

Correlation between O₃ and HCl in the lower stratosphere as observed by SMILES

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Ozone (O₃) in the upper troposphere (UT) has an effect on radiative forcing. One of poorly constrained source of tropospheric O₃ is the stratosphere. Marcy et al. (Science, 2004) have suggested that measurements of HCl in the UT can be used to calculate how much O₃ was transported from the lower stratosphere (LS). Using the correlation between O₃ and HCl in the LS, a fraction of the source of the stratosphere has been quantified from measurements in the UT. To perform such a study, it is important to establish the O₃/HCl correlations in the LS. Here, we will present the O₃/HCl correlations as observed by the Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) on board the International Space Station (ISS) (Kikuchi et al., JGR, 2010). We first focus on latitudes between 30°S and 66°S in periods of November 2009, February 2010, and April 2010, when SMILES mainly covered the Southern Hemisphere (S.H.). Both the slope and intercept of the O₃/HCl correlation in the S.H. Feb. are larger than those in Nov. (outside the Antarctic vortex). This is probably due to mixing of air inside and outside the Antarctic vortex, where the enhanced HCl values were observed only inside the vortex (The break-up of the vortex occurred in Dec. 2009 in the LS). Then, hemispheric contrasts in spring and fall will also be presented. In the S.H. Nov. (late spring), the slope is larger than that in the N.H. Apr. (30-66°N). Also, in the S.H. Apr. (fall), the slope is larger than that in the N.H. Oct. (30-66°N). Although, the reason for these larger slopes in the S.H. is not known, the O₃/HCl correlations obtained from SMILES give recent references for the mid to high latitude LS in both the hemispheres.

Keywords: SMILES, ISS, ozone, chlorine