



Global satellite observations of isotopically substituted molecules: past, present and future

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Chemical and physical processes may give rise to isotope fractionation of molecular species in the atmospheres. A brief overview of fractionation theory and the implications for water vapor in the stratosphere is presented along with recent observation results. Odin is a Swedish-led satellite project funded jointly by Sweden, Canada, Finland and France. The SubMillimeter Radiometre (SMR) onboard the Odin satellite, launched in February 2001, employs 4 tunable single-sideband Schottky-diode heterodyne receivers in the 485-580GHz spectral range. In aeronomy mode, various target bands are dedicated to observations of trace constituents relevant to stratospheric/mesospheric chemistry and dynamics such as O₃, ClO, N₂O, HNO₃, H₂O, CO, NO, as well as isotopes of H₂O and O₃. The global distribution of the isotopomer of water vapor was observed for the first time with Odin/SMR. The δD of water vapor in the stratosphere agrees with previous measurements and a model. The methane contribution to the increase of δD with altitude is discussed. An estimation of the net contribution of methane to the abundance of water vapor is given. The results help us refine some of the basic questions about the processes controlling water vapor abundance in the stratosphere, and illustrate some critical areas where more observations and models are needed.