

Lagrangian analysis of dehydration processes inside the Antarctic polar vortex

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Interannual variations of stratospheric water vapor have a large impact on the surface temperature as well as the stratospheric temperature. The stratospheric water vapor concentration is primarily controlled by dehydration processes in the tropical tropopause layer and methane oxidation in the stratosphere. However, the water vapor concentration inside the stratospheric polar vortex, especially in the Antarctic, is affected by additional dehydration, because the lower stratosphere in the polar vortex becomes colder than the tropical tropopause. Thus it is inferred that the stratospheric water vapor, which is one of primary greenhouse gases, over the Antarctic changes in a different way from other latitude regions. In order to examine how much the stratospheric water vapor concentration varies due to the dehydration and any other processes unique to the Antarctic stratosphere, a trajectory-based analysis is applied to the stratospheric water vapor data of the Microwave Limb Sounder (MLS) onboard the Aura satellite. It can give a minimum saturation mixing ratio of water vapor on each trajectory, which should be identical with the observed water vapor mixing ratio if it is determined by the dehydration during the trajectory period. This analysis will provide quantitative estimates of the dehydration and any other processes contributing to the variation of water vapor concentration in the Antarctic stratosphere.

Key words: water vapor, polar vortex, Antarctic, dehydration, trajectory