WRF-Chem Simulations of Aerosol Optical Properties and Composition During the GVAX Experiment

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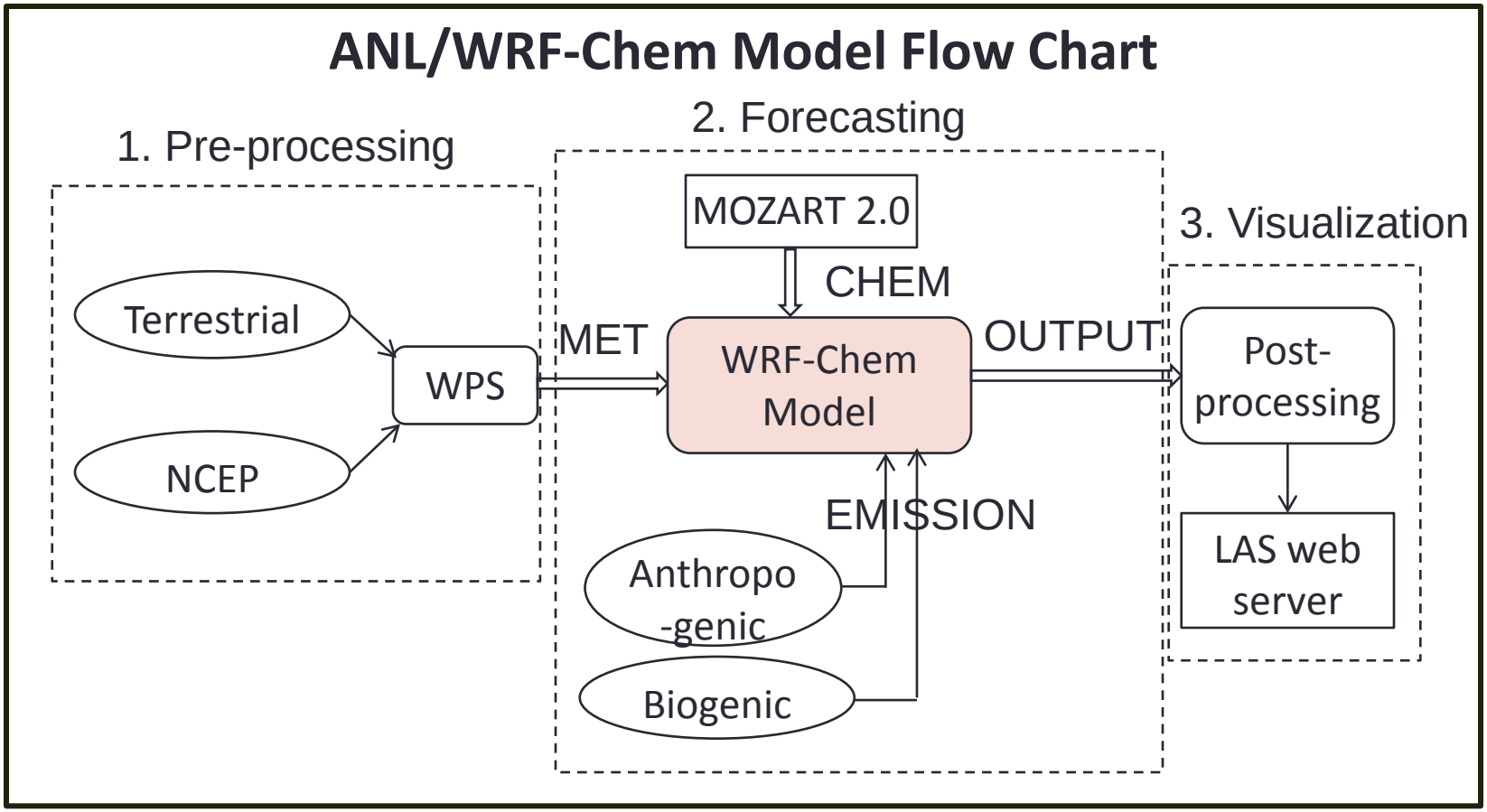
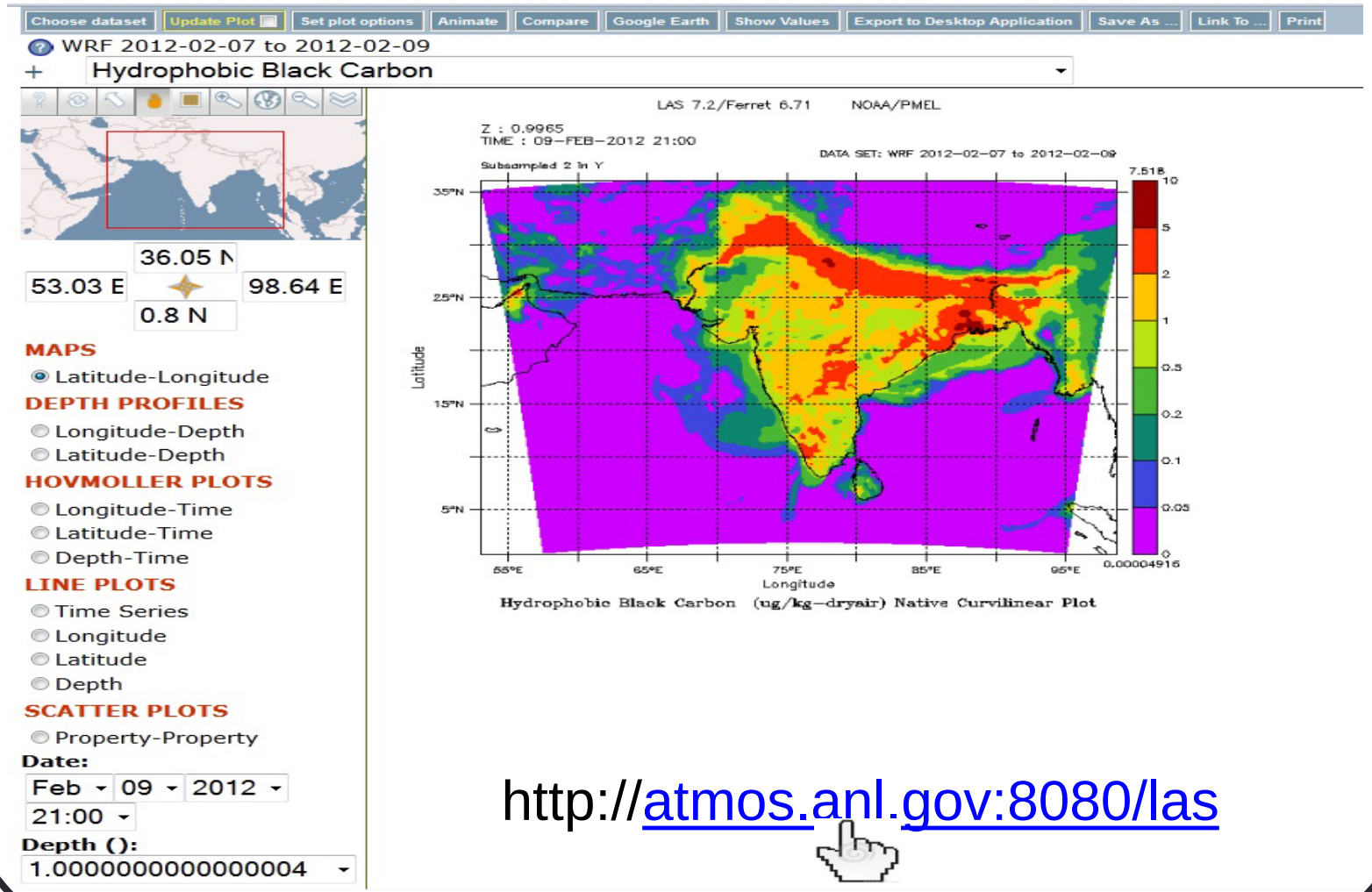
WRF-Chem is used to examine aerosol optical properties and chemical composition over the Indian subcontinent from August to December of 2011



http://atmos.anl.gov:8080/las

Online visualization of weather and chemistry model forecasts



http://atmos.anl.gov:8080/las

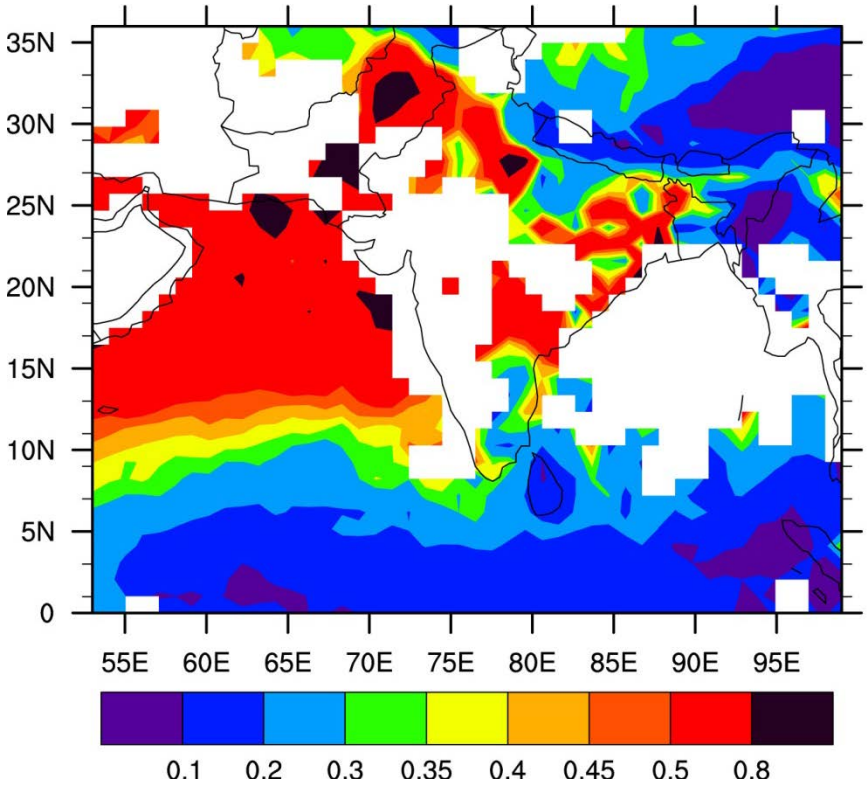
WRF-Chem Configs

- **WRF/Chem 3.3 with modifications**
- **Domain**: 55E ~ 95E and 0 ~ 36N
- **Grid size**:12km x 12km
- **Vertical layers**: 27
- **Chemistry**: MOZCART
  - MOZART gas-phase chemistry
  - GOCART aerosols:
    - Sulfate
    - BC and OC (hydrophilic and hydrophobic)
    - Dust (0.5, 1.4, 2.4, 4.5, and 8 μm in effective radius)
    - Sea salt (0.3, 1.0, 3.2, and 7.5 μm)
  - Photolysis rates: F-TUV
  - Dry deposition and wet scavenging included;
  - Aerosols feedback to radiative transfer is on

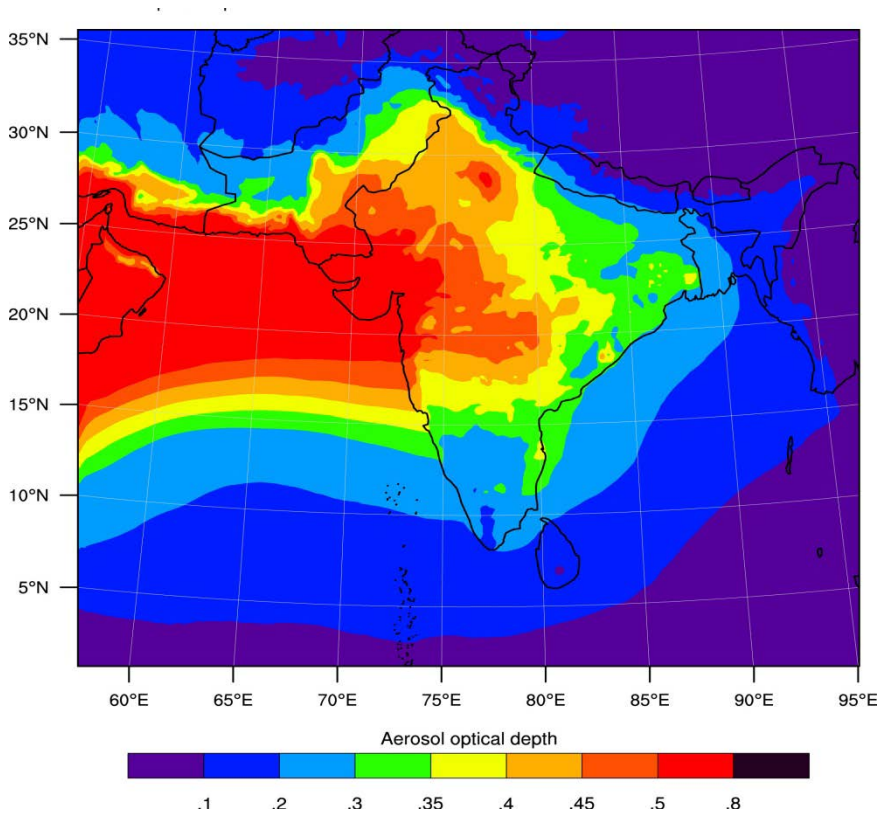
- **Anthropogenic emissions:** fossil-fuel and bio-fuel SO_2, BC, and OC (Lu et al., 2011); PM2.5 and sulfate from waste and biofuel burnings (Yevich and Logan, 2003); others from EDGAR;
- **Physics/Dynamics:**
  - RRTMG for shortwave and longwave radiation
  - MYJ TKE PBL scheme
  - Thompson cloud microphysics
  - Zhang-McFarlane deep convection

Monthly mean AOD (August, 2011)

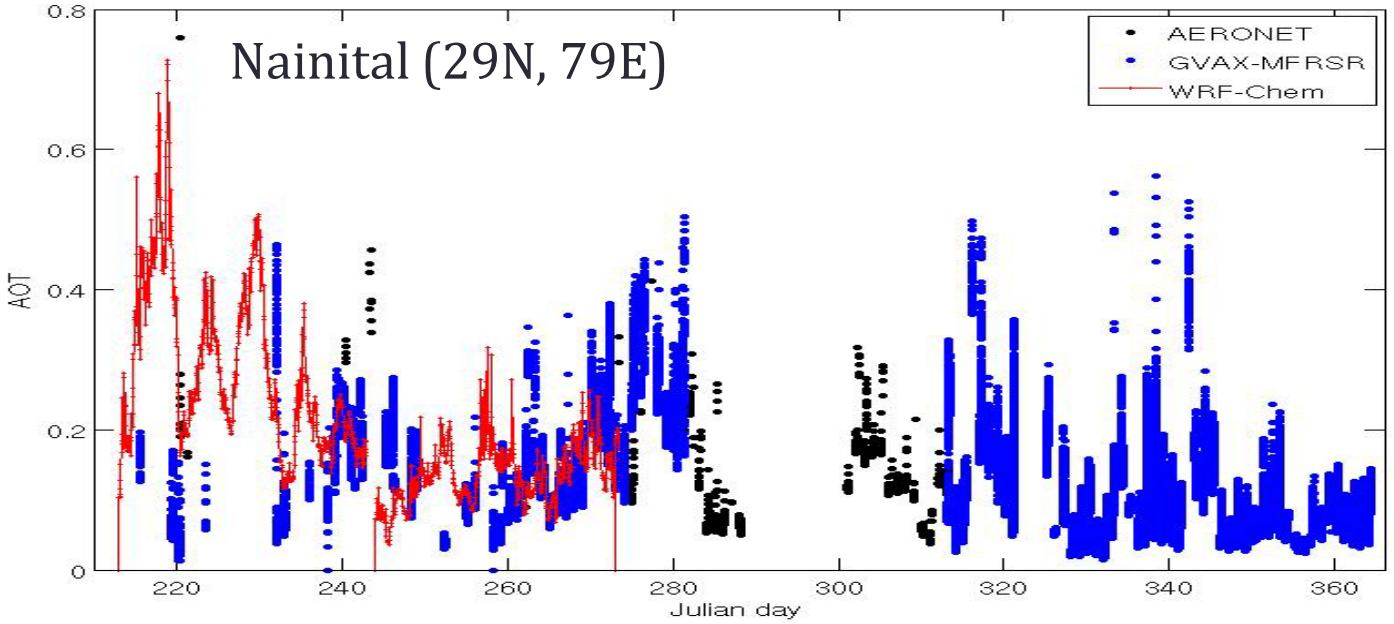
MODIS/Terra Level 3

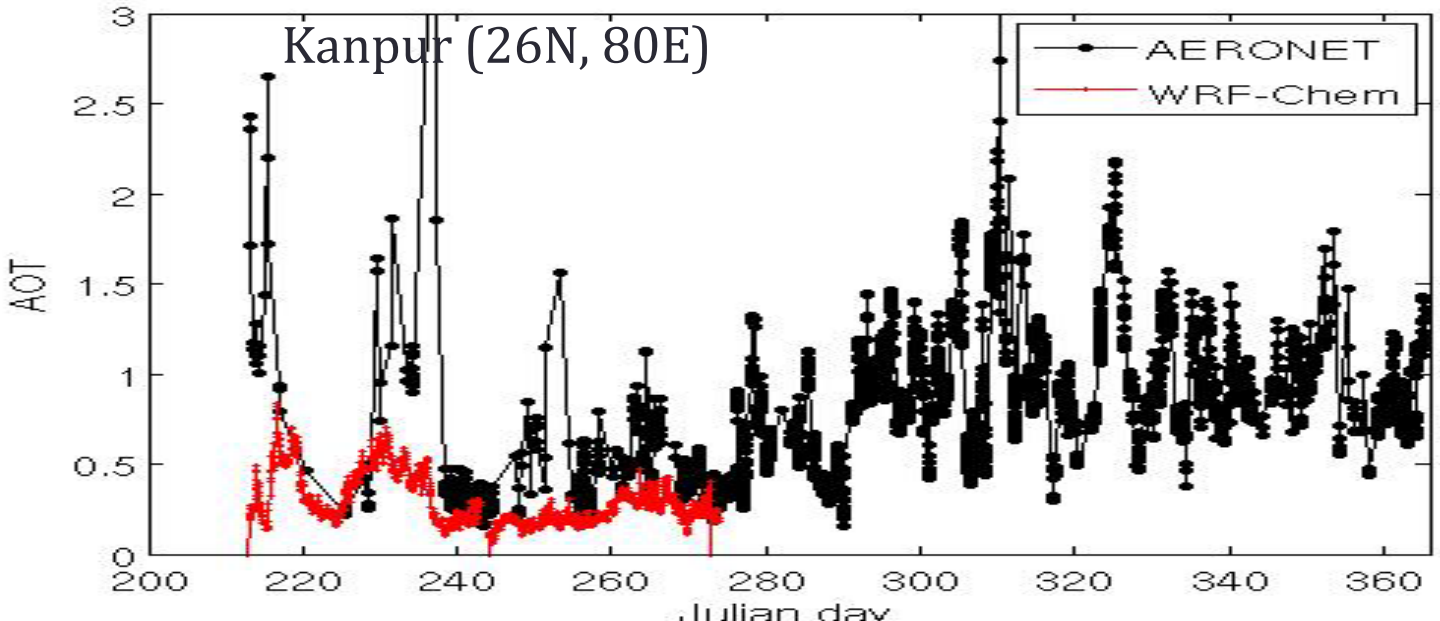


WRF-Chem

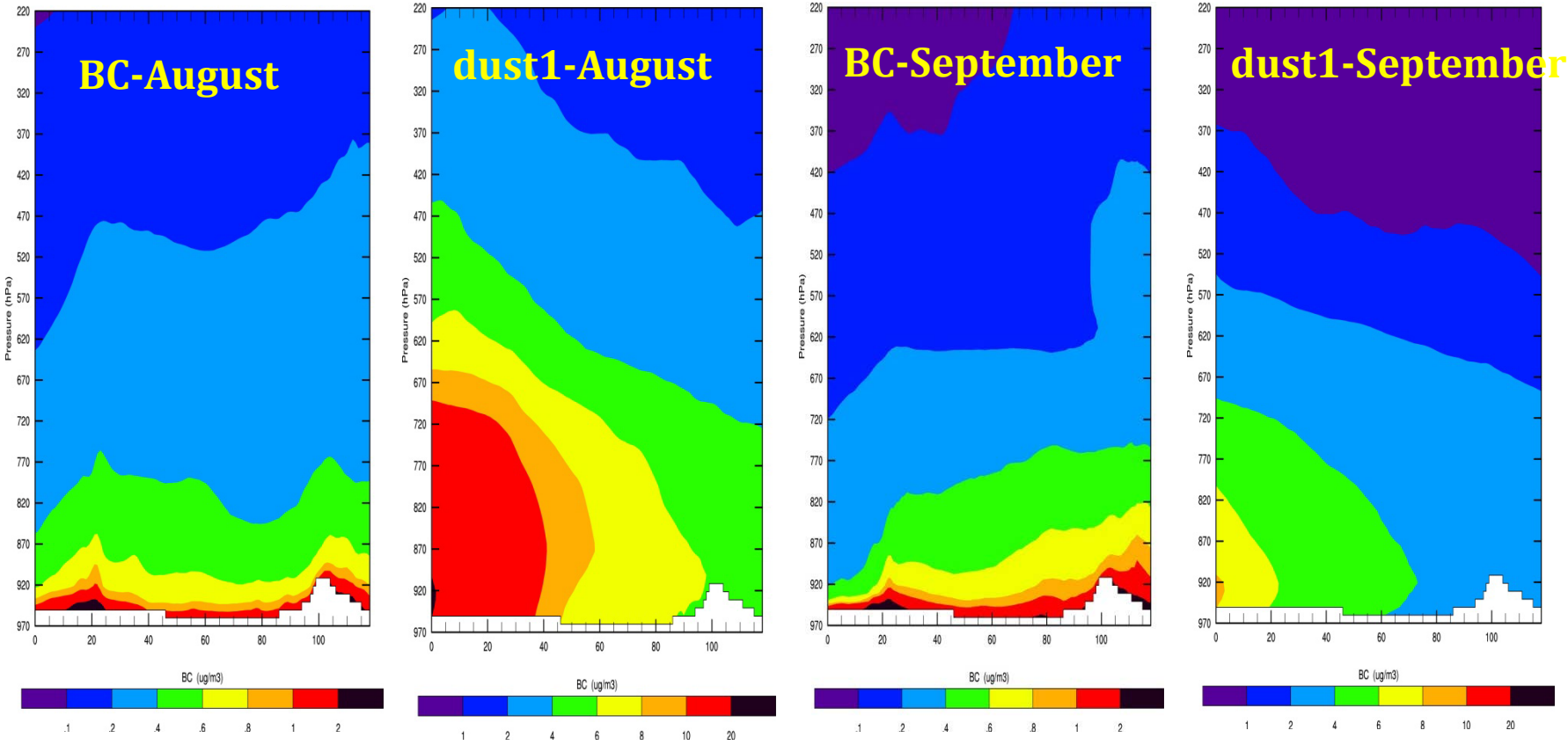


Comparison of AOD with surface measurements

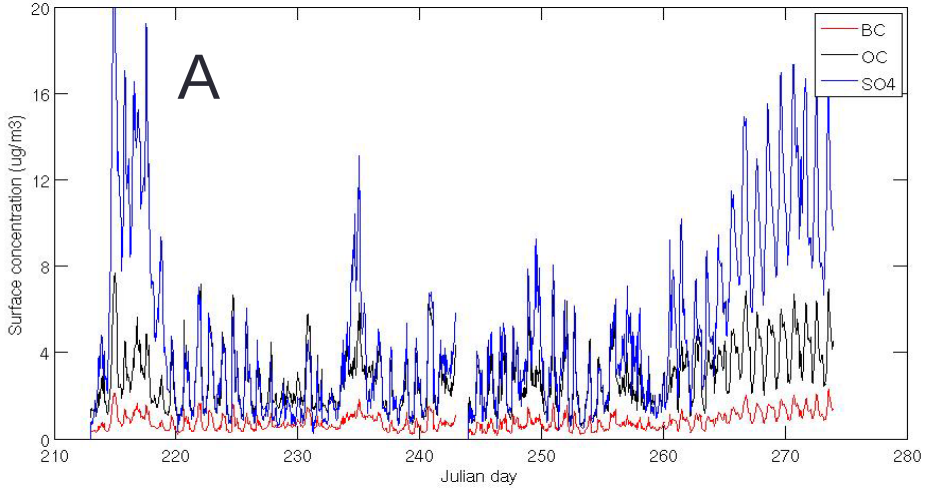


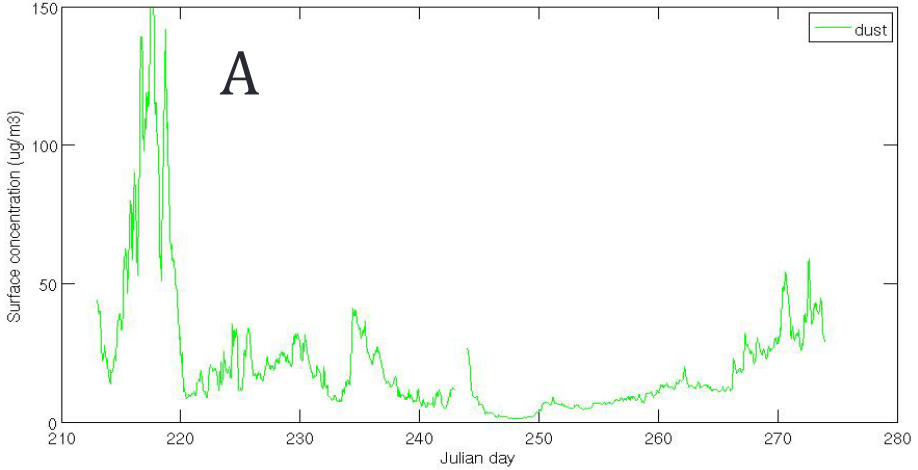


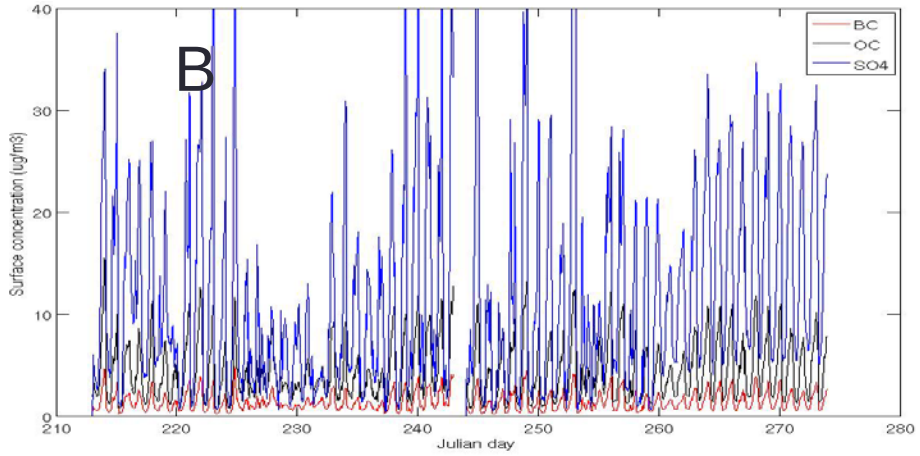
Cross-section of BC and fine dust concentrations (along the red line)

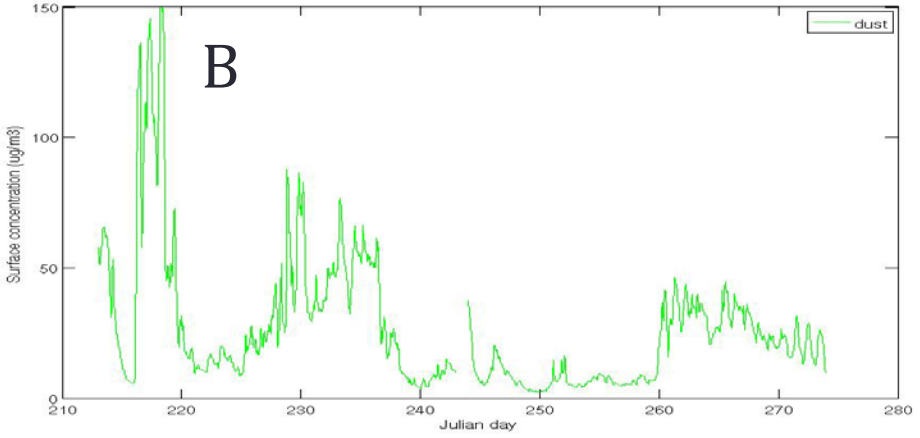


Simulated surface concentrations of aerosols

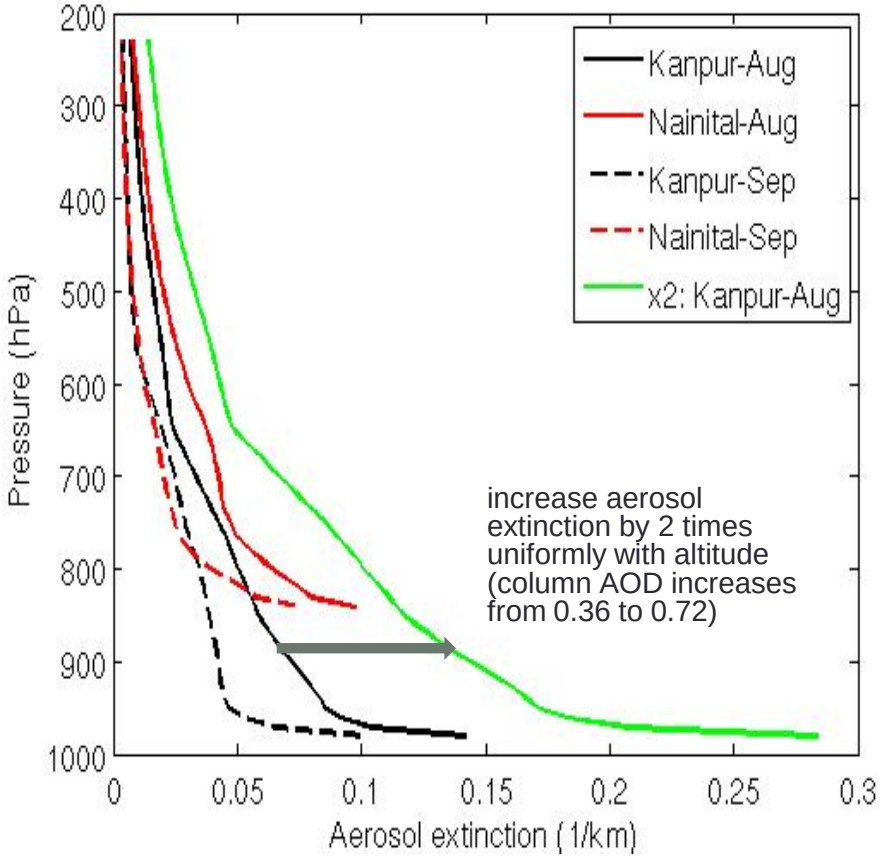


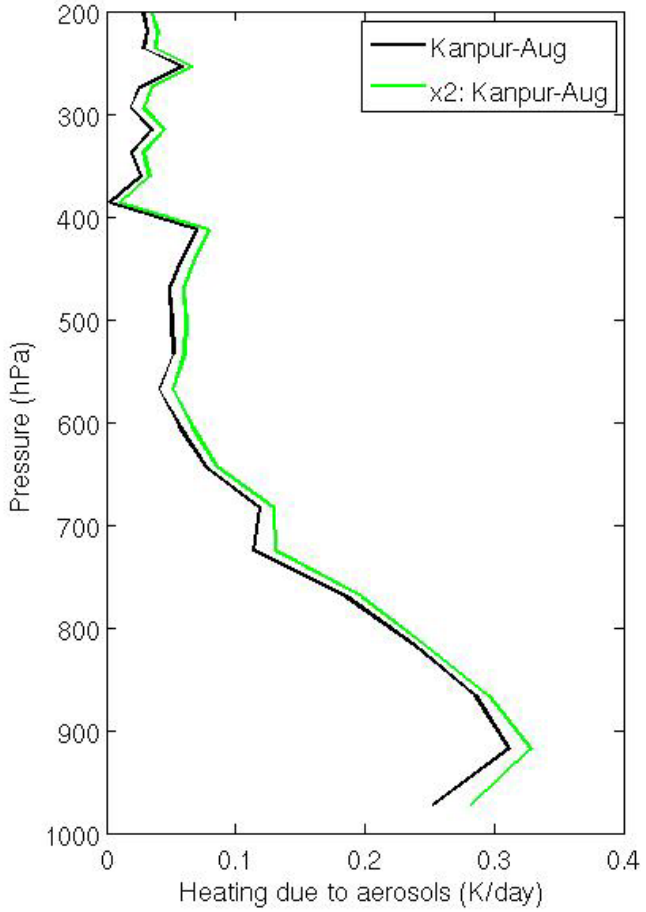


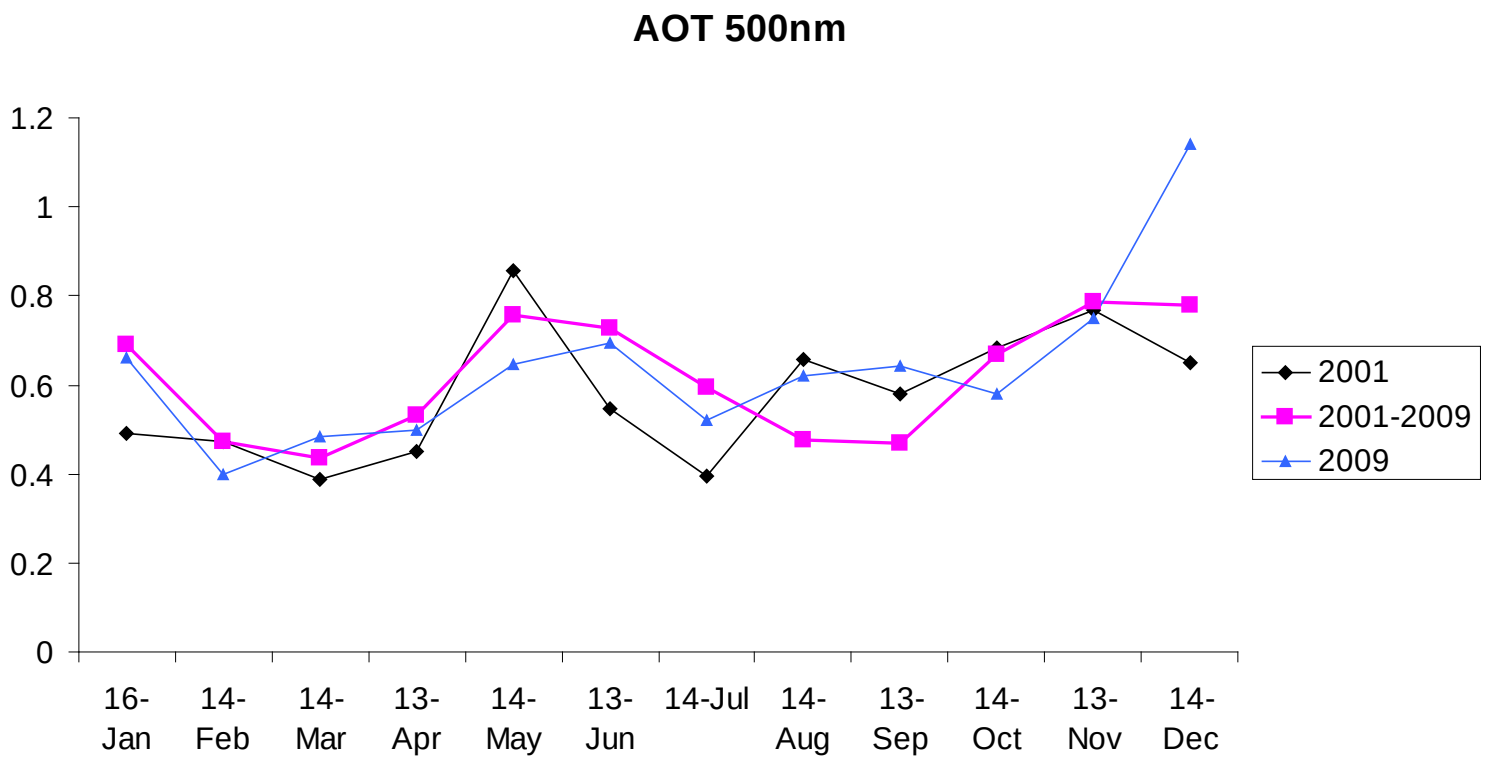




Estimated atmospheric heating due to aerosols (0.2~0.3K/day near surface; and ~0.1K/day in the mid troposphere)






AOT 500nm
1.2
1
0.8
0.6
0.4
0.2
0
16-Jan
14-Feb
14-Mar
13-Apr
14-May
13-Jun
14-Jul
14-Aug
13-Sep
14-Oct
13-Nov
14-Dec
2001
2001-2009
2009