

MEASUREMENTS OF THE HDO/H₂¹⁶O RATIO WITH IASI/METOP

J.-L. Lacour¹, H. Herbin², D. Hurtmans¹, L. Clarisse¹, P.-F. Coheur¹, C. Clerbaux^{3,1},
S. Fally⁴, C. Hermans⁴, M. De Mazière⁴

¹ Spectroscopie de l'Atmosphère, Chimie Quantique et Photophysique,
Université Libre de Bruxelles, Belgium,

² Laboratoire d'Optique Atmosphérique, Université de Lille, France,

³UPMC Univ. Paris 06; CNRS/INSU, LATMOS-IPSL, Paris, France,

⁴Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium

Study of the isotopic composition of atmospheric water vapour is necessary to improve our knowledge of the mechanisms taking place within the hydrological cycle. In particular there are uncertainties in the response of water to environment variability such as global warming. Present comprehension of the variability of water isotopologues is mainly based on models; observations exist but are mainly sporadic. Recent global sounders and ground-based instruments have shown good sensitivity for heavier isotopic species, and in particular HDO. In this perspective the capabilities of the IASI/METOP satellite instrument to measure water vapour isotopologues at any place 2 times a day, with relatively high spatial resolution and in a unique long term perspective (15-20 years) is of great interest. Additionally, spatial and temporal coverage of IASI make it an ideal tool to capture perturbations in the isotopic composition of the water vapour during extreme meteorological events.

We will provide a short description of the IASI instrument and a thorough analysis of its capabilities to probe independently H₂¹⁶O and HDO and to measure δD values in the lower troposphere. We will show that accurate values of δD can be retrieved from IASI in the altitude range between 1 and 4 km. In addition, we will give preliminary results for IASI H₂¹⁸O retrievals, mainly restricted, however, to information content and error budget analyses.

To support our study of the HDO and δD retrievals with IASI, a series of measurements above Hawaii, made in the frame of the Havaiki campaign, will be presented and discussed, notably with respect to existing models. Example of retrievals during extreme meteorological events will be shown as well. Finally, retrievals above the Reunion Island, where a ground-based FTIR is operated, will be provided, to stimulate and strengthen satellite validation activities.