NORTH ATLANTIC AEROSOL RADIATIVE IMPACTS BASED ON SATELLITE MEASUREMENTS AND AEROSOL INTENSIVE PROPERTIES FROM TARFOX AND ACE 2

Russell, Philip B. (1) Bergstrom, Robert W. (2) Schmid, Beat (2) Livingston, John M. (3)

(1) NASA Ames Research Center, Moffett Field, CA (USA)
(2) Bay Area Environmental Research Institute, San Francisco, CA (USA)
(3) SRI International, Menlo Park, CA (USA)

We estimate the impact of North Atlantic aerosols on the net shortwave flux at the tropopause by combining satellite-derived aerosol optical depth (AOD) maps with model aerosol properties determined via closure analyses in TARFOX and ACE 2. We exclude African dust, primarily by restricting latitudes to 25-60 N. The analyses use in situ aerosol composition measurements and air- and ship-borne sunphotometer measurements of AOD spectra. The aerosol model yields computed flux sensitivities (dFlux/dAOD) that agree with measurements by airborne flux radiometers in TARFOX. Its midvisible single-scattering albedo is 0.9, which is in the range obtained from in situ measurements of scattering and absorption in both TARFOX and ACE 2. Combining satellite-derived AOD maps with the aerosol model yields maps of 24-hour average net radiative flux changes. Cloud-free results range from –9 W/m² near the eastern US coastline in summer to –1 W/m² in the mid-Atlantic during winter; the regional annual average is –3.5 W/m². Using a non-absorbing aerosol model increases values by ~30%. Including cloud effects using ISCCP cloud-fraction maps greatly reduces the computed aerosol-induced direct flux changes. For example, the regional annual average decreases to –0.8 W/m². We compare results to previous calculations for a variety of aerosol types.

Presenter:
Russell, Philip B.
NASA Ames Research Center
MS 245-5
Moffett Field, CA 94035-1000
USA
Phone: +1 650 604 5404
Fax: +1 650 604 6779
e-mail: prussell@mail.arc.nasa.gov
http://geo.arc.nasa.gov/sgg/ACE-2

Oral Presentation

Session: 2, Atmospheric Aerosols