

SPARC Water Vapor Assessment: Winter and springtime water vapour distribution in the Arctic stratosphere

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Lower stratospheric water vapour is radiatively important however, the observational data is relatively sparse. There is a very steep gradient in the water vapour profile over the tropopause and the stratosphere is very dry, which makes accurate observations difficult to obtain. Modelling of the extratropical stratospheric water vapour is also challenging, e.g. due to temperature dependent processes (dehydration) in the tropical tropopause. The main sources of stratospheric water vapour are intrusion through the tropical tropopause and production from oxidation of methane. Accurate soundings of stratospheric water vapour have been made above Sodankylä, in northern Finland, since early 2000s. Two major water vapour measurement campaigns have been organized in Sodankylä, i.e. the LAPBIAT Upper Troposphere Lower Stratosphere Water Vapour Validation Project (LAUTLOS-WAVVAP) in 2004 and the LAPBIAT atmospheric sounding campaign in 2010. In this study we will analyse the stratospheric water vapour distribution during these two campaigns using both balloon sounding and satellite data. For the duration of the campaigns there are a relatively large amount of measured water vapour profiles available. In addition to the campaign data there is a continuous water vapour sounding record starting in early 2000s. The observed winter/spring time water vapour distribution will be analyzed together with modelled stratospheric water vapour profiles for the Arctic region. The stratospheric water vapour distribution will be simulated using the FinROSE chemistry-transport model driven by the reanalysis data produced by the European Centre for Medium-Range Weather Forecasts (ECMWF). In this work the ERA-Interim (1989-2011) winds and temperatures are used.