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Tropospheric water vapor profiles retrieved from pressure broadened emission spectra at 22 GHz under clear sky conditions

A. Haefele and N. Kämpfer

Institute of Applied Physics, University of Bern, Switzerland (haefele@iap.unibe.ch)

We present a characterization and first results of the optimal estimation retrieval of water vapor profiles from the surface up to 10 km from pressure broadened emission spectra. The spectra have a bandwidth of 1 GHz and are centered around 22.235 GHz. The measurements are made by a ground based heterodyne receiver equipped with a digital FFT spectrometer and calibrated by means of a hot and a cold load at ambient and liquid nitrogen temperature, respectively. The system is originally designed for measuring middle atmospheric water vapor profiles and is operated in the frame of the Network for the Detection of Atmospheric Composition Change, NDACC, on a routine basis.

The analysis of the averaging kernels reveals a total of 3 independent layers that can be retrieved in the troposphere. A first evaluation of the retrieved profiles based on a total of 13 profile to profile comparisons with coincident balloon soundings under clear sky conditions gives promising results.