Air pollution forecasting by coupled atmosphere-fire model WRF and SFIRE with WRF-Chem

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Atmospheric pollution regulations have emerged as a dominant obstacle to prescribed burns. Thus, forecasting the pollution caused by wildland fires has acquired high importance. WRF and SFIRE model wildland fire spread in a two-way interaction with the atmosphere. The surface heat flux from the fire causes strong updrafts, which in turn change the winds and affect the fire spread. Fire emissions, estimated from the burning organic matter, are inserted in every time step into WRF-Chem tracers at the lowest atmospheric layers. The buoyancy caused by the fire then naturally simulates plume dynamics, and the chemical transport in WRF-Chem provides a forecast of the pollution spread. We discuss the choice of wood burning models and compatible chemical transport models in WRF-Chem, and demonstrate the results on case studies.