3.029 Investigating the global emission and transport of bioaerosols: combining modeling tools with ground-based and aircraft observations.

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Abstract:

Bioaerosols are ubiquitous in the global atmosphere. They can influence cloud formation by acting as ice nuclei (IN) in their entirety or as cloud condensation nuclei (CCN) after rupturing into smaller particles when exposed to high humidity. Their presence in surface air can also have adverse effects on public health and agriculture. However, their concentrations are not well constrained, which inhibits our understanding of their impact on air quality and climate. We present simulations of global bioaerosol emissions, including fungal spores, pollen and bacteria, and their atmospheric transport using the GEOS-Chem chemical transport model. Emissions of fungal spores are described by a newly developed emission scheme, while we have implemented existing schemes for pollen and bacteria. The fungal spore emission scheme is developed by first deriving fungal spore fluxes from observed concentrations at various locations across the US, and by subsequently relating those fluxes to meteorological and land surface variables. We evaluate simulated concentrations of bioaerosols with ground-based and aircraft observations. We assess both the ability of the model simulations to represent seasonal variations in bioaerosol concentrations for various land use types, and the ability of the simulations to describe the vertical transport of biological aerosol particles to heights at which they can participate in cloud formation.