



Impacts of Siberian forest fire aerosols on meteorology over East Asia in May 2003

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Intense forest fires occurred over Siberia in May 2003 and released high concentrations of biomass burning aerosols into the atmosphere, affecting regional air quality in East Asia. The enhancement in aerosol concentrations from fires may also affect regional climate through their solar radiation extinction. In this study, we examine the effects of Siberian fire aerosols on regional meteorology using the National Centers for Environmental Prediction-Department of the Energy (NCEP-DOE) reanalysis II data and the NCAR Community Atmosphere Model (CAM3). Our analysis of the NCEP-DOE reanalysis data show 99% statistically significant increases in both surface air pressure over Siberia and precipitation over the NW Pacific, possibly associated with significant changes in surface air temperature due to the Siberian fire aerosols, in 2003 relative to the 30 years climatology. We also conducted NCAR CAM3 simulations forced by 3-D daily mean biomass burning aerosols mainly consisting of black and organic carbons and sulfate aerosols from a global chemistry-transport model, GEOS-Chem. We found that the model simulation with the Siberian forest fire aerosols reproduced the observed cooling over Siberia and downwind East Asia and large-scale perturbations in surface pressure and precipitation. The simulated results clearly indicate a significant impact of Siberian fire aerosols on regional meteorology over East Asia, having important implications not only for regional climate but also for synoptic scale weather patterns.