

Retrieval of tropospheric water vapour by using spectra from a microwave spectro-radiometer at 22 GHz

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We present an approach to retrieve the tropospheric water vapour content from spectra observed at 22 GHz by the groundbased microwave radiometer MIAWARA (Middle Atmospheric Water Vapour Radiometer), located in the south of Bern (CH) and operated by the Institute of Applied Physics observing the 22.235 GHz water vapour emission line. MIAWARA was originally designed to retrieve middle atmospheric water vapour content, what is done operationally in the frame of NDACC (Network for Detection of Atmospheric Composition Change).

Additionally, the tropospheric water vapour content is retrieved by using total power spectra from tipping curve calibration (usually used to determine tropospheric opacity). Our validations with balloon soundings showed, that our retrieval approach is able to deliver reasonable results up to ~ 7 km with limited altitude resolution.

In addition to a standard a priori profile, we try to improve the performance of our retrieval by using additional external informations as retrieval constraints. One attempt is to use informations about cloud coverage delivered by a Ceilometer (installed close to the instrument) and an infrared sensor, which is attached to the instrument with the same line-of-sight. Thereby the cloud-base height together with an assumed relative humidity of 100% deliver a “fixed-point” with known profile value as additional a-priori information.

This work is part of COST-Action ES0604 project, whose goal is to develop an integrated retrieval algorithm to retrieve water vapour from the surface to the mesosphere.