Geophysical Research Abstracts
Vol. 14, EGU2012-1999, 2012
EGU General Assembly 2012

Impacts of interannual variation of the East Asian winter monsoon on aerosol concentrations over eastern China

J. Zhu, H. Liao, J. Li, and J. Feng
Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

China has been experiencing increased concentrations of aerosols, commonly attributed to the large increases in emissions associated with the rapid economic development. We apply a global three-dimensional Goddard Earth Observing System chemical transport model (GEOS-Chem) driven by the NASA/GEOS-4 assimilated meteorological data to quantify the impacts of East Asian winter monsoon (EAWM) on the aerosol concentrations over eastern China. We found that the simulated aerosol concentrations over eastern China have strong interannual variation and negative correlations with the strength of EAWM. Model results show that, accounting for sulfate, nitrate, ammonium, black carbon, and organic carbon aerosols, the winter surface layer PM2.5 concentration averaged over eastern China (110°-125°E, 20°-45°N) can be 17.97% (4.78 μg m-3) higher in the weak monsoon years than that in the strong monsoon years. Regionally, the weakening of EAWM is shown to be able to increase PM2.5 concentration in the middle and lower reach of the Yellow River by 12 μg m-3. This point indicates that climate change associated with variation of EAWM has an essential influence on worsening air quality over eastern China. The possible causes of higher aerosol concentrations in the weak monsoon years may be attributed to the changing in wind fields and planetary boundary layer height between the weak and strong monsoon years. Sensitivity studies are performed to identify the role of chemical reaction associated with temperature and humidity on the higher aerosol concentrations in the weak monsoon years over eastern China.