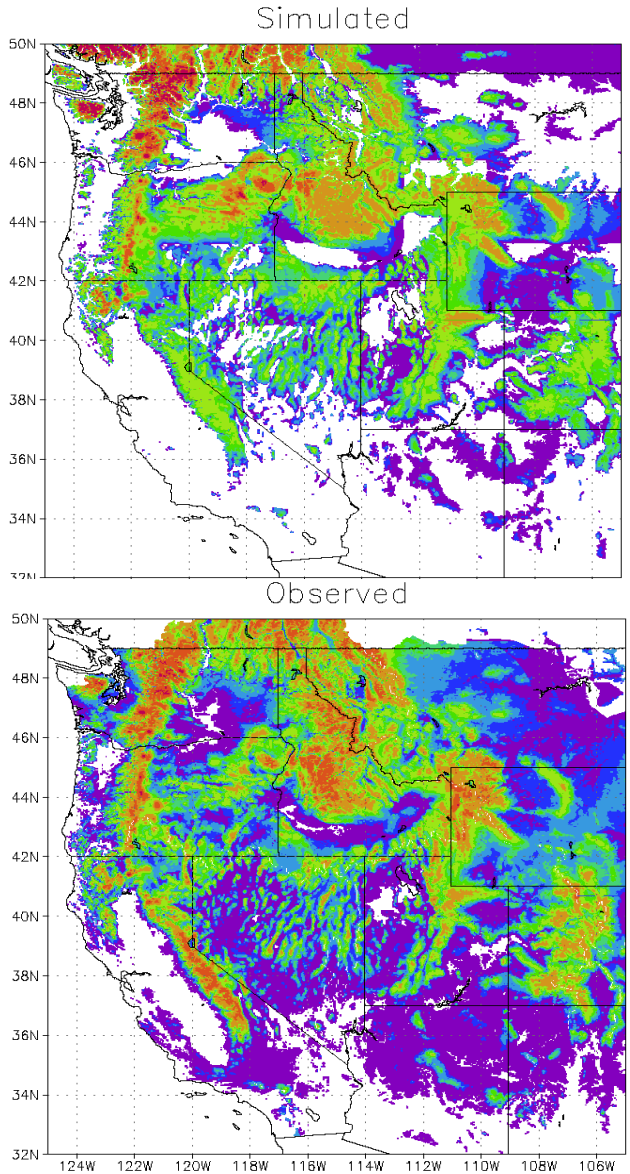
GC-9 Highlight

PNNL



Application of a Subgrid Orography Scheme to a Global Climate Model

Assessments of the impacts of climate change typically require climate information at spatial scales of 10 km or less. The horizontal resolution of present global climate models is presently about 300 km – far too coarse to resolve the spatial structure of climate in regions with complex terrain. To provide the necessary resolution, a physically-based subgrid-scale treatment of the influence of surface elevation on climate has been applied to a global climate model. The scheme yields climate fields for each of a modest set of elevation classes in each grid cell. The simulated climate fields (surface temperature, precipitation, snow cover, etc.) for each elevation class can then be distributed in post-processing to different locations according to the spatial distribution of surface elevation within each grid cell. The figure shows an example of the snow water simulated and observed for the western United States in the month of March.

EMSL UP # 1836

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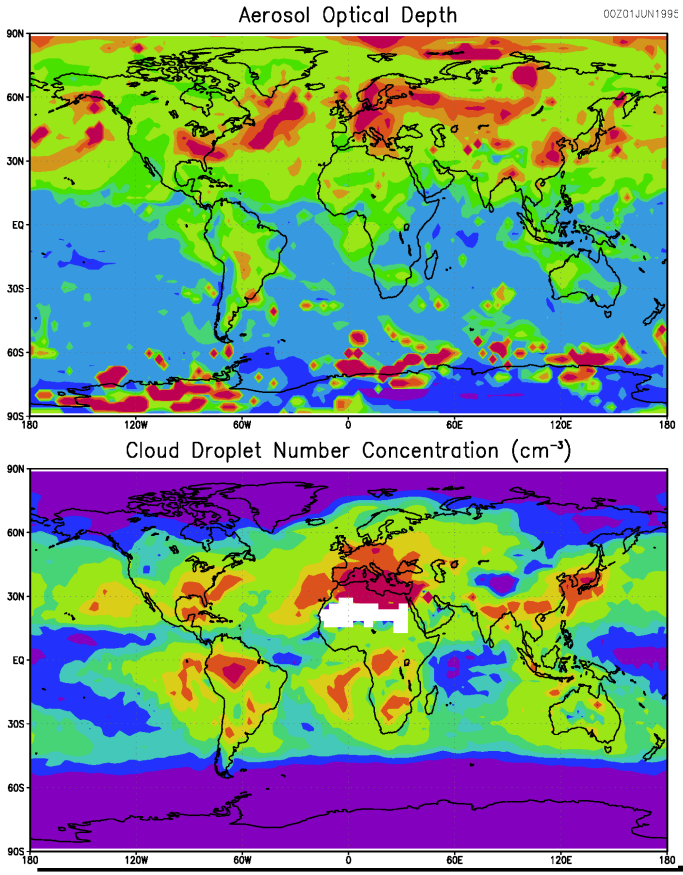
Simulation of Climate Forcing by Aerosols



One of the greatest sources of uncertainty in projections of climate change during this century is the climate forcing by aerosol particles produced by combustion of coal, diesel fuel, and biomass. A global model of emissions of aerosol particles and their gaseous precursors, of aerosol formation, growth, transport and removal, and of the influence of aerosols on the planetary energy balance has been used to estimate the climate forcing by anthropogenic sulfate aerosols.The model treats both direct forcing through scattering and absorption of solar energy, and indirect forcing through the influence of particles on cloud droplet number concentration, cloud optical properties, and cloud lifetime. Aerosols treated are sulfate, sea-salt, dust, organic, and soot.

Ghan, Easter, Chapman, Abdul-Razzak, Zhang, Lleung, Laulainen, Saylor, and Zaveri, A physically-based estimate of radiative forcing by anthropogenic sulfate aerosol. J. Geophys. Res., 106, 5279-5293, 2001.

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