

# Water Vapour Measurements in Mérida

**M. Quack, J. Notholt and K. F. Kuenzi**, Institute of Environmental Physics  
University of Bremen, Otto-Hahn-Allee, 28359 Bremen, Germany

Mail to: quack@uni-bremen.de

## First preliminary results of the water vapour measurements on Pico Espejo

At the station on Pico Espejo we measure the emission line of water vapour at 22 GHz in the microwave spectrum. This is a rotational transition of the water vapour molecule. From the measured spectrum, we try to retrieve stratospheric water vapour profiles. In the following section, we would like to show an example of the measured spectra and the retrieved profile.

In figure 1 on the left are shown two measured full spectra of the water vapour emission in the range around 22 GHz. The rough shape of the spectra is caused by

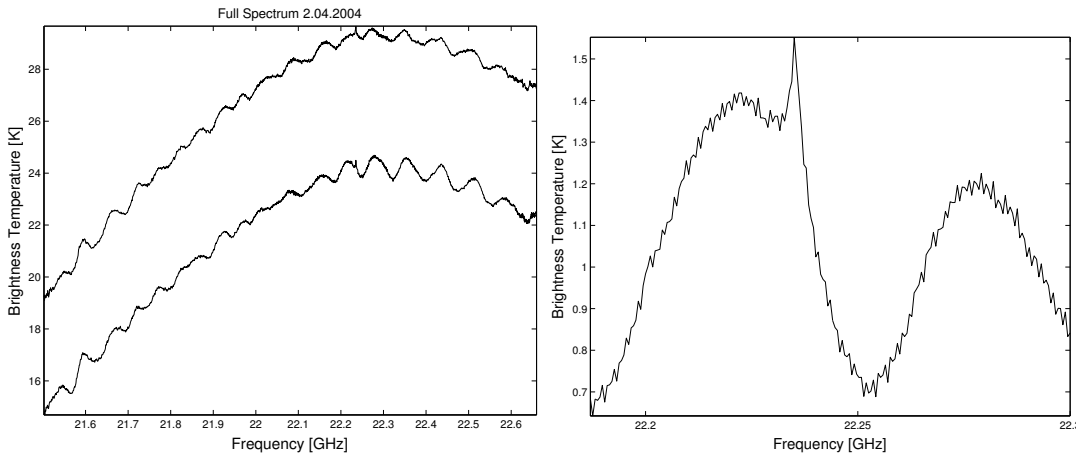


Figure 1: Left: Water Vapour spectra from 2. April 2004, right: Corrected spectrum.

the pressure broadened emission of water vapour in the troposphere. Each spectrum is integrated about 600 s. The absolute temperatures of the spectra depend on the amount of water vapour in the atmosphere. In this case, the values around 15 to 30 Kelvin show excellent measurement conditions at this high altitude site. So we should get a good signal from the stratosphere. This 'stratospheric part' of the spectral line is shown on the right side of figure 1. It is an integration of 20 spectra, corrected by tropospheric absorption. The water vapour line is superimposed by a sinusoidal pattern, called standing waves, that are caused by multiple reflection in the optical

part of the radiometer. This line is corrected by this standing wave, and run through an

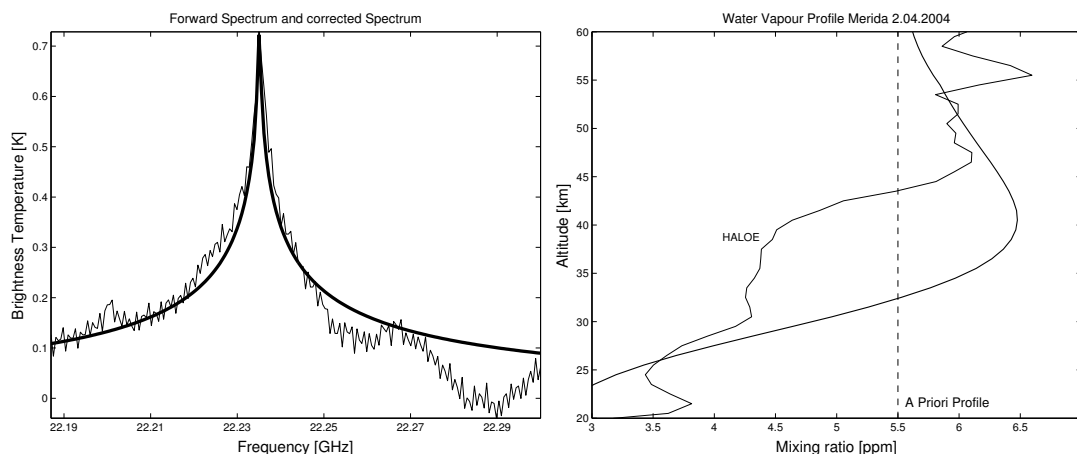


Figure 2: Left: Corrected spectra and forward calculation, right: retrieved water vapour profile and a priori.

optimal estimation calculation. That means we calculate the radiative transfer from the a priori profile (figure 2 left: 5.5 ppm in the stratosphere) and optimise this calculated spectrum in respect to the measured spectrum. The thick line in figure 2 on the left shows the calculated spectrum, and the thin line the measured spectrum. This leads to a calculated stratospheric water vapour profile that is shown on the right side of figure 2. This preliminary results show a reasonable agreement with HALOE measurements from the middle of March (17. March, meanvalue of six measurements from 6°N-8.5°N and 165°W-285°W).

So we can conclude that the station in Mérida provides excellent conditions for the measurement of stratospheric water vapour.

*Many thanks to Prof. Pedro Hoffman who operates our instrument and makes these measurements possible!*