EMS Annual Meeting Abstracts
Vol. 12, EMS2015-24, 2015
15th EMS / 12th ECAM

High resolution modeling of the upper troposphere and lower stratosphere region over the Arctic – GEM-AC simulations for current climate with and without aviation emissions.

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Upper troposphere and lower stratosphere (UTLS) region is a layer around the tropopause. Perturbation of the chemical composition in the UTLS region can impact physical and dynamical processes that can lead to changes in cloudiness, precipitation, radiative forcing, stratosphere-troposphere exchange and zonal flow.

The objective of this study is to investigate the potential impacts of aviation emissions on the upper troposphere and lower stratosphere. In order to assess the impact of the aviation emissions we will focus on changes in atmospheric dynamic due to changes in chemical composition in the UTLS over the Arctic. Specifically, we will assess perturbations in the distribution of the wind, temperature and pressure fields in the UTLS region. Our study will be based on simulations using a high resolution chemical weather model for two scenarios of current (2006) climate: with and without aircraft emissions.

The tool that we use is the GEM-AC (Global Environmental Multiscale with Atmospheric Chemistry) chemical weather model where air quality, free tropospheric and stratospheric chemistry processes are on-line and interactive in an operational weather forecast model of Environment Canada. In vertical, the model domain is defined on 70 hybrid levels with model top at $\sim$60km. The gas-phase chemistry includes detailed reactions of Ox, NO_x, HO_x, CO, CH4, ClOx and BrO. Also, the model can address aerosol microphysics and gas–aerosol partitioning. Aircraft emissions are from the AEDT 2006 database developed by the Federal Aviation Administration (USA).

Results from model simulations on a global variable grid with $\sim$100 km uniform resolution over the Arctic will be presented.