Biomass burning organic aerosol from prescribed burning and other activities in the United States

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ABSTRACT

A three-dimensional chemical transport model, PMCAMx-SR, was applied in the continental U.S. to investigate the contribution of prescribed burning and other biomass burning sources to the total organic aerosol (OA) concentrations. Simulations were performed during three seasonally-representative months (April, July and September 2008).

Prescribed burning bbOA emission rates are approximately 300, 80 and 250 tn d^{-1} during April, July and September respectively. Prescribed burning was limited during July due to the prevailing weather conditions. The predicted maximum hourly biomass burning organic aerosol (bbOA) concentration reached a value of approximately 100 μg m^{-3} during April and September, whereas it was less than 15 μg m^{-3} during July. The concentration levels of biomass burning secondary organic aerosol (bbSOA) away from the source of fire indicate that bbSOA can travel several kilometers (more than 500 km) away from the source maintaining a concentration higher than 1.5 μg m^{-3}.

We performed sensitivity simulations where we assumed higher emissions of the more volatile (10^5 and 10^6 μg m^{-3} bins) intermediate volatile organic compounds (IVOCs). Predicted OA concentrations at biomass-impacted sites were compared to observed values from the STN and IMPROVE networks. The analysis has shown that the base case is in better agreement with the observations than the sensitivity one during July and September, whereas during April the sensitivity scenario performs better.