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Monitoring the Transport of Biomass Burning Emissions in South America

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The atmospheric transport of biomass burning emissions in the South American and African continents is monitored with the aid of numerical simulation of air mass motions using the tracer transport capability of the atmospheric model RAMS (Regional Atmospheric Modeling System) coupled to an emission model. In this application, the mass conservation equation is solved for carbon monoxide (CO) and particulate material (PM2.5). Source emissions of trace gases and particles associated with biomass burning activities in tropical forest, savanna and pasture are parameterized and introduced into the model. The sources are distributed spatially and temporally and assimilated daily according to the biomass burning locations detected by remote sensing. Advection at grid scale, and turbulent transport at sub-grid scale, are provided by the RAMS parameterizations. A sub-grid transport parameterization associated with moist deep and shallow convection, not explicitly resolved by the model due to its low spatial resolution, is also introduced. Sinks associated with wet and dry removal of aerosol particles and chemical transformation of gases are parameterized and introduced into the mass conservation equation. An operational system was implemented producing daily 48-hour numerical simulations (24-hour forecast) of the mass concentrations for CO and PM2.5, in addition to traditional meteorological fields. Time series of PM2.5 measured at the surface are compared with the model results and demonstrate the good forecasting ability of the model.

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