



Polar Stratospheric Cloud formation and denitrification during the Arctic winter 2009/2010 and 2010/2011

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The sedimentation of HNO_3 containing polar stratospheric cloud particles leads to a permanent removal of HNO_3 from the stratosphere. The so-called denitrification is an effect that plays an important role in stratospheric ozone depletion. The Arctic winter 2009/2010 and 2010/2011 were both quite unique. The Arctic winter 2010/2011 was one of the coldest winters on record leading to the strongest depletion of ozone measured in the Arctic. Though the Arctic winter 2009/2010 was rather warm in the climatological sense it was distinguished by an exceptionally cold stratosphere from mid December 2009 to mid January 2010 leading to prolonged PSC formation and significant denitrification. Model simulations and space-borne observations are used to investigate PSC formation and denitrification during these two winters. Model simulations were performed with the atmospheric chemistry-climate model ECHAM5/MESy Atmospheric Chemistry (EMAC) and compared to observations by the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations Satellite (CALIPSO) and the Odin Sub-Millimetre Radiometer (Odin/SMR) as well as with observations from the Microwave Limb Sounder on Aura (Aura/MLS). While PSCs were present during the Arctic winter 2010/2011 over nearly four months, from mid December to end of March, they were not as persistent as the ones that occurred during the shorter (one month) cold period during the Arctic winter 2009/2010. Although the PSC season during the Arctic winter 2009/2010 was much shorter than in 2010/2011, denitrification during the Arctic winter 2009/2010 was similar in magnitude than during 2010/2011.