Oral contribution: Towards better global atmospheric HDO/H_2O retrievals

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Recently we acquired an entirely new perspective on the near-surface distribution of water vapor isotopologues with the first space-borne retrievals of global HDO/H_2O abundances.

As evaporation and condensation processes deplete heavy water in the gas phase, the relative abundance of the heavy water isotopologue HDO provides a deeper insight in the water cycle. For the retrievals of HDO/H_2O we are using the 2.3 micron (SWIR) channel of the SCanning Imaging Absorption spectroMeter for Atmospheric CartograpHY (SCIAMACHY) instrument on-board ENVISAT. Considering the great potential of the HDO/H_2O dataset, we set out to further improve the accuracy of our retrievals and to provide these to the public. Similar retrievals of the greenhouse gas methane have been shown to systematically improve by reanalysis of the spectroscopic line parameters. We therefore exploit the same technique in order to derive an improved spectral linelist for H_2O and its isotopologues in the 2.3 micron window. We use the laboratory spectra of Jenouvrier et al. (2007), for which we improve the line intensities, pressure broadening coefficients and the pressure-induced line shifts for the 4174-4300 cm^{-1} spectral range. The updated spectral linelist is tested on retrievals of ground-based atmospheric FTS spectra, showing reductions of systematic residuals of up to 5%. Future improvements of our HDO/H_2O retrievals will include the implementation of a novel technique to correct for the scattering effects of an ice layer on the SWIR detector and better filtering for bad pixels. We also provide an outlook for the new TROPOMI instrument, scheduled for launch in 2014 on-board ESA's Sentinel 5 precursor satellite. With its smaller ground pixels, shorter revisit time and increased sensitivity, TROPOMI will greatly increase the amount of useful data for retrieving near-surface water vapor isotopologues in the atmosphere.