

Atmospheric Composition and Asian Monsoon (ACAM) – A coordinated modeling and analysis project

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Motivation:

The Asian monsoon system is a major climate component on Earth. With rapid population and economic growth across the Asian monsoon region, it has become a serious concern that the monsoon system coupled with surface emissions is playing an increasingly significant role in affecting not only the regional air quality but also the global atmospheric composition. This proposed project is to form a coordinated modeling and analysis effort among AeroCom, CCMI, and the ACAM communities to study the interactions between Asian air pollution and the Monsoon system.

Objectives:

- Compare and evaluate the model simulated aerosol and related species in the Asian monsoon region with observations from remote sensing and recent ground-based and aircraft measurements
- Examine the pathways of trace gases and aerosols in the Asian UTLS region via transport by monsoon anticyclone, large scale transport, and atmospheric chemistry
- Investigate the interactions between Asian pollution and monsoon meteorology

Type of Simulation:

Model output from the proposed AeroCom Phase III model experiment can be used for the ACAM analysis. For example, the UTLS experiments is particularly suitable for such analysis. Specifically, the following output from UTLS can be used:

BASE: 2002-2018 (17 years): all emissions

- Anthropogenic emissions: CMIP6
- Biomass burning emissions: CMIP6
- Natural emissions: Model own

Perturbation:

- Same as BASE but with anthropogenic emissions turned off over (a) East Asia (b) South Asia, and (c) the globe
- Same as BASE but with global biomass burning emissions turned off

Model output:

- See requirements under UTLS experiment on AeroCom wiki

Available Data for Model Evaluation:

Polar-orbiting satellite (remote-sensing instrument):

- Aura (e.g., OMI, MLS, TES)
- CALIPSO (CALIOP)

- Envisat (SCIAMACHY, MIPAS, GOMOS)
- Oden (OSIRIS)
- Suomi-NPP (OMPS-LP)

Geostationary satellite over Asia:

- GOCI and GOCI-II
- Himawari
- GEMS (to be launched early 2020)

Suborbital (aircraft, ground-based, balloon) measurements over Asia:

- OMO (aircraft)
- StratoClim (aircraft)
- IAGOS-CARIBIC (aircraft)
- KORUS-AQ (aircraft)
- BATAL (Balloon measurements)
- Surface networks over Asia

Considerations:

- The proposed activity is also in coordination with the CCMI community on ACAM related studies
- This is an opportunity to engage the extended international modeling and observation communities to study the aerosol-chemistry-weather-climate interactions
- We now have plenty of remote sensing and in-situ observations over Asian monsoon regions for thorough model evaluations and uncertainty assessments