

# Water Vapour Radiometers

Radiometer Group (RAM)

Institut für Umweltphysik (IUP)

## Radiometers

- 2 similar H<sub>2</sub>O Radiometers
- 22 GHz Water Vapour line
- WARAM operating since January 1999 in Ny-Alesund (Spitzbergen)
- WARAM 2 operating since March 2003 in the Schneefernerhaus at Zugspitze (2650 m)
- Planned for Mérida (Venezuela)

# MARS

## Mérida Atmospheric Research Station

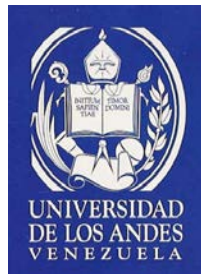
Partners:



Institute of Environmental Physics (IUP)  
University of Bremen, Germany

Forschungszentrum Karlsruhe  
Technik und Umwelt

Institut für Meteorologie und  
Klimaforschung (IMK)  
Forschungszentrum Karlsruhe, Germany



Department of Physics  
Universidad de los Andes, Venezuela

# MARS

## Location of MARS:

- Pico Espejo near Mérida  
8°N, 71°W, 4765 m asl
  - Access by cable car
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- The building is completed
  - Waiting for customs clearance
- Goal:**  
Validation of SCIAMACHY (onboard ENVISAT)



# The MARS Observing Site at Pico Espejo



Building on top of Pico Espejo, 4765 m



# MARS

## Instruments at Pico Espejo:

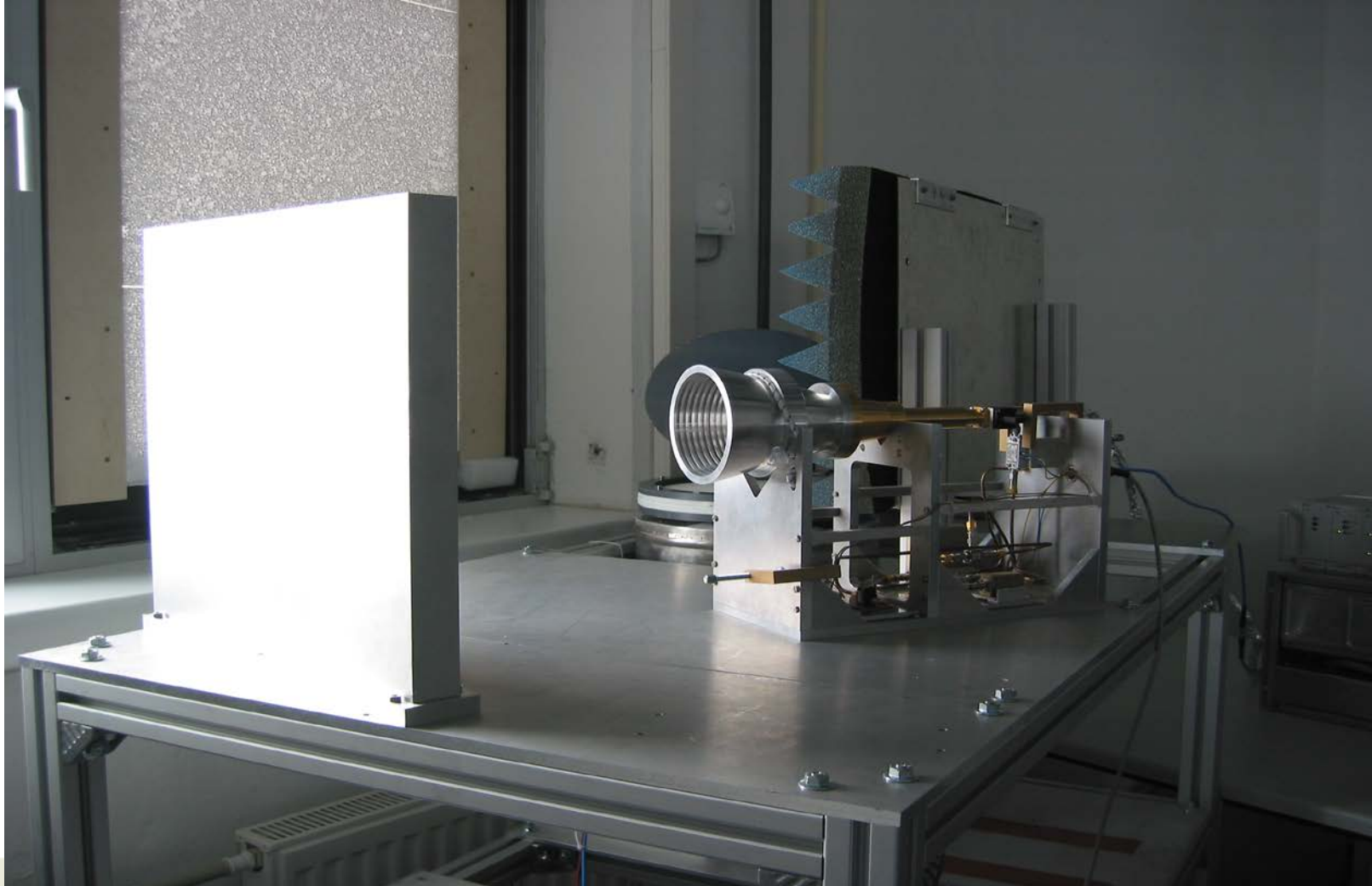
- 2 Microwave Radiometers:  
 WARAM 2 (water vapour radiometer operating at 22 GHz)  
 MIRA 2 (multi species instrument operating at 268-280 GHz)
- DOAS, IUP
- In situ measurements of O<sub>3</sub>, Meteorological Parameters

Species	Alt. range [km]	Accuracy	Comments
H <sub>2</sub> O	25 - 55	0.3 ppm	WARAM 2
O <sub>3</sub>	17 - 55	0.5 ppm	MIRA 2
ClO	17 - 55	0.4 ppb	MIRA 2
HNO <sub>3</sub>	17 - 55	1 ppb	MIRA 2
N <sub>2</sub> O	17 - 55	30 ppb	MIRA 2
O <sub>3</sub>	Columns  (free Troposphere and Stratosphere)	< 2%	DOAS
NO <sub>2</sub>		< 5%	
OCIO		1*10 <sup>13</sup> molec/cm <sup>2</sup> or 15%	
IO		1*10 <sup>13</sup> molec/cm <sup>2</sup> or 30%	
BrO		1*10 <sup>13</sup> molec/cm <sup>2</sup> or 10%	
HCHO		1*10 <sup>13</sup> molec/cm <sup>2</sup> or 20%	
H <sub>2</sub> O		1*10 <sup>13</sup> molec/cm <sup>2</sup> or 4%	

- WARAM measurement modi: Totalpower  
Reference beam method
- Calibration: Cold load is LN<sub>2</sub>
- Hot load is an microwave absorber at room temperature
- Stable Calibration
- Problems: Quality and availability of liquid nitrogen

## WARAM 2

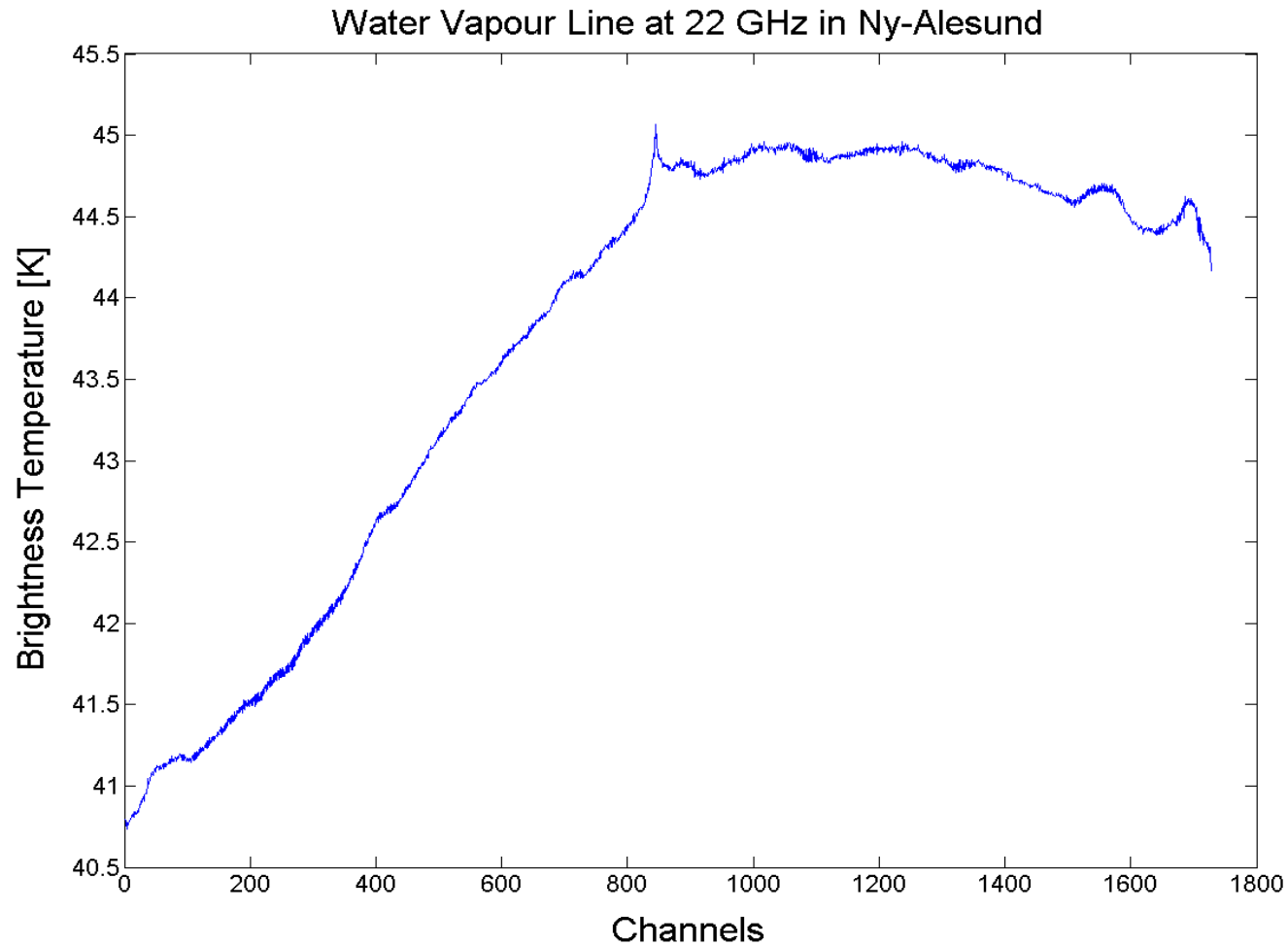
- WARAM 2 Zugspitze





# Spectrum

- Totalpower spectrum at Ny-Alesund (17.09.2002)



## Spectrum

- Totalpower Spectrum at Bremen (25.02.2003)

