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TRANSBOUNDARY INFLUENCES ON PM CONCENTRATIONS IN THE UNITED STATES

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We use a global three-dimensional model (GEOS-CHEM) to quantify transboundary pollution influences on sulfate, nitrate, ammonium, elemental carbon (EC) and organic carbon (OC) aerosols in the United States through year-round simulations for 1998 and 2001. This work is motivated in part by the Regional Haze Rule of the U.S. Environmental Protection Agency (EPA), which requires improvement in visibility in U.S. wilderness towards an endpoint of natural visibility conditions by 2064. We find that transboundary transport of pollution from Canada, Mexico, and Asia dominates over natural influences for both sulfate and nitrate. Transpacific transport of Asian pollution accounts for 30% of background sulfate in both the western and eastern United States. Our best estimates of natural concentrations for ammonium sulfate and ammonium nitrate in the U.S. are either consistent with or lower than the default values recommended by EPA for natural visibility calculations. However, the large transboundary pollution influence means that a natural visibility objective cannot be met with emissions controls from the U.S. sources alone. We find that fires in Mexico and Canada contributed 40–70% of annual mean natural EC in the United States for 1998 and 20–30% of annual mean natural OC. Our best estimates of mean natural concentrations of EC and OC in the United States, using a model simulation with climatological monthly mean fire emissions, are 2–3 times higher than the default values recommended by the EPA for visibility calculations, except for OC in the eastern United States (16% lower).