

Mesoscale Simulations of Bioaerosols in the Mediterranean Basin

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Abstract

Primary biological aerosol particles (PBAPs), referred as bioaerosols, are atmospheric particles released from the biosphere to the atmosphere. They include bacteria, fungi, algae, pollen, viruses, microbial fragments and plant debris. Bioaerosols are composed of organic matter affecting weather and climate by influencing cloud formation and precipitation. They also have adverse impacts on human health by acting as pathogens, allergens and toxins and contributing to the transmission of crop and animal pests. This study focuses on simulating bacteria, fungal spores and pollen emissions, concentrations and deposition in the Mediterranean Basin using WRF-Chem, a regional numerical weather prediction model coupled with chemistry. Bioaerosol emissions parameterizations derived from experimental data were integrated into the model and bioaerosol tracers are following the organic aerosol behavior for atmospheric transport, chemical aging and deposition. First, the model is evaluated by comparison of WRF-Chem predictions of meteorological variables, gas and aerosol phase concentrations with near-surface observations. Bacteria and fungal spores atmospheric concentrations are consistent with terrestrial and oceanic region observations, in the magnitude of 10^4 number/m³. For pollen, lesser observational data exist on their atmospheric observations as well as their emission dependence on temperature and precipitation, implying larger uncertainties in the simulations.

Early Career Scientist

YES, I am an early career scientist.