

# Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft

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## Observation of stratospherical trace gases by millimeter wave radiometry in tropical South America

### The Station



The MARS building with the cable car system and the peaks of Sierra Nevada de Merida

The Merida Atmospheric Research Station (MARS) is the only tropical station with almost continuous microwave observations of the atmosphere since 2004. The location is:

**Pico Espejo, Merida, Venezuela**  
**8,58°N, 71,15°W, 4765 m asl**

This site offers excellent conditions due to its high altitude with low water vapor column content and high transmission of the troposphere, the accessibility by the world's highest public cable car and the proximity to the university. MARS is jointly operated with the Universidad de los Andes and shared by the universities of Bremen and Stockholm



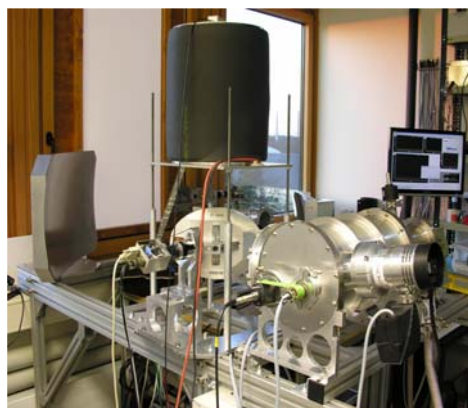
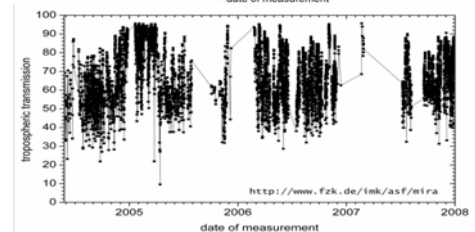
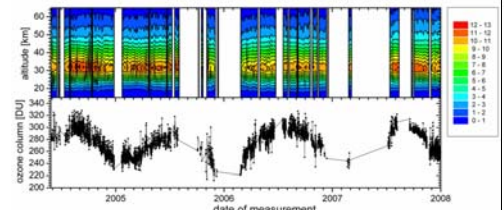
MARS building on the crest of Pico Espejo with both measurement windows above the cliff



The 268 – 280 GHz-Radiometer installed inside the MARS station

### Ozone measurement

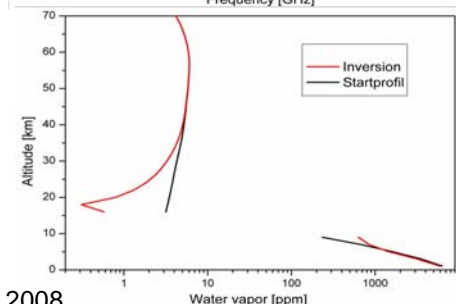
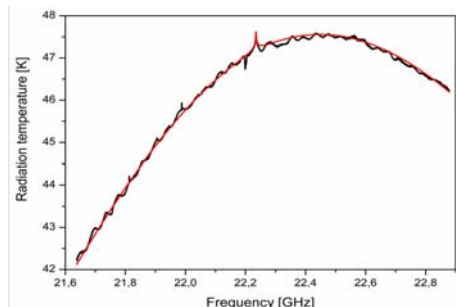
Ozone profiles in the altitude range from 20 to 80 km have been recorded since 2004 using the radiometer MIRA2. This instrument is tunable over the frequency range of 268 – 280 GHz for observations of O<sub>3</sub>, N<sub>2</sub>O, HNO<sub>3</sub> or ClO. The diagrams illustrate the annual cycle of the ozone column and often excellent (i.e. >70%) transmission of the troposphere. The resulting data are used for satellite validation (ENVISAT, ODIN, AURA) and for the international research networks (e.g. NDACC).



MIRA5 during lab tests. The cold load is contained in the dewar in front and provides a reference radiation temperature of 30 K.

### Water vapor measurement

The new instrument MIRA5 with the spectral range of  $22.235 \pm 0.5$  GHz has been designed for long-term unattended operation. The cold load is embedded in a dewar and permanently cooled by a closed-cycle refrigerator. The dewar constraints demand a unusually complex quasi-optical system. The receiver has a noise temperature of 170 K. The spectrum is resolved by now by AOS with a resolution of 0,7 MHz. The water vapor profile has been retrieved in the troposphere as well as in the stratosphere and mesosphere. A validation campaign is planned at UFS Schneefernerhaus during winter 2008/09.



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