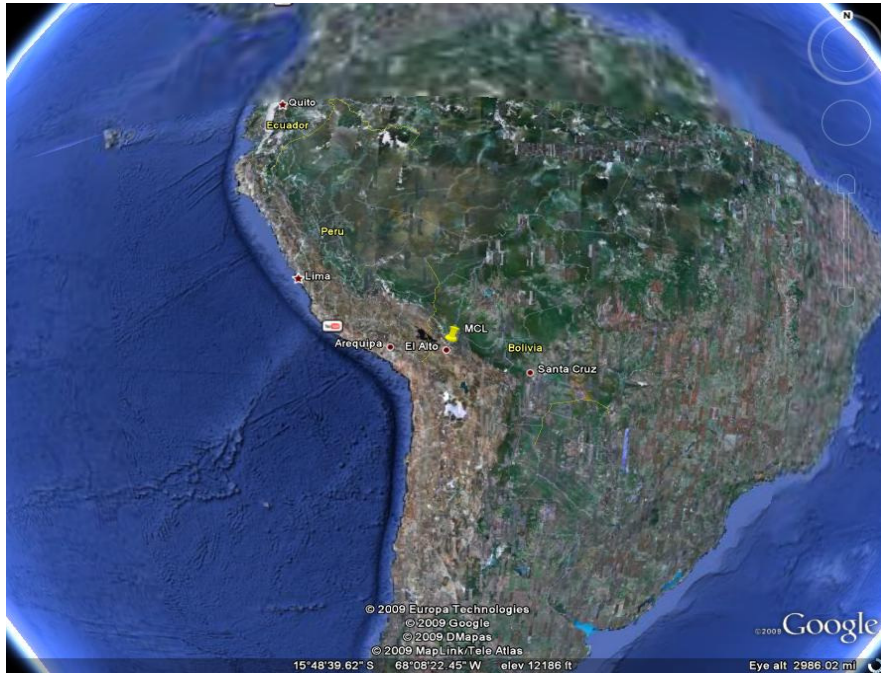
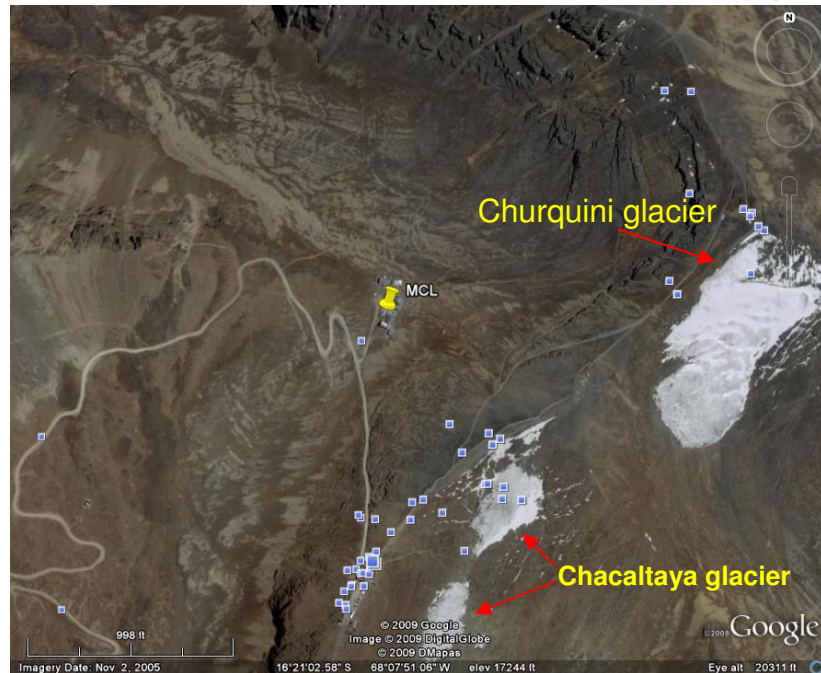


The Mount Chacaltaya Laboratory: **past**, **present** and **future**

Francesco Zaratti, Atmospheric Physics Laboratory, La Paz, BOLIVIA



MCL: Latitude 16.2 S; Longitude 68.1 W, altitude 5270 m asl



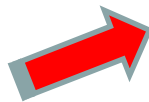
Illimani: the superb Andes mountain near La Paz, Bolivia



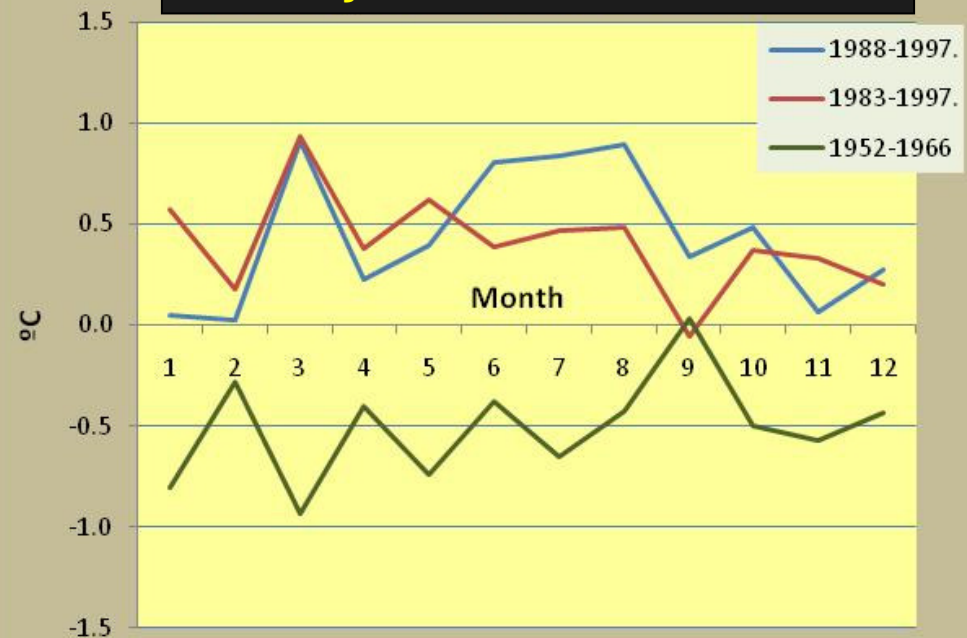


**MCL began as a
weather station (1942)**

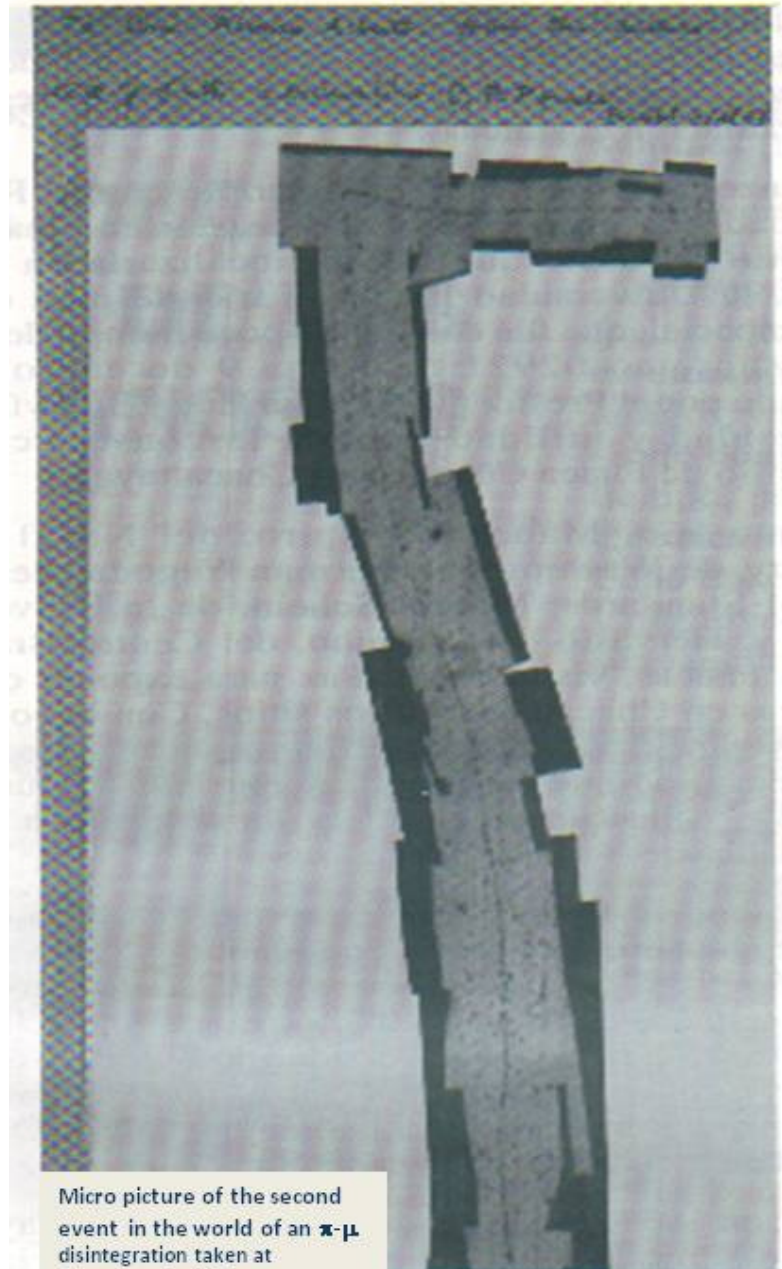
Something is happening



Monthly minima T anomalies



The golden years



Micro picture of the second event in the world of an π - μ disintegration taken at Chacaltaya in 1947.

The time of co-operation and competition

- **1952:** The Cosmic Ray Laboratory is officially created, as a branch of La Paz University
- **1950- today:** Several joint experiments (USA, Italy, Japan, Brazil, UK, ...) are carried out at MCL with important contributions to Cosmic Ray Physics
- Health research at high altitude was performed by international teams
- The “competition” of particle accelerators (since 60’s) and satellite born instruments decreased the relevance of MCL in elementary particles research.
- **At present**, some old experiments continue in operation and an important new one is being carried out, linked to the Auger project (**LAGO** = *Large Aperture Grb Observation*) .

The LAGO experiment (Large Aperture Grb Observation)

Muons produced from gamma ray bursts are detected through Cerenkov radiation



New research area at APL-MCL



A Lidar Network in Latin America in the context of GALION.

Juan Carlos Antuña¹, Eduardo Landulfo², Barclay Clemesha³, Eduardo Quel⁴, Francesco Zaratt⁵, Álvaro Bastidas⁶ and Efraín Solarte⁷



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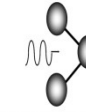
² Comissão Nacional de Energia Nuclear
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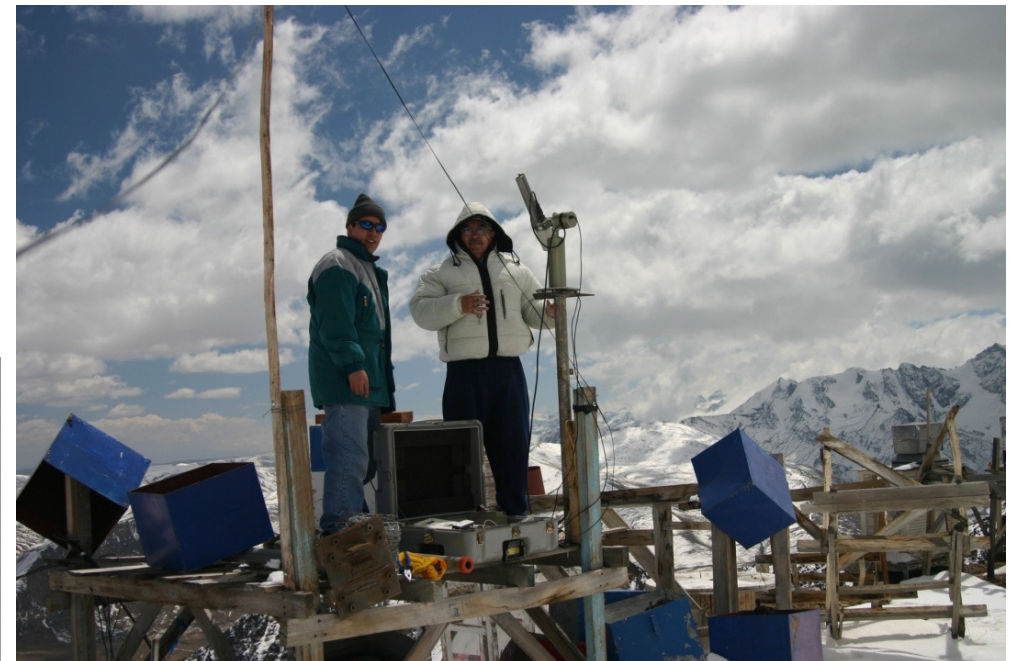
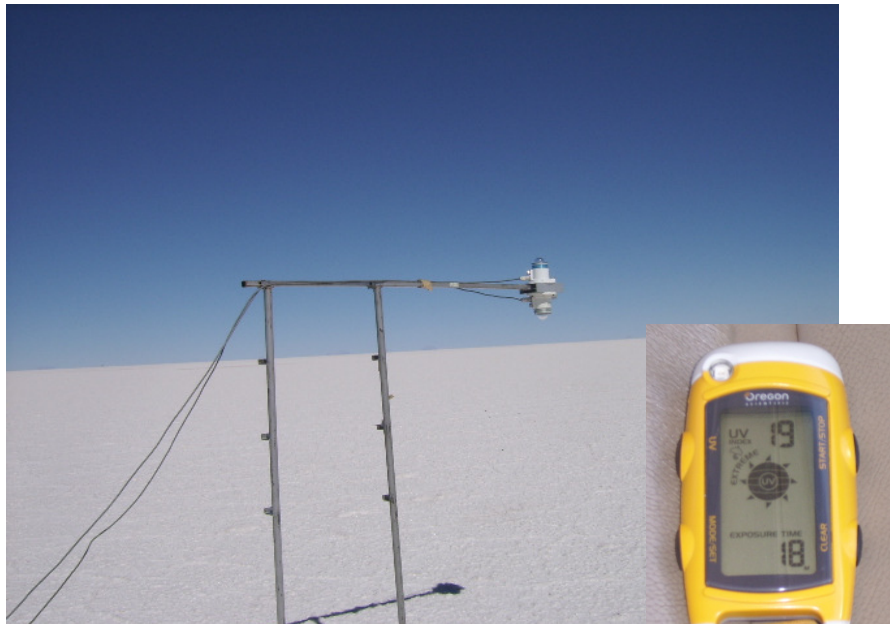
⁵ Laboratorio de Física de la Atmósfera
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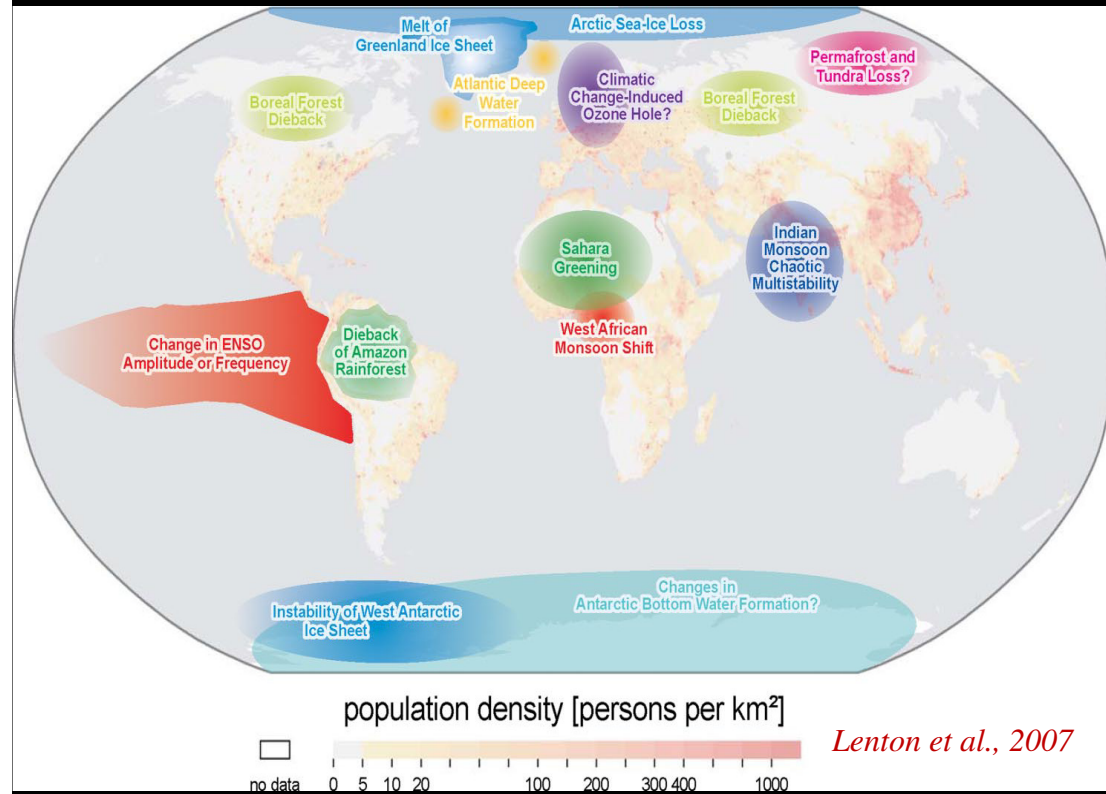


The importance of MCL in climate change research

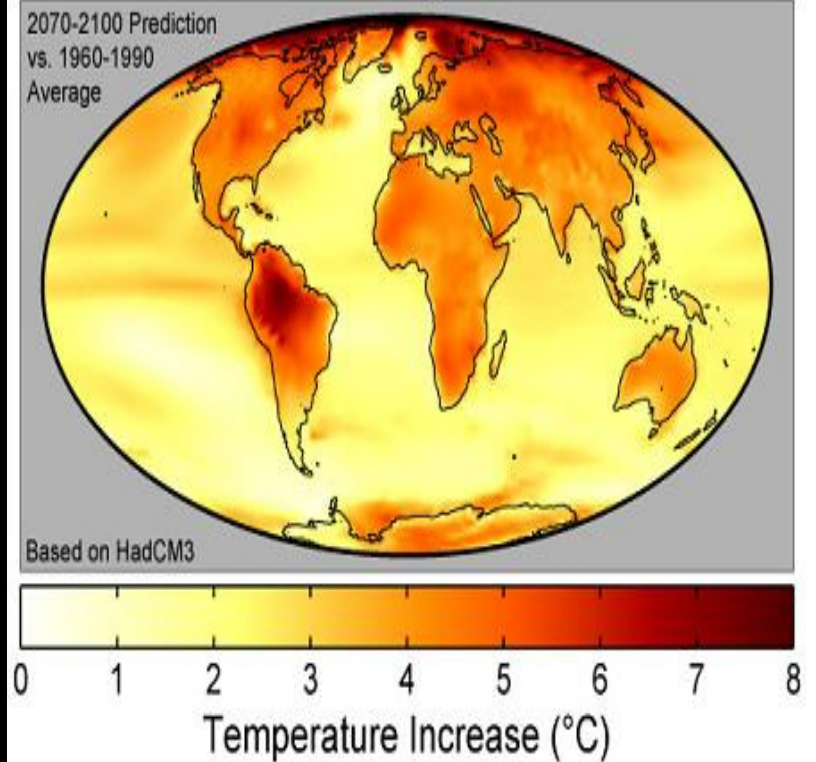
- **The geographic location:** few research centers in South America at high altitude sites
- Easy access, **built in facilities**, permanent personnel
- MCL is usually **above the boundary layer**.
- **The retreat of tropical glaciers** as a landmark of global warming
- **The role of biomass burning** in the energy balance of glaciers: plumes crossing over the Andes have been observed
- **The uncertainty in climate models and satellite data** over the high mountain regions: urgency for reliable surface data.
- All this region is considered very “hot” by the most accredited climate models.

A new era for MCL in the field of climate change

Potential future policy-relevant
tipping elements in the climate
system and estimates of the
global warming

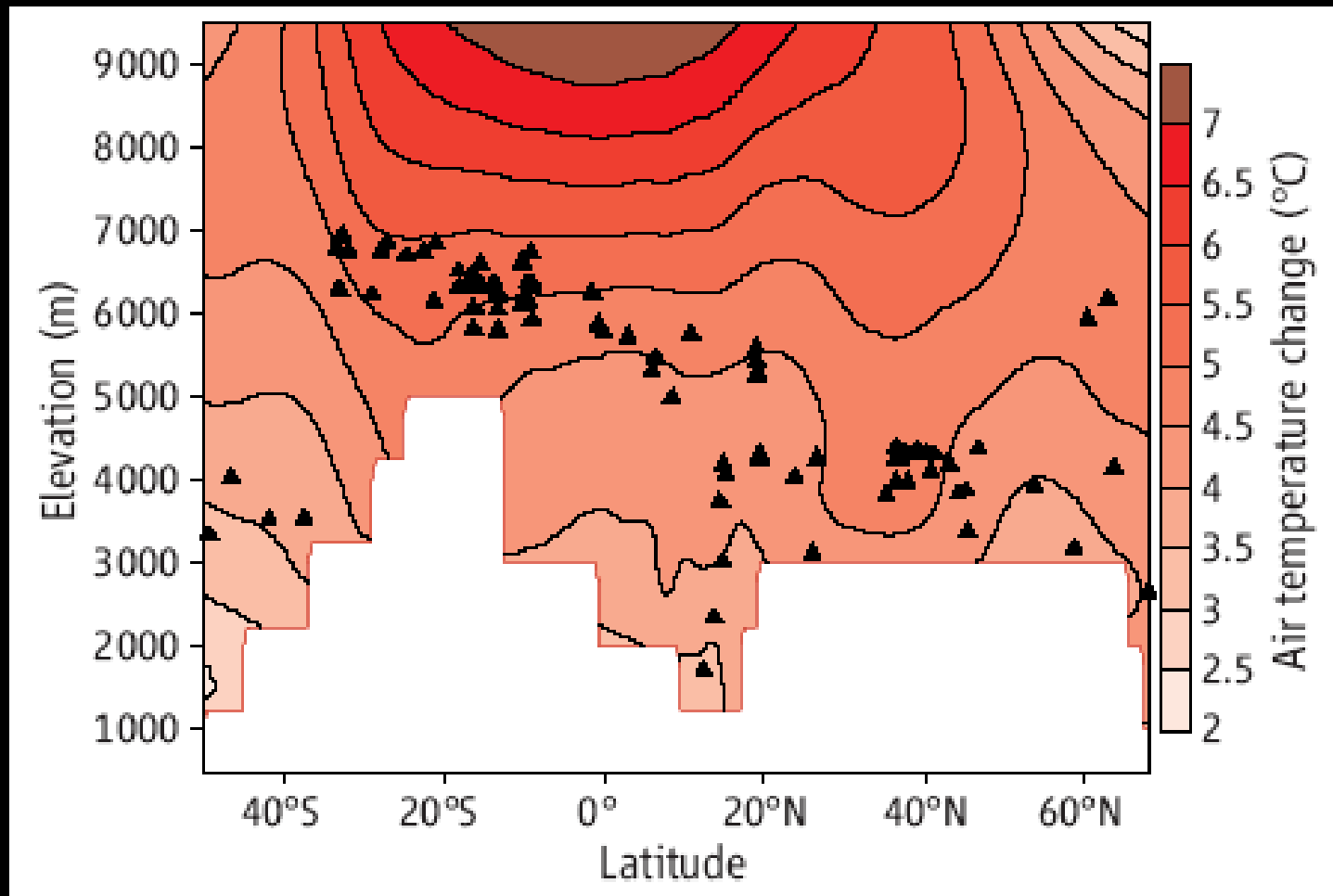


Global Warming Predictions



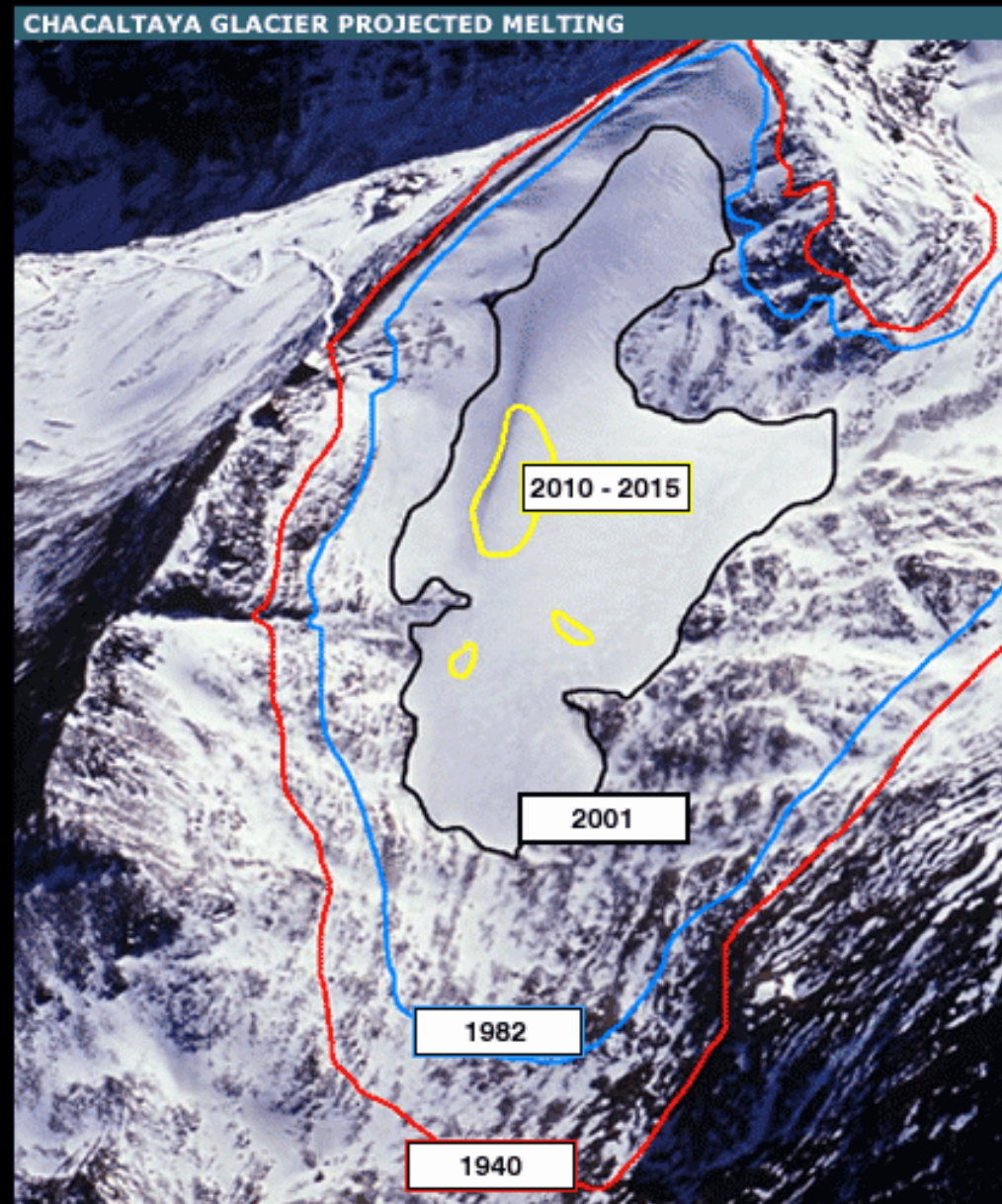
Projected changes of Temperature in a transect from Alaska to Chile: 2090-2099)

(Triangles show changes in 1990-1999 period)



Raymond S. Bradley, Mathias Vuille, Henry F. Diaz, Walter Vergara, *Threats to Water Supplies in the Tropical Andes*, SCIENCE VOL 312 23 JUNE 2006

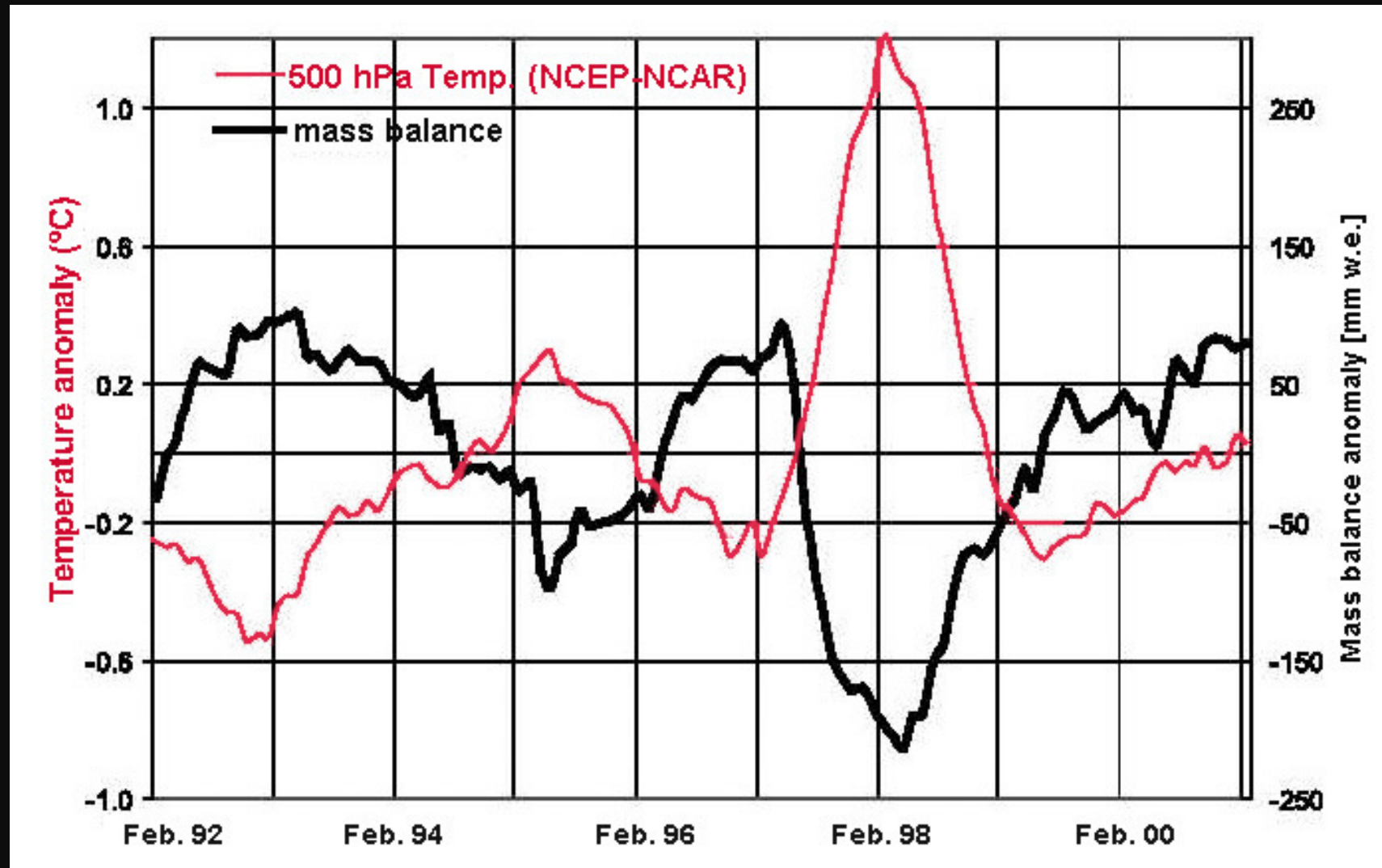
Retreat of the Chacaltaya glacier: observations and projections



Picture by B. Francou (2005)

Coudrain A., Francou B., and Kundzewicz, Glacier shrinkage in the Andes and consequences for water resources, *Hydrological Sciences—Journal—des Sciences Hydrologiques*, 50(6), 2005.

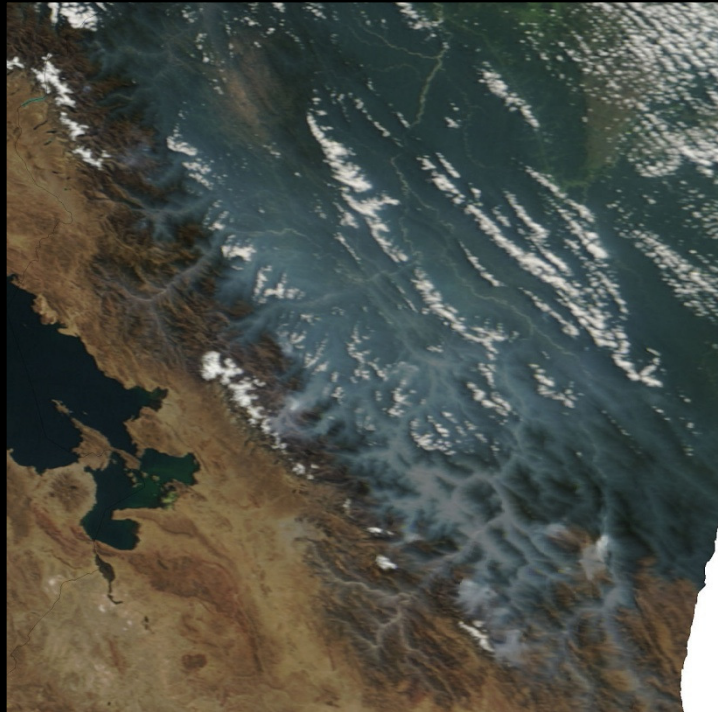
Glaciers retreat and ENSO



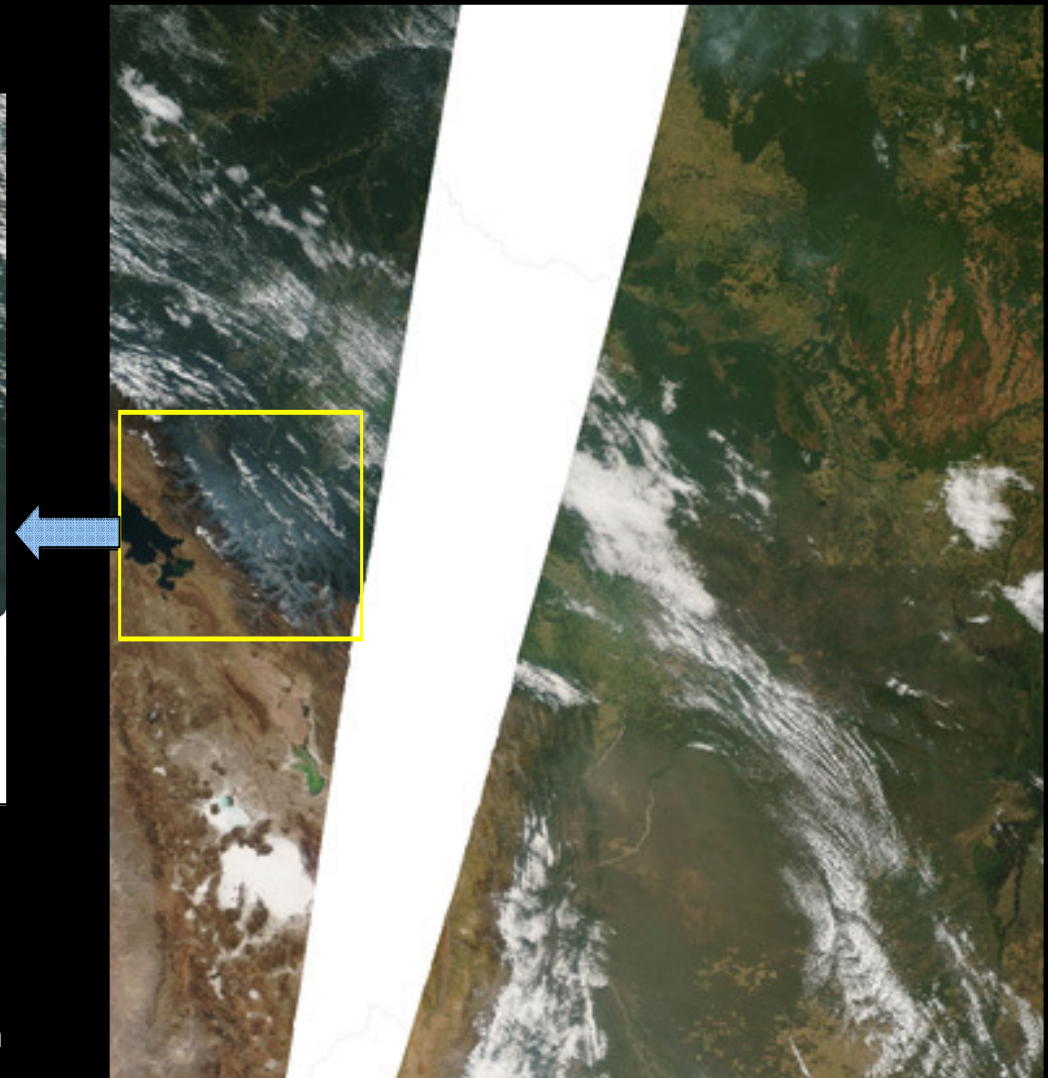
Francou et al.: Tropical Climate Change on Chacaltaya

Smoke from biomass burning crossing over the Andes

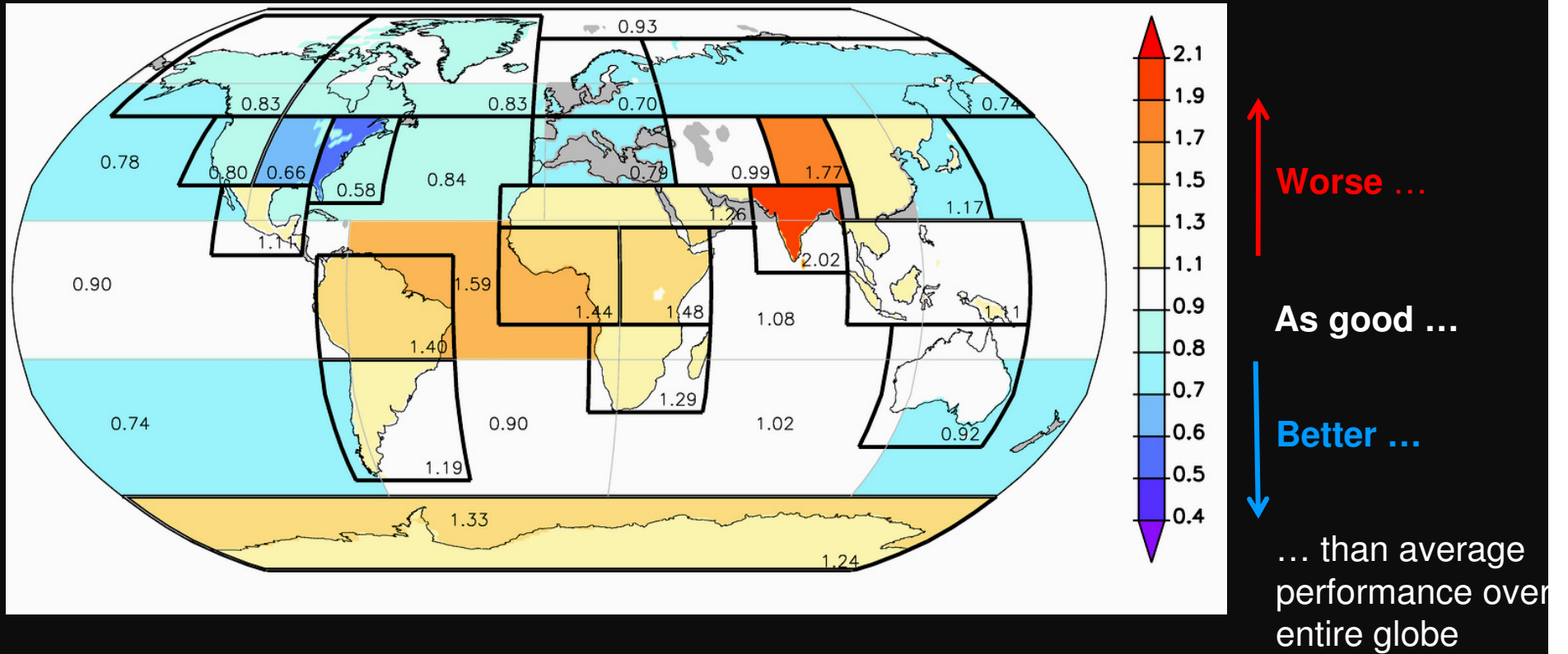
July 23rd, 2006



Picture from MODIS aboard of satellite Aqua



Average Model Performance



- Tropics generally less well (+50%) simulated than extratropics (-20 to -50%)

Reichler and Kim (2008)

Conclusions

We propose the MCL as a new international center for climate change observations, with the aim of:

- hosting and operating instruments for atmospheric research
- developing agreements for carrying out joint projects at MCL in the area of climate research.
- integrating international networks for climate change research, like SHARE and GAW

We suggest for the new commitment the “explosive” name of **C-4: Chacaltaya Climate Change Center**

THANK YOU

GRAZIE MILLE

MUCHAS GRACIAS