Geophysical Research Abstracts
Vol. 18, EGU2016-14268, 2016
EGU General Assembly 2016

Mineral dust transport in the Arctic modelled with FLEXPART

Christine Groot Zwaaftink (1), Henrik Grythe (1,2,3), and Andreas Stohl (1)

(1) NILU - Norwegian Institute for Air Research, Kjeller, Norway (cgz@nilu.no), (2) Stockholm University, Department of Environmental Science and Analytical Chemistry (ACES), Atmospheric Science Unit, Stockholm, Sweden, (3) Finnish Meteorological Institute (FMI), Air Quality Research, Helsinki, Finland

Aeolian transport of mineral dust is suggested to play an important role in many processes. For instance, mineral aerosols affect the radiation balance of the atmosphere, and mineral deposits influence ice sheet mass balances and terrestrial and ocean ecosystems. While many efforts have been done to model global dust transport, relatively little attention has been given to mineral dust in the Arctic. Even though this region is more remote from the world's major dust sources and dust concentrations may be lower than elsewhere, effects of mineral dust on for instance the radiation balance can be highly relevant. Furthermore, there are substantial local sources of dust in or close to the Arctic (e.g., in Iceland), whose impact on Arctic dust concentrations has not been studied in detail. We therefore aim to estimate contributions of different source regions to mineral dust in the Arctic. We have developed a dust mobilization routine in combination with the Lagrangian dispersion model FLEXPART to make such estimates. The lack of details on soil properties in many areas requires a simple routine for global simulations. However, we have paid special attention to the dust sources on Iceland. The mobilization routine does account for topography, snow cover and soil moisture effects, in addition to meteorological parameters.
FLEXPART, driven with operational meteorological data from European Centre for Medium-Range Weather Forecasts, was used to do a three-year global dust simulation for the years 2010 to 2012. We assess the model performance in terms of surface concentration and deposition at several locations spread over the globe. We will discuss how deposition and dust load patterns in the Arctic change throughout seasons based on the source of the dust. Important source regions for mineral dust found in the Arctic are not only the major desert areas, such as the Sahara, but also local bare-soil regions. From our model results, it appears that total dust load in the Arctic atmosphere is dominated by dust from Africa and Asia. However, in the lower atmosphere, local sources also contribute strongly to dust concentrations. Especially from Iceland, significant amounts of dust are mobilized. These local sources with relatively shallow transport of dust also affect the spatial distribution of dust deposition. For instance, model estimates show that in autumn and winter most of the deposited dust in Greenland originates from sources north of 60 degrees latitude.