

4.105 Temporal variation of HCl related to the change of the meridional circulation in the northern lower stratosphere.

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Abstract:

HCl is a main chlorine reservoir species in the stratosphere. The amount of HCl is a good indicator for a potential of ozone depletion. Observed total column of HCl was decreasing in 2000s after the CFCs regulation but showed increase from 2007 to 2010. Mahieu et al. [2014] investigated that this increase is due to interannual dynamical variability in the northern stratosphere from Fourier Transform Infrared spectrometer (FTIR) observations at 8 sites including Tsukuba and 3D-chemical transport model simulations. In this study we extended the analysis of HCl total column observed with FTIR at Tsukuba to 2017. The temporal variation of HCl total column showed decrease again from 2011 to 2014 then increase from 2015 to 2017. Mass stream function was calculated from ERA-Interim meteorological data to confirm that these temporal variations are also due to stratospheric circulation change. The difference of the mass stream function between the average of 2003 - 2005 and the average of 2007 - 2009 shows negative values in the northern lower stratosphere. This means the deceleration of circulation and it is consistent with the result of Mahieu et al. [2014]. The difference between the average of 2007 - 2009 and the average of 2011 - 2013 shows positive values in the northern lower stratosphere that means the acceleration of circulation. The difference between the average of 2011 - 2013 and the average of 2015 - 2016 shows negative values in the northern lower stratosphere again. These changes correspond to the HCl temporal variation. Thus we confirm that the temporal variation of HCl after 2011 is also due to stratospheric circulation change.