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- ▣ [Special Issue](#)

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HDO measurements with MIPAS

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Abstract. We have used high spectral resolution spectroscopic measurements from the MIPAS instrument on the Envisat satellite to simultaneously retrieve vertical profiles of H₂O and HDO in the stratosphere and uppermost troposphere. Variations in the deuterium content of water are expressed in the common δ notation, where δD is the deviation of the Deuterium/Hydrogen ratio in a sample from a standard isotope ratio. A thorough error analysis of the retrievals confirms that reliable δD data can be obtained up to an altitude of ~ 45 km. Averaging over multiple orbits and thus over longitudes further reduces the random part of the error. The absolute total error of averaged δD is between 36‰ and 111‰. With values lower than 42‰ the total random error is significantly smaller than the natural variability of δD . The data compare well with previous investigations. The MIPAS measurements now provide a unique global data set of high-quality δD data that will provide novel insight into the stratospheric water cycle.

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