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SIMULATING SULFUR FOR THE ACE-2 EXPERIMENT: PRELIMINARY RESULTS

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The Global Chemistry Model driven by Observation-derived meteorology (GChM-O, Benkovitz and Schwartz, 1997; Benkovitz et al., 1994) has been modified to include the production of H_2O_2 from HO_2, aqueous phase sulfur chemistry in non-precipitating clouds, use of daily averaged oxidant concentrations from the MOZART model (Brasseur, 1998), and dynamic estimation of the cloud water pH. Resolution has been enhanced to $1^\circ \times 1^\circ$ in the horizontal and 27 η coordinate levels in the vertical (surface to ~100 hPa). The model uses the time and location dependent meteorological data from ECMWF. The model has been applied to simulate mixing ratios of sulfate, SO_2, DMS, and MSA for the Northern Hemisphere to 81˚N during the ACE-2 experimental period. Eighty four percent of the sulfur emissions in the modeling domain are contributed by anthropogenic sources, 12% by biogenic sources, and 4% by volcanos. Primary sulfate emissions are only 3% of the sulfur emissions; other statistics for the sulfur emissions are also presented. Analysis of the results for one specific day, June 26, 1997 at 0 UT, show that biogenic emissions contributed ~6% of the total sulfate burden in the domain, anthropogenic emissions contributed ~66%, and volcano emissions contributed 28%. The contributions to the sulfate column burden of the anthropogenic emissions by main source regions (generically called North America, Europe, and Asia) and by formation process (primary, gas-phase, aqueous-phase) are also presented. Vertical profiles of sulfate concentrations at two ACE-2 land sites and the largest contributor at each level demonstrate the difference between a site within an area of heavily anthropogenic emissions and a site away from the direct influence of such emissions.

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