2.174 Sensitivity of biogenic volatile organic compounds (BVOCs) to land surface parameterizations and vegetation distributions.

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Abstract:

Current climate models still have large uncertainties in estimating biogenic trace gases, which can significantly affect atmospheric chemistry and secondary aerosol formation that ultimately influences air quality and aerosol radiative forcing. These uncertainties result from many factors, including uncertainties in land-surface processes and specification of vegetation types, both of which can affect the simulated near-surface fluxes of biogenic volatile organic compounds (BVOCs). In this study, the latest version of Model of Emissions of Gases and Aerosols from Nature (MEGAN v2.1) is coupled within the land surface scheme CLM4 in the Weather Research and Forecasting model with chemistry (WRF-Chem). In this implementation, MEGAN v2.1 shares a consistent vegetation map with CLM4 for estimating BVOC emissions. This is unlike MEGAN v2.0 in the public version of WRF-Chem that uses a standalone vegetation map that differs from what is used by land surface schemes. This improved modeling framework is used to investigate the impact of two land surface schemes, CLM4 and Noah, on BVOCs and examine the sensitivity of BVOCs to vegetation distributions in California. The measurements collected during the Carbonaceous Aerosol and Radiative Effects Study (CARES) and the California Nexus of Air Quality and Climate Experiment (CalNex) conducted in June of 2010 provide an opportunity to evaluate the simulated BVOCs. Sensitivity experiments show that land surface schemes do influence the simulated BVOCs, but the impact is much smaller than that of vegetation distributions. This study indicates that more effort is needed to obtain the most appropriate and accurate land cover datasets for climate and air quality models in terms of simulating BVOCs, oxidant chemistry, and consequently secondary organic aerosol formation.