COCHISE:
a 2.6m mm/submm telescope at Dome C

1. COCHISE installation
   (a collection of pictures)
2. Intraday measurements of water vapour
   (routine water vapour measurements to evaluate the transmission)

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COCHISE

Cosmological **O**bservations at **C**oncordia
with **H**igh-sensitivity **I**nstrument for **S**ource **E**xtraction

A 2.6m millimeter telescope, very similar to the OASI telescope (installed @ MZS since 1989)

Focal plane:

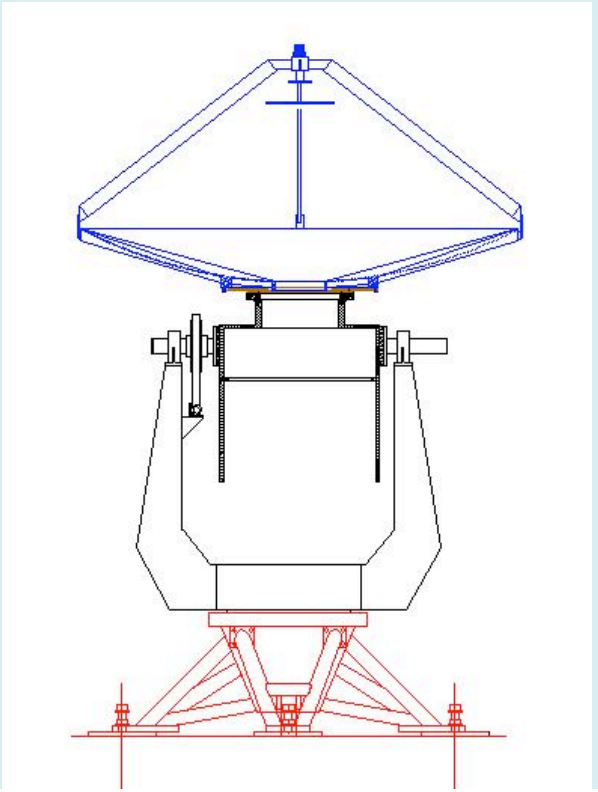
- Multichannel millimetric photometer ($\lambda \approx 1 \div 2$ mm)
- FTS

Scientific Goals:

- Sunayev-Zeldovich Effect on galaxy clusters
- CMB polarization
- Galactic and extragalactic astrophysics @ mm and submm wavelengths (eg. HII regions, GPRS…)
- Study of dust (anomalous emission, spinning dust…)

COCHISE

From Valenziano presentation to the "Submm astronomy from Dome C" Workshop (Rome, 21/12/2006)

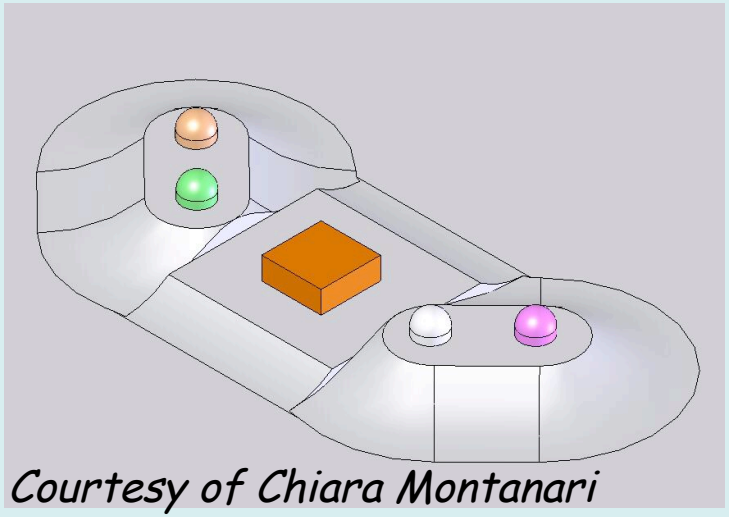


To be installed January 07

First fairly large antenna at DomeC

Late December 2006

Ice platform: height 3.5m ÷ 4.2m
Laboratory tent



Courtesy of Chiara Montanari

Courtesy of Marco Maggiore

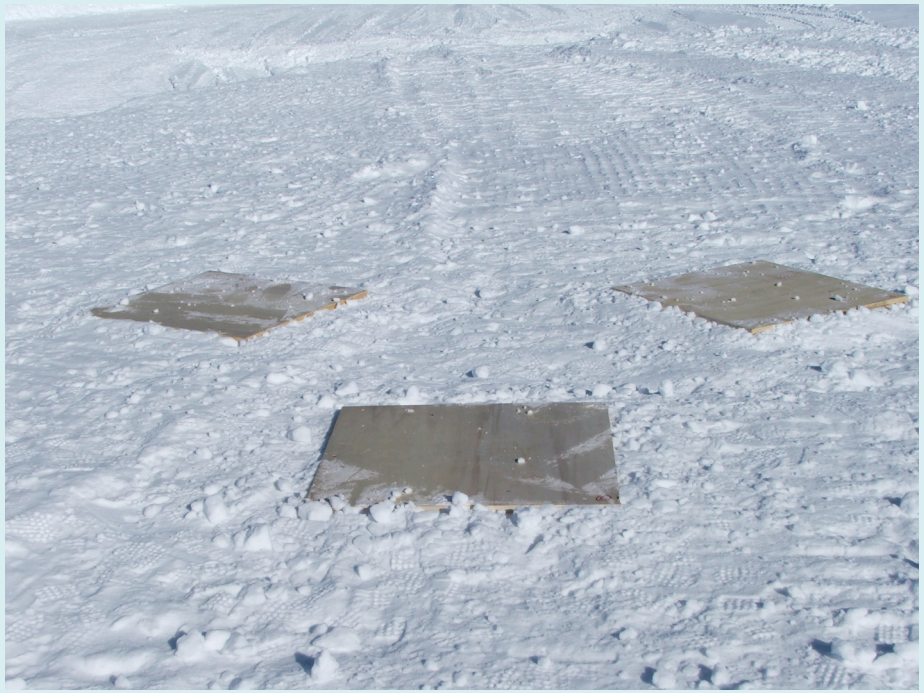
30 Dec 2006

30 Dec 2006

December 31st

Arrival of the telescope with the traverse #2 from DDU to Dome C
(1 year late…)

January 10th



Wood base on the platform to prevent from sinking into the ice

January 11th

Assembling the mounting in a heated tent ("*falegnameria*")…

…and installing it on the ice platform:

January 12th

Preparing the primary mirror in the heated tent
Assembling the secondary mirror and the modulator
First alignment of the optics

January 12th

Installation of the mirror

January 13th

Mechanical balancing of the system

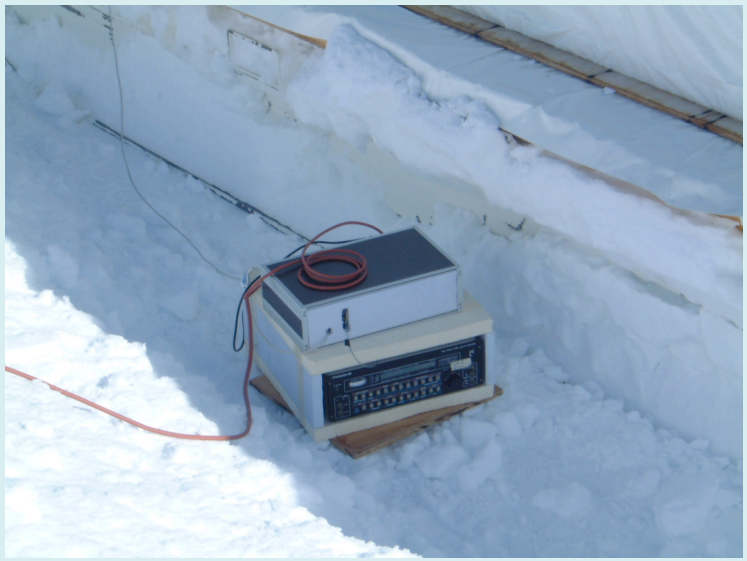
January 14th-17th

Preparing electronics, cables and connections

Test of electronics at ambient temperatures

Test of modulator

Alignment of the optics



January 18th

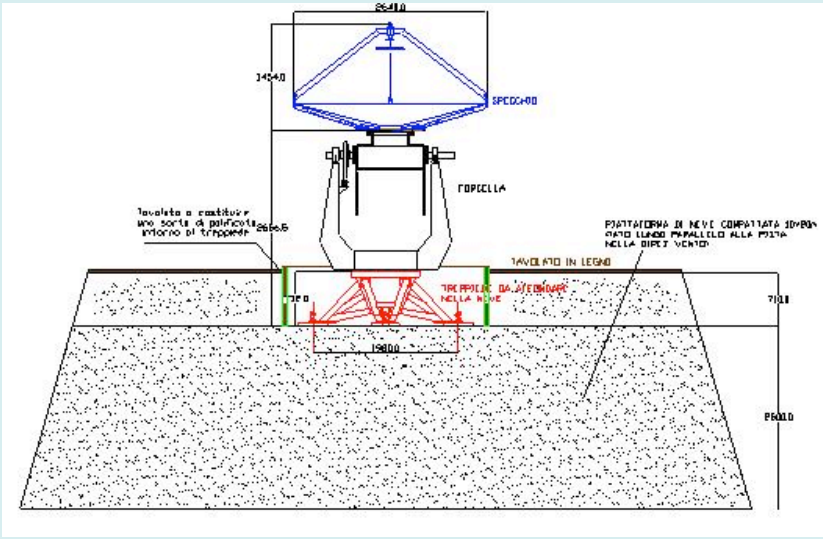
Special thanks to

PNRA and IPEV people

From Concordia's roof (looking NW direction)

COCHISE

COCHISE (**C**osmological **O**bservations at **C**oncordia with **H**igh sensitivity **I**nstrument for **S**ource **E**xtraction)	
Optical configuration	Cassegrain
Primary mirror	D = 2600mm
Focal legth	f = 1300 mm
Focal ratio	f/D = 0.5
Secondary mirror	d = 410 mm
Equivalent focal length	F = 10400 mm
Equivalent focal ratio	F/D = 4
Angular resolution	Few arcmins in mm range

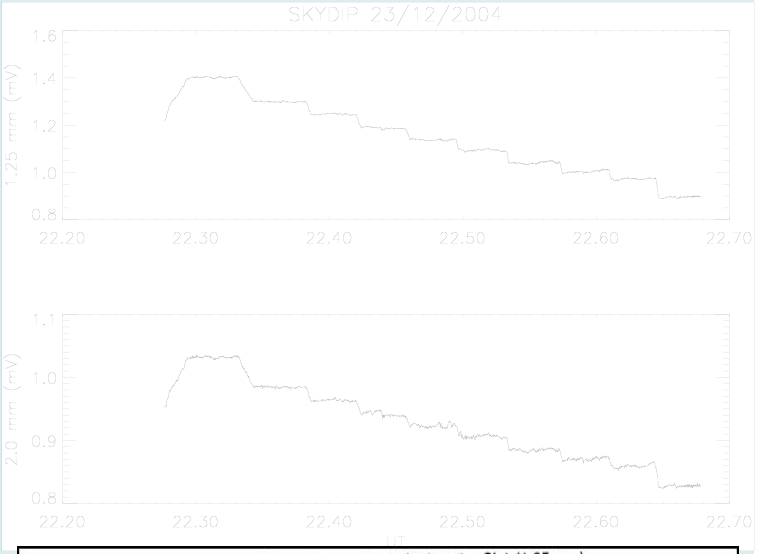


January 2007: Installation @ Dome C

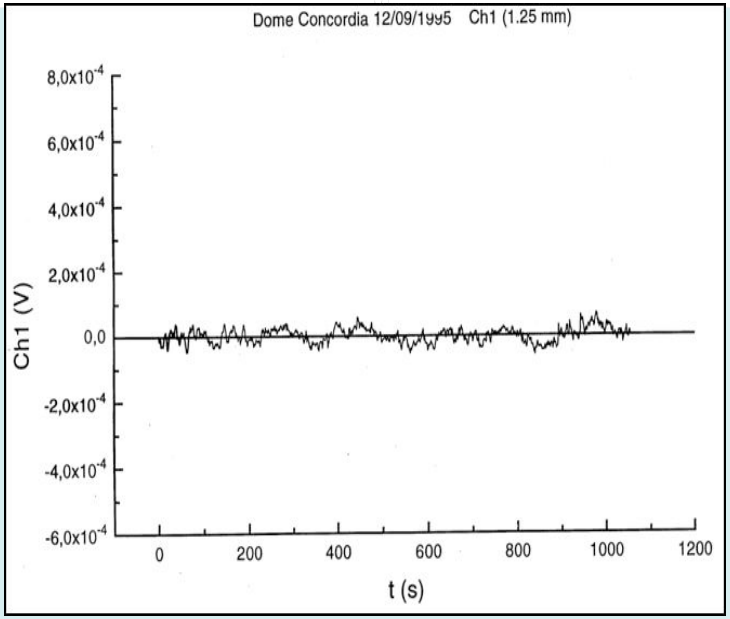
Site testing with COCHISE

skydip observations:

- a direct measurement to evaluate sky opacity.
- the sky luminosity is observed varying the elevation angle θ.
- Eg: a skydip performed at MZS from OASI telescope at 1.25 and 2.0 mm (December 2004)



sky noise measurements



Activities already performed:
intraday measurements of pwv

Solar hygrometer

Solar hygrometer designed by Tomasi and Guzzi (1974)

Solar irradiance measurements in two spectral bands:
- $\lambda_1 \approx 0.940$ µm (water vapour absorption band)
- $\lambda_2 \approx 0.870$ µm (transparency window)

Hygrometric ratio: R = V(0.940)/V(0.870)

→ accuracy and reliability
→ low costs
→ easy to be operated at harsh sites
→ but only for antarctic summer…

Calibration: using radiosoundings
(kindly provided by PNRA - ENEA sez. CLIM-OSS)

Measurements of pwv (1997 & 2007)

December 1996 – January 1997 (Valenziano et al. 1998) :

about 80 intraday measurements

New calibration (Tomasi et al. 2007, submitted):

using the monthly mean vertical profiles of pressure, temperature and humidity using 87 radiosoundings performed in 2003 and 2004

→First attempt to characterize the site (pwv content)
→First instrumental calibration specific for Dome C values (pwv < 1mm)

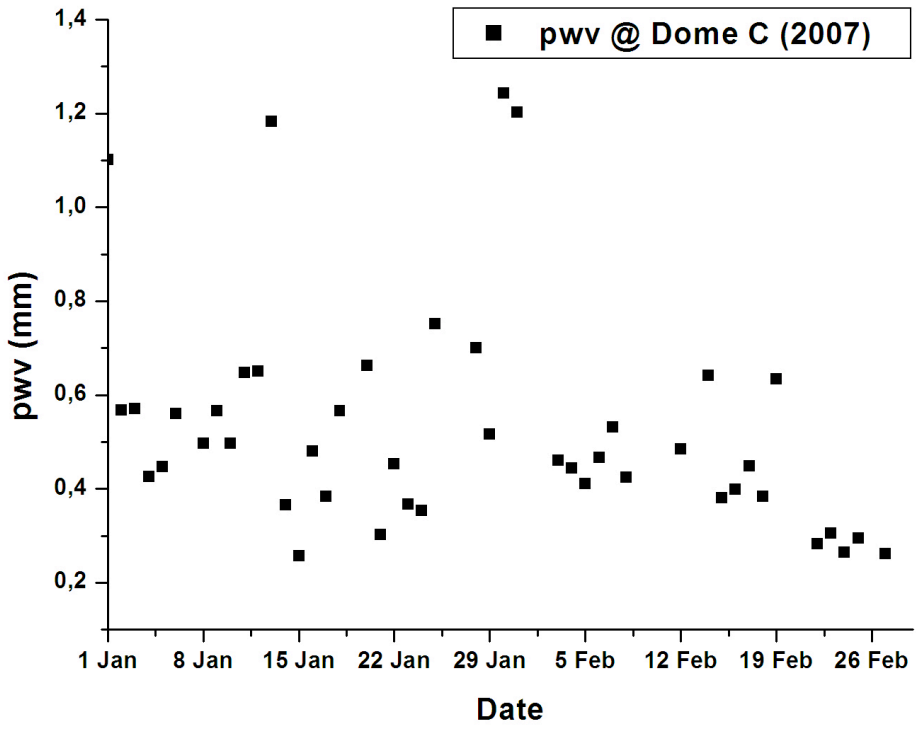
January-February 2007:

16 days, measurements every 2 hours (day time)

More than 100 measurements of pwv
Improvements in the procedure (3 measurements for each point to reduce the fluctuations)

→The instrument is still at Dome C: it is possible to have other measurements at the beginning of next summer season (thanks to Runa Briguglio)
→First systematic monitoring of daily variation of pwv

pwv from radiosoundings



Mean:

<pwv>≈0.53 ±0.04 mm

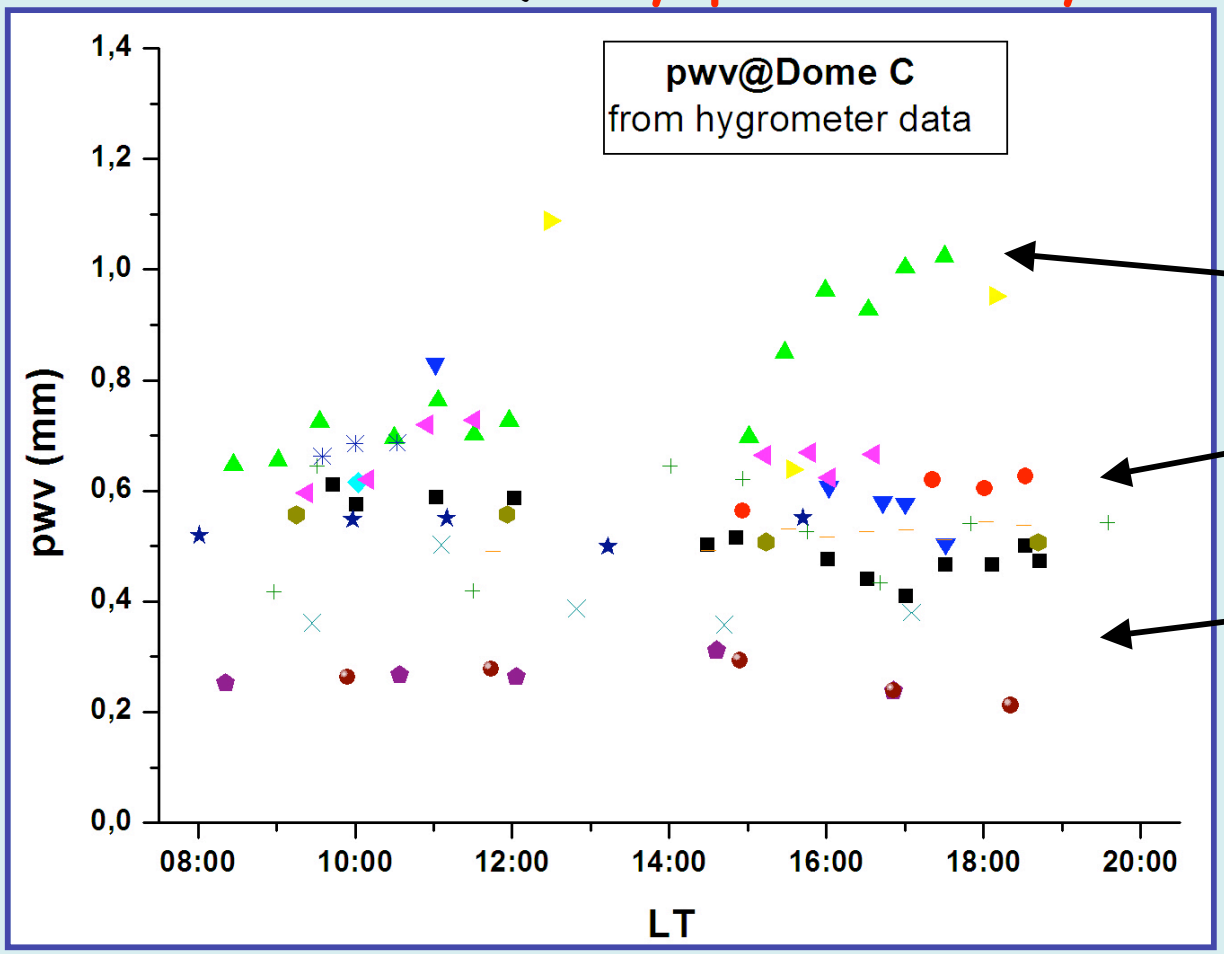
"bad days"
(pwv>1mm):

1 - 13 - 30 - 31 Jan

Lower values at
february

Data obtained from *www.climantartide.it*

pwv from hygrometer
(very preliminary results!)

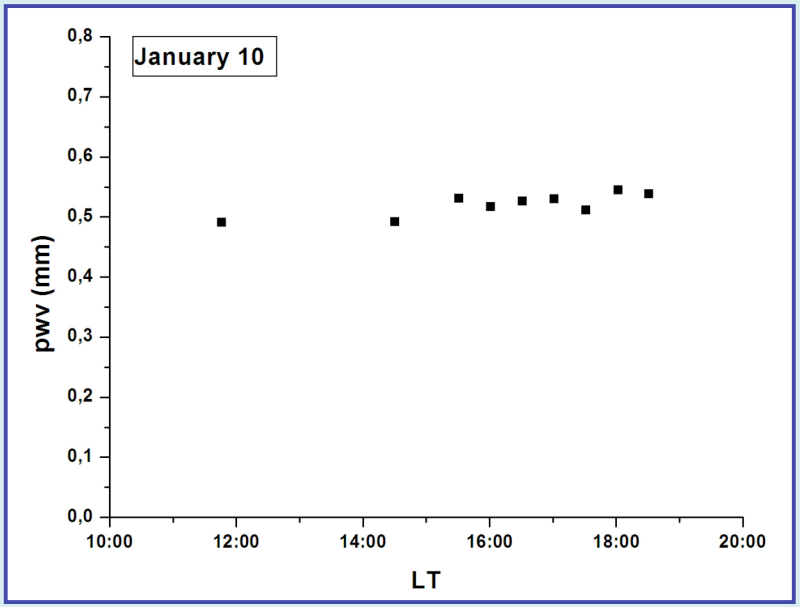


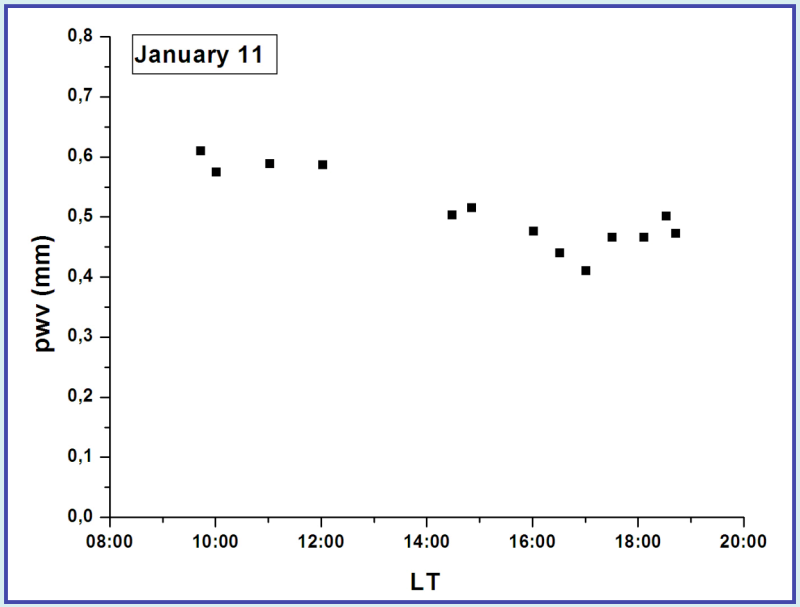
January 13th

January

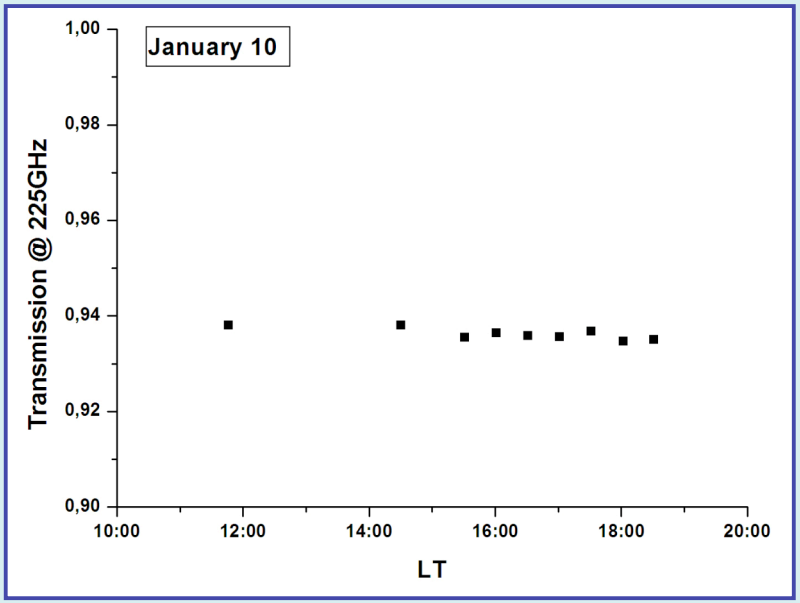
February

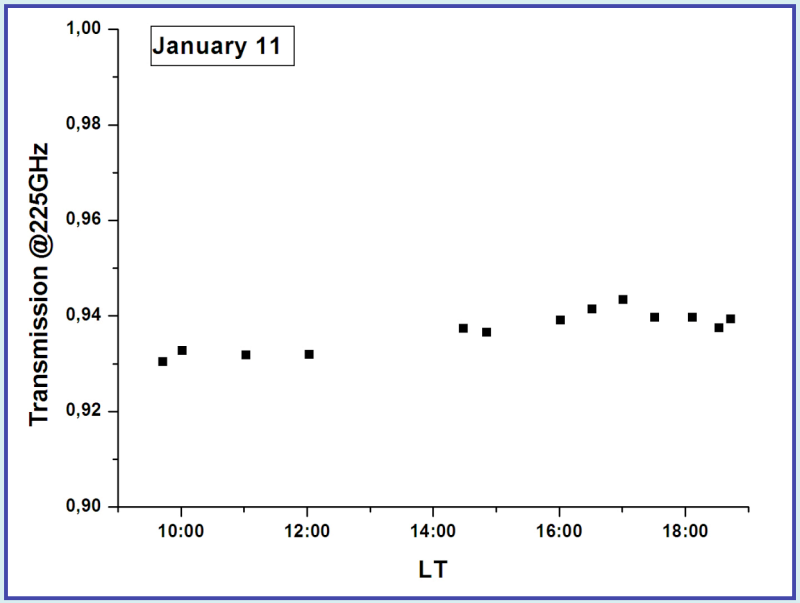
January (preliminary results)



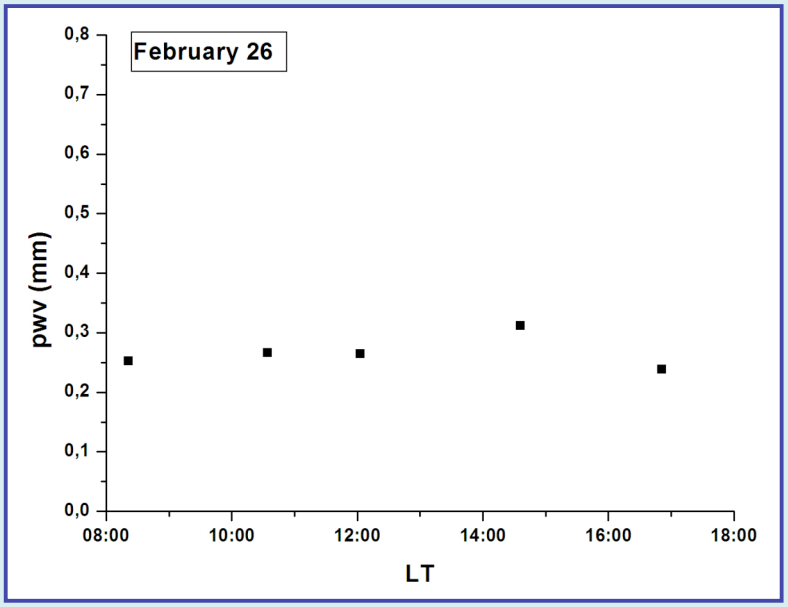


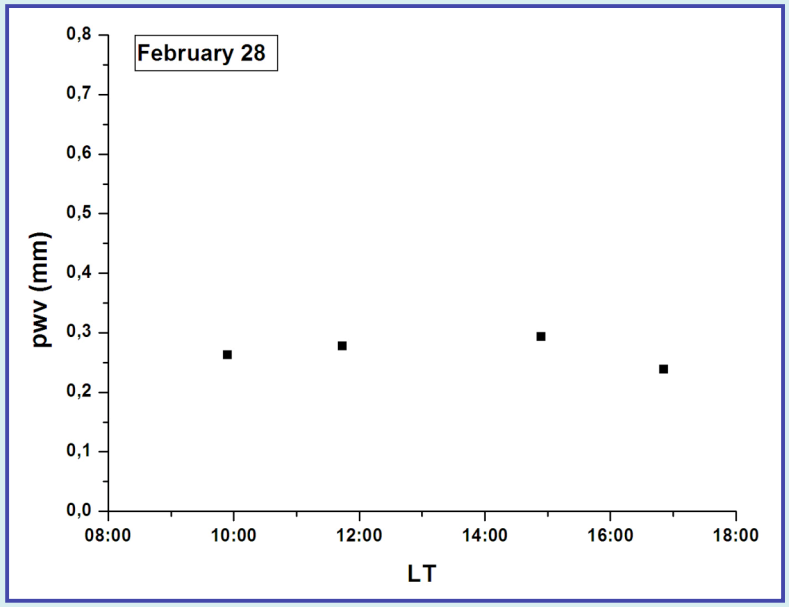
Chamberlin, Lane & Stark 1997: τ_0 (225GHz) = 0.030 + 0.069 pwv





February (preliminary results)





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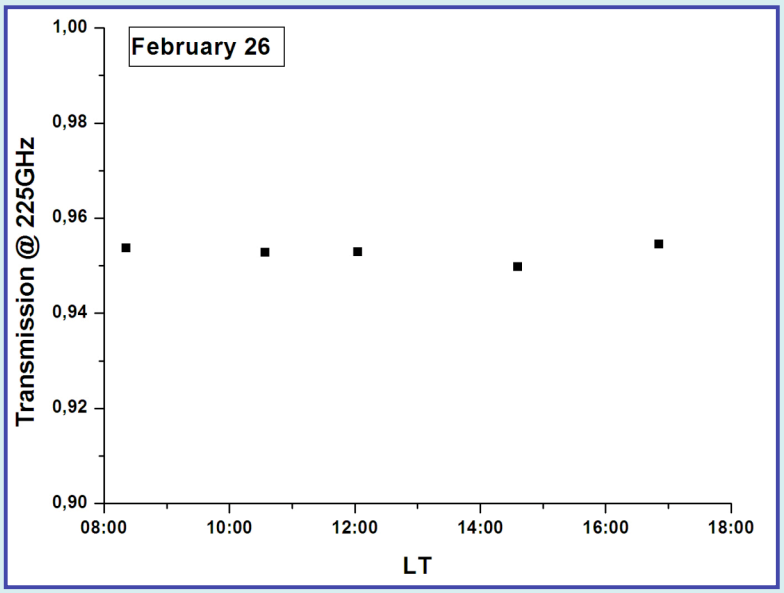
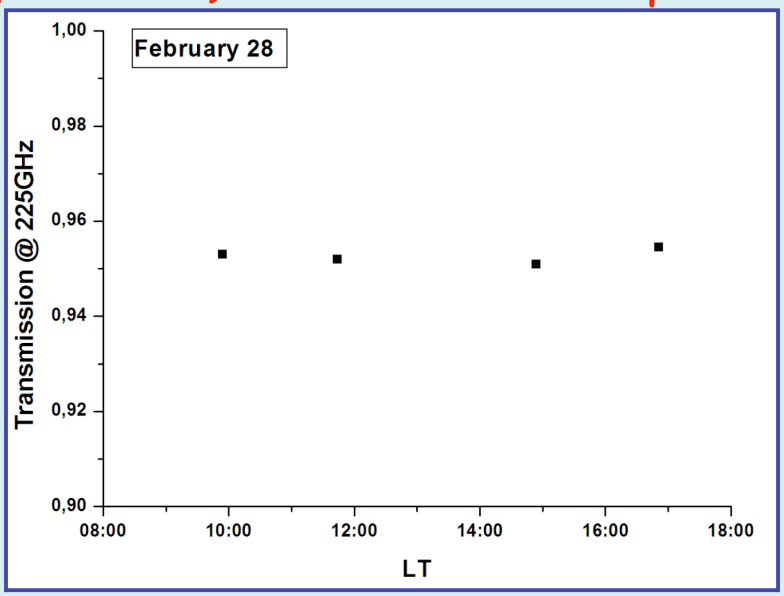
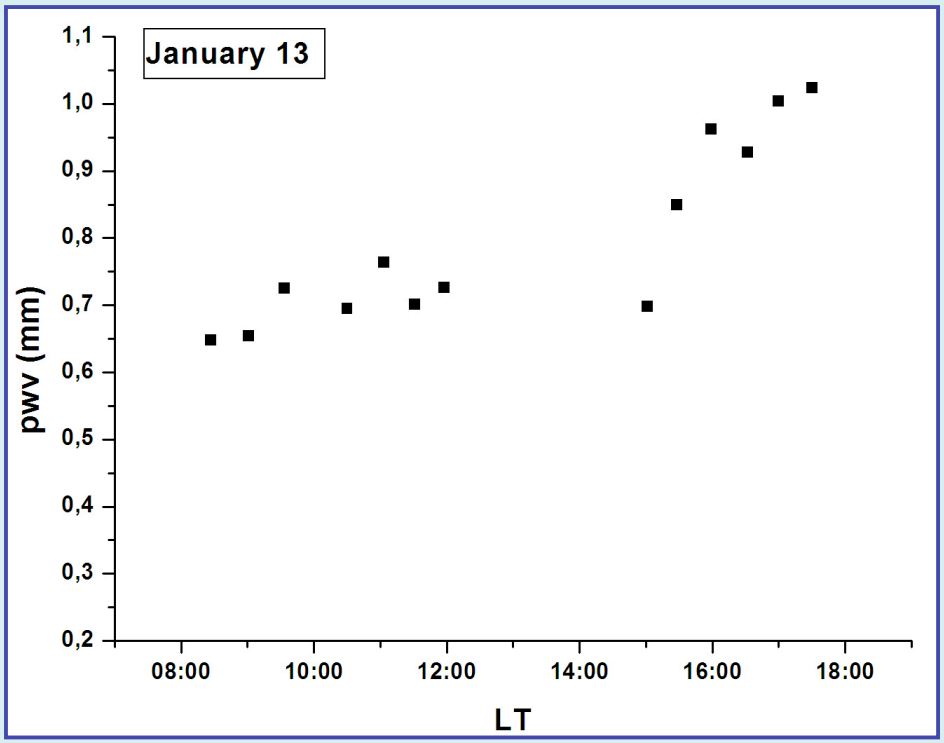




January 13th



Work in progress…

- More accurate use of radiosoundings:
  removal of systematics (Tomasi et al. 2006, JGR)
  (→Valenziano)
- More accurate calibration of the hygrometer
  (Tomasi et al. 2007, submitted)
- Use of atmospheric models to obtain transmission at mm-submm wavelengths
  (→Pardo, De Petris)
- Next antarctic summer (nov 2007 – Jan 2008):
  - First light
  - Start of scientific observations