Ministry of Environment
National Institute of Environmental Research

2 May – 14 June 2016

Status of the 1st KORUS-AQ and Introduction of next research

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Questions Addressed

1. Can we identify a) the portion of aerosol derived from secondary production in SMA and across Korea, and b) the major sources and factors controlling its variation?
2. Is ozone formation in Seoul NOx limited or VOC limited? Can we determine the biogenic or natural contributions to ozone production?
3. How well do KORUS-AQ observations support current emissions estimates (e.g., NOx, VOCs, SO_2, NH_3) by magnitude and sector?
4. How significant is the impact of the large point sources along the west coast on the air quality of SMA temporally and spatially?
5. How is Seoul affected by transport of air pollutants from their sources at regional, continental, and hemispheric scales?

Goals and Rationale of KORUS-AQ

Science

- Improve capability for satellite remote sensing of air quality
- **Better understand the factors controlling air quality**
- Test and improve model simulations of air quality

International Collaboration

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

Social Impact

Provide guidance on measures to improve air quality in Korea

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NASA

KORUS-AQ combined assets from the Korean and U.S. atmospheric science communities and organizations (NIER, NASA, Universities, etc.) to implement an integrated observing system to study air quality in Korea

Airborne sampling

Provides critical view for evaluation strategies in connecting ground-based and satellite observations, but is short term

Satellites

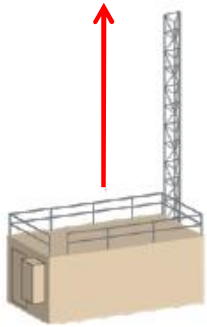
Provide broad coverage, continuity, but it needs reliable information on near-surface information

KORUS-AQ Goals

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

Ground monitoring

Will continue to be the primary method for monitoring exposure, but coverage is limited



Modeling

Provides air quality forecasting and warning service, but requires reliable information of emissions and accurate meteorology

Multiplatform Observations

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NASA DC-8

LaRC King Air

Hanseo King Air

Baengnyeong

Mt. Taehwa

Gwangju

Jeju

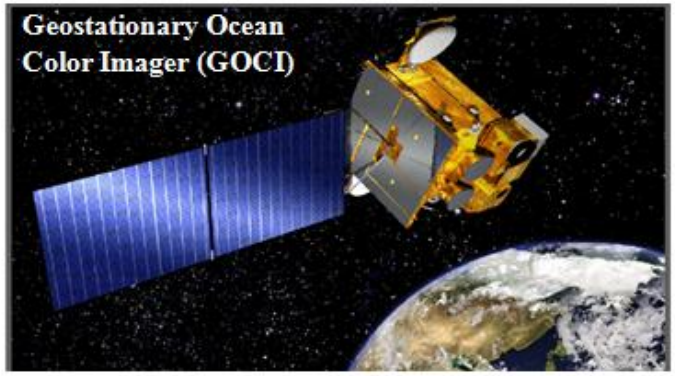
Seoul

Olympic Park

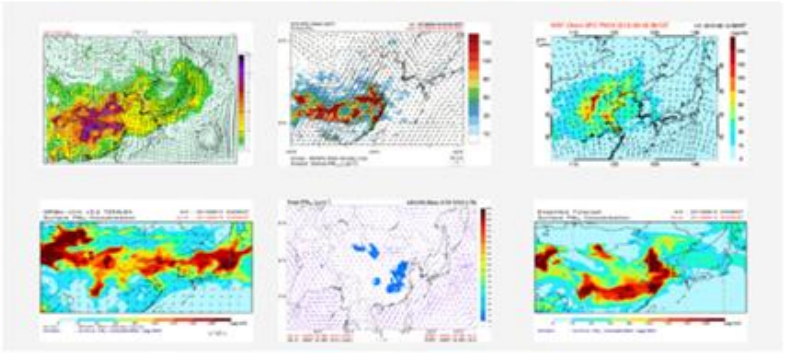
Daejeon

Ulsan

Geostationary Ocean Color Imager (GOCI)



Korean and US Air Quality Model Forecasts



RV Onnuri

RV Kissng

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Summary of Observations

Participants	130 research groups, 580 participants
Aircrafts	• DC-8 : 20 flights, 150 hrs, measurement of over 200 air pollutants and parameters • B200 : 30 flights, 124 hrs, carried GEO-TASO simulator • Hanseo King Air : 32 flights, 120 hrs, supported NASA King Air and flew near point sources
On-ground	• 3 major sites : Olympic Park, Taewha Forest, Baengnyeong Island • 5 NIER supersites, 3 NIMR monitoring sites, and 5 other sites
Remote sensing	• 18 AERONET sites, 8 Pandora sites, 6 LIDAR sites • Ozone Lidar in Taewha, HSRL in Seoul
Vessels	• R/V Kisang (NIMR) : 17 transits between Incheon and Mokpo • R/V Onnuri : KORUS-OC • R/V Jang Mok
Satellites	GOCI, OMI, MODIS, CALIPSO, IASI, etc.
Modeling	10 models with common emissions inventory

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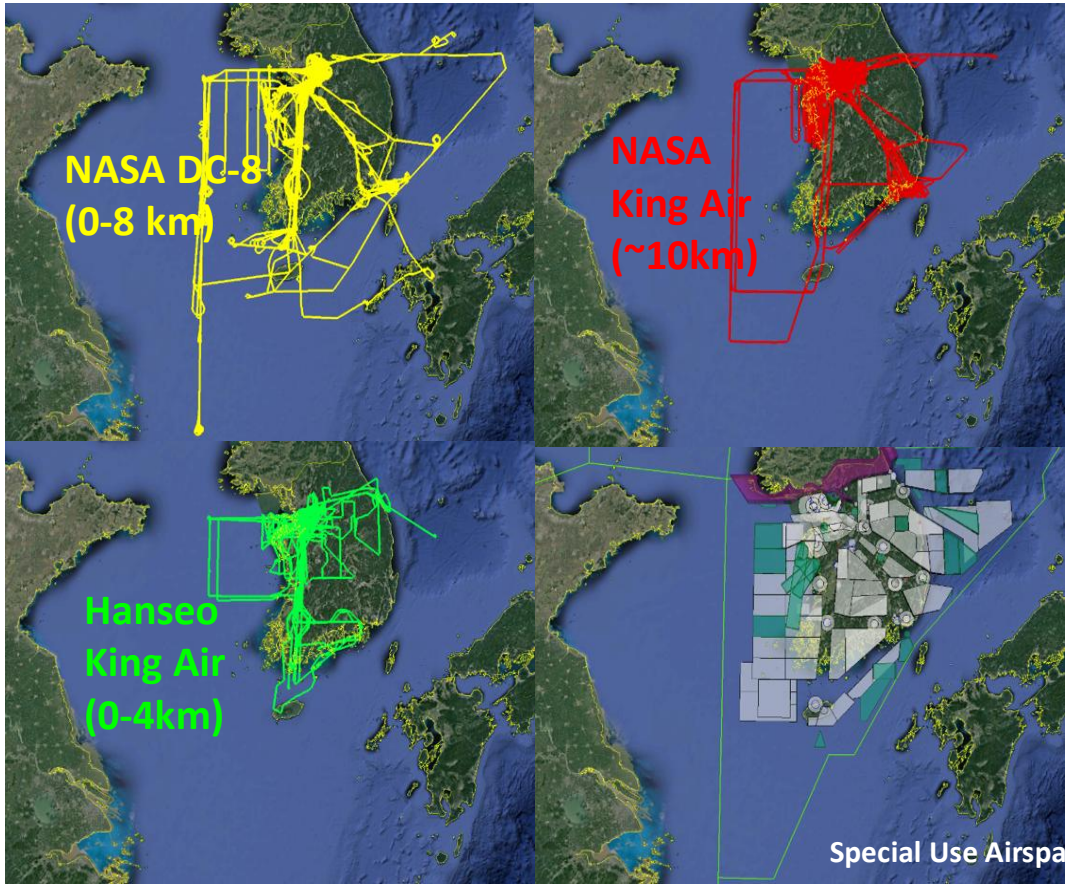
Model forecasts guided flight plans

Models played a critical role

- Forecasts from 10 models (6 Korea, 4 US)
- Daily forecasting briefing
- Weather, O_3, NO_2, CO, SO_2, PM, etc.

Flight plan design

- Sampled chemical evolution of the Seoul
- plume and point sources



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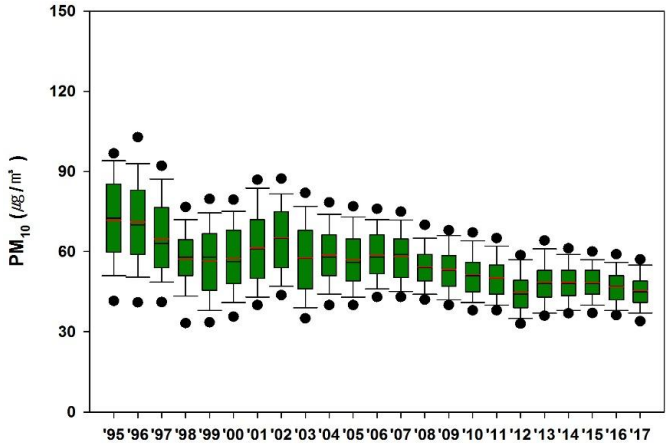
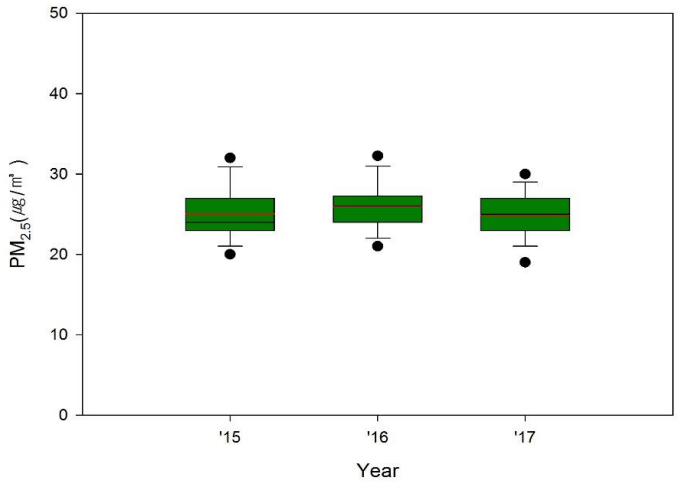
NASA King Air **NASA DC-8** **Hanseo King Air**

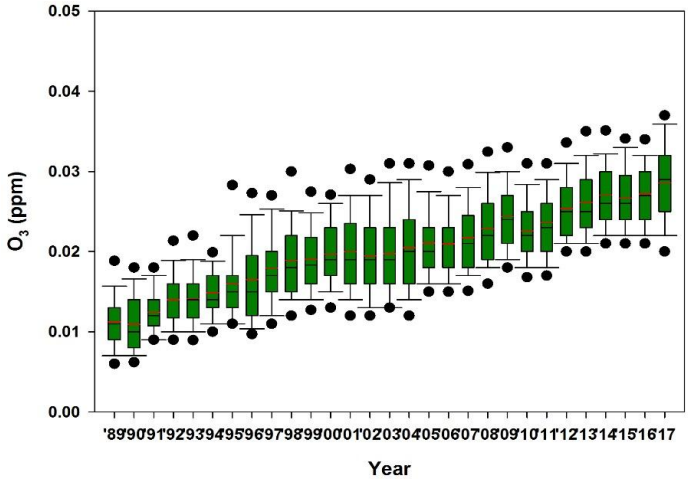
Summary and Recommendations

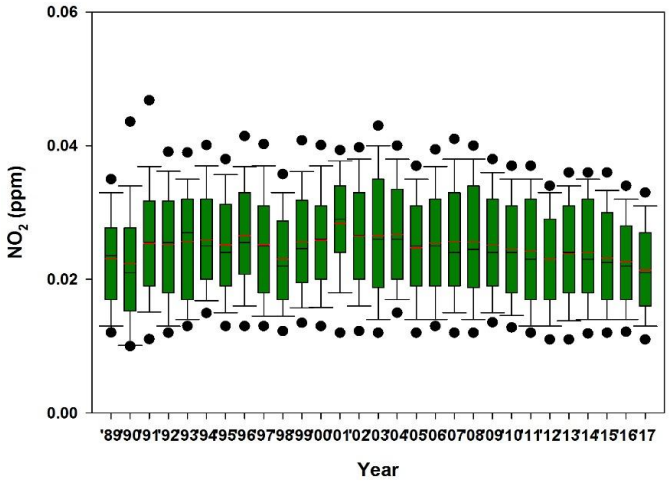
1. **Reducing emissions of NOx and VOCs, particularly aromatics such as toluene, will reduce formation of both fine particle and ozone pollution.**
2. **Emissions inventories must be further evaluated and improved to allow for accurate air quality modeling to be performed.**
3. **Point source impacts on ozone and fine particle pollution are strongest in the southern portion of SMA, and there are also localized impacts of toxic compounds that need to be addressed.**
4. **The impact of sources outside Korea varies greatly with seasons and requires further study.**

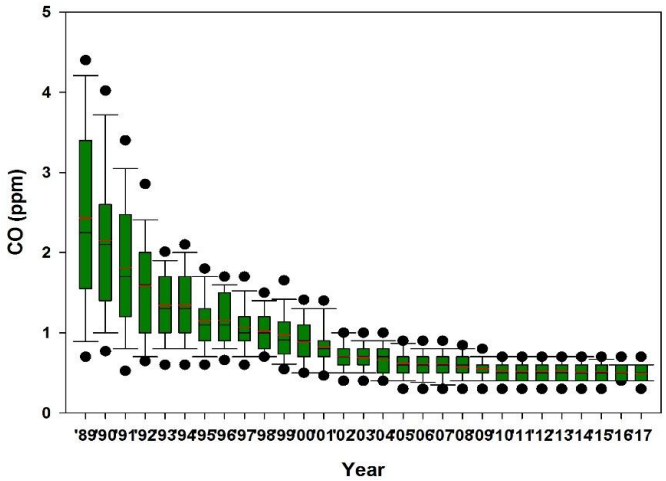
Status of Air Quality in Korea

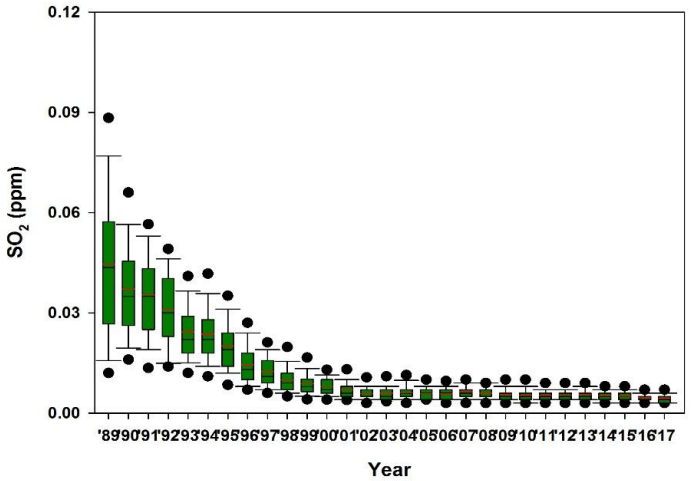












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Future schedule of the 1st KORUS-AQ

1. Research workshop of the 1st KORUS-AQ (June 2019, Korea)
2. Publication of the final report of the 1st KORUS-AQ by the end of 2019

Future plan of the next research

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Plan of Korea's pre-campaign in preparation for next research

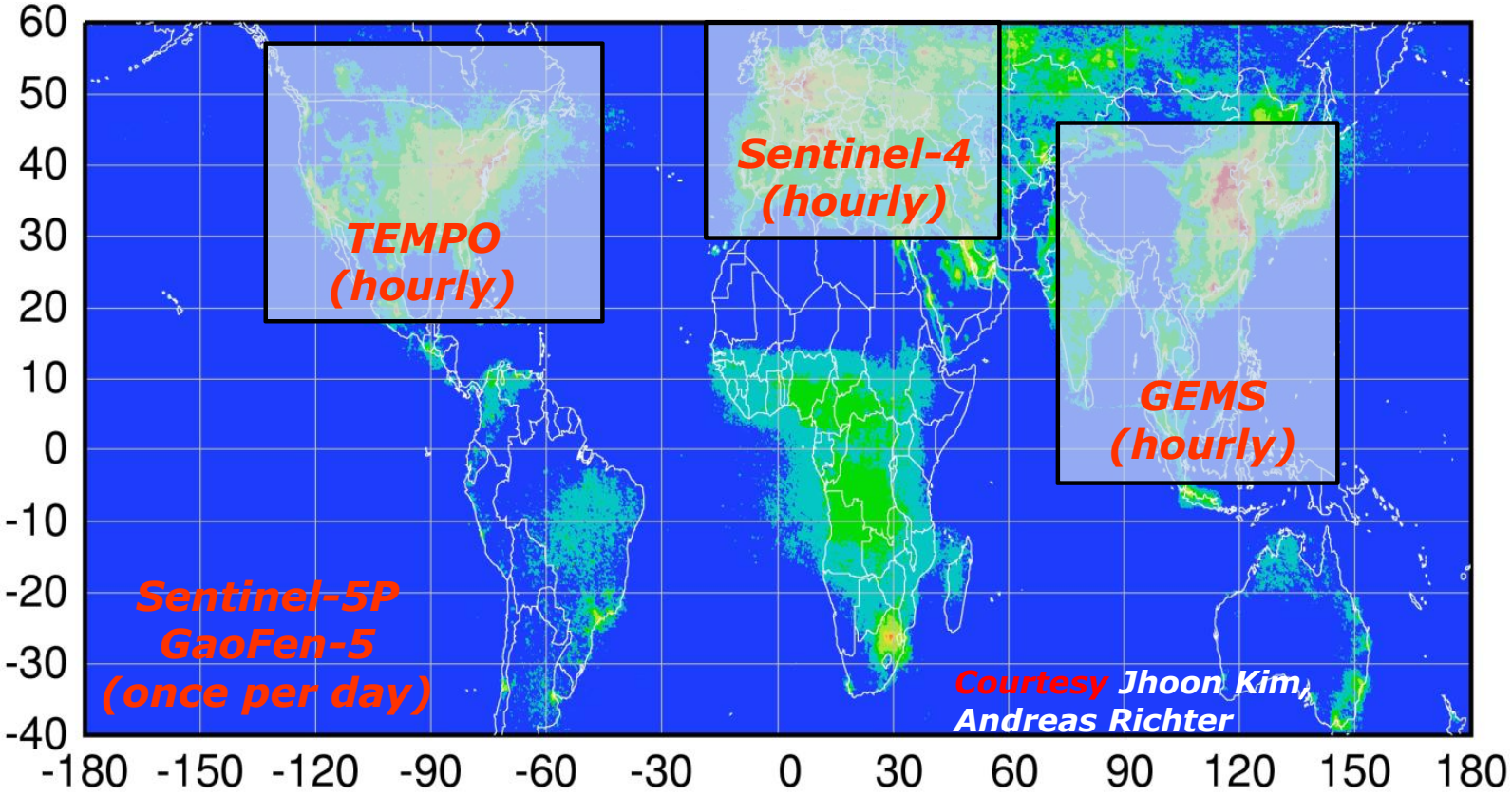
1. White paper for the pre-campaign will be drafted by June 2019.

   - Research scale and participants will be determined following consultation among Korean researchers and NIER by December 2019.

2. Main purpose of Korea`s pre-campaign are additional scientific air quality research related with result of the first KORUS-AQ and validation of GEMS products.

3. Pre-campaign period is expected from December 2020 to Spring 2021 (TBD).

Air Quality Monitoring Constellation of Geostationary Satellites in Near Future



Policy-relevant science and environmental services enabled by joint 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

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Thank you for your attention