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**Title:** *Transport of anthropogenic and biomass burning aerosols from Europe to the Arctic during spring 2008.*

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Aircraft measurements taken as part of the POLARCAT campaign (Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate, Chemistry, Aerosols, and Transport) were aimed at investigating pollution transport and atmospheric chemistry in the Arctic. During this campaign, pollution plumes of anthropogenic and biomass burning origin were measured in the Arctic troposphere in spring 2008. We combine those aircraft measurements with simulations using the WRF-Chem model (Weather Research and Forecasting Model including aerosol and chemistry) to investigate cases of aerosol transport from Europe to the Arctic during spring 2008.

We focus our work on the POLARCAT-France campaign in the Scandinavian Arctic in April 2008. We evaluate the model's ability to reproduce observations made during this campaign. Then, we assess with WRF-Chem the extent, vertical distribution and composition of the aerosol plumes by comparing model results with in situ observations of aerosols and CO, used as an anthropogenic and biomass burning tracer. We also use airborne aerosol LIDAR measurements to assess modelled aerosol vertical distributions in the Arctic. With the help of Lagrangian back-trajectories, we investigate in more detail the aerosol transport pathways from Europe to the Arctic, as well as the processes responsible for horizontal and vertical transport. By comparing model results with POLARCAT aircraft data from spring 2008, we provide a means for interpreting the POLARCAT aircraft data set with the goal of improving our understanding of aerosol transport to the Arctic.