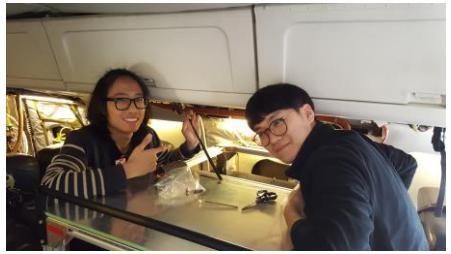
KORUS-AQ: Connecting science and policy

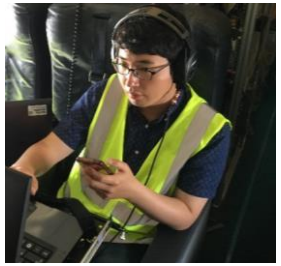
James H Crawford, NASA Langley Research Center

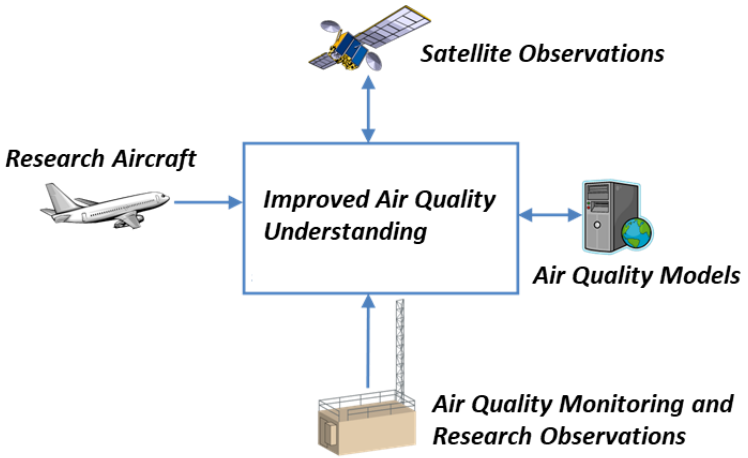








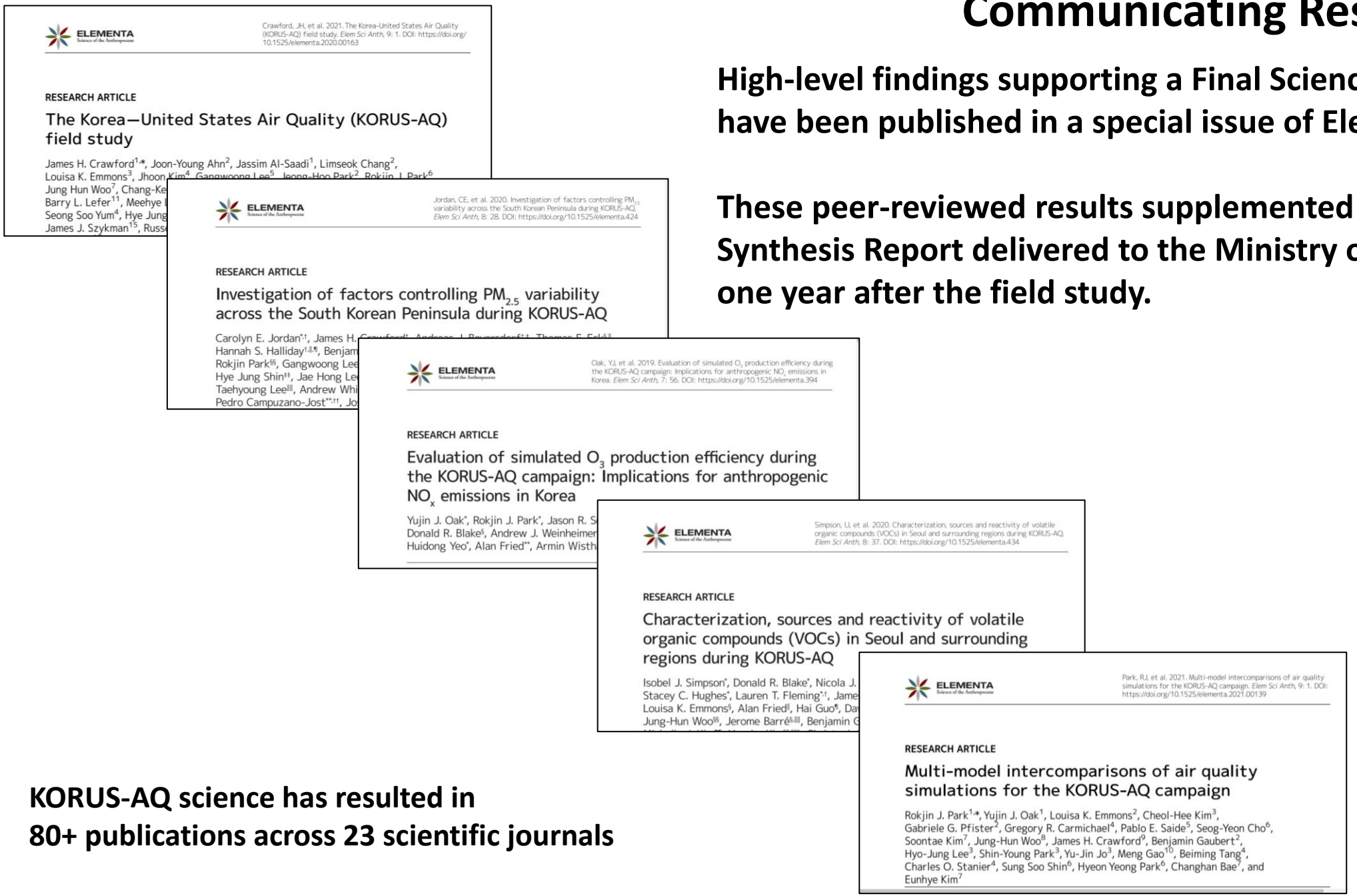




Communicating Results

High-level findings supporting a Final Science Synthesis Report have been published in a special issue of Elementa

These peer-reviewed results supplemented a Rapid Science Synthesis Report delivered to the Ministry of Environment one year after the field study.



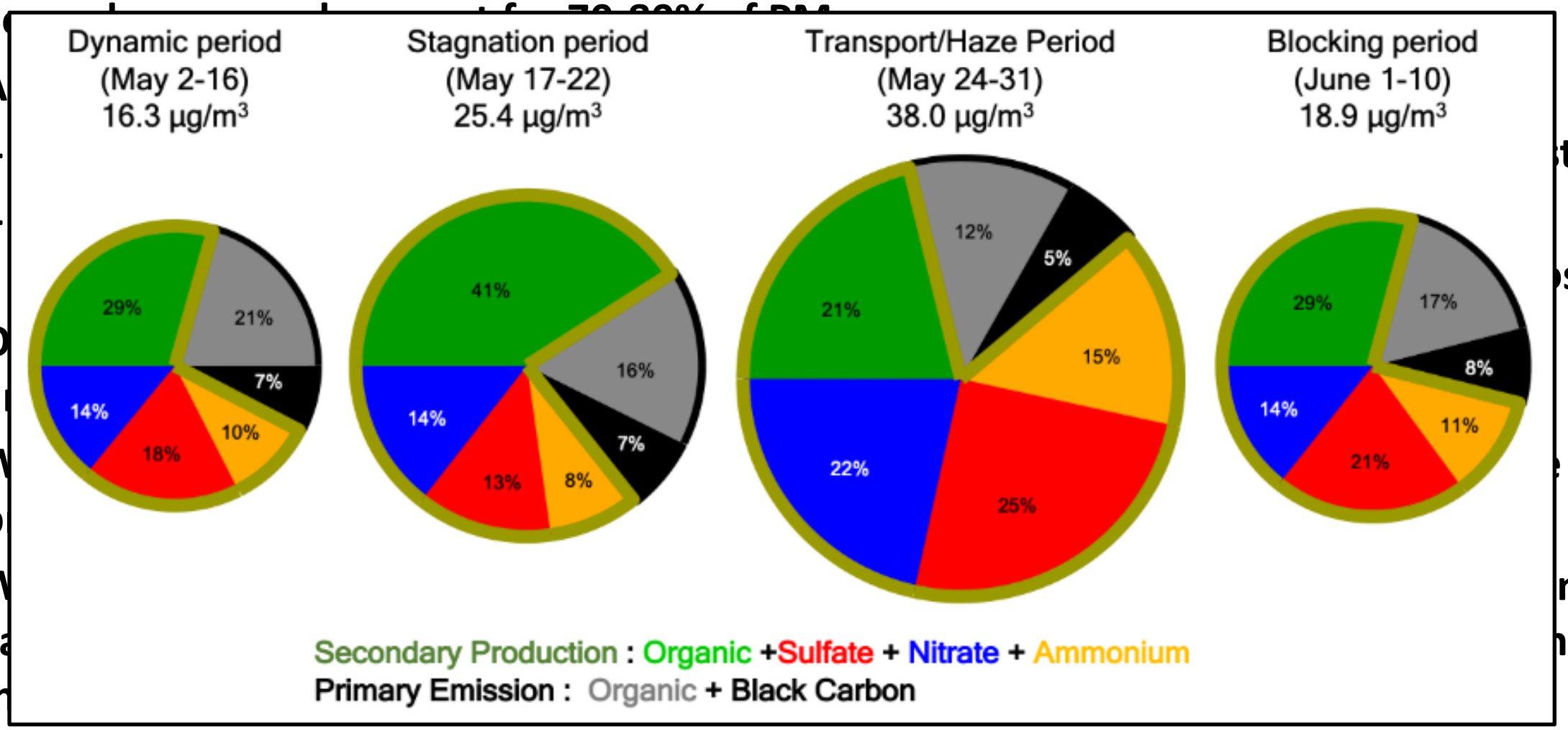
KORUS-AQ science has resulted in 80+ publications across 23 scientific journals

Recommendation 1: Improving both $PM_{2.5}$ and ozone pollution relies on coordinated reductions in both NO_x and VOCs, specifically higher (C_7+) aromatic compounds.

- **Secondary aerosol account for 70-80% of $PM_{2.5}$**
- **Aerosol composition changes with meteorological conditions.**
  - **Aromatic compounds dominate organic aerosol production through photochemistry.**
  - **Frontal passages enhance both transported and local aerosol due to shallow boundary layer and faster heterogeneous production of secondary inorganic aerosol.**
- **Ozone production is more sensitive to aromatic compounds than all other anthropogenic VOCs combined.**
- **While ozone production is VOC-limited in urban areas, the regional extent of ozone production depends on NO_x reductions.**
- **While emission reductions will immediately benefit $PM_{2.5}$, strategies to control ozone call for careful reduction in aromatic compounds along with NO_x to limit short-term increases in urban ozone.**

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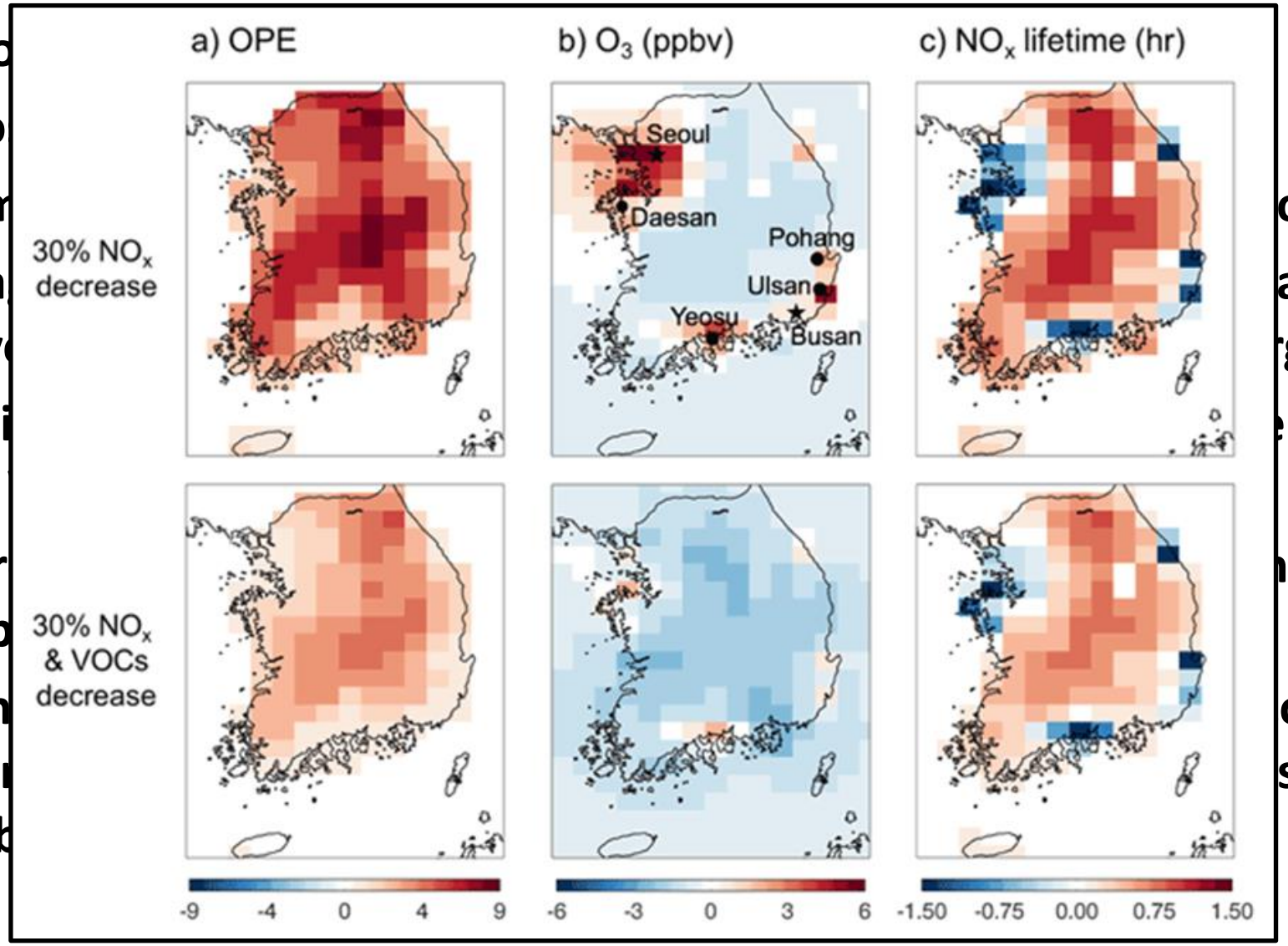


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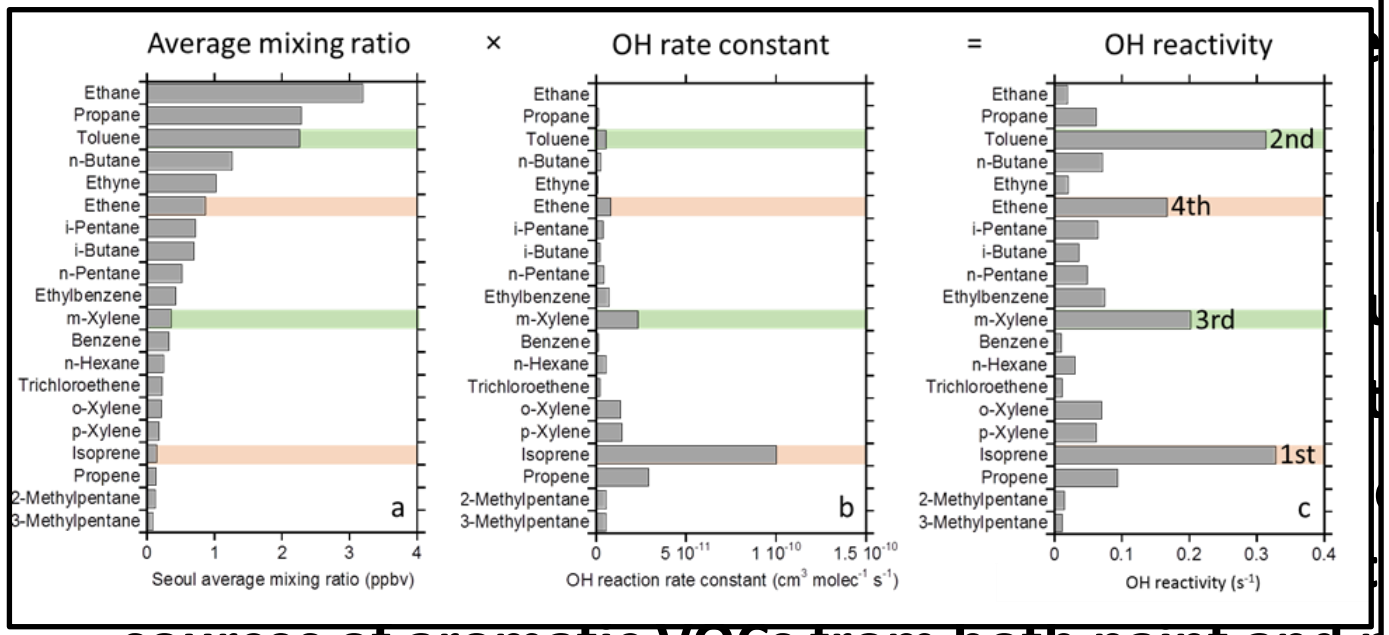


Recommendation 2: Improved estimates place better bounds on current emissions, but specific sources for higher (C_7+) aromatic compounds need to be targeted to enable effective control strategies.

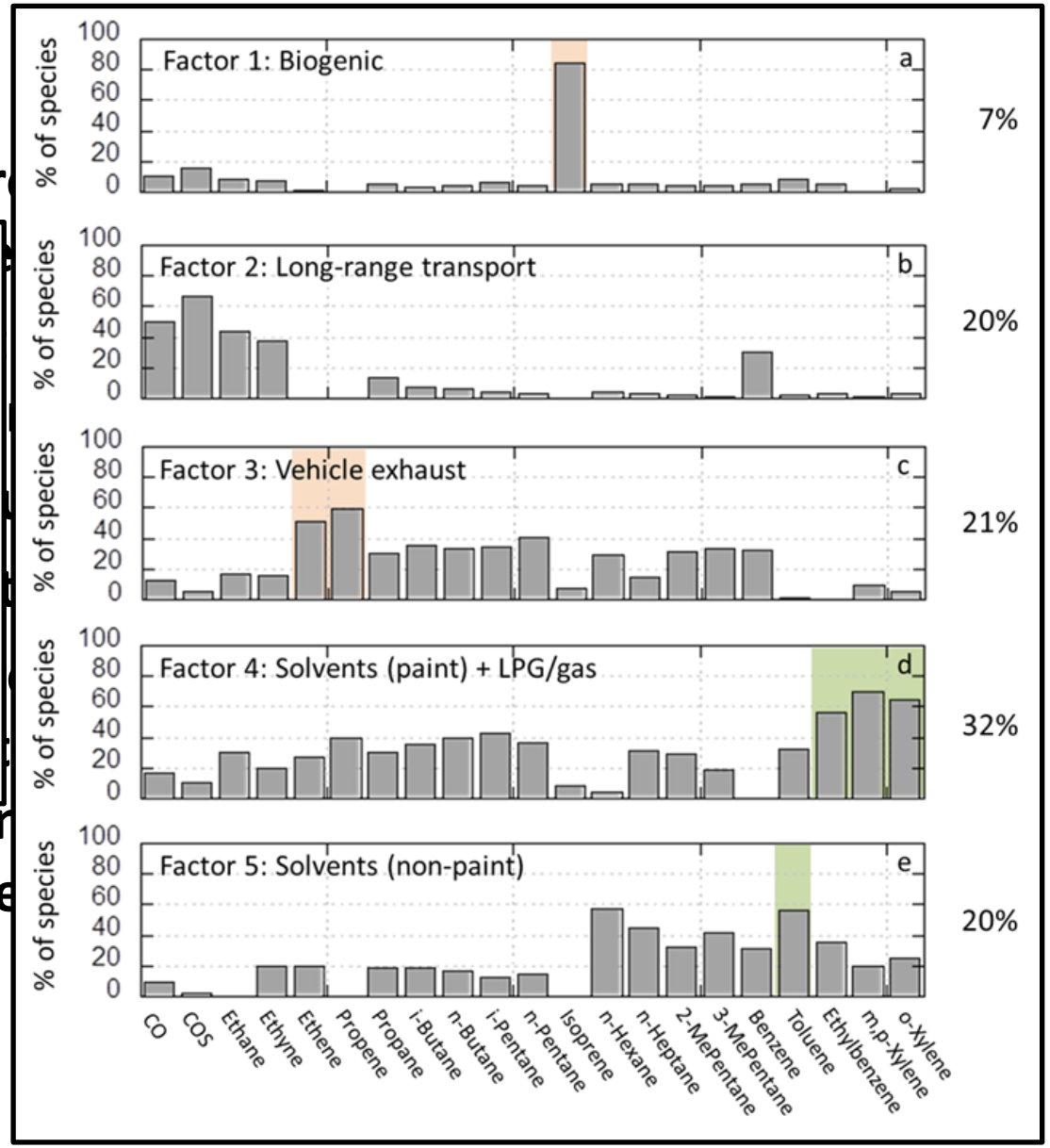
- **Models require accurate emissions in order to realistically simulate air quality and be useful for testing air quality control strategies.**
- **Initial model simulations compared to observations revealed large underestimations of NO_x and aromatic compounds.**
- **Top-down satellite estimates corroborated the underestimation of NO_x emissions.**
- **Aromatic emissions were improved through better speciation of VOC emissions.**
- **While the updated emissions dramatically improved model simulations, observation-based source apportionment points to diverse and broadly distributed sources of aromatic VOCs from both paint and non-paint solvent use that will be difficult to target without more detailed knowledge of their use and specific products to target.**

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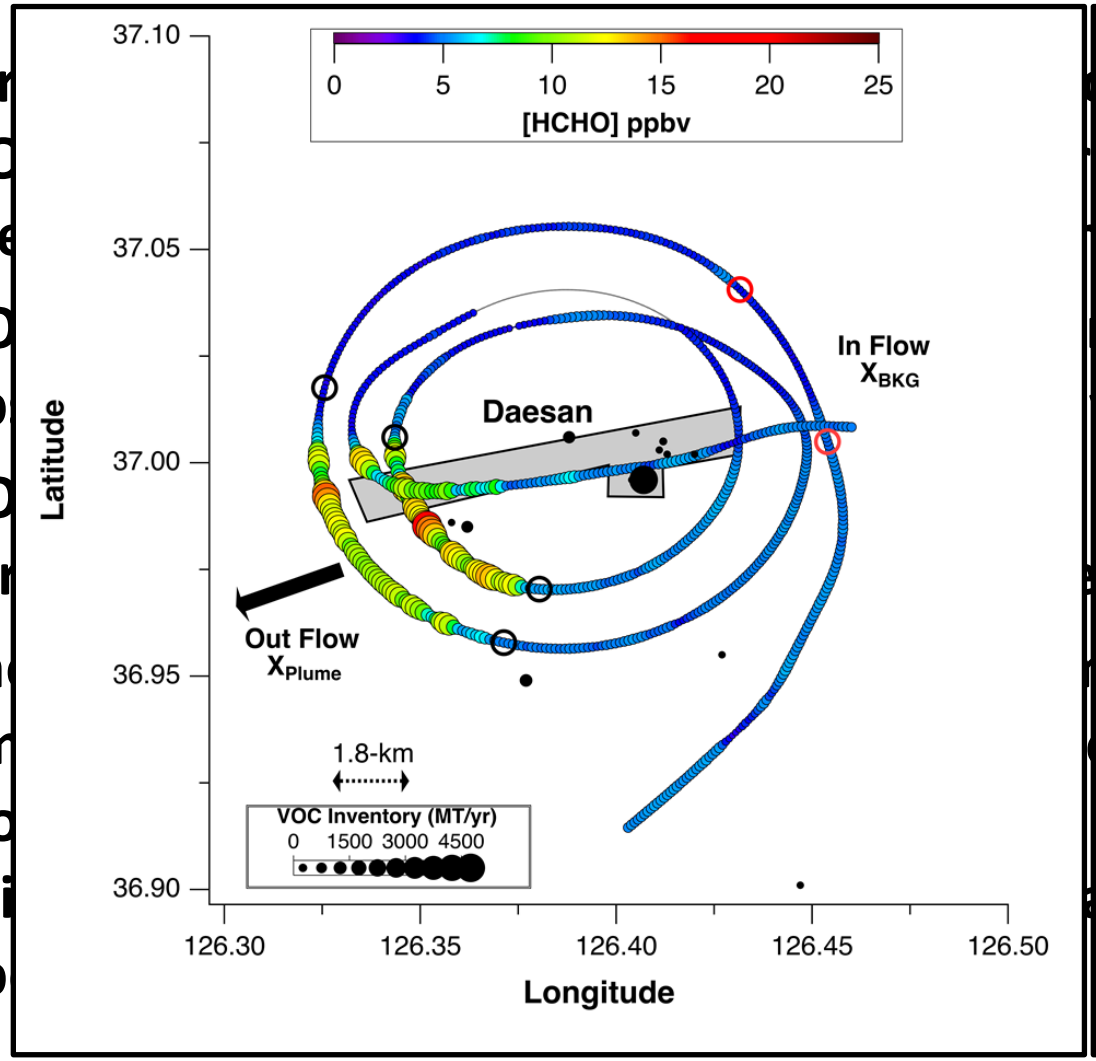


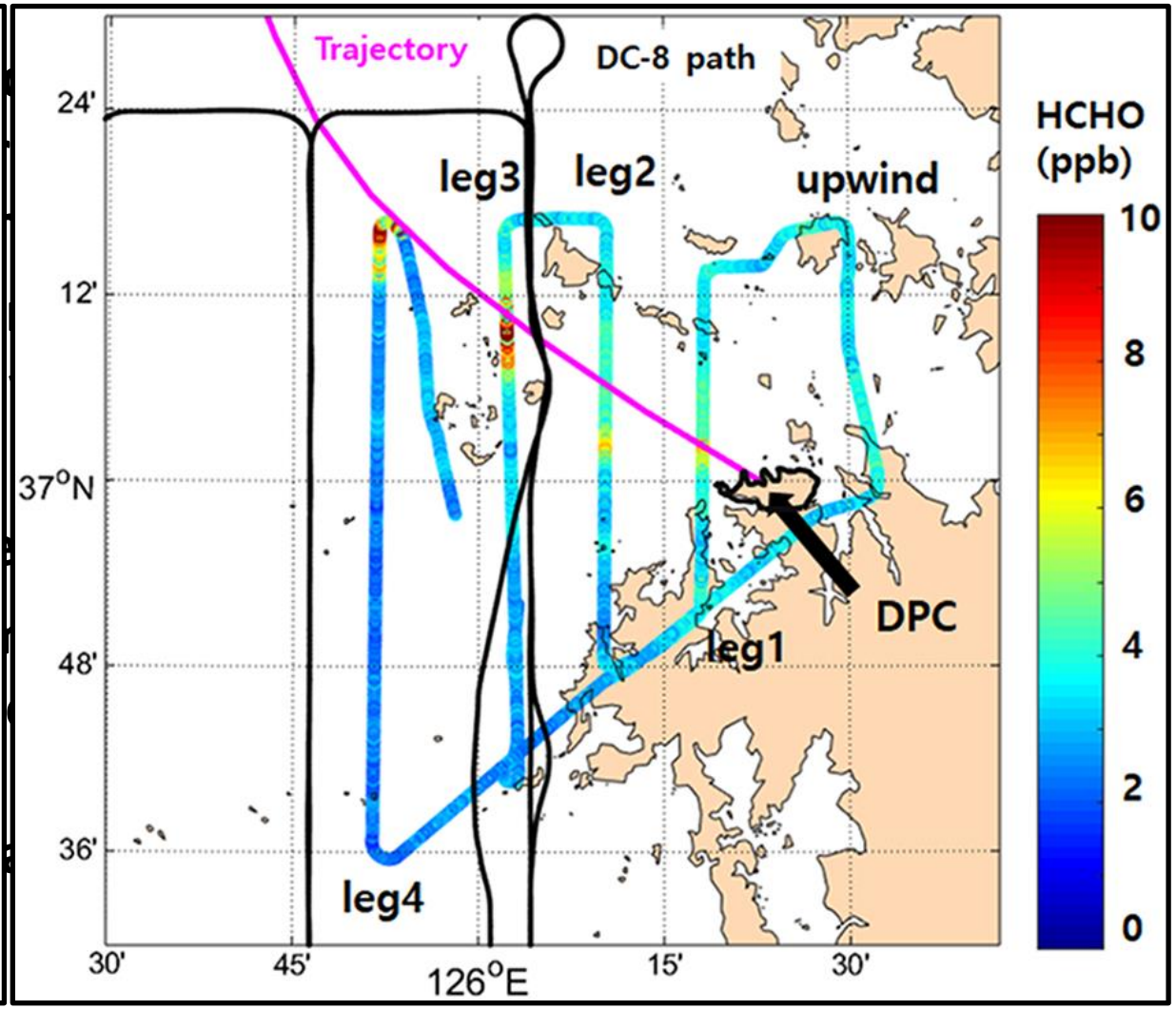
Recommendation 3: Large underestimates of VOC emissions from industrial point sources warrant continued scrutiny and verification.

- **Direct sampling of point sources revealed good agreement for stack emissions of NO_x and SO_2 from power plants and industrial sites, supporting the effectiveness of the continuous emissions monitoring system for these large sources.**
- **VOC emissions were shown to be underestimated by factors of 2.5 to 4 based on observations at the Daesan Chemical Facility, Korea's largest industrial VOC source.**
- **VOC emissions carry additional health risks to workers and local communities as they carry multiple hazardous pollutants and their oxidation products.**
- **These VOC emissions are more difficult to monitor since they mainly occur as fugitive emissions that come from a multitude of facility components and activities such as storage tanks, transport pipelines throughout the complex and to/from nearby shipping sites, petroleum production and handling, as well as combustion and flaring operations.**

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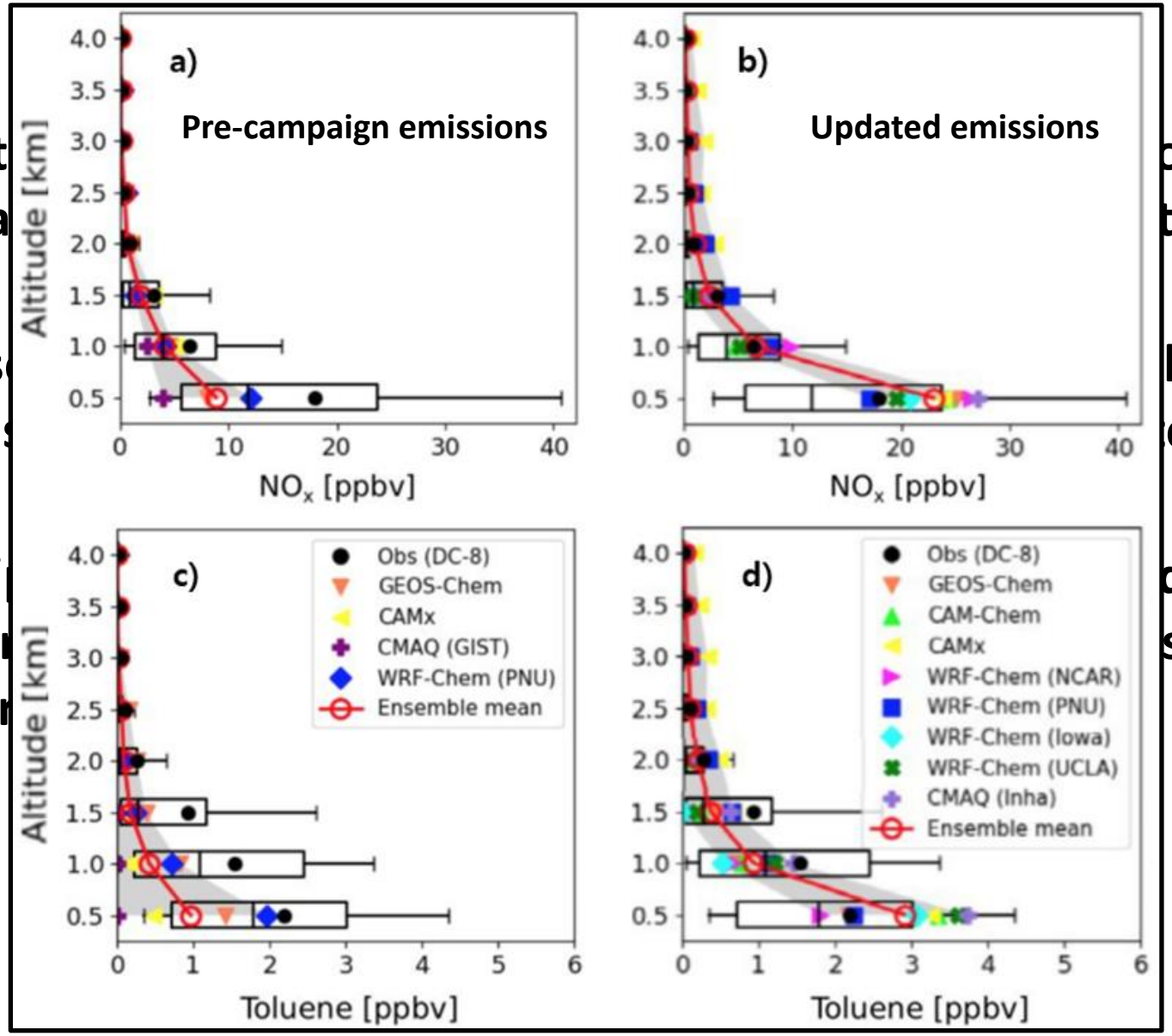


Recommendation 4: Model simulations of air quality require a hierarchy of models to obtain the best representation and understanding of uncertainties to support decision making.

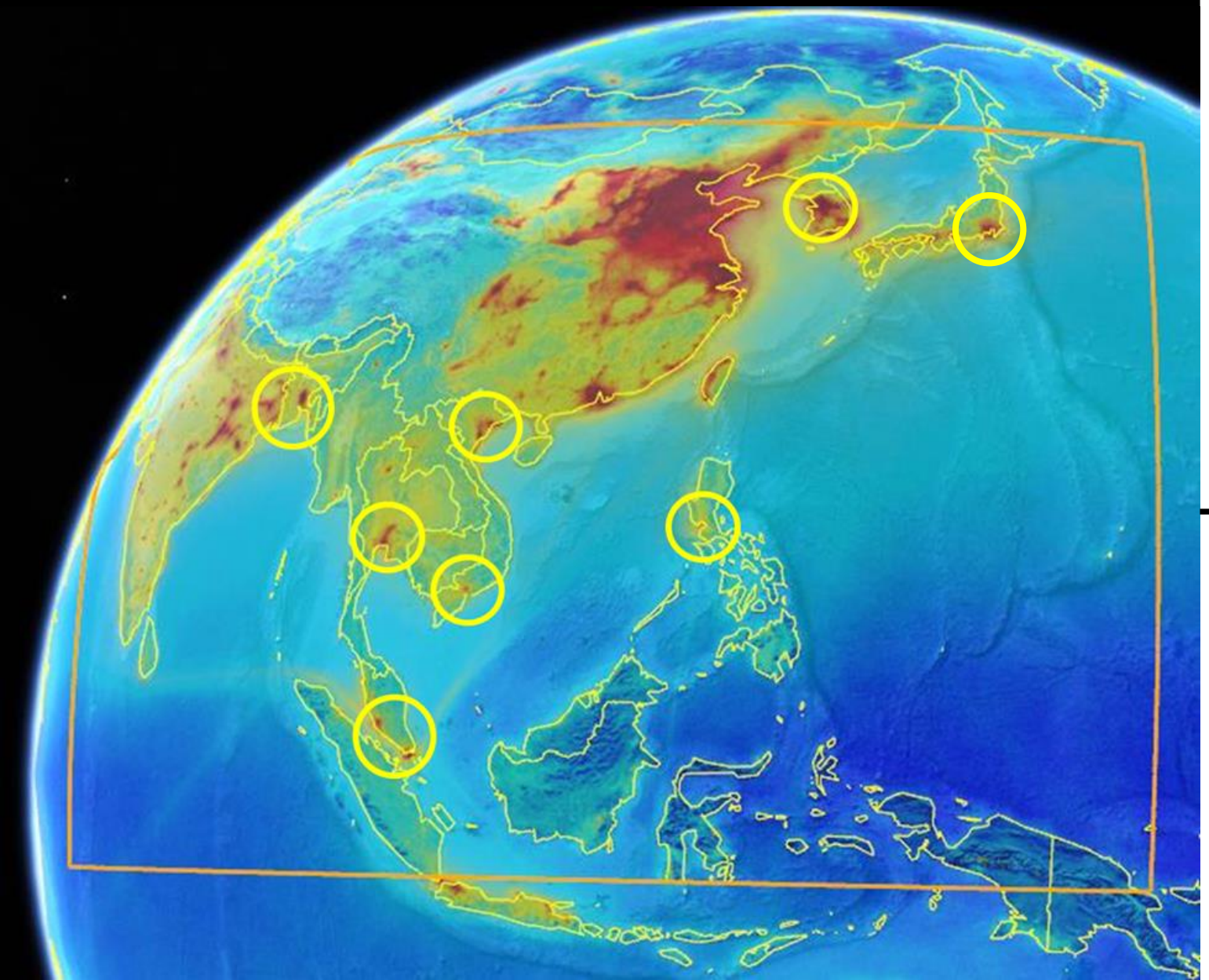
- **The KORUS-AQ team employed a hierarchy of models covering regional-to-global domains with various resolutions and complexity in their treatment of ozone and PM formation.**
- **The average of several different models, each with differing strengths and weaknesses, was generally better than any individual model at matching observations.**
- **The use of multiple models is needed to best identify drivers of air quality and place uncertainty bounds on quantitative assessments of conditions and strategies to mitigate poor air quality.**

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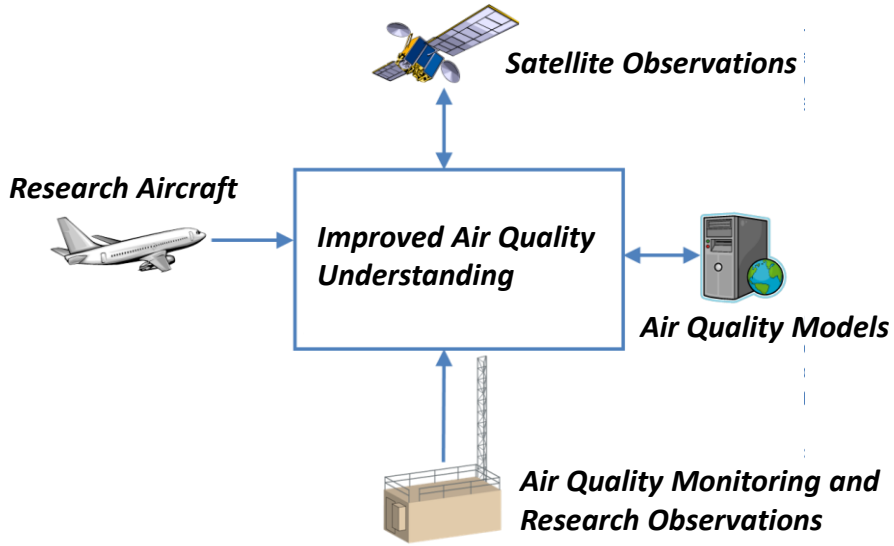
Airborne and Satellite Investigation of Asian Air Quality (ASIA-AQ)



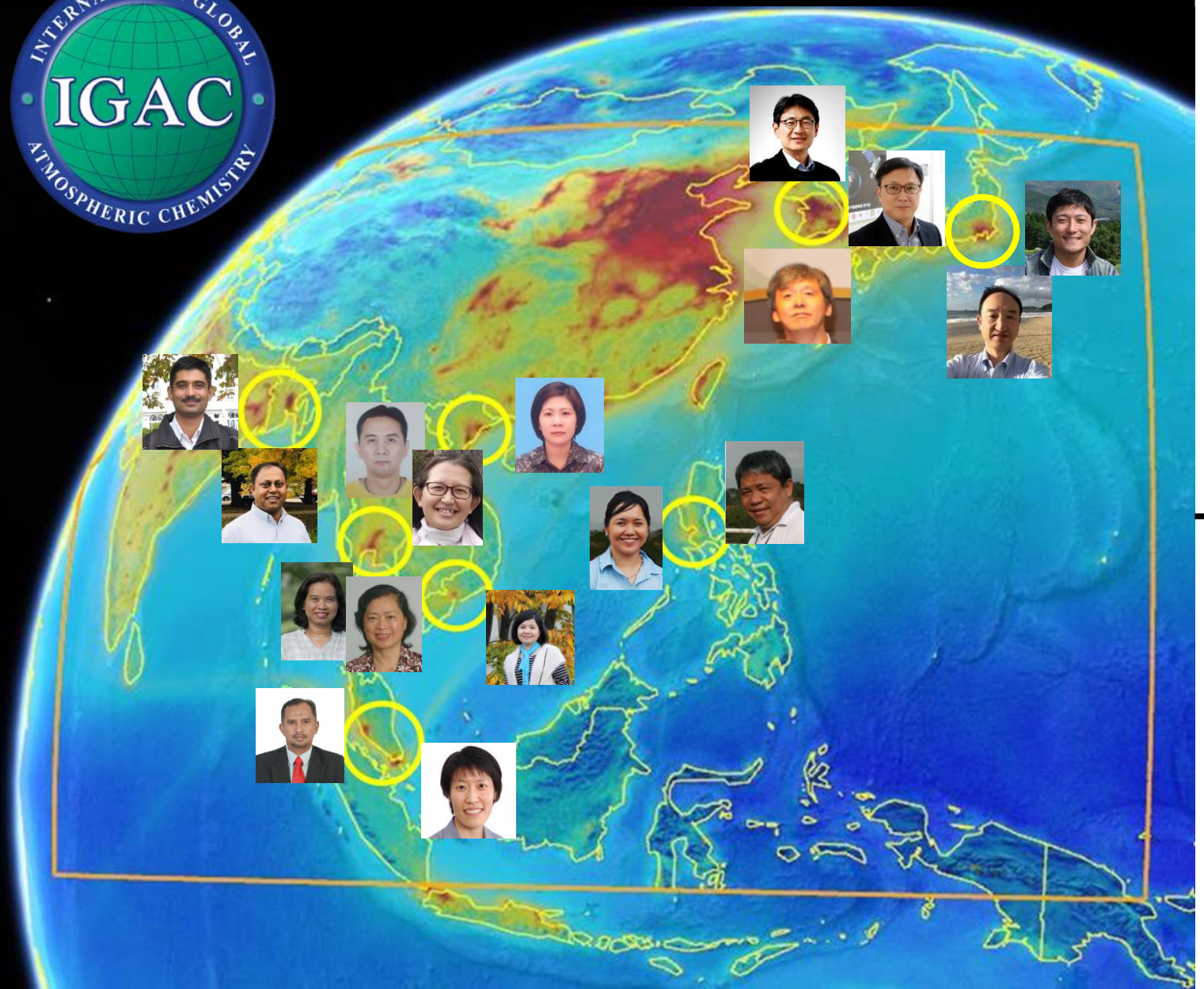
Purpose: Improve understanding of the factors controlling local air quality across Asia through multi-perspective observations and modeling.

Approach: Conduct airborne sampling across three to five locations in collaboration with local scientists, air quality agencies, and other relevant government partners.

Philosophy: Openly share data during all phases, conduct joint analysis with local scientists and air quality agencies, and report findings to local governments.



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