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Seasonal variations of stratospheric deuterated water in the Asian summer monsoon

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With water vapour being one of the most important stratospheric greenhouse gases, the concentration as well as its way of transportation are of special interest to climate research. In the deep tropics, it has been consistently shown in recent years that slow uplift above deep convection is the main process leading to stratospheric moistening. However, several publications arose the question whether or not monsoon circulation has to be considered as a special case for stratospheric moistening in the subtropics. The analysis of H_2O isotopes (deuterated water) and their mixing ratio in comparison to standard conditions is considered to improve the understanding of major water vapour fluxes into the Stratosphere.
With the intention to use only one consistent dataset of an monsoonal area over the period of several years, satellite data of the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) is used in this investigation. The passive remote sensing instrument has been operated on the ENVISAT satellite from 2002 to 2012.
In this work we concentrate on a predefined latitude-longitude box, located at the region of the Asian summer monsoon anticyclone. Monthly means of H_2O, HDO and δD, as well as single profiles that exceed certain threshold values in the lower stratosphere are correlated with each other. In order to distinguish between tropospheric and stratospheric altitudes, the results are calculated and presented with respect to the lapse rate tropopause.
So far, the results show that there is clear evidence of changing deuterium depletion patterns during the season of the Asian summer monsoon. This indicates that the transport pathway of water vapour into the stratosphere has a seasonal dependence, determined by the monsoon system.
In further steps, correlations of prominent high values of H_2O, HDO and δD shall be linked to specific geolocations in respect to their climatological characteristics. In this way, it is expected to achieve a comprehensive understanding of the subtropical transport processes of water vapour into the lower Stratosphere.