The Mount Chacaltaya Laboratory: past, present and future

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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

- 1988-1997
- 1983-1997
- 1952-1966

Month

°C
The golden years
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
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

Lenton et al., 2007

Global Warming Predictions

Based on HadCM3

Temperature Increase (°C)

2070-2100 Prediction vs. 1980-1990 Average

Lenton et al., 2007
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

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