Geophysical Research Abstracts, Vol. 8, 04437, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04437


# Characterization of stratospheric water vapour vertical distribution in the Arctic from balloon observations during the recent winters.

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During the recent winters water vapour has been accurately measured from different Arctic sites using balloon-borne Lyman-alpha FLASH-B hygrosonde. Here we present the results of 18 balloon water vapour soundings conducted at Sodankylä (67 N) and Ny-Alesund (79 N) during 2003/04, 2004/05 and 2005/06 winters. The obtained data set allows case studies and detailed characterization of stratospheric water vapour vertical distribution within different conditions in the Arctic polar stratosphere. Water vapour vertical distribution in the Arctic lower stratosphere is primarily affected by the dynamical effects of polar vortex and by phase aggregation at the temperatures below ice PSC threshold. The measured H2O profiles carry the signatures of different processes occurring in the Arctic winter stratosphere and reveal a detailed view on the Arctic UT/LS water vapour distribution. The measurements clearly demonstrate typical differences in stratospheric water vapour concentration inside and outside the vortex; for example in the polar vortex of 2003/04 at 20 hPa the difference reaches 1.4 ppmv. Also it is pointed out that water vapour profiles obtained at the edge or close to the edge of vortex are characteristic by their laminated structure. As shown by the results of RDF-analysis this structure is not linked to dehydration but to differential advection of air masses originating from inside and outside the vortex. Thus water vapour is proved to be a valuable tracer for dynamical processes in the polar stratosphere. In the other case, the water vapour vertical profiles obtained at Ny-Alesund in January 2005 during the presence of PSCs clearly show the dehydration layers with reduced water vapour. Another focus is put here on the water vapour vertical distribution

within the so called transition layer above the polar tropopause. The existence of this transition layer may be caused by diffusion of water vapour through the smeared polar winter tropopause, whereas the vertical structure of the H2O profile is affected by the dynamical processes. In addition the variability of water vapour at the hygropause and the distance between tropopause and hygropause are discussed. This work has been partly supported by INTAS YSF 05-109-4955 grant.