



Impact of forest fire long-range transport on European air composition

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Forest fires produce ozone precursors and aerosols that may impact air quality. Forest fire case studies showed that forest fire plumes can be transported all over the world and produce ozone far from emissions, partly because of the large amounts of emitted pollutants and their eventually high altitude of injection. Global models generally fail to reproduce the strong filamentation observed on those plumes at remote location, as well as the ozone signature of the plumes. It is therefore difficult to evaluate the real impact of forest fire on remote location.

The aim of this study is to evaluate the impact of Alaskan forest fires on European air composition during July 2004, where aircraft measurement taken during the ICARTT campaign showed high levels of pollutants with a forest fire origin over the North Atlantic and Europe

To do so, we combined a regional air quality model (POLYPHEMUS), run at a regional scale over Europe, with composite boundary conditions that realistically simulated the transport and chemical composition of forest fires from Alaska. These boundary conditions are constituted of FLEXPART simulations of Alaskan forest fire CO tracer, added to global model simulations (GEOS-CHEM, without forest fire emissions) that represent background conditions. In forest fire plumes, concentrations of aerosols and reactive species, such as Nox, ozone or VOC, were scaled to FLEXPART CO using measurement performed in forest fire plumes prior to reach Europe.

Using these composite boundary conditions, the air quality model is able to realistically simulate CO and reactive gas measurement taken over Europe during the campaign, as well as aerosol in-situ measurement and tropospheric optical depth measured all over Europe during that period. The strong filamentation of forest fire plumes is very well simulated as well as ozone gradients in plumes. Once the model validated, it is used to realistically evaluate the impact of Alaskan forest fires on European air composition and European air quality.