

Global Observations of Isotopes of Ozone and Water Vapour in the Stratosphere and Lower Mesosphere by the Odin Sub-Millimetre Radiometer

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The *Sub-Millimetre Radiometer* (SMR) on board the Odin satellite, launched in February 2001, observes thermal emission lines of species relevant to chemistry and dynamics of stratosphere and mesosphere.

Besides the basic stratospheric mode measurements of O₃, ClO, N₂O, and HNO₃ in two bands around 501 GHz and 544 GHz, Odin/SMR is also regularly tuned to other frequency bands and observation modes. Isotopes of ozone and water vapour are for example observed on the basis of one day per week in two bands near 489 GHz.

The aim of the presentation is first of all to investigate the potential of the Odin/SMR measurements for the study of the global distribution and variability of the enrichment of heavy isotopes of ozone in the stratosphere. The Odin/SMR measurements allow to retrieve profiles of the main isotope O₃-16 as well as the asymmetric and symmetric variants O₃-18-asym, O₃-18-sym, and O₃-17-asym in the stratosphere above 20 km, whilst the altitude range and resolution depends critically on the signal-to-noise ratio obtained for each species.

The same band is used to study the amount and variability of water vapour and its isotopes. Vertical profiles of H₂O-16, H₂O-18, and HDO are retrieved between roughly 20 and 70 km in the stratosphere and lower mesosphere. Measurements in monthly intervals of H₂O-17 at 551 GHz complete the picture on water isotopes provided by Odin. The measurements allow to study the isotopic depletion/enrichment of water, potentially supplying information on the origin of stratospheric water vapour: transport of tropospheric air through the tropical tropopause layer (TTL) vs in-situ chemical production by methane oxidation.

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