Geophysical Research Abstracts
Vol. 16, EGU2014-11470, 2014
EGU General Assembly 2014


# Water vapour variability and trends in the Arctic stratosphere

Laura Thölix (1), Rigel Kivi (2), Leif Backman (1), and Alexey Karpechko (3)

(1) Finnish Meteorological Institute, Climate Research, Helsinki, Finland , (2) Finnish Meteorological Institute, Arctic Research, Sodankylä, Finland , (3) Finnish Meteorological Institute, Arctic Research, Helsinki, Finland

Water vapour in the upper troposphere-lower stratosphere (UTLS) is a radiatively and chemically important trace gas. Stratospheric water vapour also affects ozone chemistry through odd-hydrogen chemistry and formation of polar stratospheric clouds (PSC). Both transport and chemistry contribute to the extratropical lower stratospheric water vapour distribution and trends. The main sources of stratospheric water vapour are intrusion through the tropical tropopause and production from oxidation of methane. Accurate observations of UTLS water vapour are difficult to obtain due to the strong gradient in the water vapour profile over the tropopause. However, modelling the stratospheric water vapour distribution is challenging and accurate measurements are needed for model validation.

Trends in Arctic water vapour will be analysed and explained in terms of contribution from different processes (transport and chemistry), using observations and chemistry transport model (CTM) simulations. Accurate water vapour soundings from Sodankylä will be used to study water vapour within the Arctic polar vortex, including process studies on formation of PSCs and dehydration. Water vapour profiles measured during the LAPBIAT atmospheric sounding campaign in Sodankylä in January 2010 indicated formation of ice clouds and dehydration. Effects on ozone chemistry will also be studied.

Global middle atmospheric simulations have been performed with the FinROSE-ctm using ERA-Interim winds and temperatures. The FinROSE-ctm is a global middle atmosphere model that produces the distribution of 30 long-lived species and tracers and 14 short-lived species. The chemistry describes around 110 gas phase reactions, 37 photodissociation processes and the main heterogeneous reactions
related to aerosols and polar stratospheric clouds.