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Inter-comparison of surface, ground based total column and satellite measurements of the isotopic composition of water vapour

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The stable isotopic composition of water vapour is determined from evapotranspiration, condensation and mixing processes in the atmosphere. Monitoring the stable isotopes in water vapour can therefore provide a continuous record of the atmospheric hydrological cycle. With the introduction of new broadband and laser technology it has become increasingly possible to collect such records at the surface. In addition, retrievals from satellite-borne instruments now enable global mapping, ideal for comparison with isotopically enabled GCMs. However, at this stage it is unclear how well column measurements from satellites represent the most active part of the atmospheric hydrological cycle; the planetary boundary layer. Thus, it is important to determine the relationship between the isotopic composition of water vapour at the surface and that retrieved by satellites. Here we compare isotopic measurements of water vapour collected at the surface using a portable low spectral resolution FTIR, and via total column retrievals from a ground-based solar FTS and from SCIAMACHY onboard ENVISAT, around Sydney, Australia. The aim of this study is to determine how well the satellite measurements capture the large variability of the atmospheric hydrological cycle on a synoptic timescale and within the planetary boundary layer.