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Modelling the chemical composition of the troposphere over the Arctic region using global model simulations within the MACC project

Claire Granier[†]; Idir Bouarar; Kathy Law; Martin Schultz; Olaf Stein; Johannes Flemming; Antje Inness
[†] LATMOS/IPSL, France
Leading author: claire.granier@latmos.ipsl.fr

The European project MACC (Monitoring Atmospheric Chemistry and Climate) provides information on the chemical composition of the atmosphere with daily forecasts and reanalysis products. In this project, reanalysis simulations using the global chemistry-transport model MOZART coupled with the ECMWF integrated forecasting system (IFS) were performed in order to reproduce and understand both the trends and variability of the tropospheric chemical composition for the period 2003-2008. We will focus first on the arctic region where pollution levels are strongly related to meteorological conditions as well as the importing airflow from North America, Asia and Europe. Aircraft measurements of chemical constituents performed during the 2008 POLARCAT campaign have indicated significant influence of biomass burning emissions from boreal wildfires and anthropogenic emissions from the mid-latitudes on the Arctic tropospheric ozone, and hence on the radiative budget in these regions. The reanalysis for key constituents of the troposphere are evaluated through comparison to POLARCAT aircraft measurements, allowing us to assess the ability of the model to reproduce the composition of the arctic troposphere. Focus is then put on seasonal and interannual variations of air pollution levels over several regions, in particular those impacting the Arctic region through long-range transport of gases and aerosols (North America, Europe and Asia). We will show comparison of the reanalysis with satellite and ground based measurements of CO and O3 for the 2003-2008 period. We will also examine the impact of assimilation of several satellite products in the reanalysis through comparisons with MOZART base simulations.