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Interhemispheric differences in changes of long-lived tracers in the stratosphere over the last decade

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Long-lived chemical species are analyzed to investigate the temporal variations of mixing ratios of HF, CH_4, and H_2O in the stratosphere from April 1992 through August 2004 using HALOE satellite observations. HF concentrations in the upper stratosphere increase at similar rates in both hemispheres. HF in the extratropical mid-stratosphere, however, has increased more rapidly in the Northern Hemisphere (NH) than in the Southern Hemisphere (SH). CH_4 and H_2O show the similar long-term intensifications in their interhemispheric differences. The characteristic features in the long-term variability of the observed tracers are related to the residual circulation and stratospheric planetary wave activity. The increasing hemispheric asymmetries of the tracer mixing ratios are in good agreement with the change in the calculated residual circulation, strengthening over the last 12 years in the NH. This change of residual circulation is caused by the intensification of the stratospheric wave activity associated with upward propagating planetary waves in the NH..