

Ground-based FTIR atmospheric observations campaign at Ile de la Réunion

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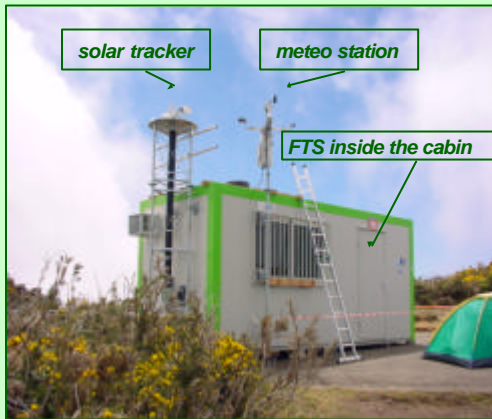
Campaign Objectives

Prepare for long-term monitoring of the atmospheric composition by FTIR remote-sensing in the frame of NDSC.

Scientific : verify feasibility of vertically resolved FTIR measurements at 2 different sites, namely the Maido summit (~2200 m asl) and the university campus at St. Denis (~50 m asl).

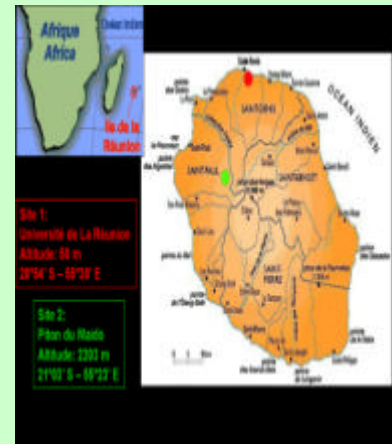
Technological : test BARCOS (Bruker Automation and Remote Control System) at the Maido site

Barcos setup at Maido



BARCOS at Maido (Neefs et al., 2003) has, in addition to the solar tracker:

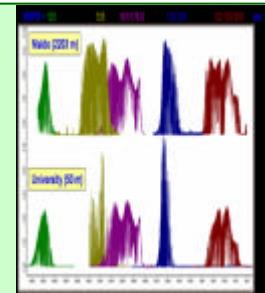
- a meteorological station with a rain detector, sensors for wind speed and direction, ambient pressure and direct solar irradiance.
- A data logger
- Software (developed in Labview) for housekeeping, suntracker commanding and interaction with the Bruker FTS dedicated OPUS s/w. An elementary scripting language has been developed so that commands can be parsed and executed at a predefined time or zenith angle. Daily scripts are uploaded and executed automatically by BARCOS.



Preliminary data analyses

Spectra

- At both sites, solar absorption spectra have been recorded in the near- and mid-IR with 2 quasi-identical Bruker 120M FTS, equipped with 6 NDSC bandpass filters and nitrogen-cooled InSB and MCT detectors.
- MOPD = 250 cm, providing a 'best' spectral resolution $(0.9/\text{MOPD}) = 3.5 \cdot 10^{-3} \text{ cm}^{-1}$
- The spectra recorded at the university clearly suffer from high H₂O absorptions, preventing for example the detection of NO in the 1900 cm⁻¹ region.



Retrievals of atmospheric constituents

- Supported by meteo data from BARCOS, to verify stability of meteo conditions during spectral recording
- Using retrieval algorithm SFIT2 or atmosfit (home-made)
- Preliminary results are shown for HCl, HF, HNO₃ (mainly stratospheric), and N₂O and C₂H₂ (mainly tropospheric) total column abundances.

The presented time series are derived using

- an update of HITRAN2000 (A. Meier, private comm., Oct. 2002). In particular, new N₂O lines in the 1200cm⁻¹ region (Toth et al., JPL, 2000) improve the spectral fits

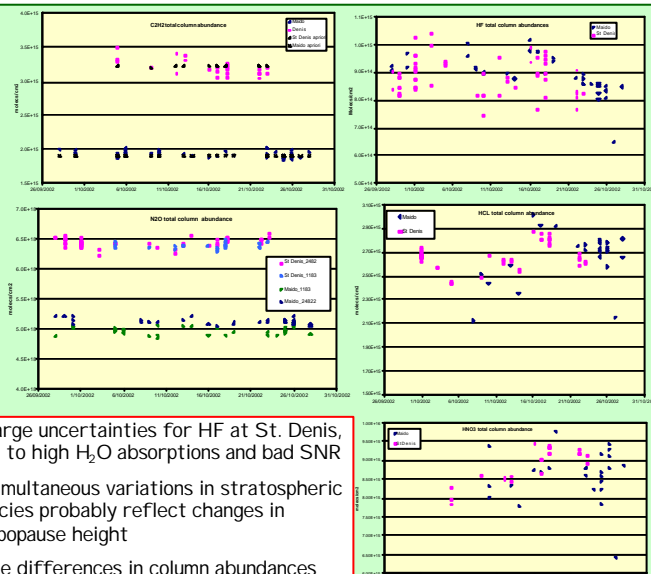
- standard a priori profiles, except for O₃ where a tropical O₃ climatology has been taken from UGAMP (BADG, Dingmin Li and Shine, 1995).

- daily NCEP T/P profiles for Reunion Island

- the tabulated retrieval parameters

Species	Window (cm ⁻¹)	OPD (cm)	Retrieval SNR
¹⁵ N ₂ O 2482 ⁺	2481.15 - 2482.8	175.44	150
¹⁵ N ₂ O 1183 ⁻	1183.25 - 1183.8	125	150
	& 1202.4 - 1202.58		
C ₂ H ₂	775.9 - 776.25	125	150
HF	4038.7 - 4039.5	125	100
HCl	2925.69 - 2926.05	175	300
HNO ₃	867.05 - 869.95	125	200

- A priori information and retrieval parameters must be optimised for tropical conditions and altitude of tropopause



- Large uncertainties for HF at St. Denis, due to high H₂O absorptions and bad SNR
- Simultaneous variations in stratospheric species probably reflect changes in tropopause height
- The differences in column abundances for the tropospheric species N₂O and C₂H₂ correspond to the 2150 m altitude difference between both observation sites
- Sensitivity to C₂H₂ is limited to SZA > 45° observations

Near- and mid- future perspectives

- Examine feasibility of vertical profile inversions
- Expand BARCOS to an autonomous observation station
- Repeat observations on a long-term campaign or quasi-continuous basis

References

Neefs et al, The BARCOS system for automatic and remote control of a Bruker FTS for solar absorption measurements from ground, poster, OSA, Quebec, 2003

Acknowledgements

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