

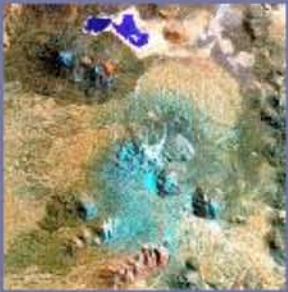


CCAT

Riccardo Giovanelli
Waterloo Jul07



CCAT:



- A 25m class FIR/submm, actively controlled telescope that will operate with high aperture efficiency to $\lambda = 200 \mu\text{m}$, an atmospheric limit
- With large format bolometer array cameras (large Field of View $\sim 20'$) and high spectral resolution heterodyne receivers
- At a very high (elevation $\sim 5600\text{m}$), very dry (Precipitable Water Vapor column $\text{PWV} < 1 \text{ mm}$) site with wide sky coverage

CCAT Drivers



1. Scientific Excellence

CCAT is a unique project geared towards the investigation of **cosmic origins**, from planets to galaxies, in the FIR/submm spectral region

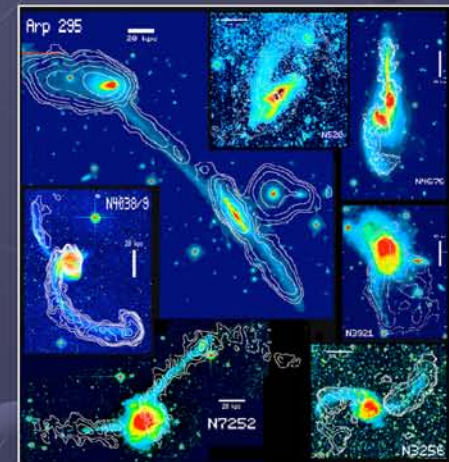
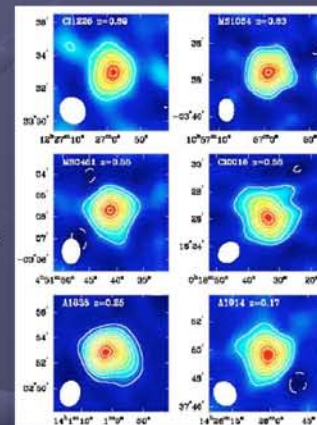
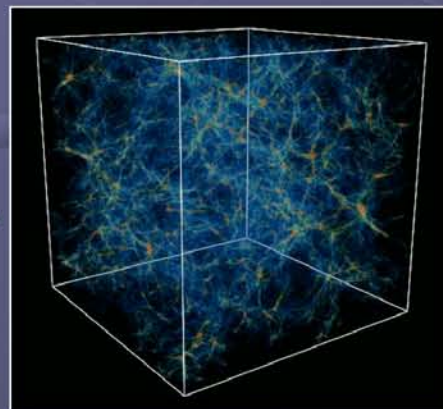
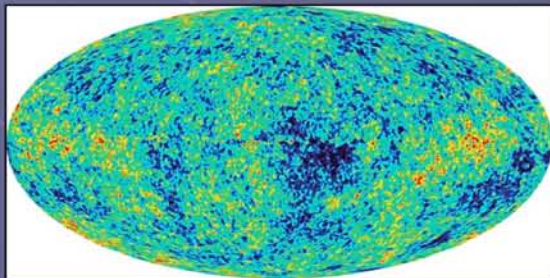
- **Early Universe Cosmology**
- **Galaxy Formation & Evolution**
- **Disks, Star & Planet Forming Regions**
- **Cosmic Microwave Background, SZE**
- **Solar System Astrophysics**

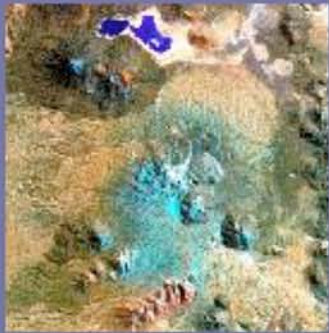


...to this?



How did we get from this



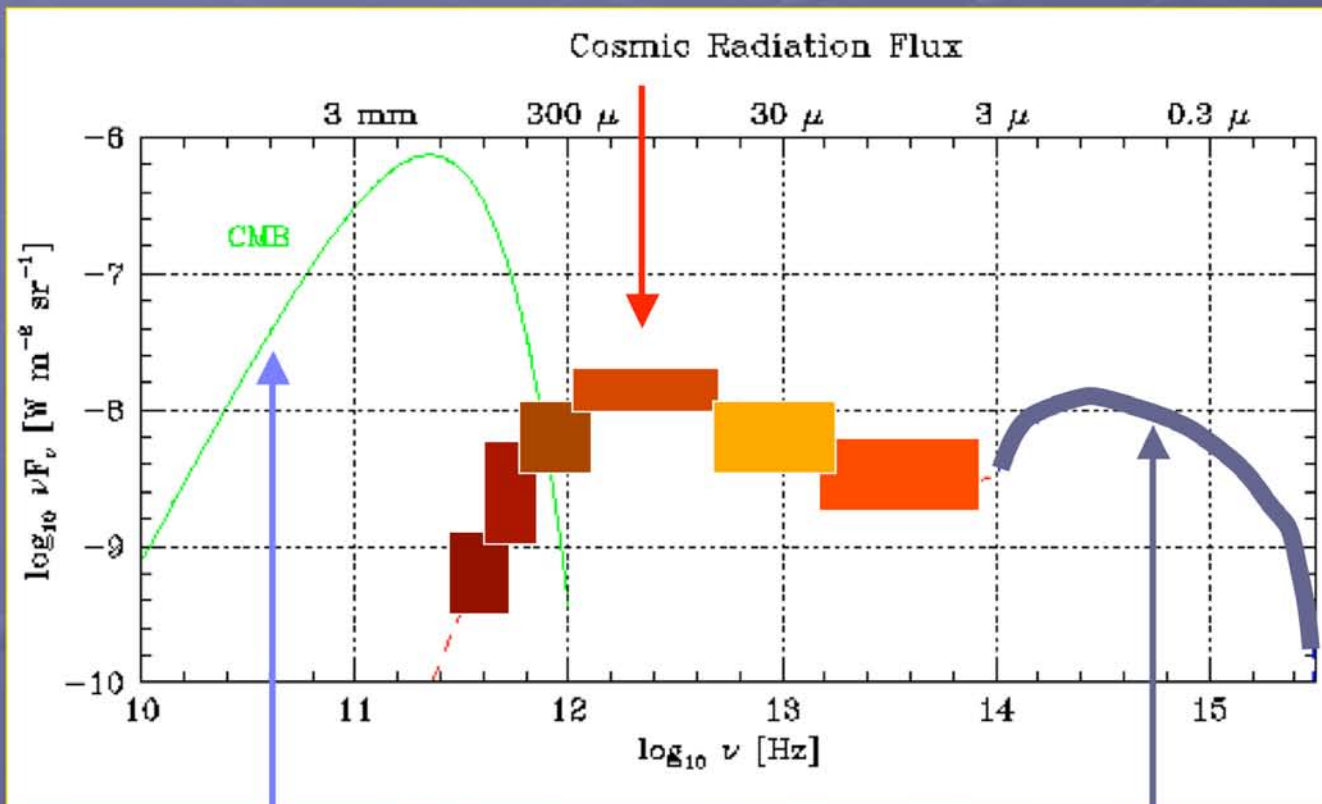


Photospheric light
Reprocessed by dust

Why FIR/submm?

That's the energy regime
at which most of the
Universe's early light
produced
after the
recombination
era reaches us.

And at which
radiation
produced
in star &
planet
forming
regions
emerges
from the
dust cocoons.



Microwave Background

Photospheric light
from stars



2. Internal Synergy

The focus of CCAT emphasizes our institutions' talents in **instrument building**, the operation of **major observatories** and the development of **forefront technologies**.

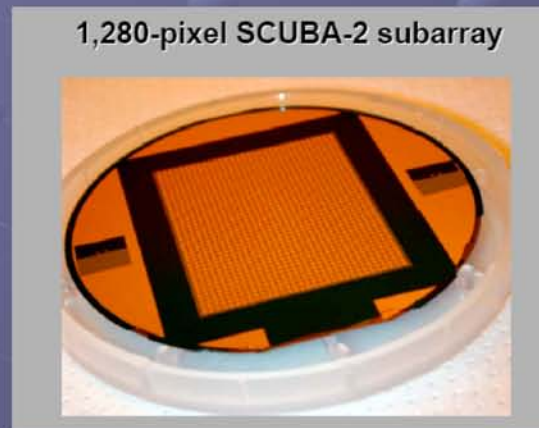
3. Ride the technology wave

in one of the **most rapidly developing** technological fields in Astronomy: detector arrays

Now (384 pix)



2007 (10^3 pix)



late 2010's : 1Mpix

Bolometer array
Cameras with
> 10^5 pix

With actively controlled optics, CCAT will be a testbed for advanced technology solutions, e.g. **Wavefront sensing, Laser metrology and Detector arrays**



4. A facility of large synergy with, and enabler to ALMA



CCAT will match ALMA in point source, continuum sensitivity at 500 μm and will be many orders of magnitude faster as a survey instrument. Although CCAT's beam will be a few arcsec, ALMA will have 100 times the spatial resolution.

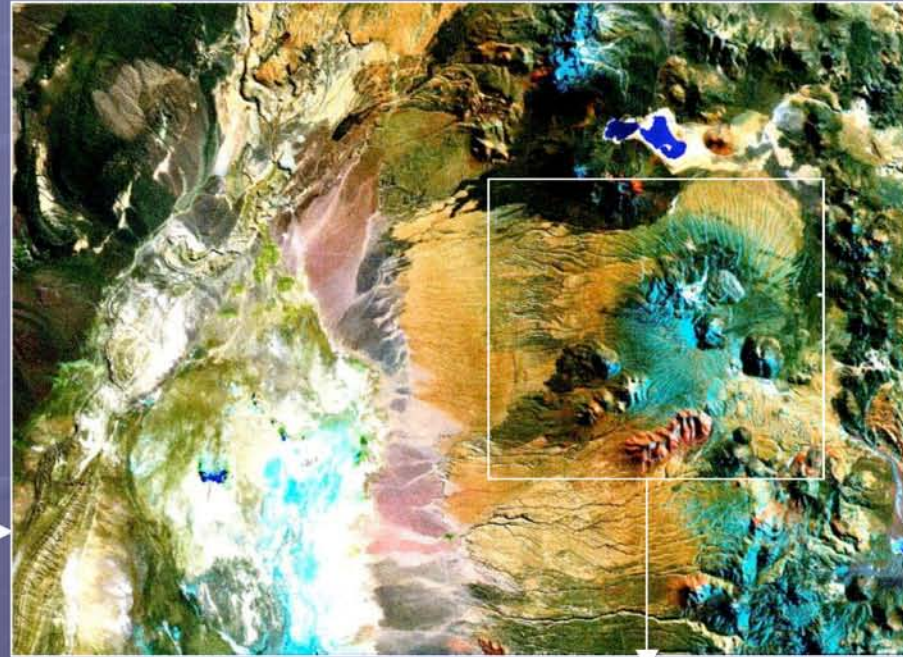
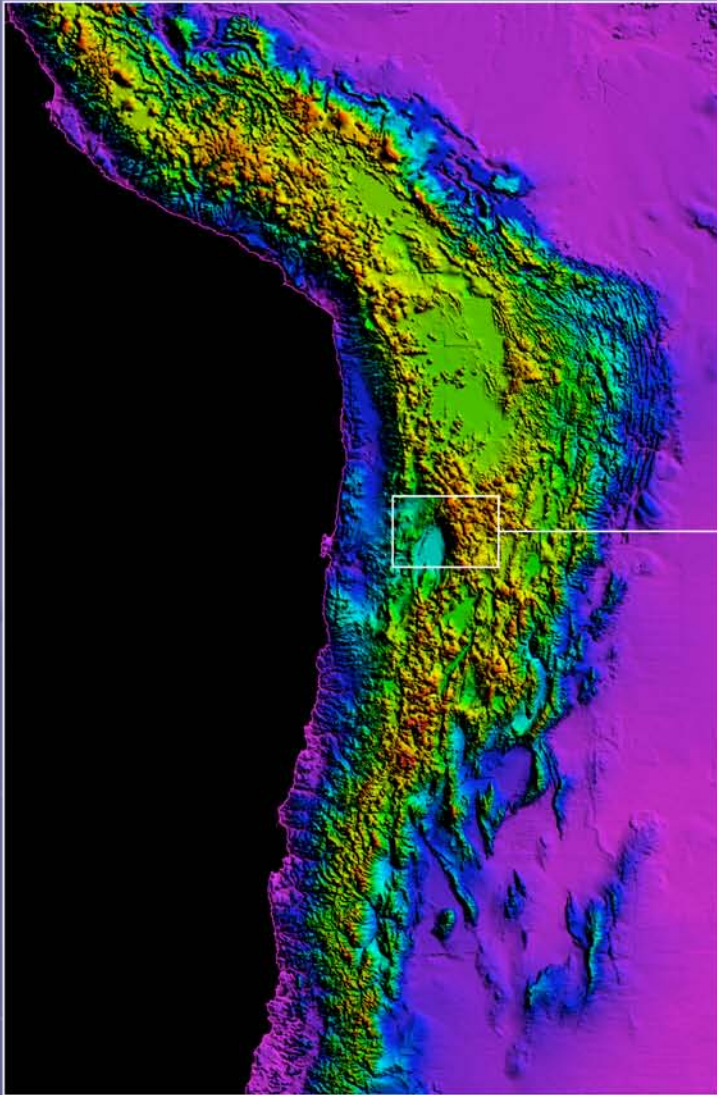
→ ideal complementarity

Scientists with favored access to CCAT will have exceptional leverage arm for ALMA follow-up science.

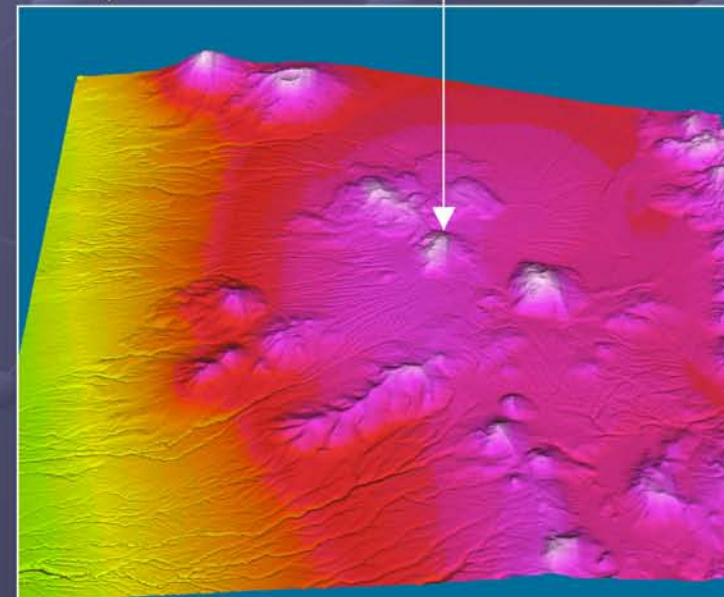
Foresee joint, large scale projects coordinated between the two facilities.



5. At the driest, high altitude site you can drive a truck to

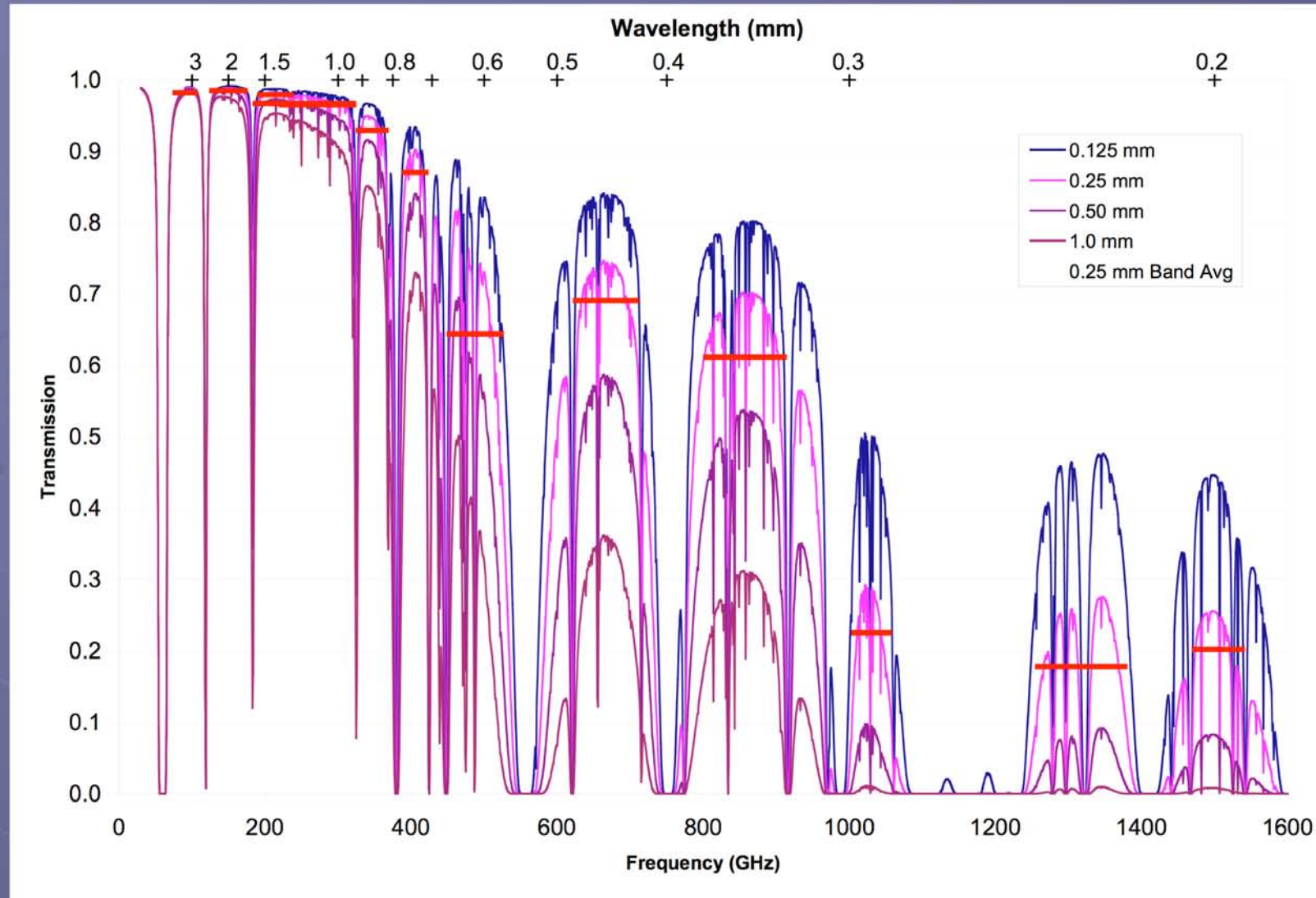


Cerro
Chajnantor
(18,400 ft)

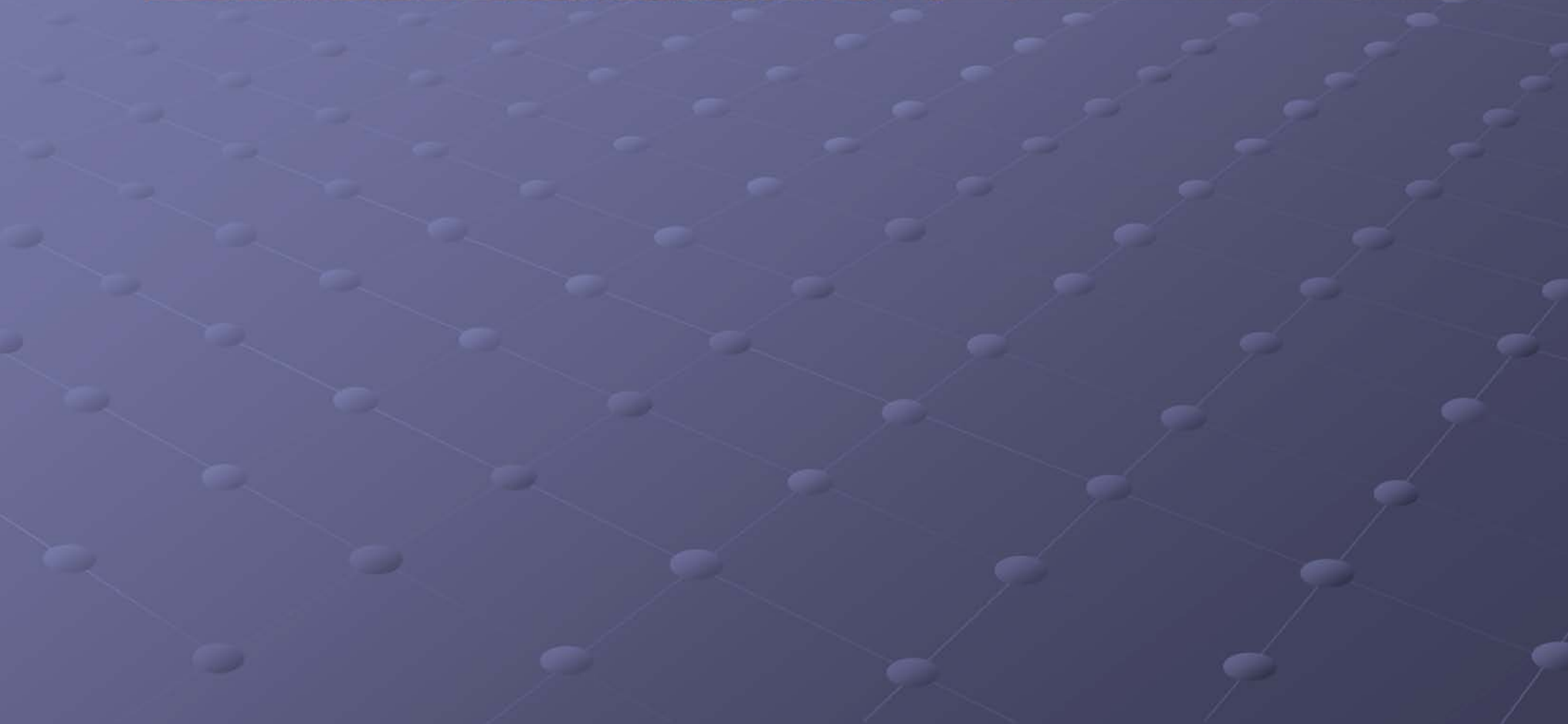


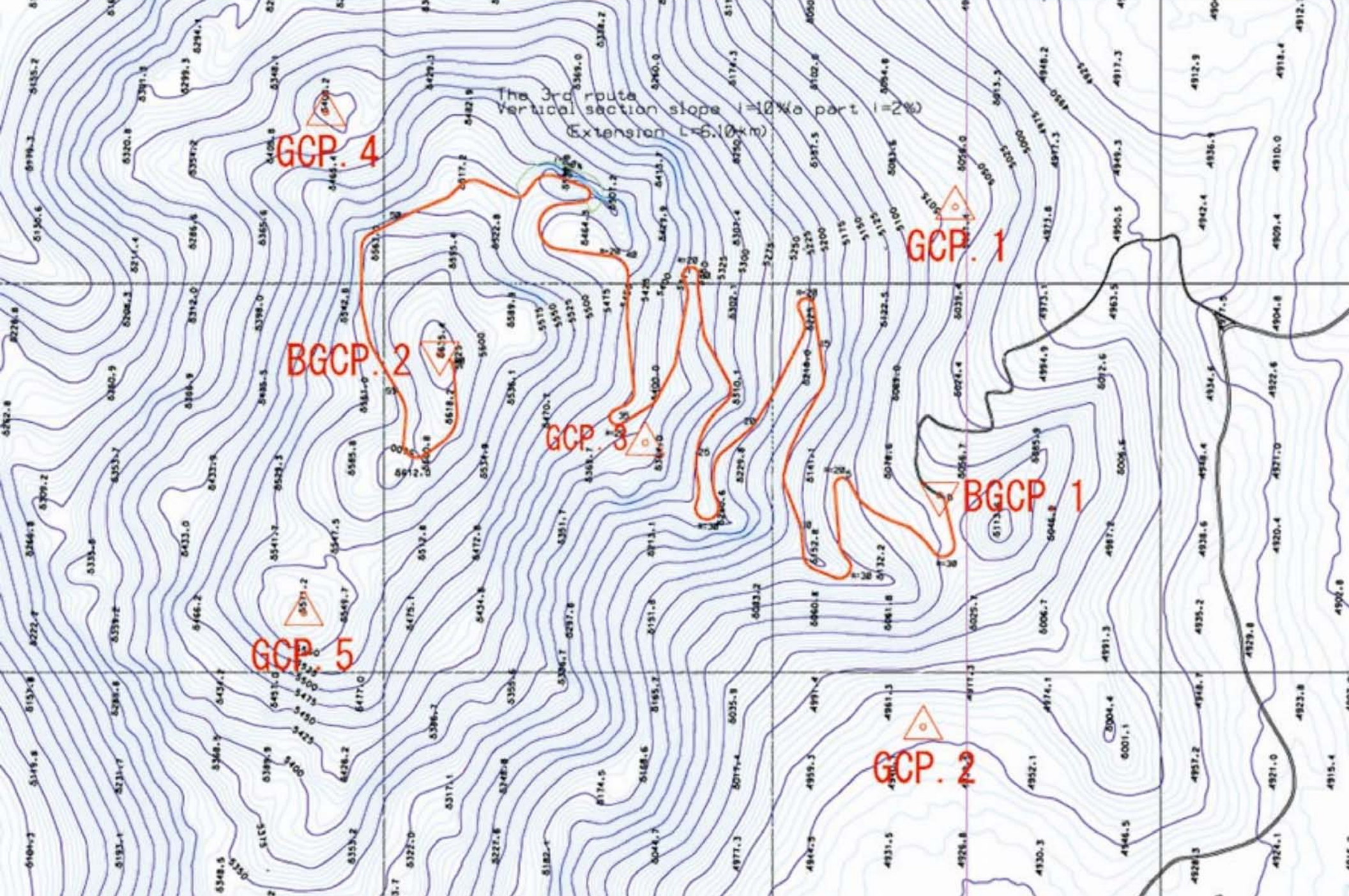


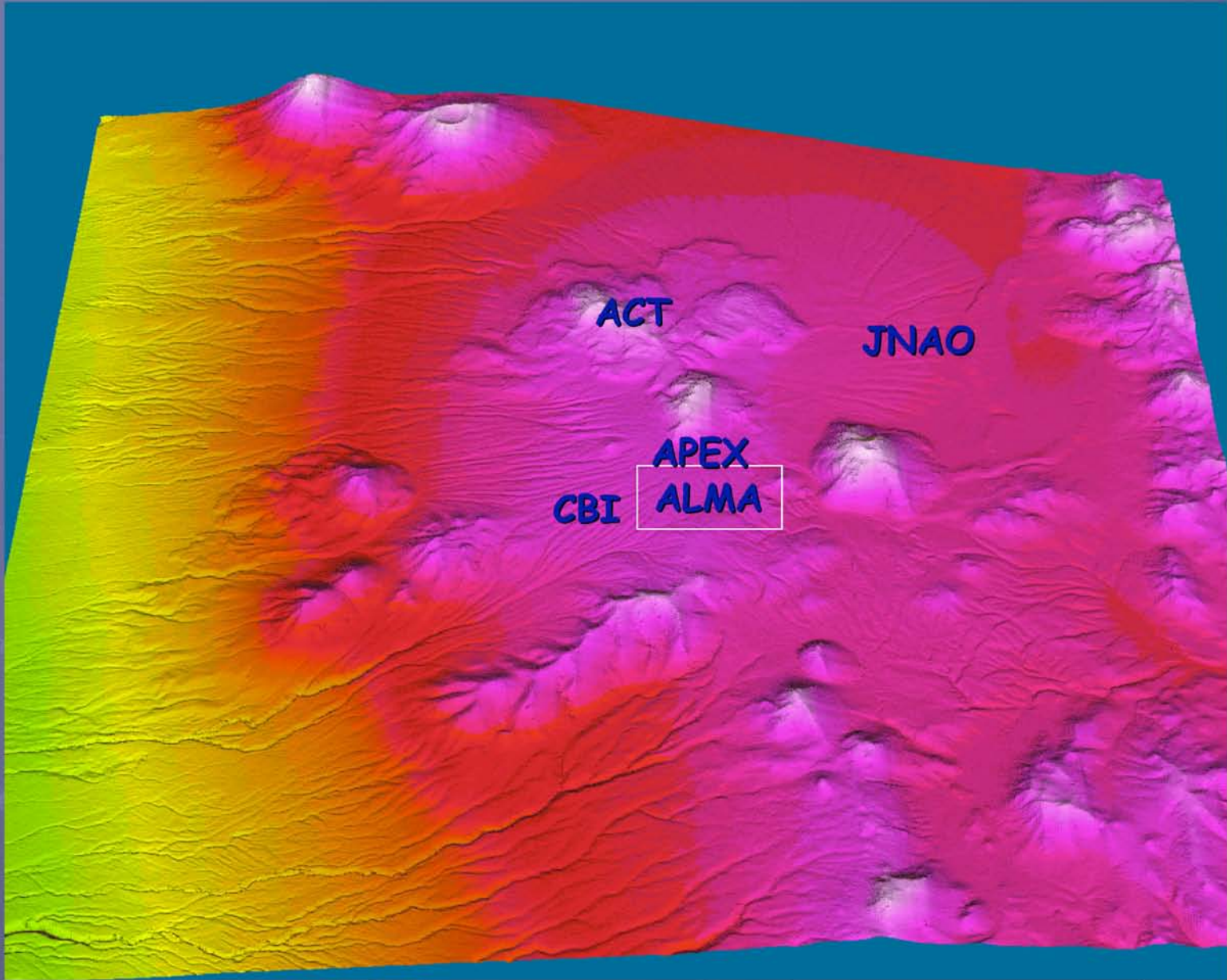
Sub-mm Atmospheric Transmission

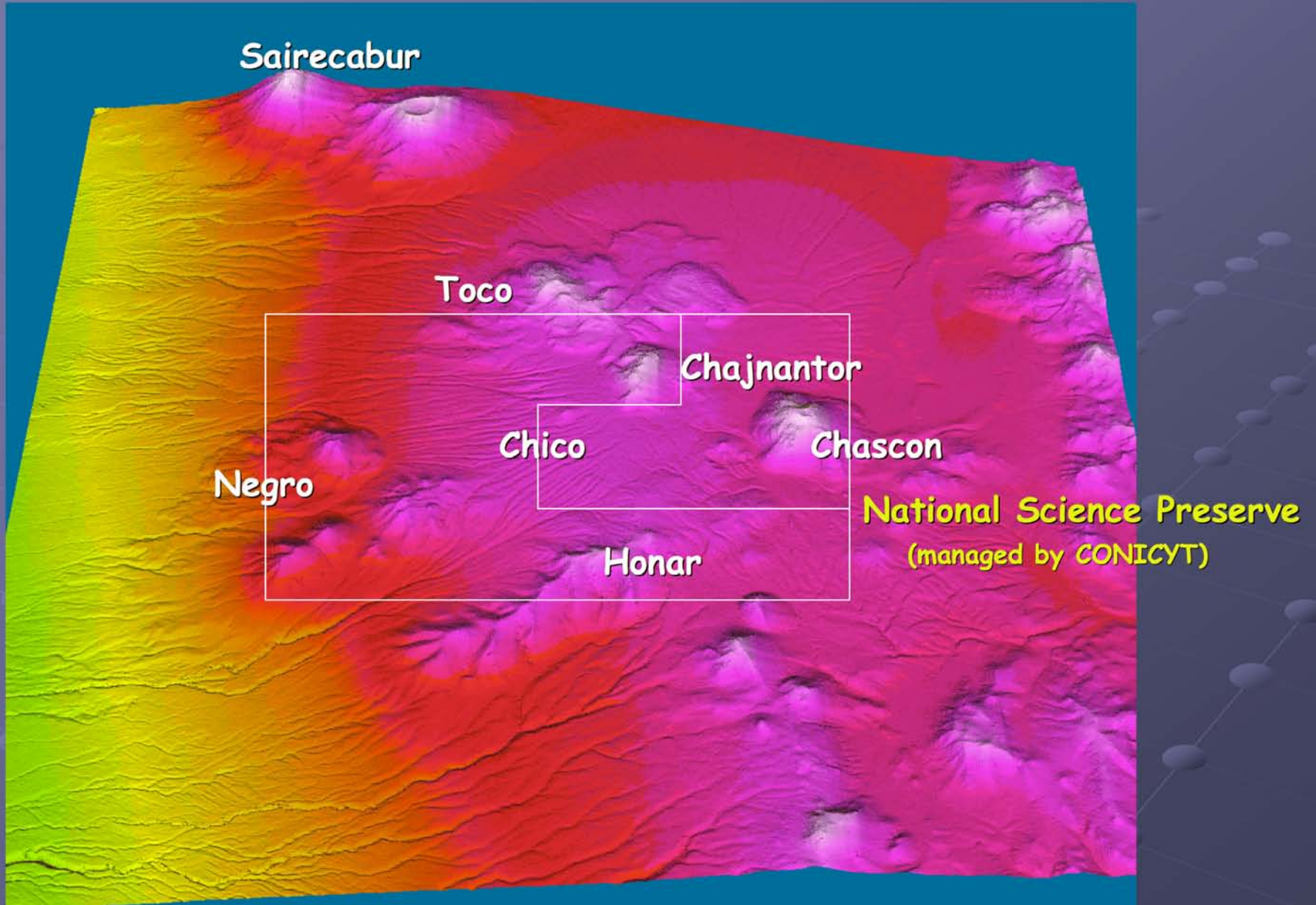


Atmospheric transmission for different amounts of precipitable water vapor. The horizontal red bars represent the adopted bandpasses and the average transmission for 0.25 mm PWV.















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- **Spring 2003 : Partnership initiated**
- **October 2003: Workshop in Pasadena**
- **Feb 2004: MOU signed by
Caltech, JPL and Cornell**
- **Late 2004: Project Office established,
PM, DPM hired,
Study Phase pace accelerates**
- **July 2005: Study Phase Midterm Review**
- **Early 2006: Study Review**
- **Mid 2007: Interim Consortium Agreement**



Feb 2006 - Study Review

Review Panel:

Robert Wilson (Harvard-Smithsonian, Chair)

Mark Devlin (Penn)

Fred Lo (NRAO)

Matt Mountain (STScI)

Peter Napier (NRAO)

Jerry Nelson (UCSC)

Adrian Russell (ALMA, NA)



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"CCAT is an important and timely project that will make fundamental contributions to our understanding of the processes of galaxy, star and planetary formation, both on its own and through its connection with ALMA. It should not wait."