Variabilidad del Monzón Sudamericano durante los últimos 1000 años inferidos a partir de estudios isotópicos en espeleotemas recolectados en los Andes orientales del Perú y Bolivia

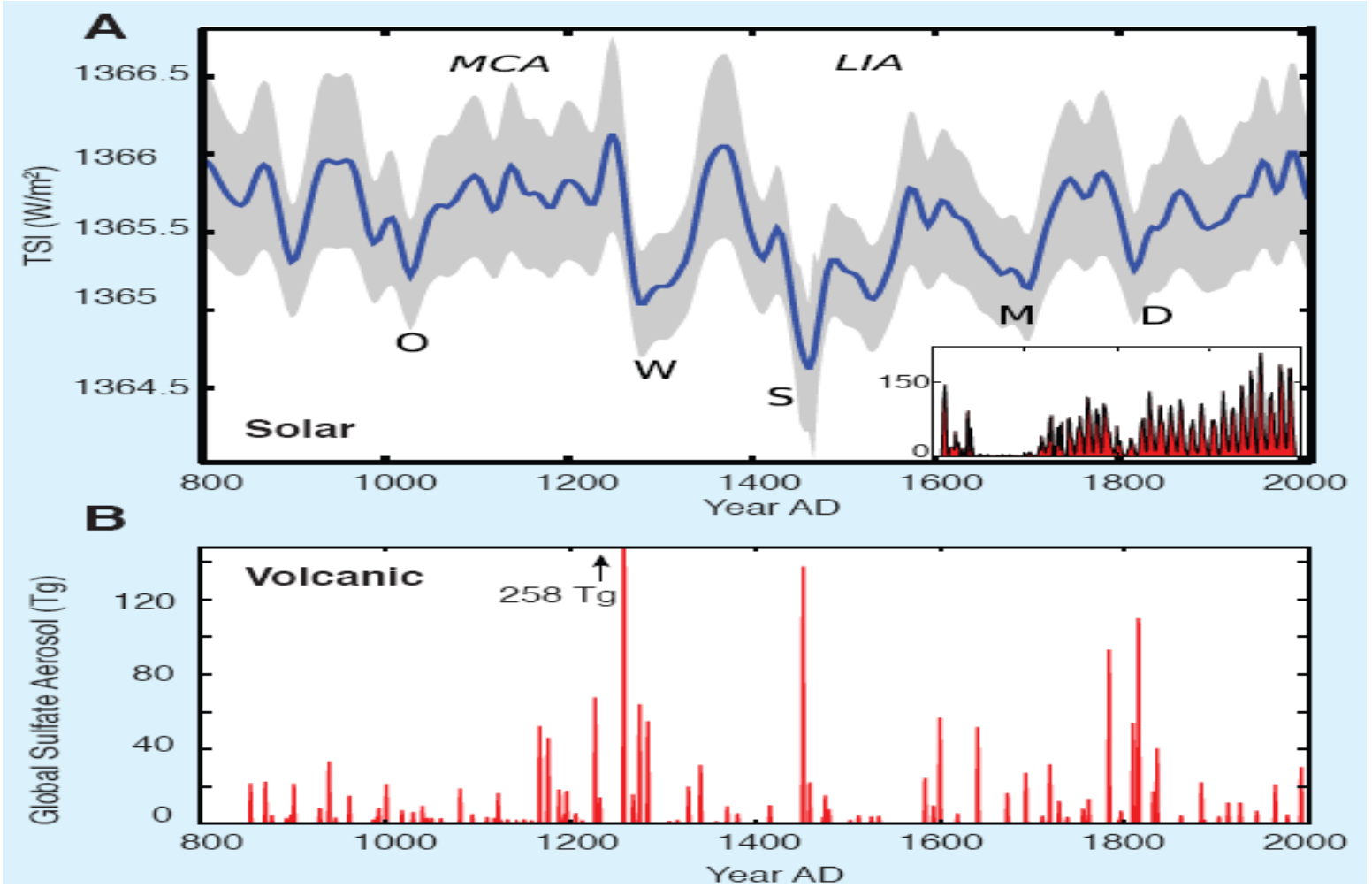
James Apaéstegui (UFF Niterói, Brasil), F.W. Cruz, J.L. Guyot, A. Sifeddine, R.V. Santos (UnB); Brasilia, L. H. Mancini(UnB –Brasilia), A. Auler, J. Ronchail, F. Sondag

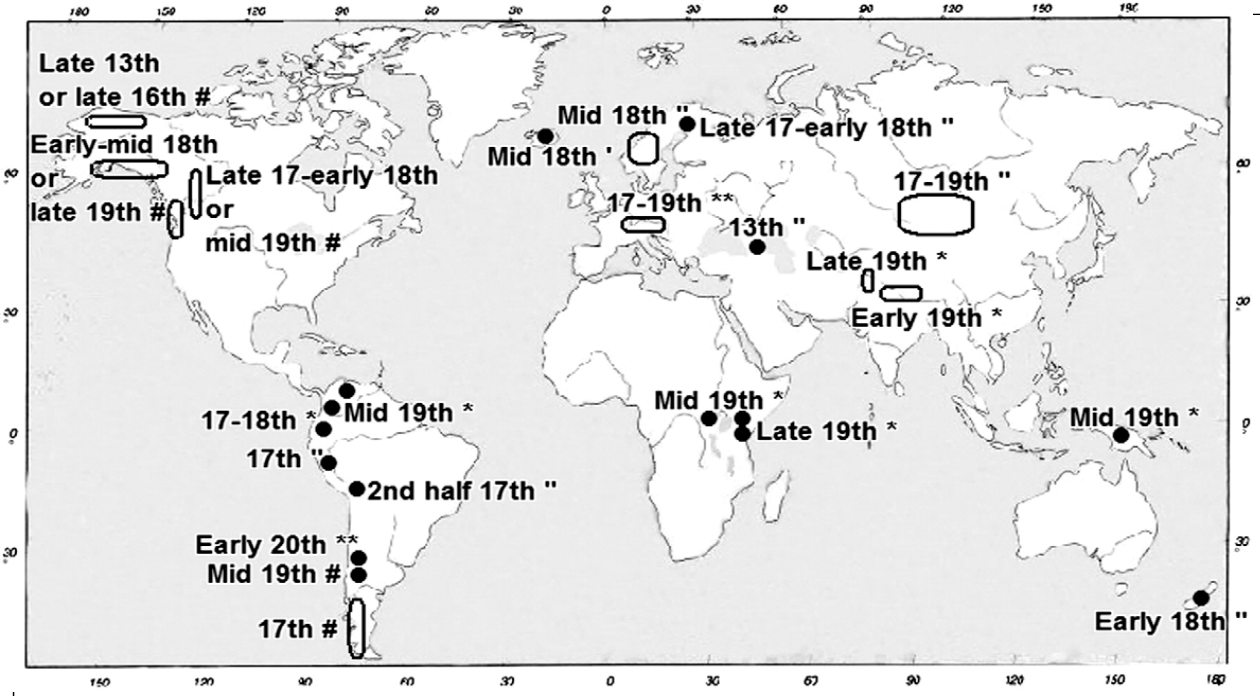
Introduçao

- Eventos climaticos de escala global no ultimo milenio. MCA – LIA
- A Monção Sul Americana
- Espeleotemas como indicador paleoclimatico ambiental.
- Como funciona el $\delta^{18}O$ como proxi de paleoprecipitações.
- Area de estudio do presente trabalho
- Resultados preliminares
- Conclusiones.

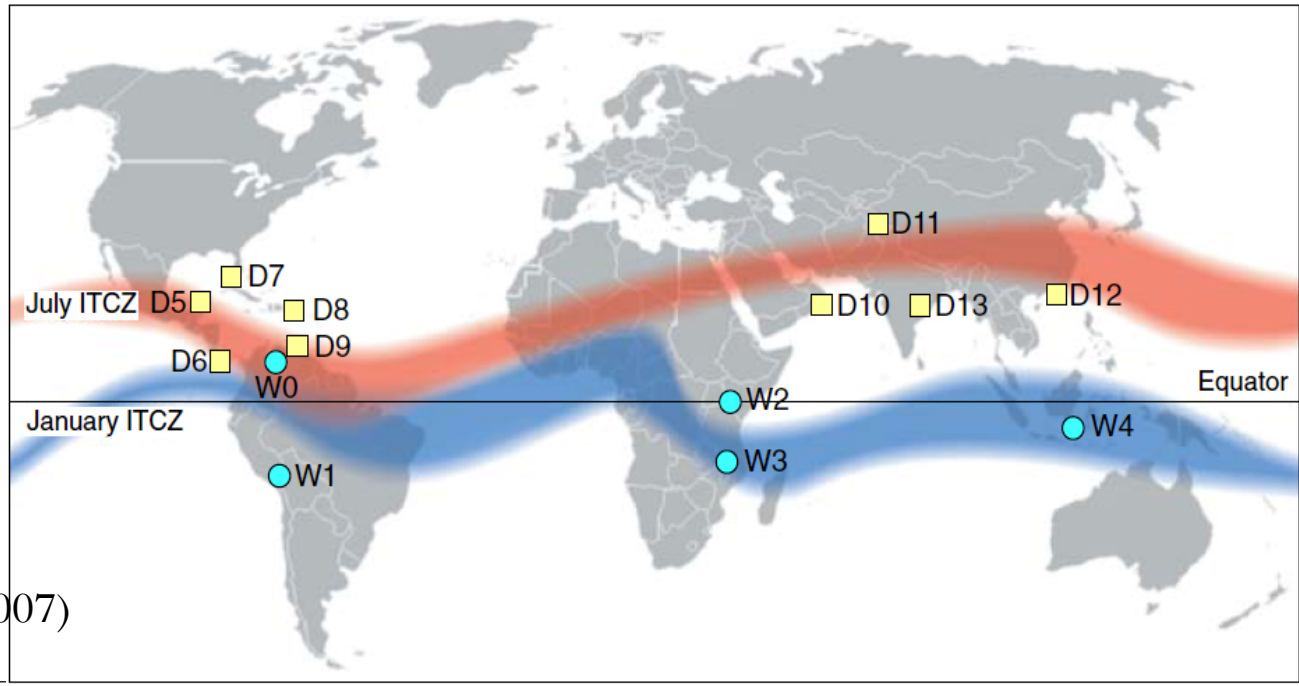
Variabilidad Climática del Ultimo Milenio

- Medieval Climate Anomaly (MCA)
- Little Ice Age (LIA)



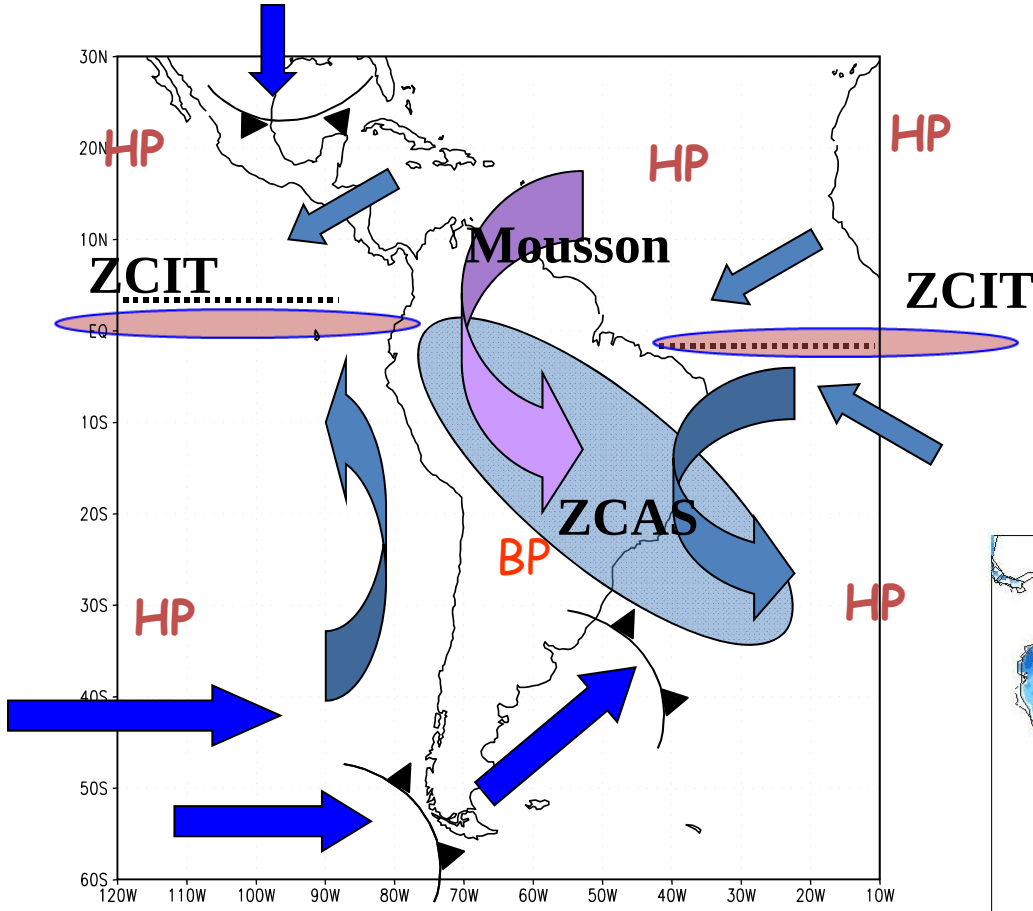


(Rabatel *et al.*, 2008)



(Newton *et al.*, 2006; Kirkby, 2007)

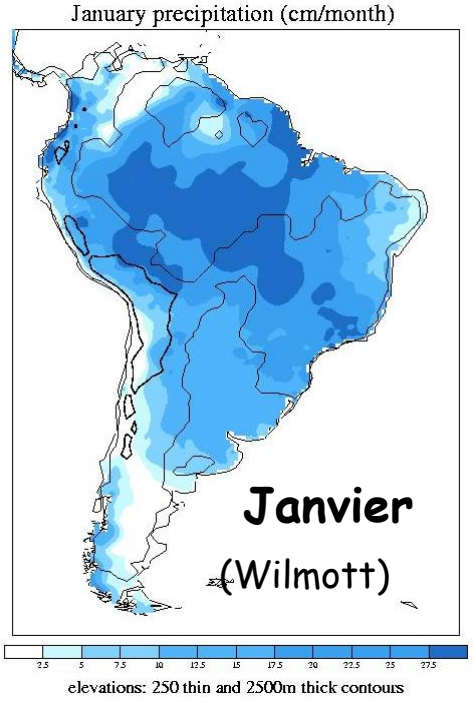
Circulacao e Chuvas no verao austral



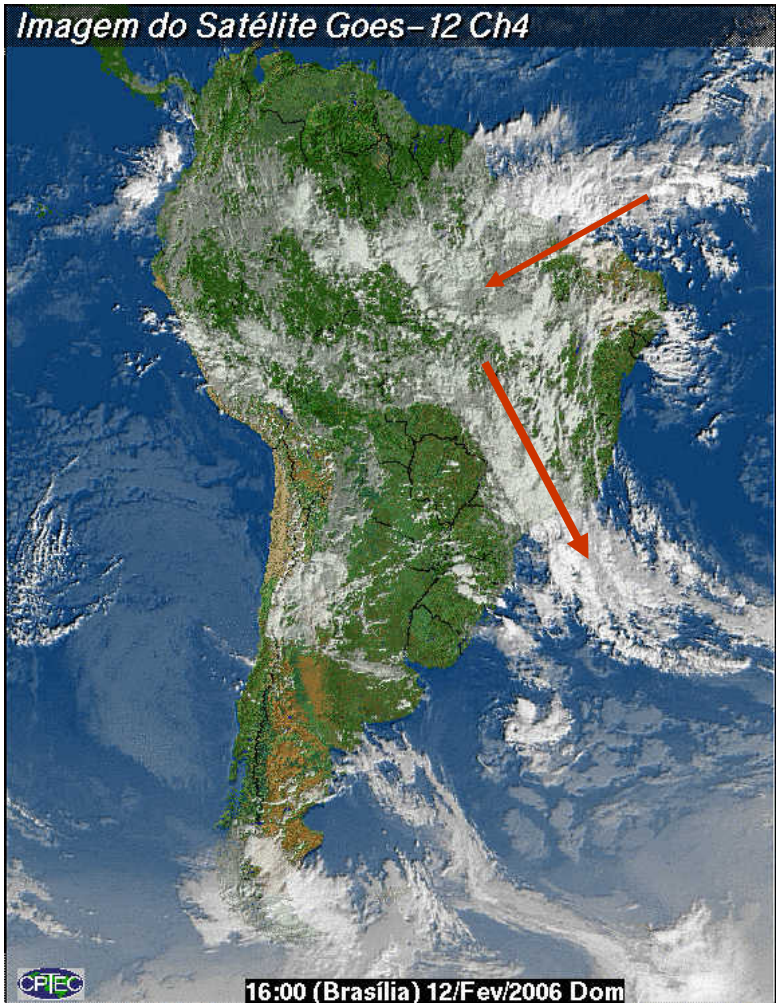
Circulation extra-tropicale

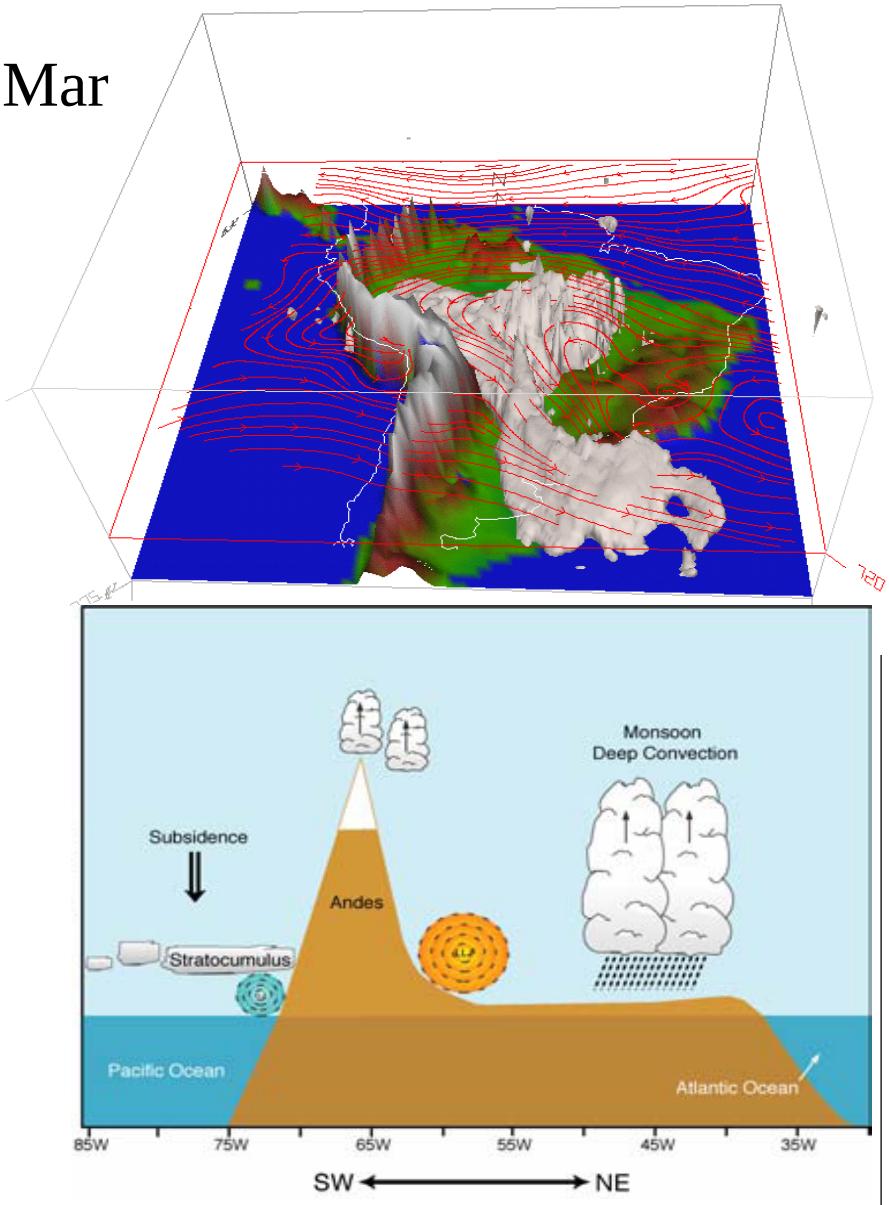
Alizés

Mousson



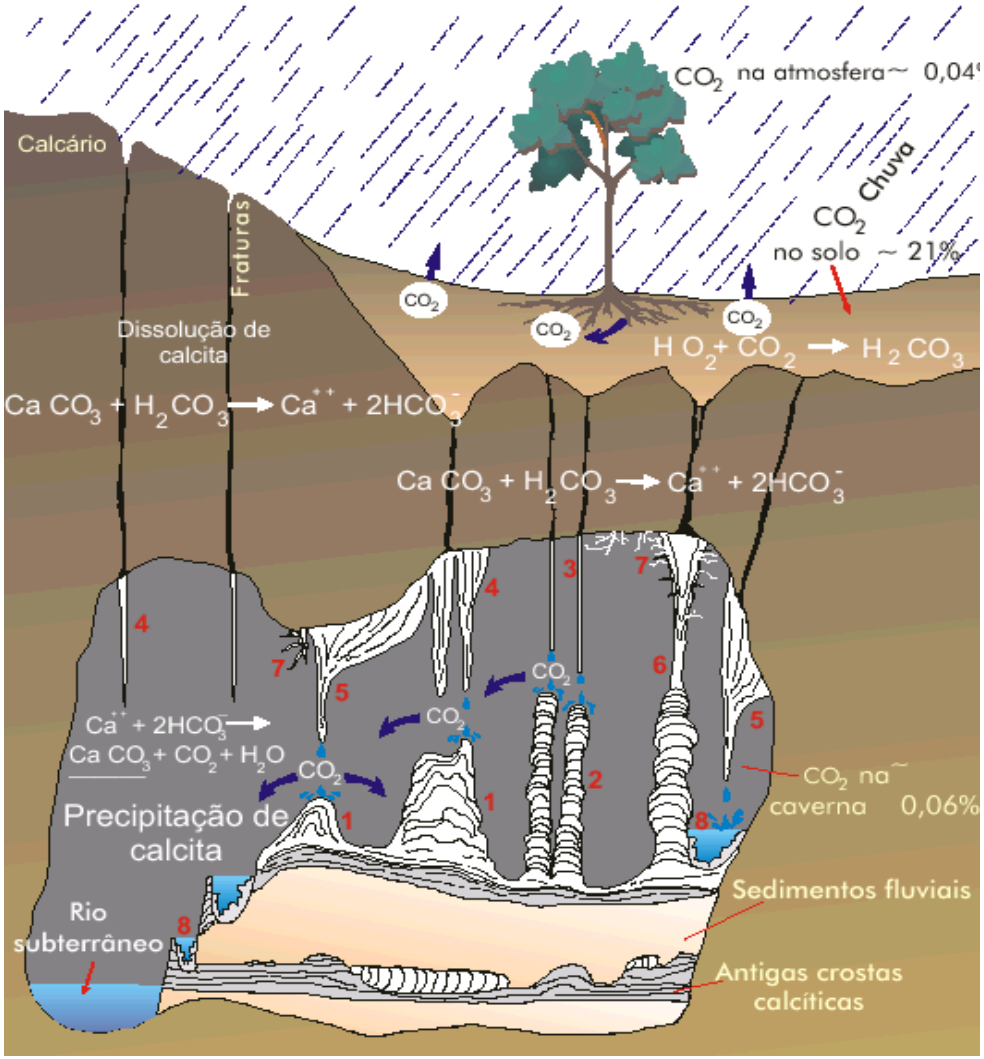
Mecanismo: Δ T = Continente - Sup. Mar



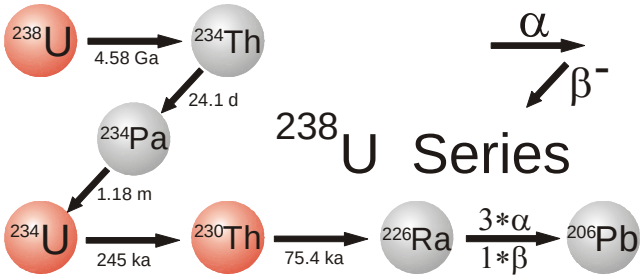


No particular, o gradiente termico entre a superficie e oceano, gera uma serie de depressoes e ascendencas do vento alimentadas por um fluxo de ar humido trans equatorial provenente do oceano produzindo precipitacoes intensas ate latitudes Subtropicais **(Monção = Sul Americano).**

Espeleotemas como indicador paleoclimático y paleoambiental

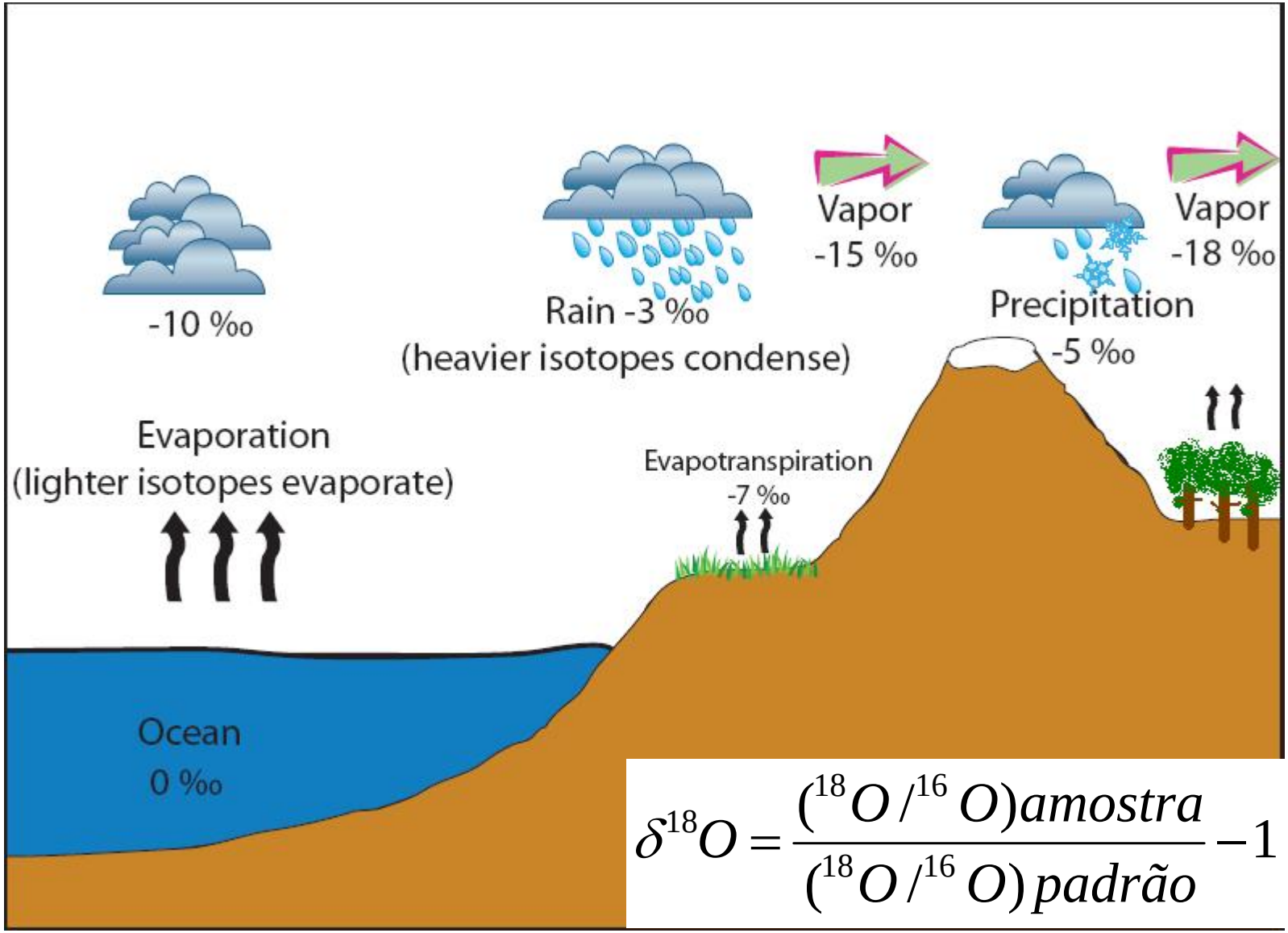


Decay of ^{238}U to ^{206}Pb

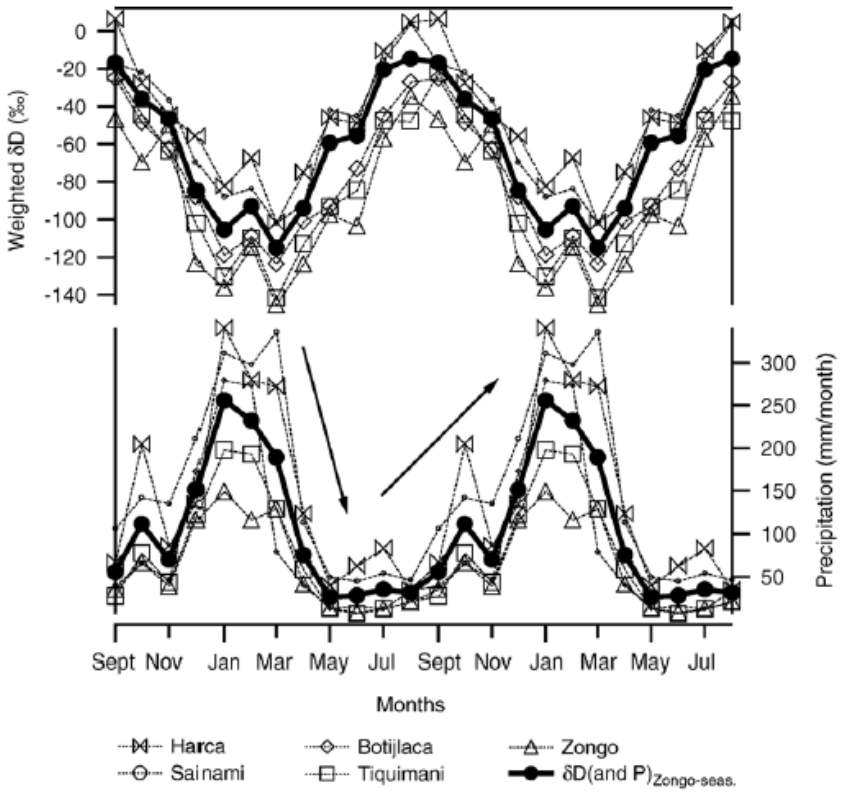


$$\delta^{18}O = \left(\frac{^{18}O/^{16}O)_{sample} - {}^{18}O/^{16}O)_{VPDB}}{(^{18}O/^{16}O)_{VPDB}}\right.$$

Efeito “Rain fall amount”

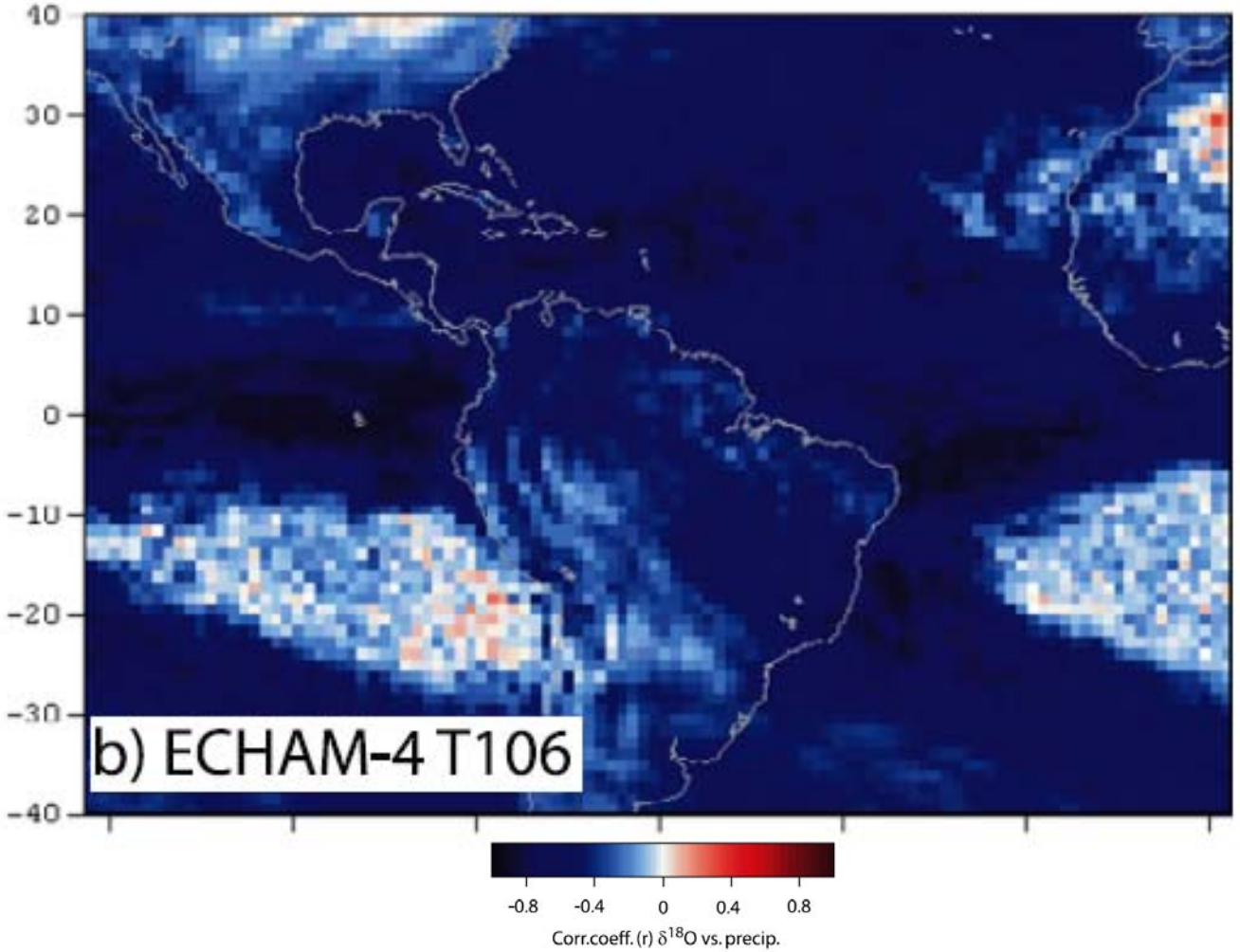


$$\delta^{18}O = \frac{(^{18}O/^{16}O)amostra}{(^{18}O/^{16}O)padrão} - 1$$

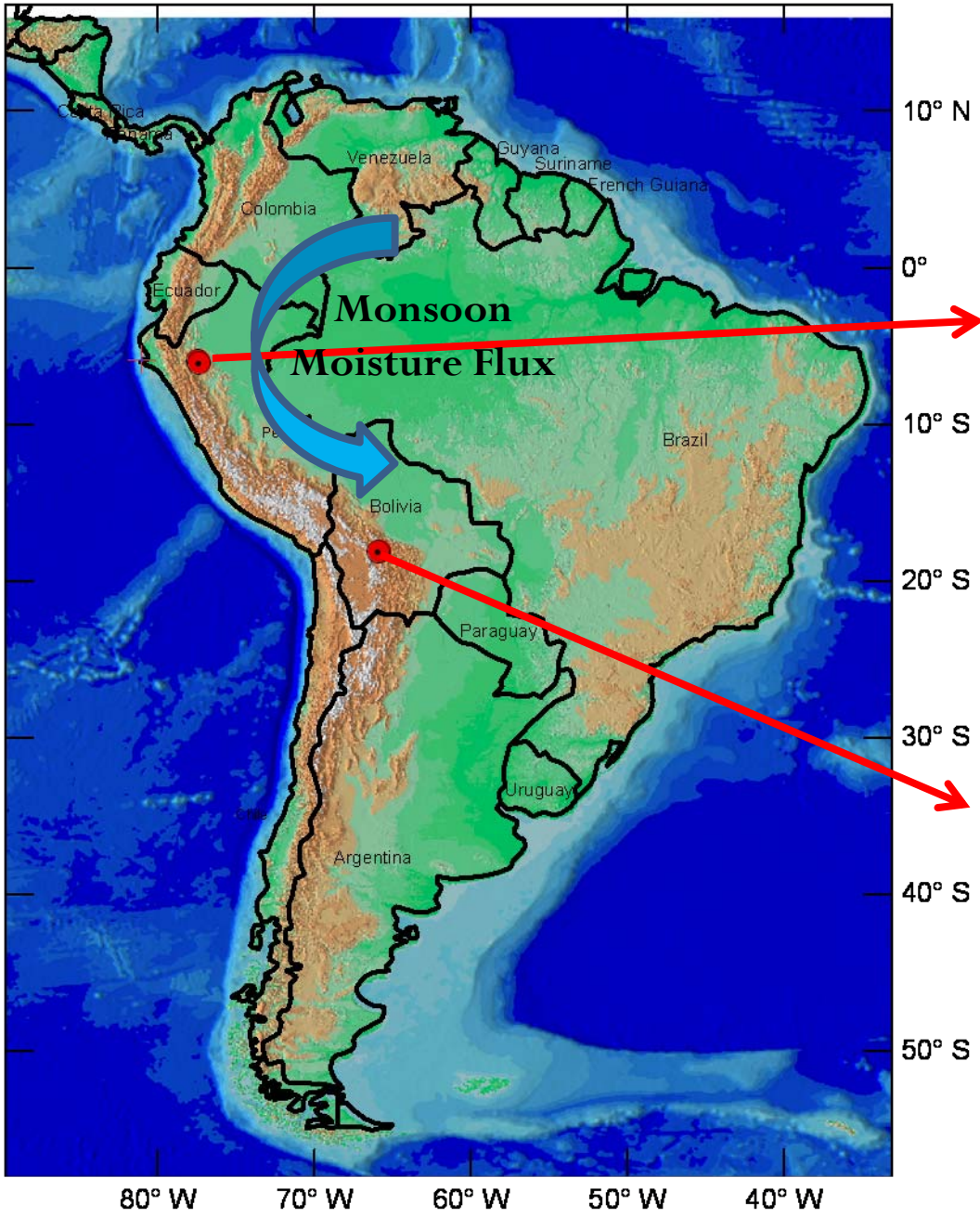


› Valley (Bolivia) with the locations of the 8 pluviometers at Huaji (945 m), Harca (1480 m), Sainami (2210 m), Cuticucho
)2 m), Tiquimani (3900 m), Zongo (4264 m) and Plataforma (4750 m).

Modelo Geral de Circulação Atmosférica (AGCM)



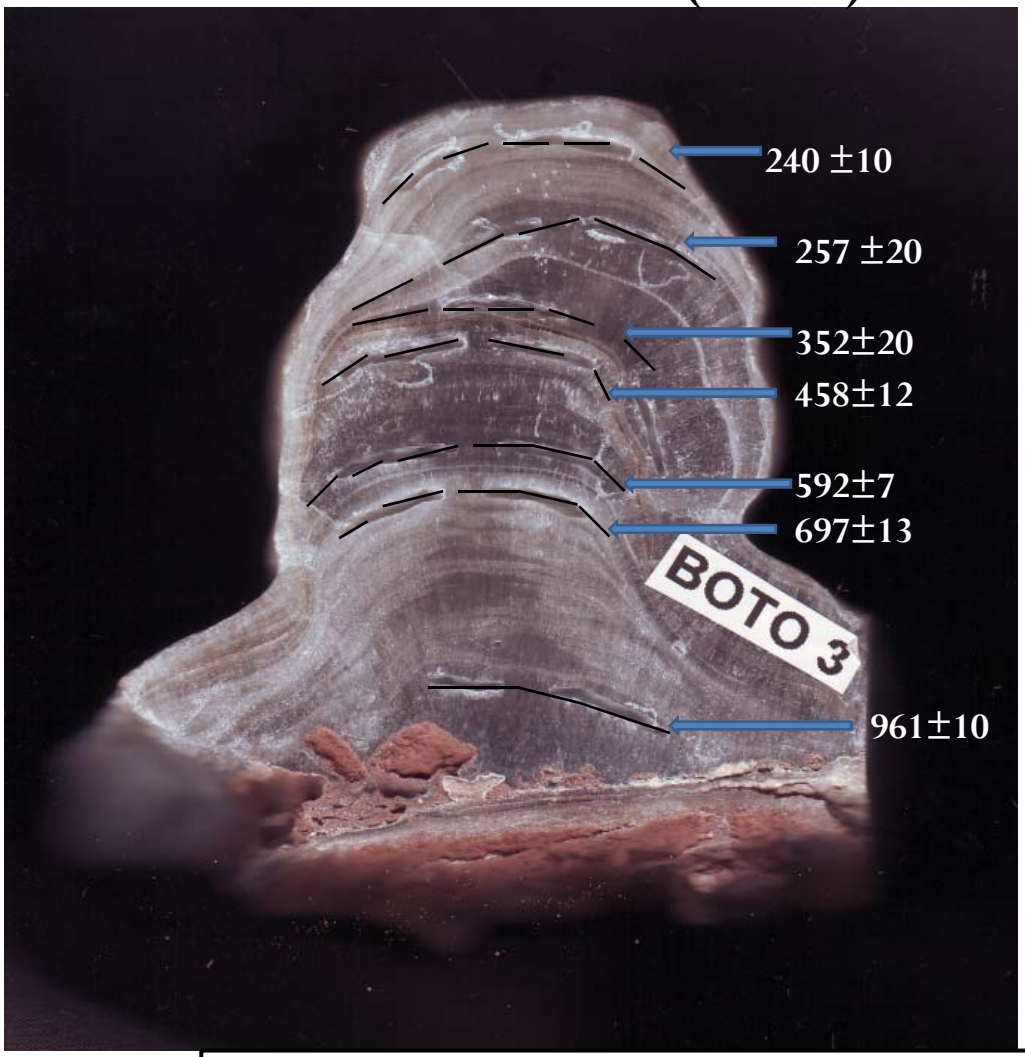
Modelo montado a partir dos dados de estações meteorológicas do Global Network Isotope Precipitation (GNIP), fornecido pela Agência Internacional de Energia Atômica



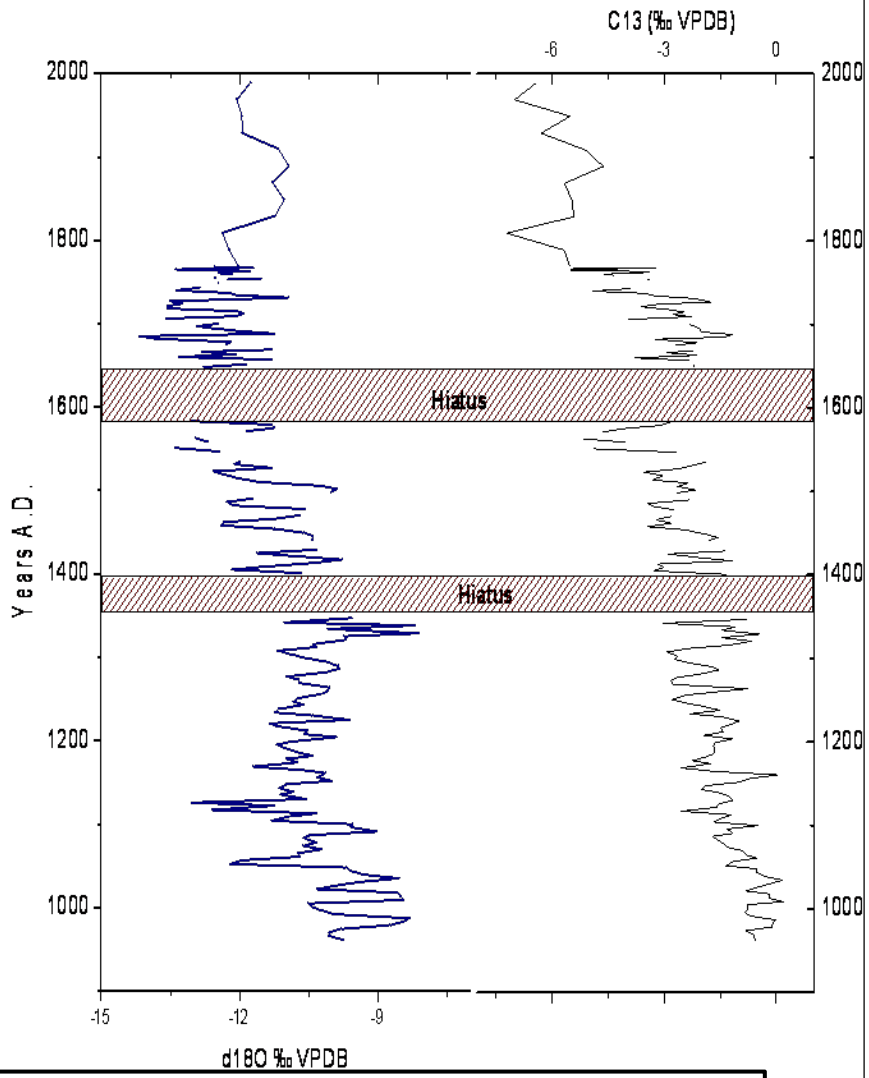
Palestina Cave

Chiflonkhakha Cave

Bolivian Sample (Chiflonkhakha Cave)
Torotoro National Park (Bolivia)



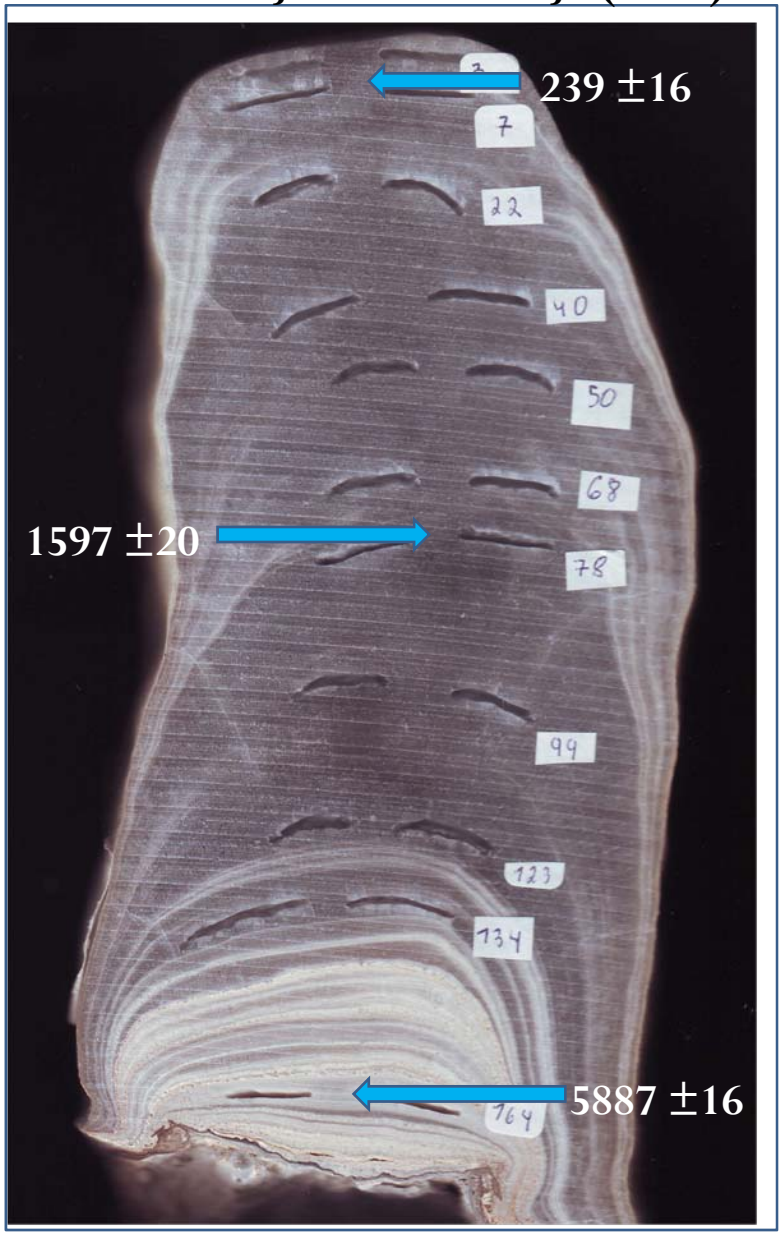
Preliminary results



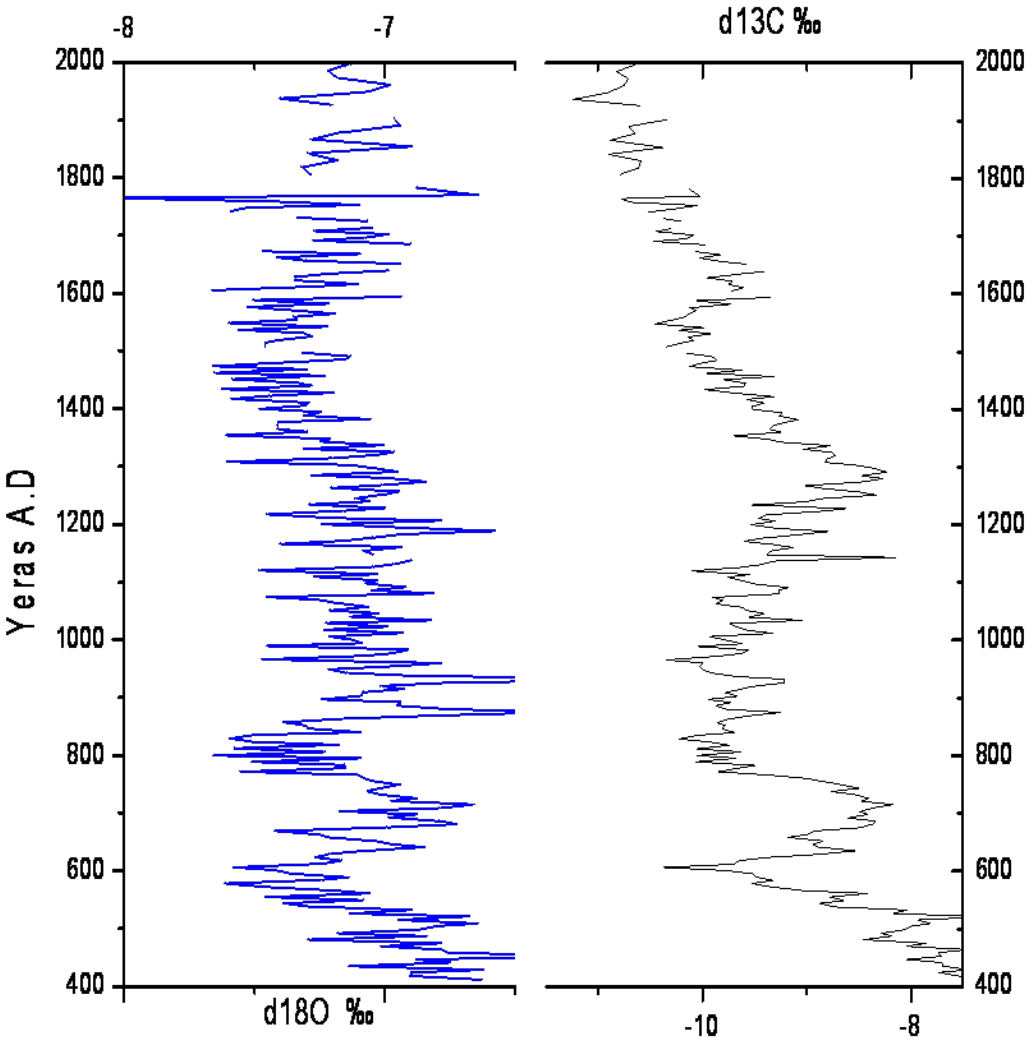
2 hiatus discovered.
(since 1583 to 1645 years A.D) ~64 yrs
(Since 1351 to 1401 years A.D) ~50 yrs

Oxigen Isotope Sampled resolution:
~0.4 mm
Mean temporal resolution of the data obtained:
~ 5 years

Peruvian Sample (Palestina Cave)
Nueva Cajamarca – Rioja (Perú)

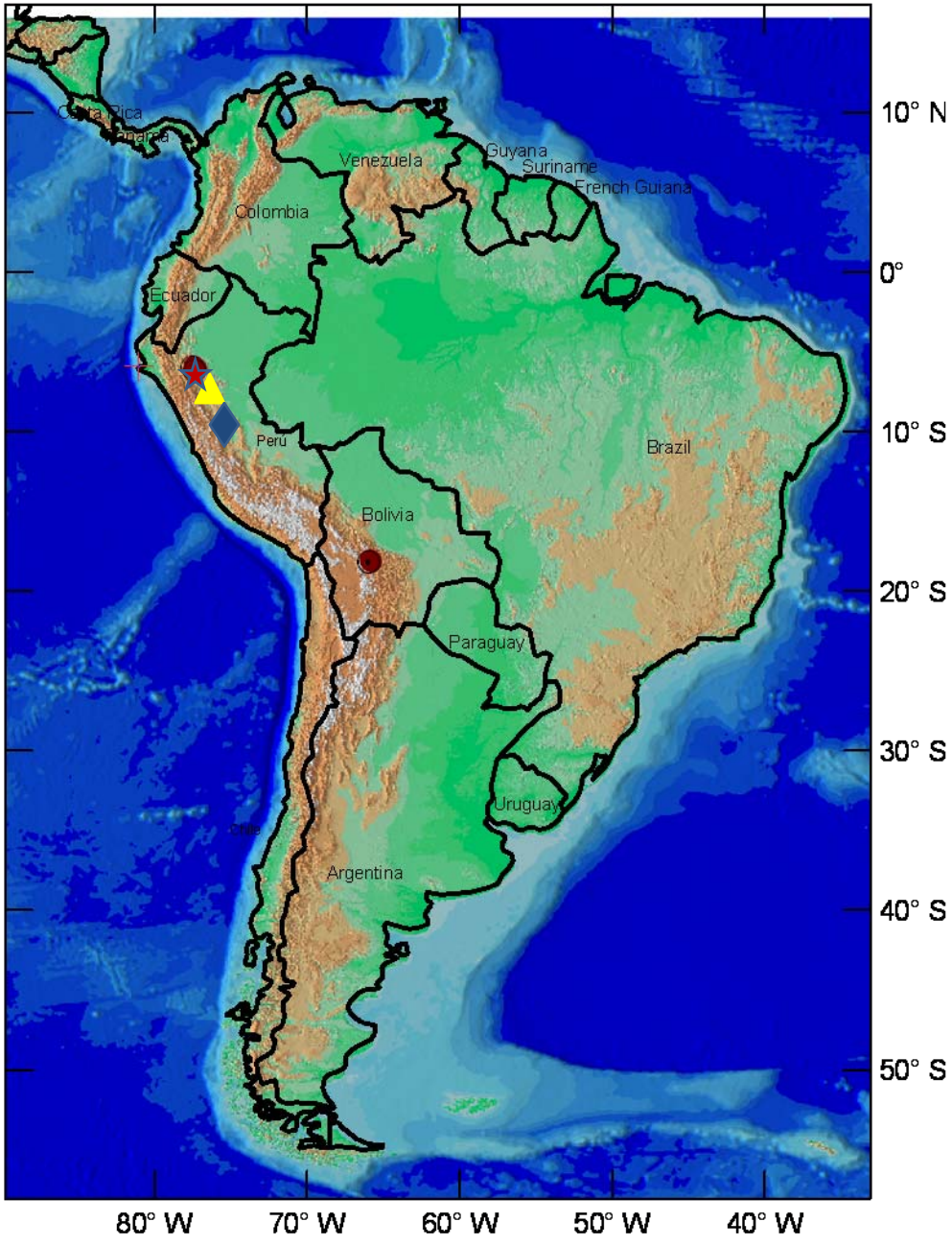


Preliminary results



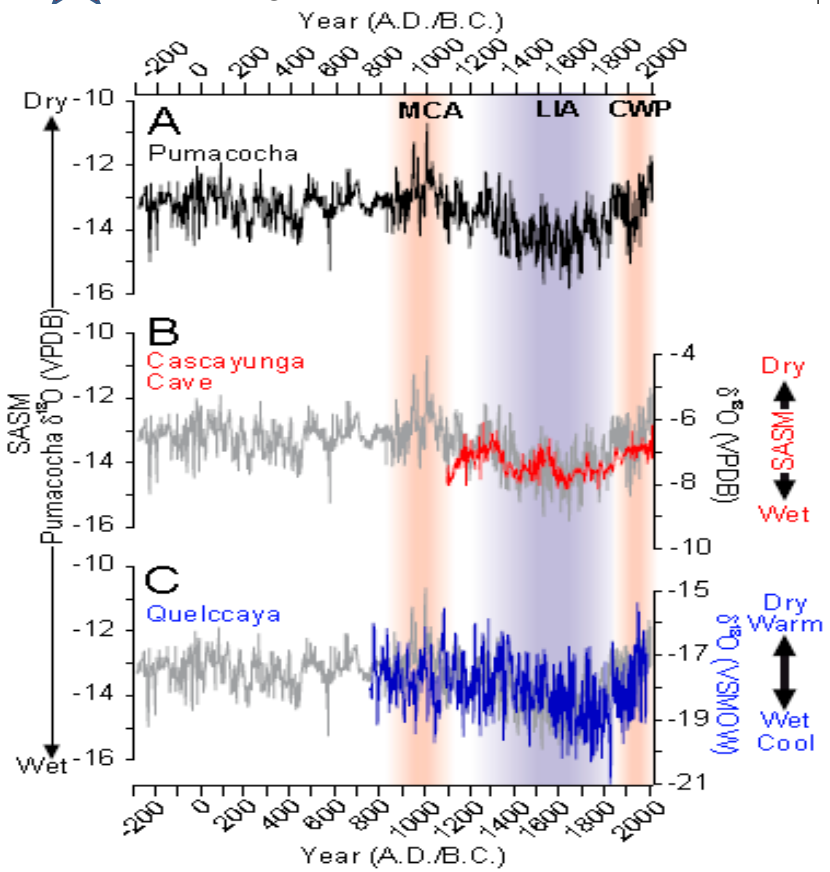
Future age model:
Include 7 points from the top to the 1597 age.
Sampled resolution for stable Isotopes: 0.3 mm
Mean temporal resolution of threshold data: 8 years

Comparação com outros proxis dos Andes em America do Sul



Estado da arte no conhecimento paleoclimatico da Monção Sul Americana

- Pumacocha Lake (Bird et al, 2011) (PNAS)
- Quelccaya Ice core (Thompson et al, 1984) (Science)
- Cascayunga Cave (Reuter et al, 2009) (GRL)

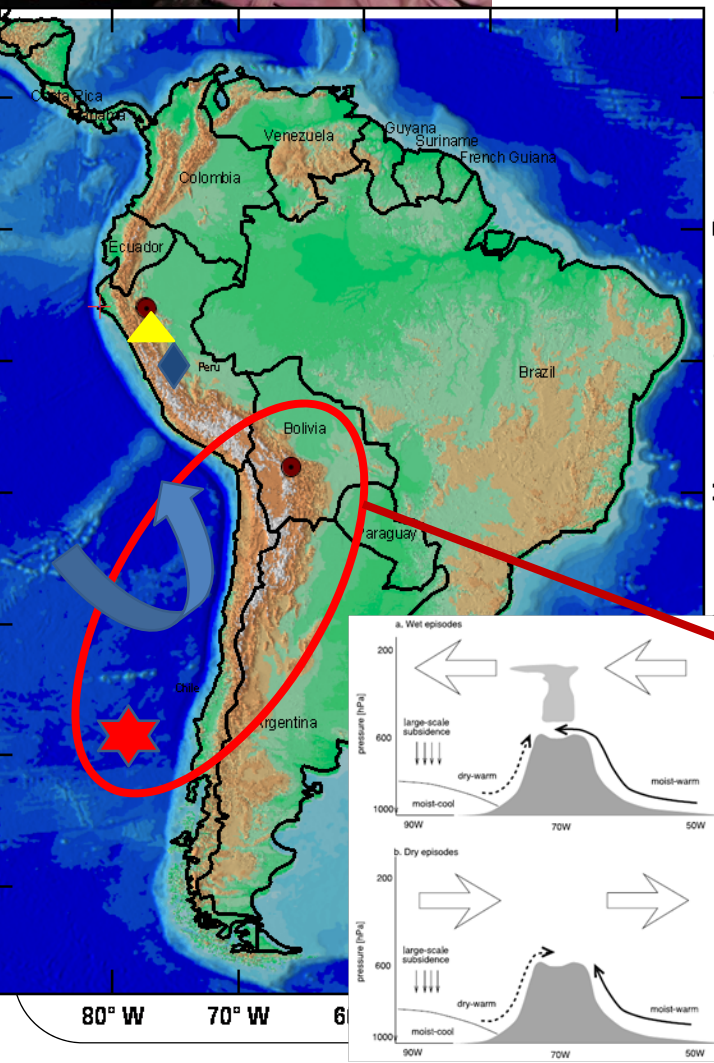


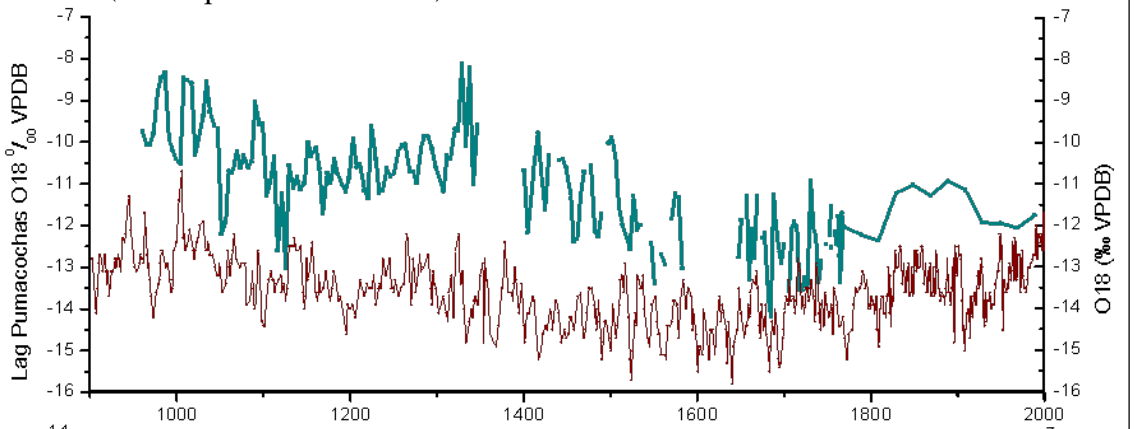
Resultados Preliminares

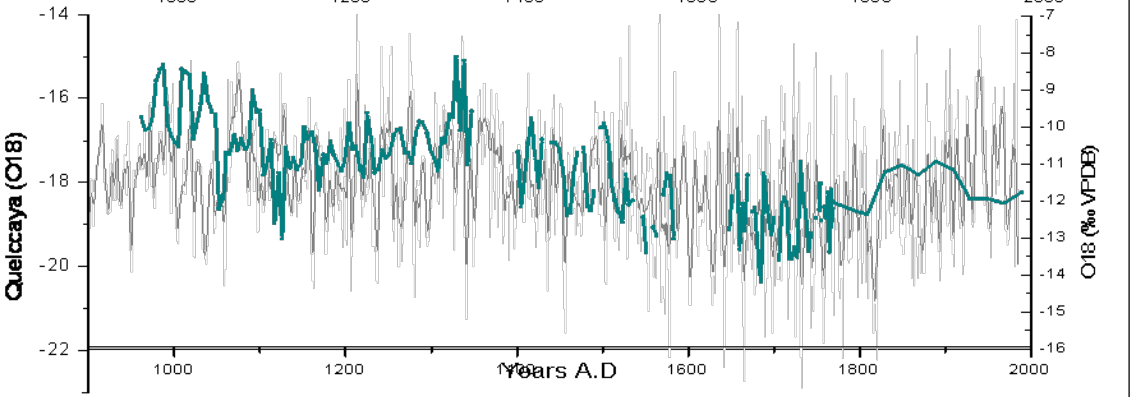
Lamy et al, 2001 . 2002 (EPSL)

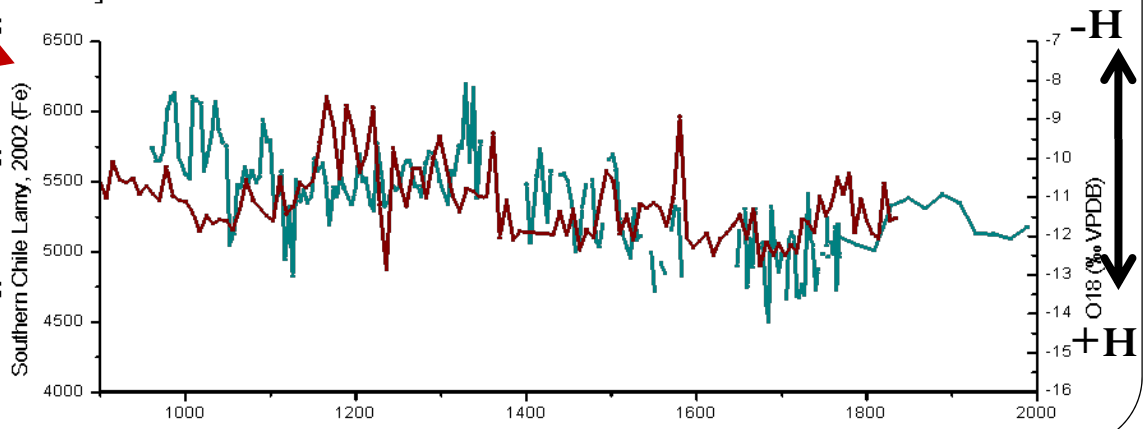
Pumacocha Lake (Bird et al, 2011) (PNAS)

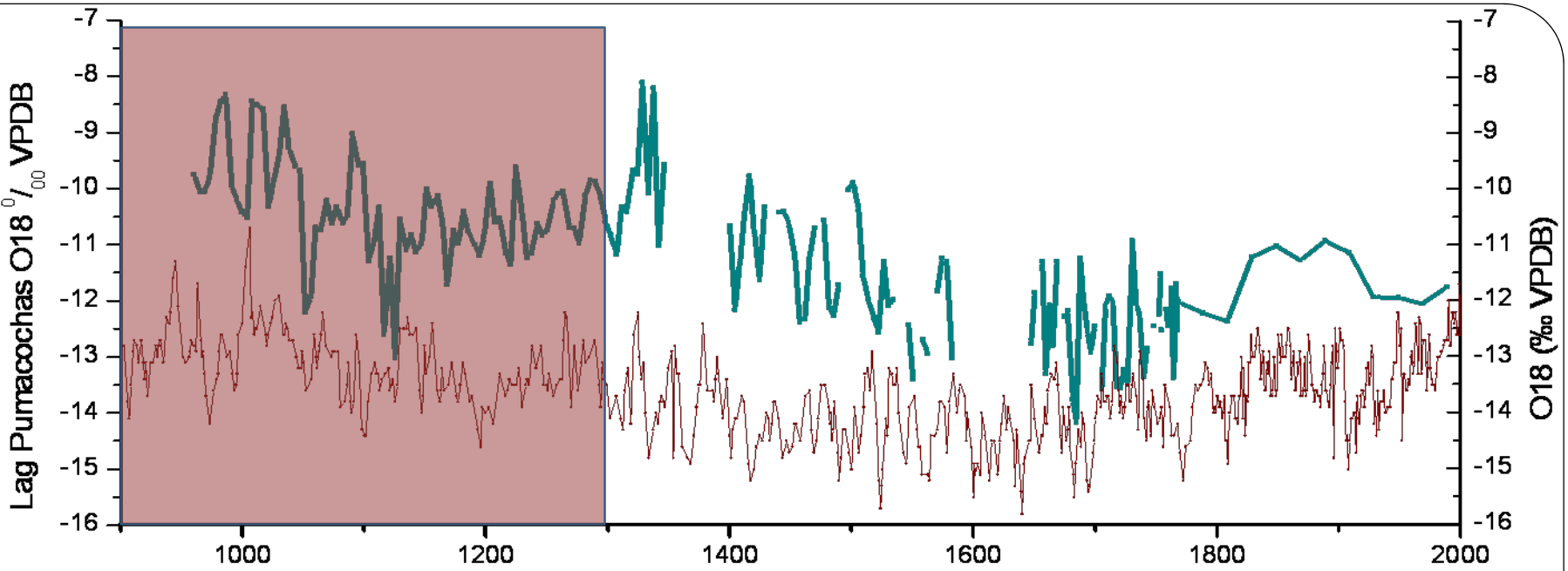
Quelccaya Ice core (Thompson et al, 1984) (Science)

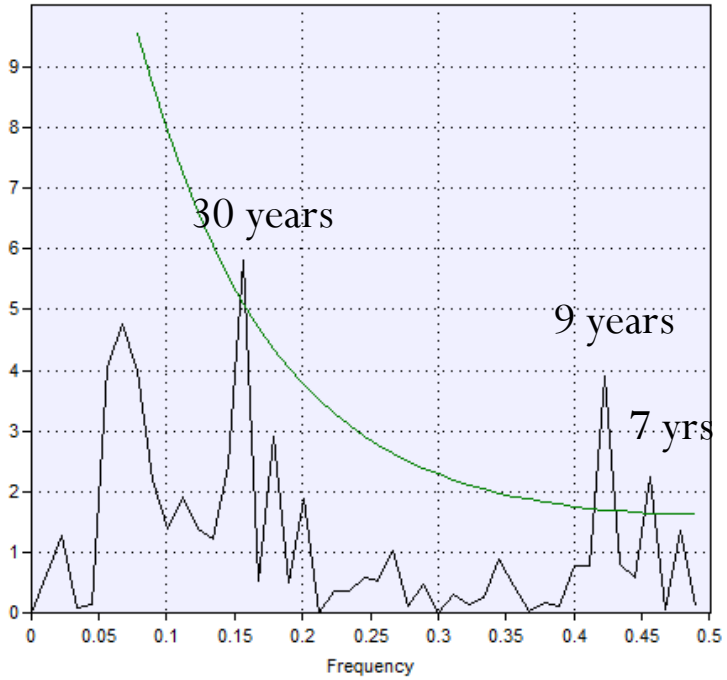












MCA (950 – 1350 years A.D.)

Conclusions and future remarks

•O lado oriental dos Andes Bolivianos relacionados com:
A Monção Sul Americana
Na escala multidecadal PDO ?
Y que con los vientos del Oeste ?

•Futuros analise das series temporais de $\delta^{18}O$ calcita dos espeleotemas ajudaram na comprensão dos diferentes modos de variabilidade da Monção Sul Americana.

•Aumentar o numero de datações feitas pelo metodo U/Th

•Aumentar a resolução do registro (Uso de elementos tracos: Mg/Ca, Sr/Ca sazonal???)

•Monitoreo de variavels fisico quimicas no ambiente das cavernas (Palestina Cave)

•Extender o periodo da informãção (Completar o Holocene) CAS-1

Gracias
Obrigado
Merci
Thank you