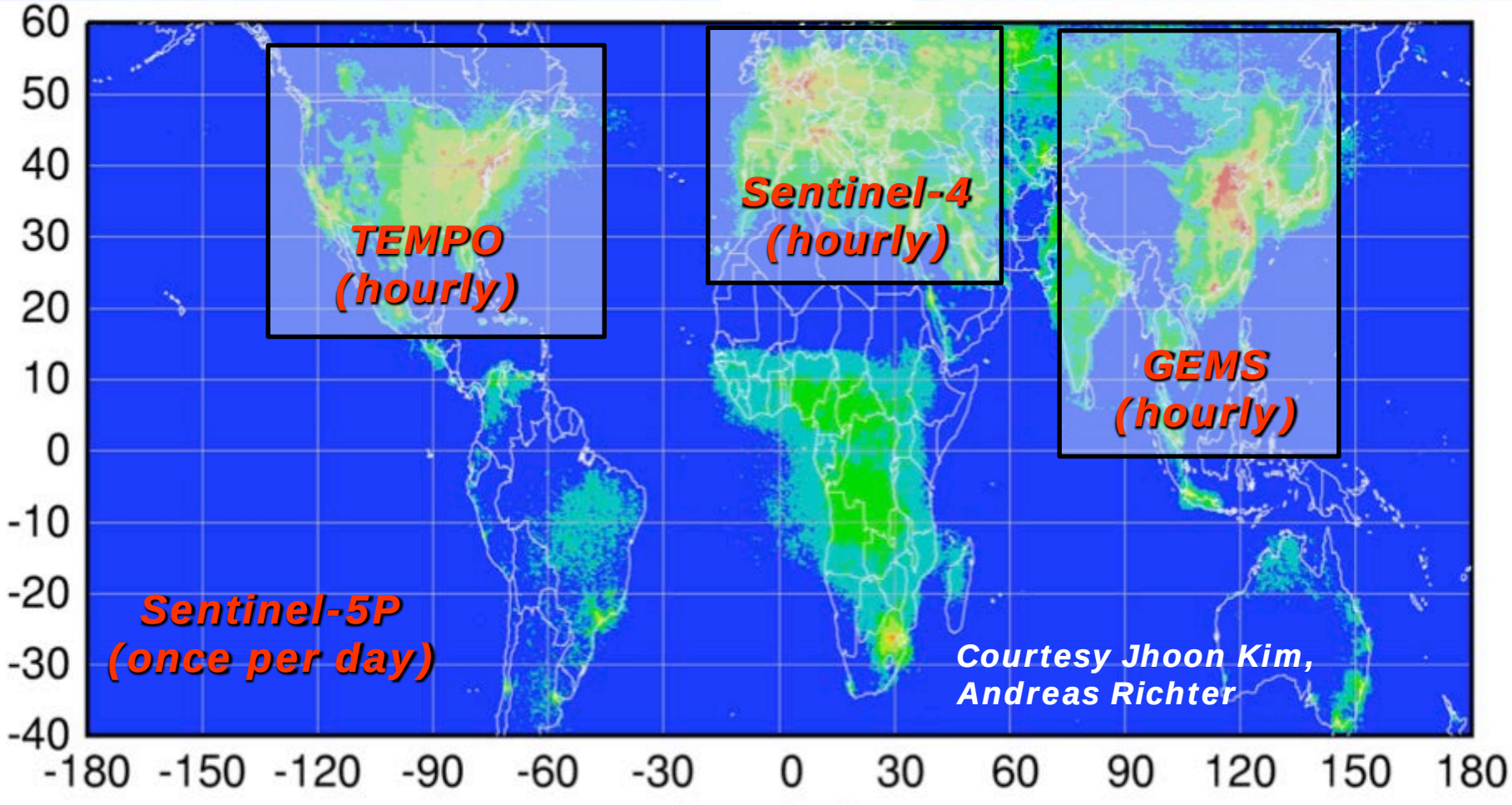
Osan Air Base, South Korea

https://espo.nasa.gov/home/korus-aq/content/KORUS-AQ

Louisa Emmons

Atmospheric Chemistry Observations and Modeling Lab, NCAR

Global Pollution Monitoring Constellation (2018-2020)



Policy-relevant science and environmental services enabled by common observations

- Improved emissions, at common confidence levels, over industrialized Northern Hemisphere
- Improved air quality forecasts and assimilation systems
- Improved assessment, e.g., observations to support United Nations Convention on Long Range Transboundary Air Pollution

KORUS-AQ

Ministry of Environment
National Institute of Environmental Research

NASA

Goals and Rationale

Science:

- Improve capability for satellite remote sensing of air quality
- Better understanding of the factors controlling air quality
- Test and improve model simulation of air quality

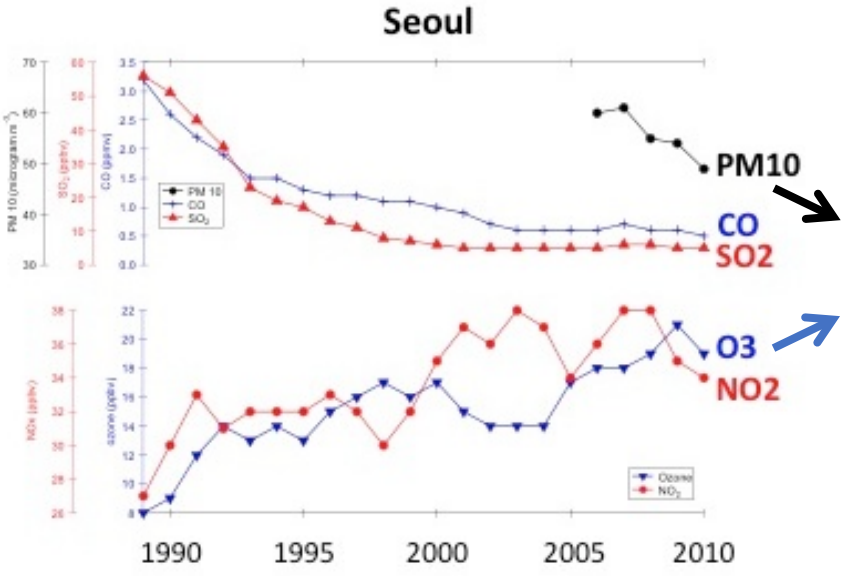
International Collaboration

Develop relationships that will enhance the global air quality satellite constellation including geostationary observations from TEMPO (NASA) and GEMS (KARI).

Capacity Building

Develop a stronger airborne science community in Korea through direct experience on the NASA DC-8 and participation in the planning of research flights.

Air quality trends and geography make Korea particularly interesting



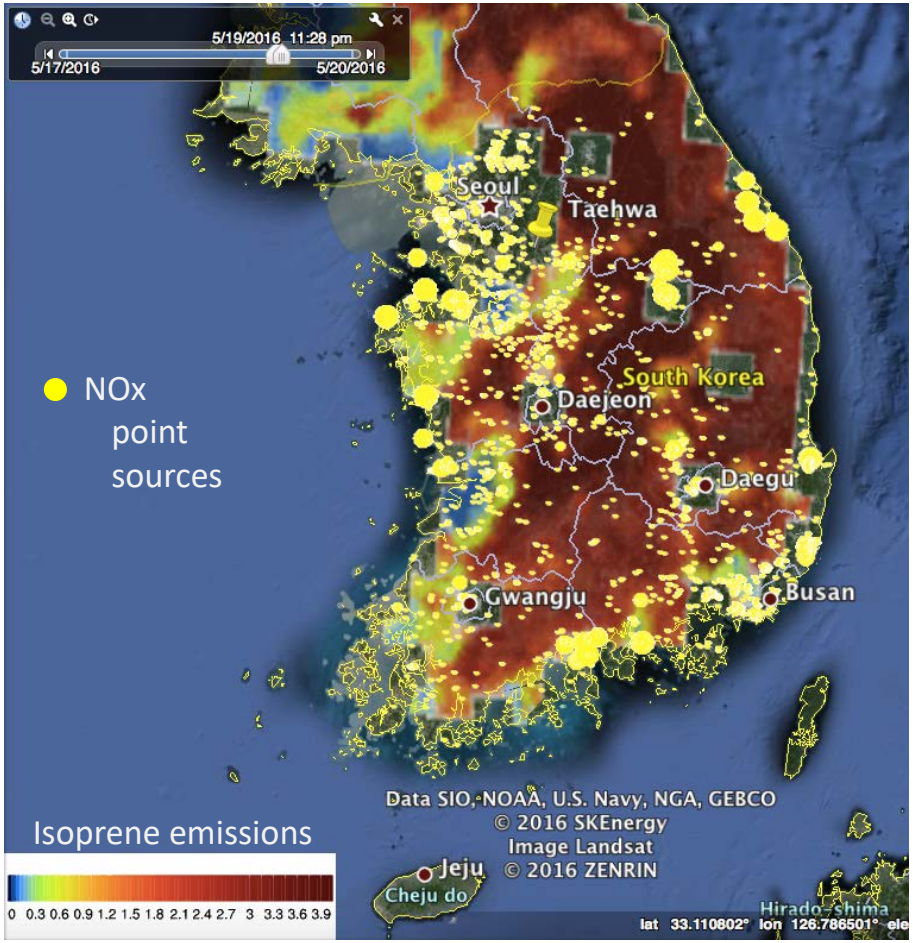
Particle emissions have dropped in recent years, but O_3 and NO_2 continue to increase in Seoul

Land cover map indicates sharp distinction between urban and natural emissions

Seoul Metropolitan Area has 25 million inhabitants, half of Korea's population

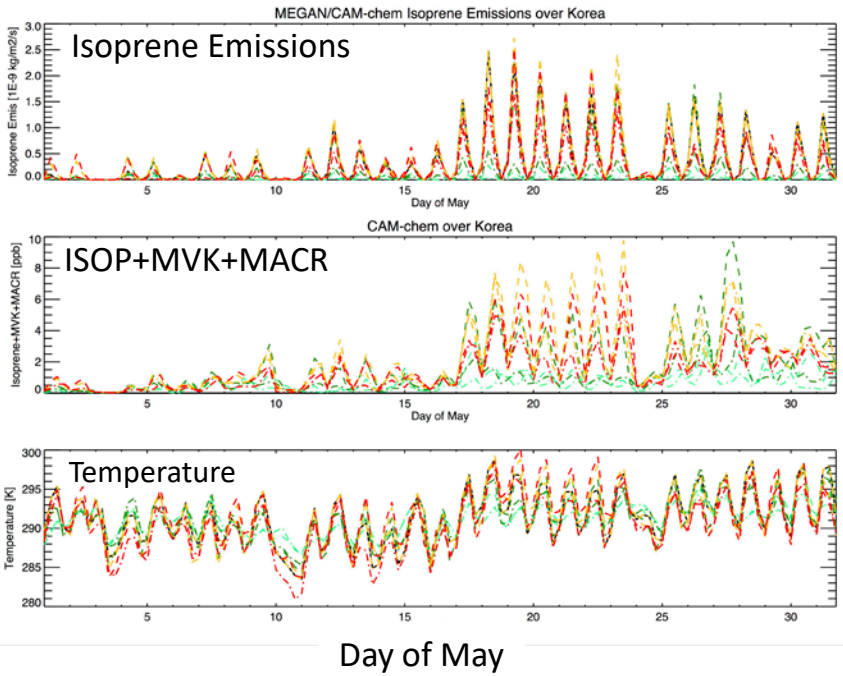
Rural regions are heavily forested

Biogenic VOCs and NOx

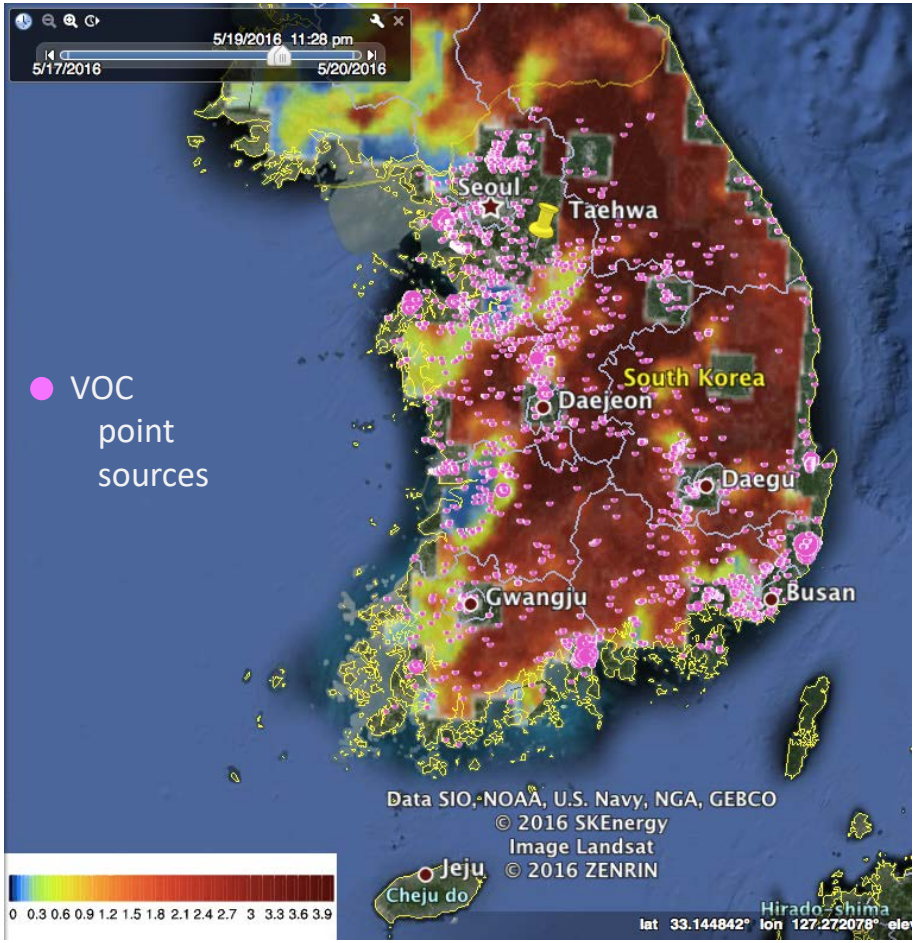


MEGAN predictions of isoprene emissions sharply increased in mid-May

Anthropogenic NOx is not confined to Seoul – many power plants on east and south coasts



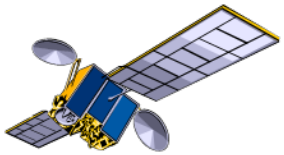
Anthropogenic VOCs are also important



- VOC point sources

Aromatics, and other anthropogenic VOCs, must also be considered as important ozone and SOA precursors

KORUS-AQ combined assets from the Korean and U.S. atmospheric science communities and their supporting organizations (NIER, NASA, Universities, etc.) to implement an integrated observing system for improving our understanding of Air Quality



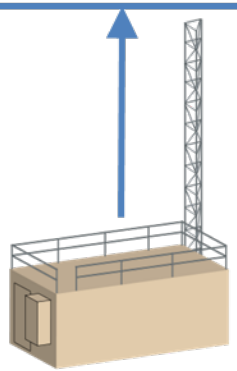
GOCI (geostationary AOD),
OMI (NO_2, O_3, AOD), MODIS (AOD),
CALIPSO (aerosol profiles),
MOPITT (CO), IASI (CO, O3, et al.),
etc.

NASA DC-8
NASA/LaRC King Air
Hanseo King Air

Model evaluation and improvement, chemical process understanding, GEMS validation and observing strategies

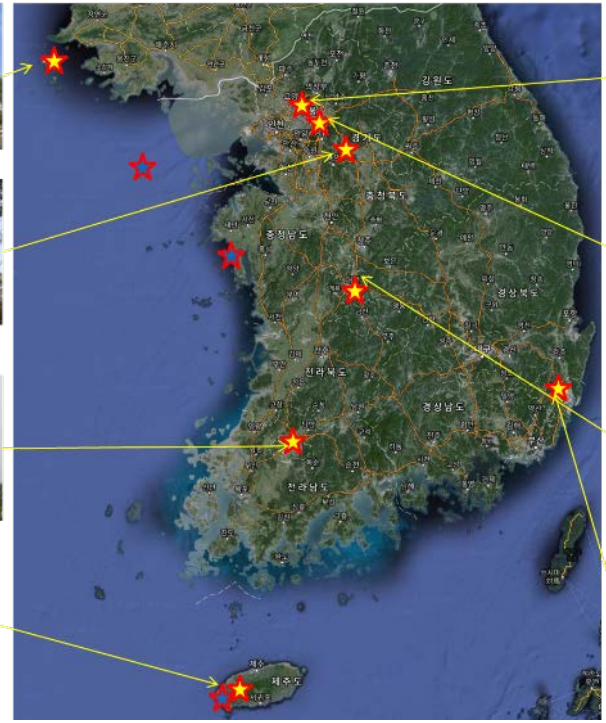
Operational Air Quality Forecasts, Regional and Global models of atmospheric composition

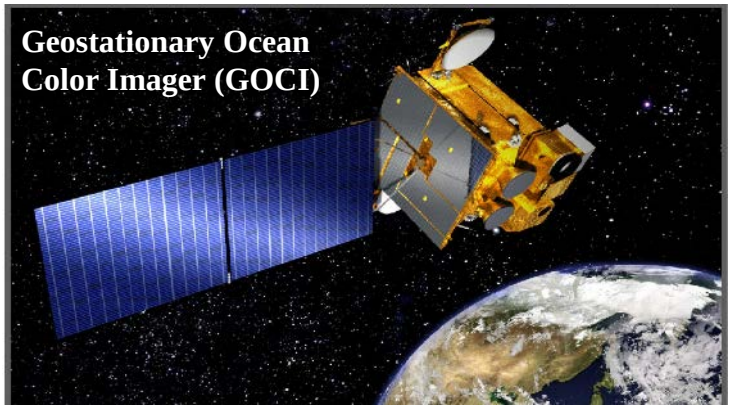
KORUS-OC



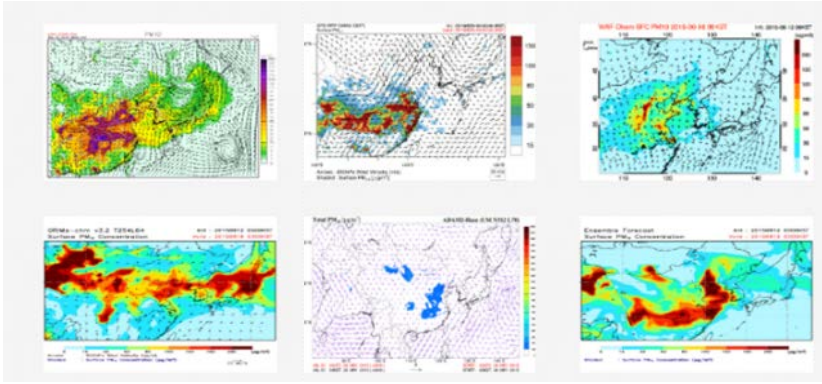
Air Quality Network, Research Sites, Research Vessels including in situ and remote sensing observations (lidar, Aeronet, Pandora)

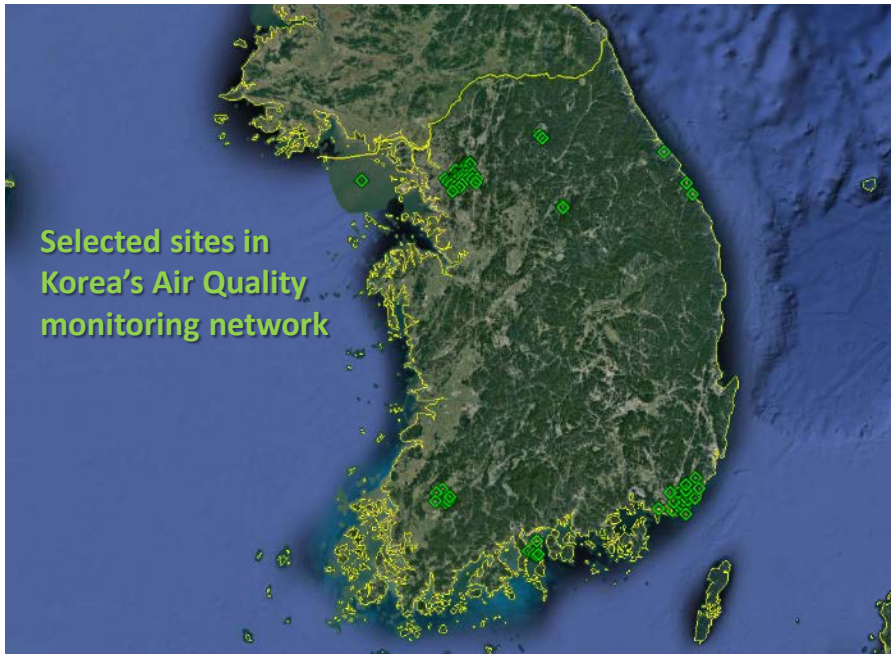
KORUS-AQ

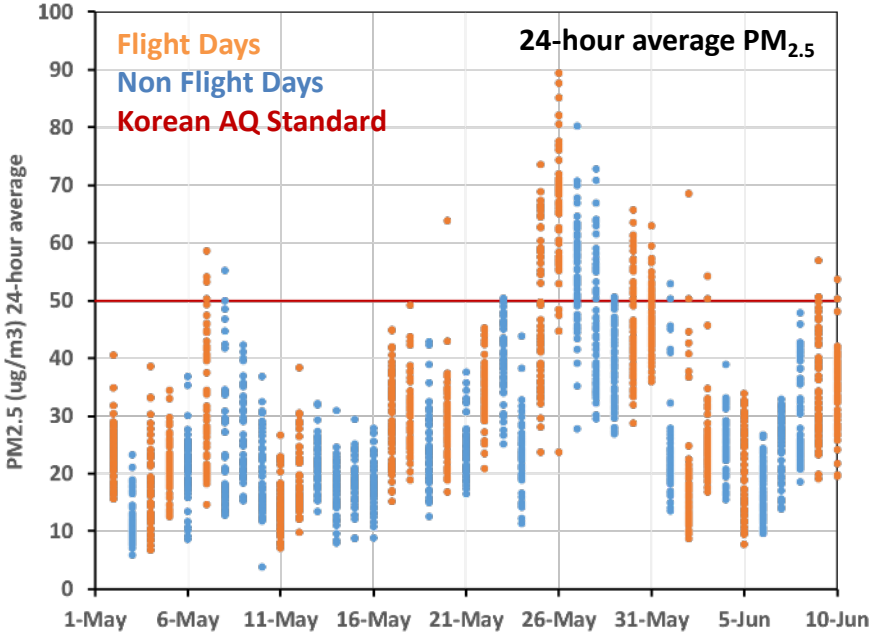


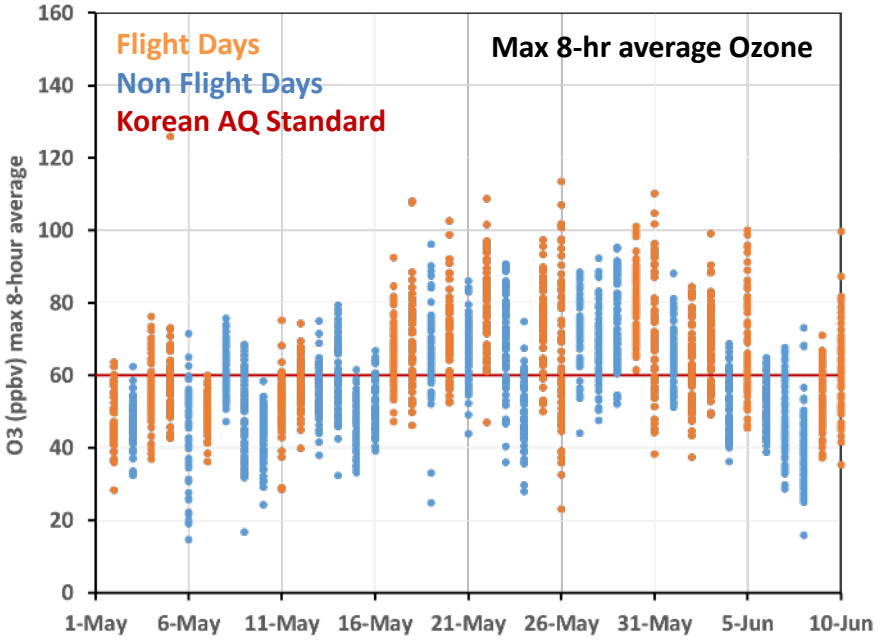


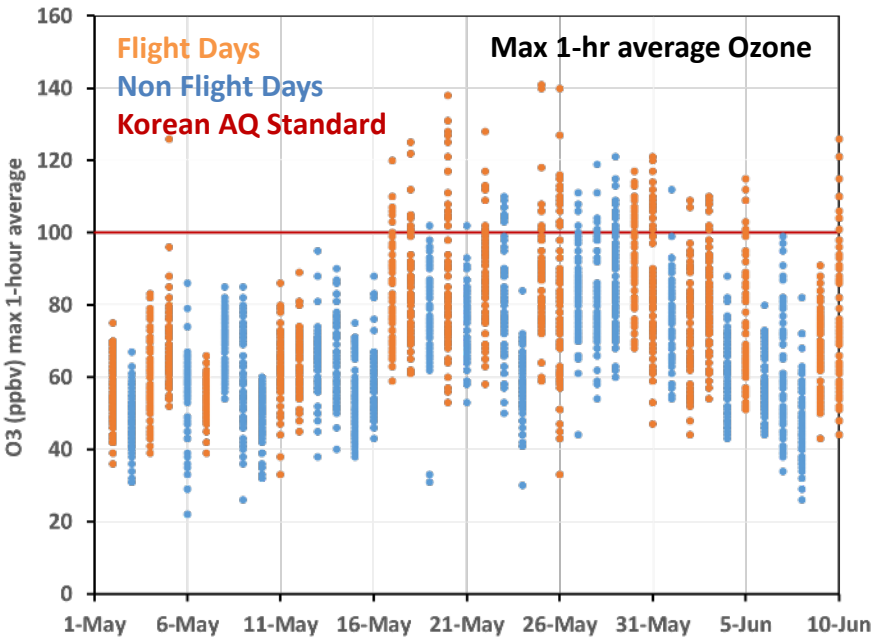
Korean and US Air Quality Model Forecasts




Selected sites in
Korea's Air Quality
monitoring network


Flight Days
Non Flight Days
Korean AQ Standard
24-hour average PM2.5
PM2.5 (ug/m3) 24-hour average
100
90
80
70
60
50
40
30
20
10
0
1-May
6-May
11-May
16-May
21-May
26-May
31-May
5-Jun
10-Jun


Flight Days
Non Flight Days
Korean AQ Standard
Max 8-hr average Ozone
O3 (ppbv) max 8-hour average
160
140
120
100
80
60
40
20
0
1-May
6-May
11-May
16-May
21-May
26-May
31-May
5-Jun
10-Jun


Flight Days
Non Flight Days
Korean AQ Standard
Max 1-hr average Ozone
O3 (ppbv) max 1-hour average
160
140
120
100
80
60
40
20
0
1-May
6-May
11-May
16-May
21-May
26-May
31-May
5-Jun
10-Jun

Complimentary aircraft payloads and flight patterns

Large payload
- Trace gases
- Aerosol composition and properties
- Lidar: ozone, aerosol properties
- Actinic flux (photolysis)

Long range (8 hrs)

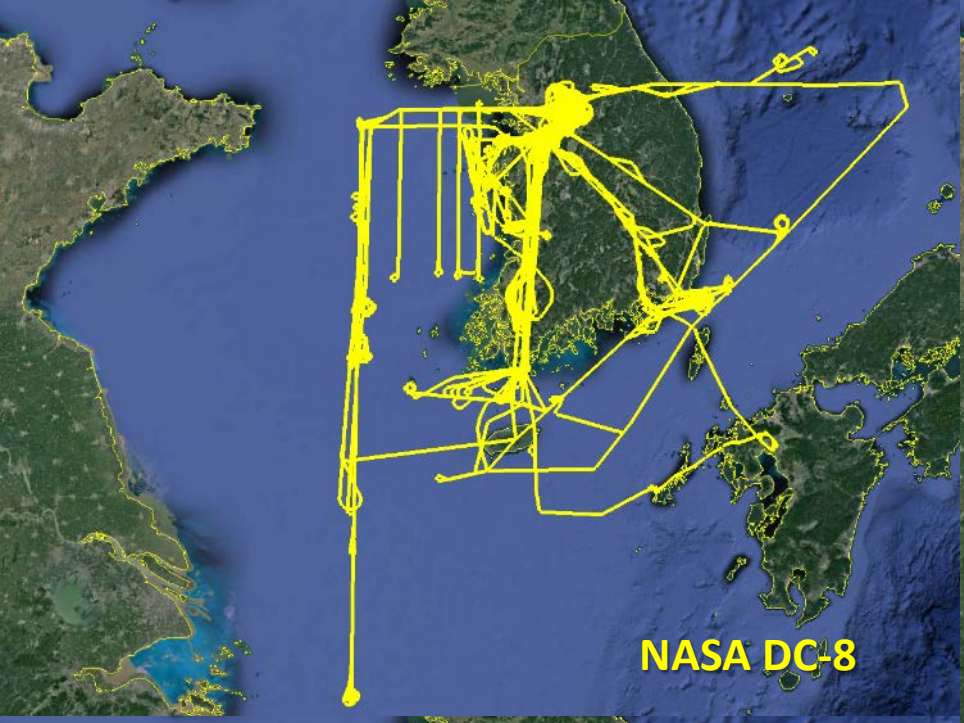
Profiling surface – 8 km

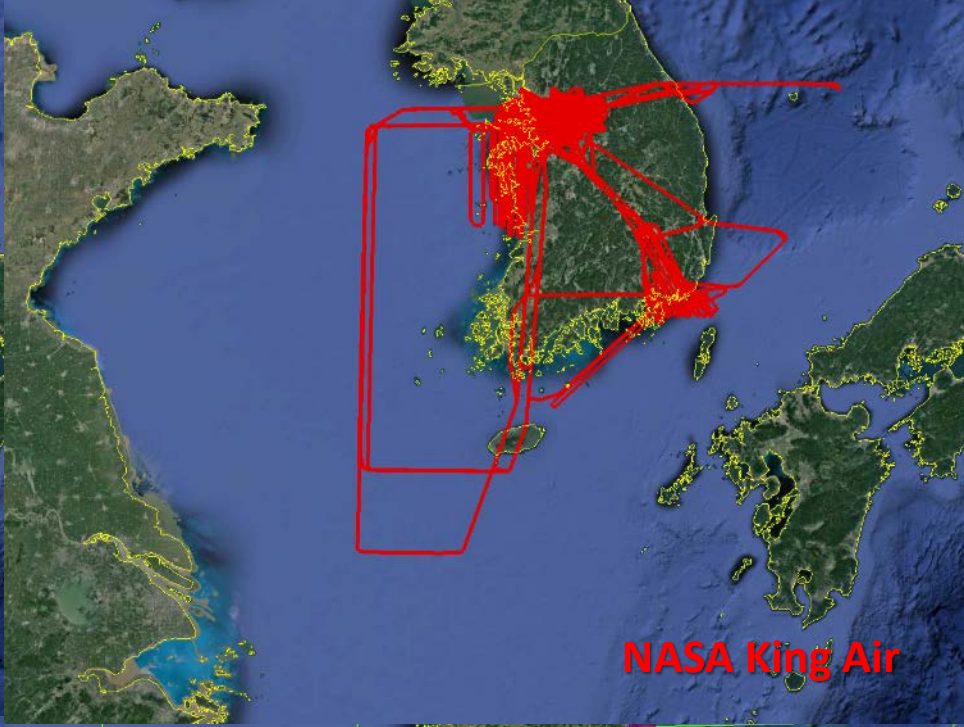
Small payload of remote sensors
- Geo-TASO (TEMPO simulator)
- MOS (ocean color)

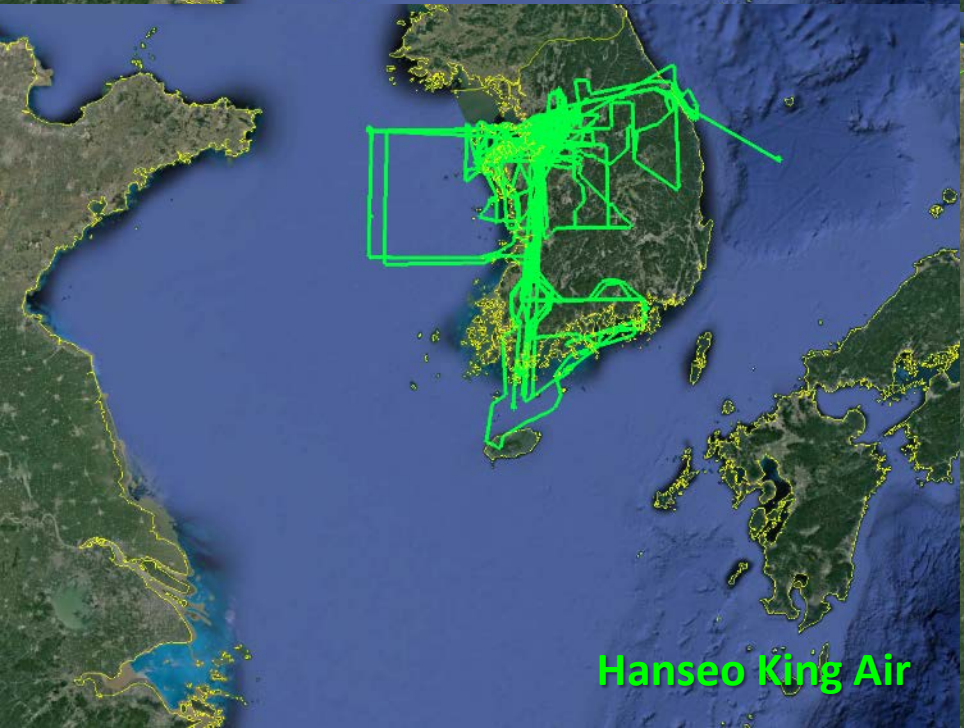
Constant altitude (~8 km)

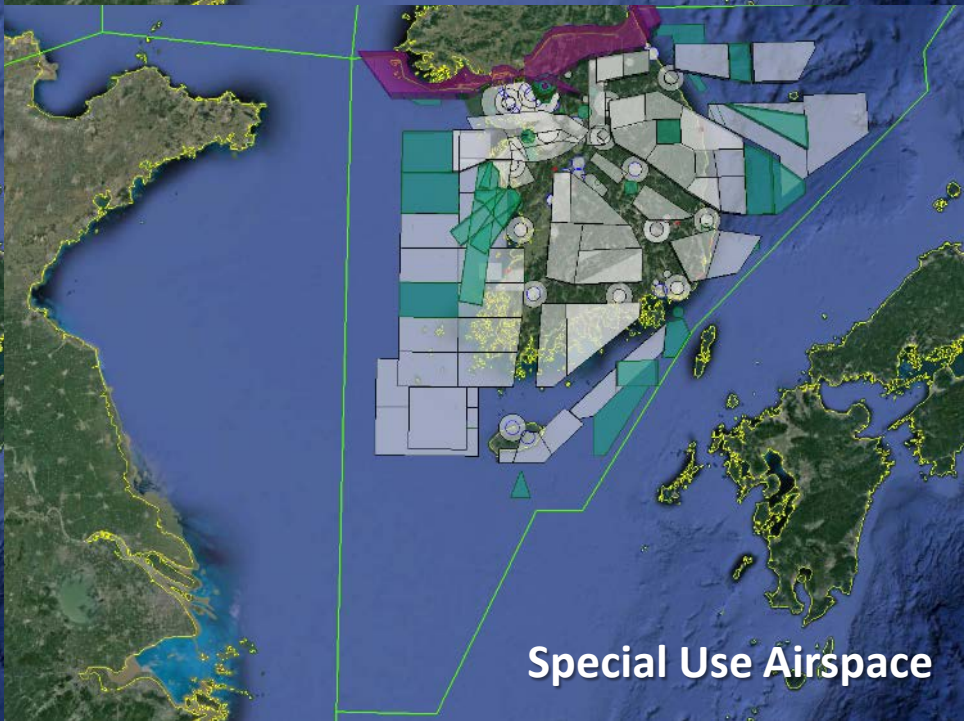
Small payload
- O_3, CO, SO_2, formaldehyde, VOCs, aerosols

Low altitude (0-4 km)


NASA DC-8


NASA King Air


Hanseo King Air


Special Use Airspace

KORUS-AQ

Ministry of Environment
National Institute of Environmental Research

NASA

Repetitive sampling by the DC-8 over research sites in Seoul and adjacent rural areas

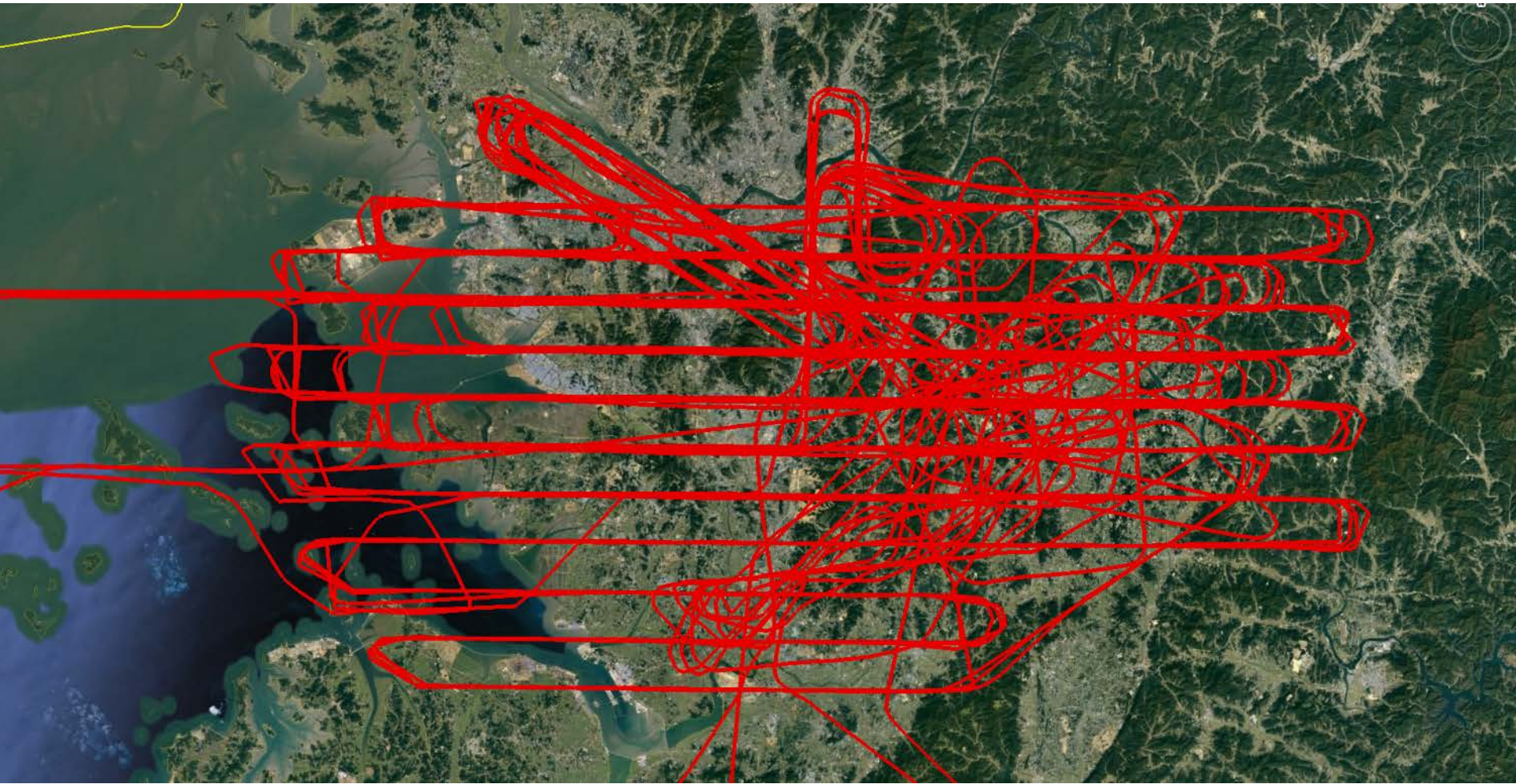
Photos by J. Crawford

KORUS-AQ

Ministry of Environment
National Institute of Environmental Research

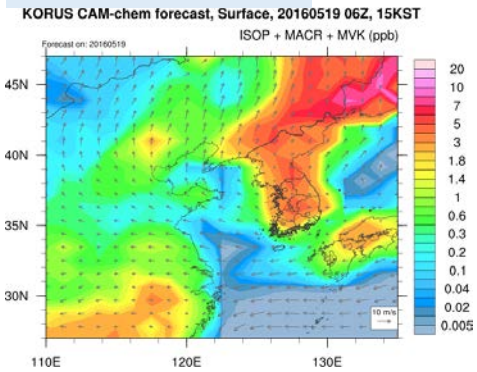
NASA

Repetitive sampling by the NASA King Air to map emissions over the Seoul Metropolitan Area and adjacent rural areas

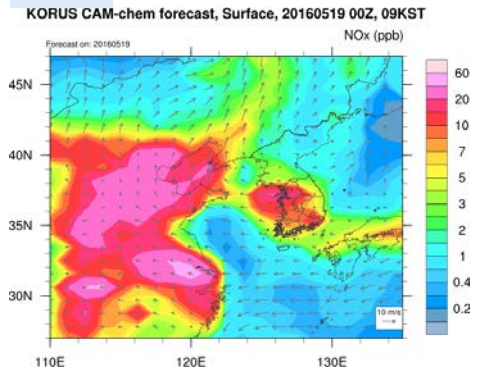


Chemical forecasts

ISOP+MACR+MVK



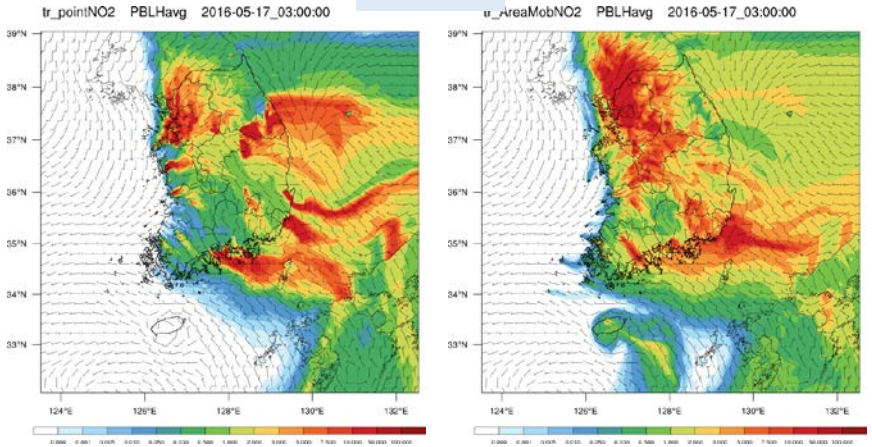
NOx



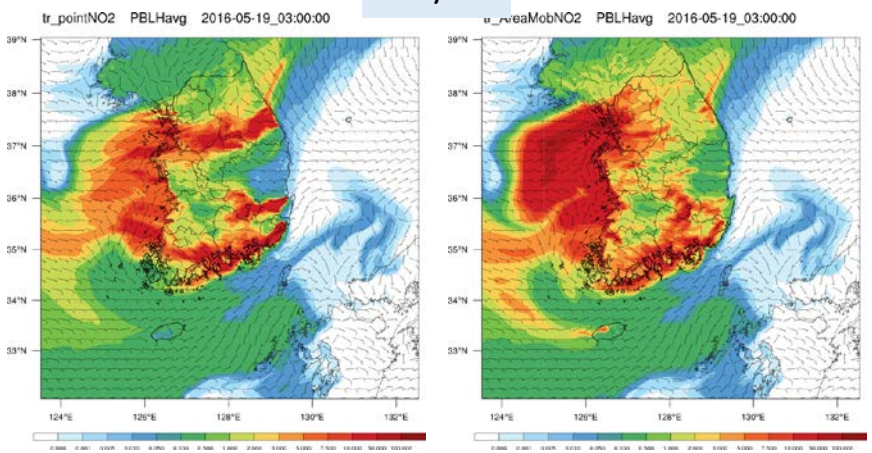
NOx point sources

NOx mobile sources

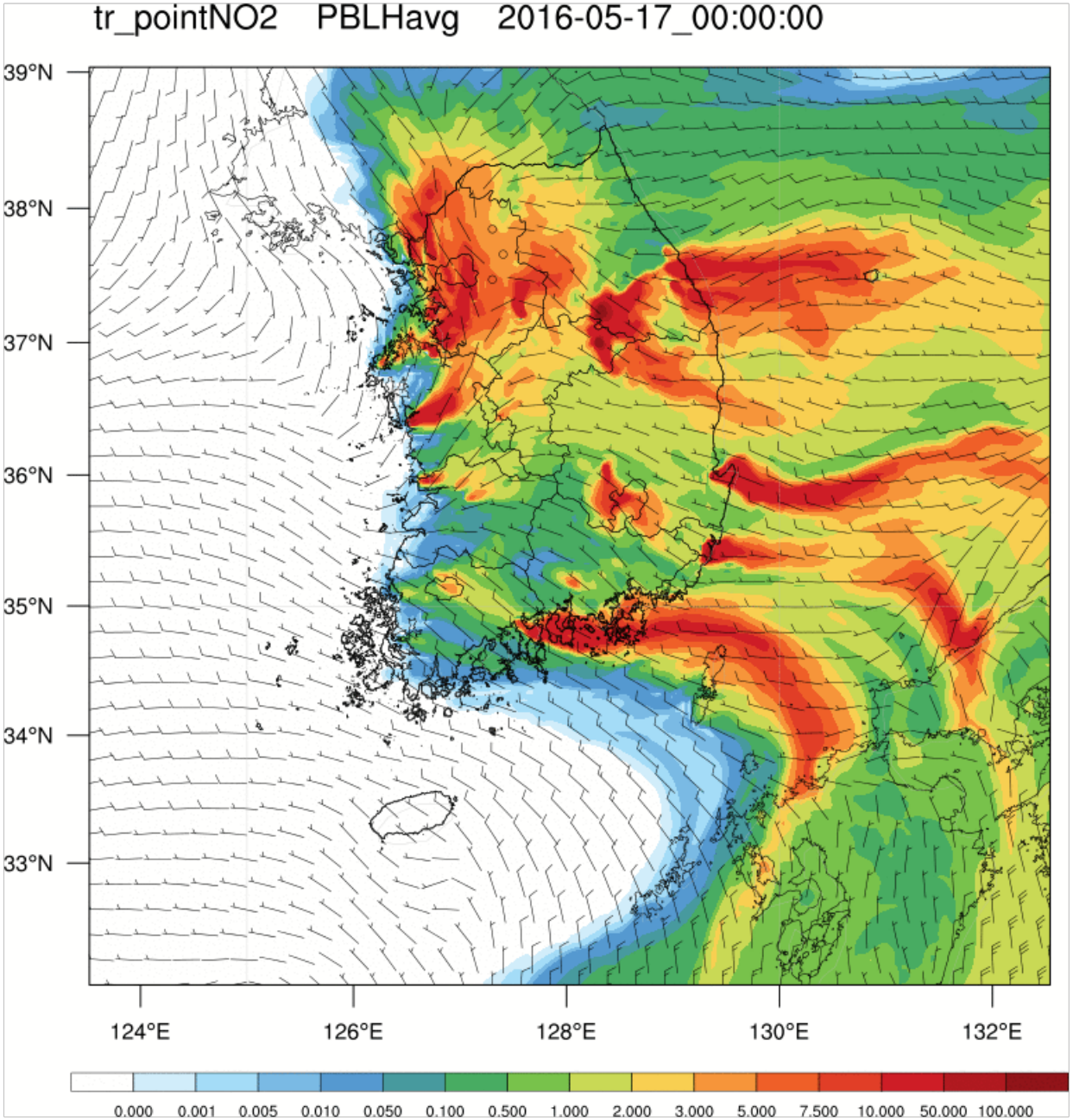
May 17



May 19

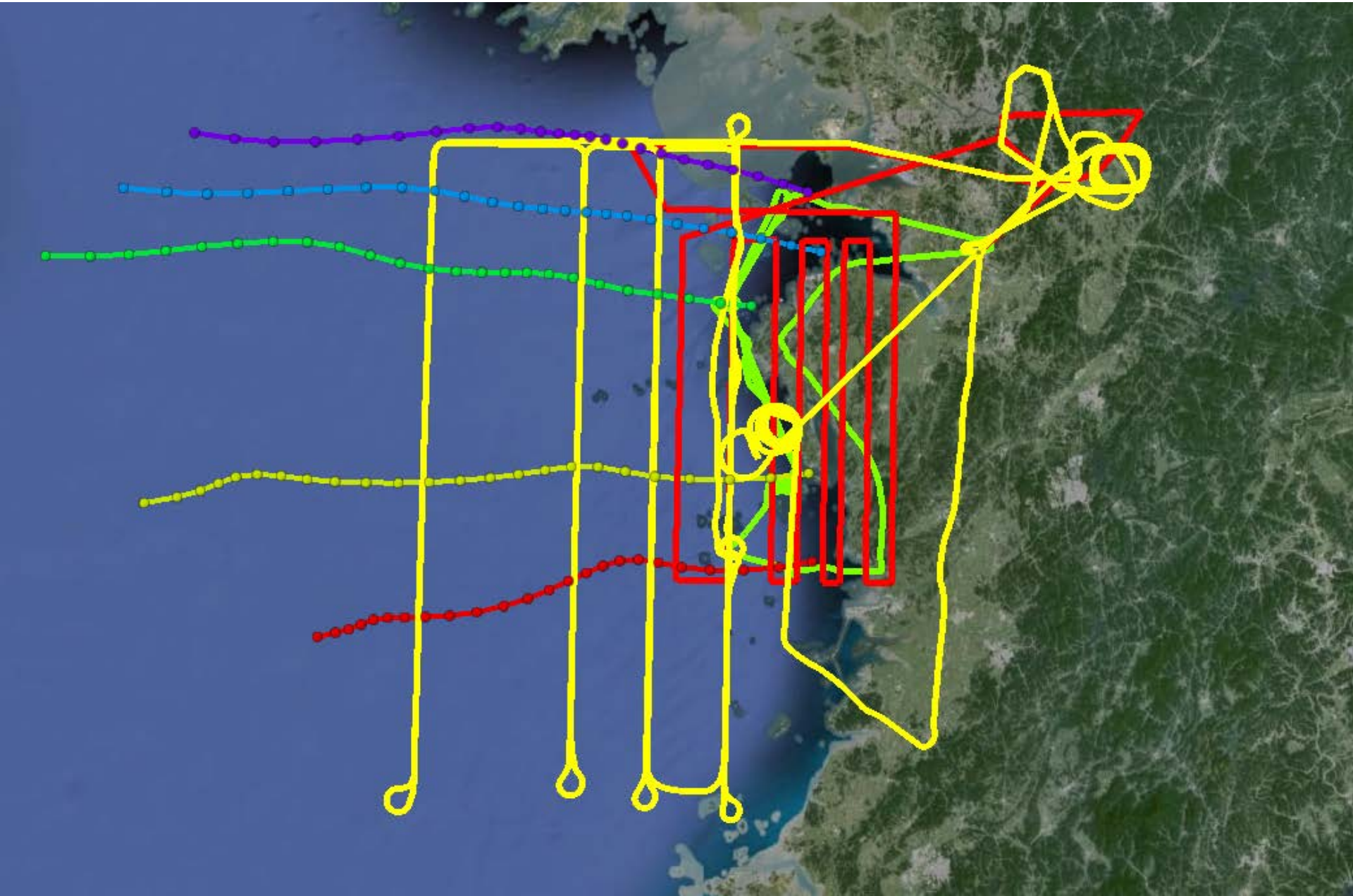


WRF-Tracer forecast of point sources



Thanks to
G. Pfister
A. Mizzi

Cooperative sampling of Power Plant and Seoul Emissions over the West Sea



KORUS-OC: An International Cooperative Ocean Color Field Study in Korea

KIOST
KOREA INSTITUTE OF OCEAN SCIENCE & TECHNOLOGY

- **A joint study led by the Korea Institute of Ocean Science and Technology (KIOST) and NASA**
- **Field study (20 May – 6 June 2016) will focus on the links between satellite and ship-based measurements of ocean color, biology and biogeochemistry as well as atmospheric composition.**
- **Korea has a geostationary satellite for ocean color and aerosol optical depth (GOCI) and is building a second-generation sensor GOCI-II.**
- **Figure shows May 20 overflight of ship stations**

KOREA-UNITED STATES OCEAN COLOR STUDY
KORUS-OC
KIOST • NASA

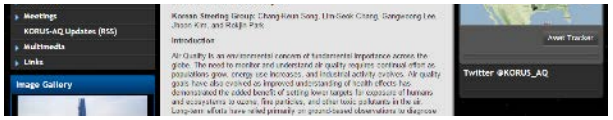
KORUS-AQ

Ministry of Environment
National Institute of Environmental Research

NASA

Website

http://www-air.larc.nasa.gov/missions/korus-aq/index.html



Data Archive

https://espo.nasa.gov/home/korus-aq/content/KORUS-AQ

Also find blogs, photos, videos, and more by searching “NASA Earth Expeditions KORUS-AQ”