Reconstrucciones paleoclimáticas del último milenio en base a registros de la cueva Palestina

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doi:10.5194/cp-10-1967-2014

Climate of the Past
Open Access

Hydroclimate variability of the northwestern Amazon Basin near the Andean foothills of Peru related to the South American Monsoon System during the last 1600 years

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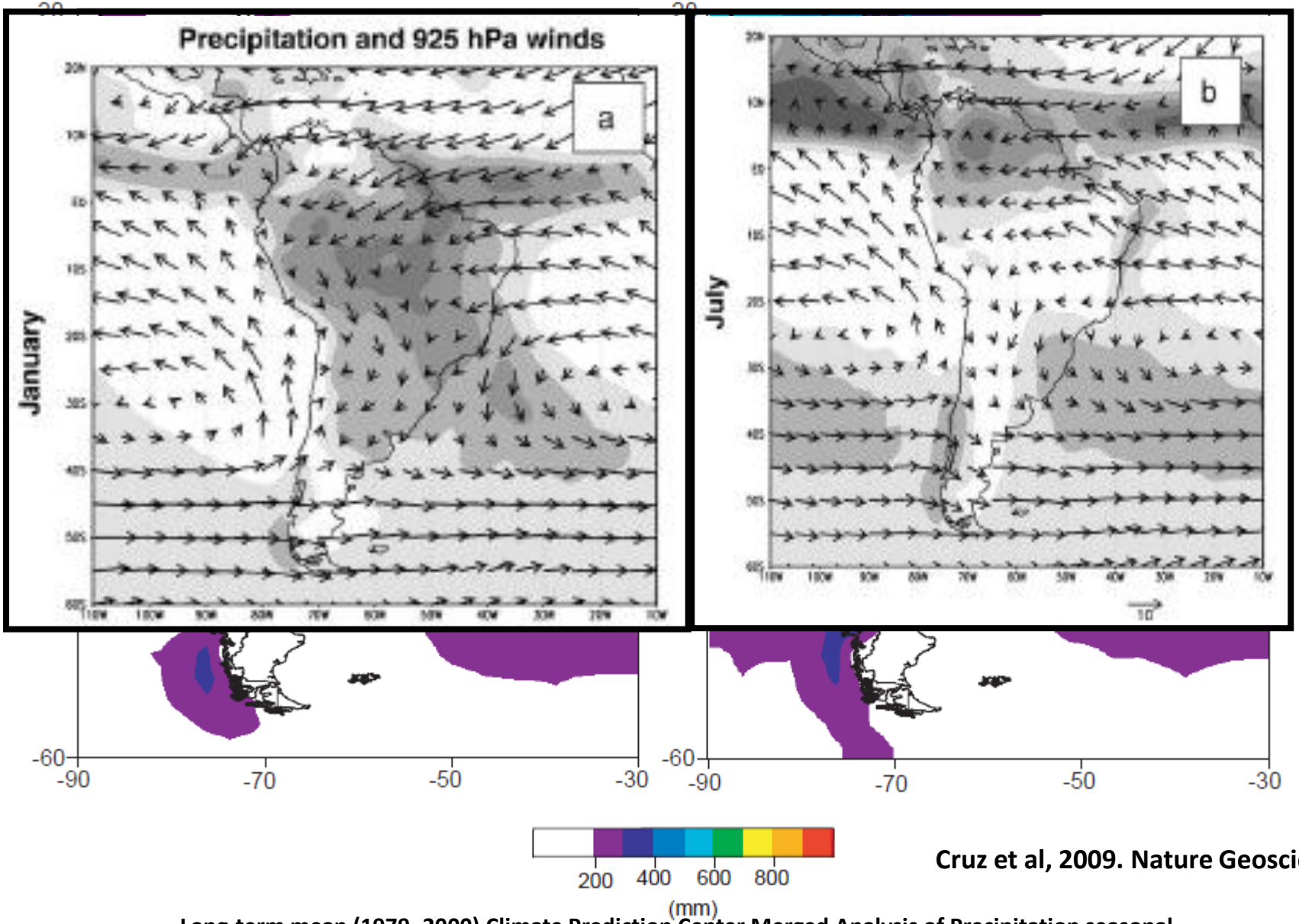
La cueva Palestina en el ojo del mundo científico!

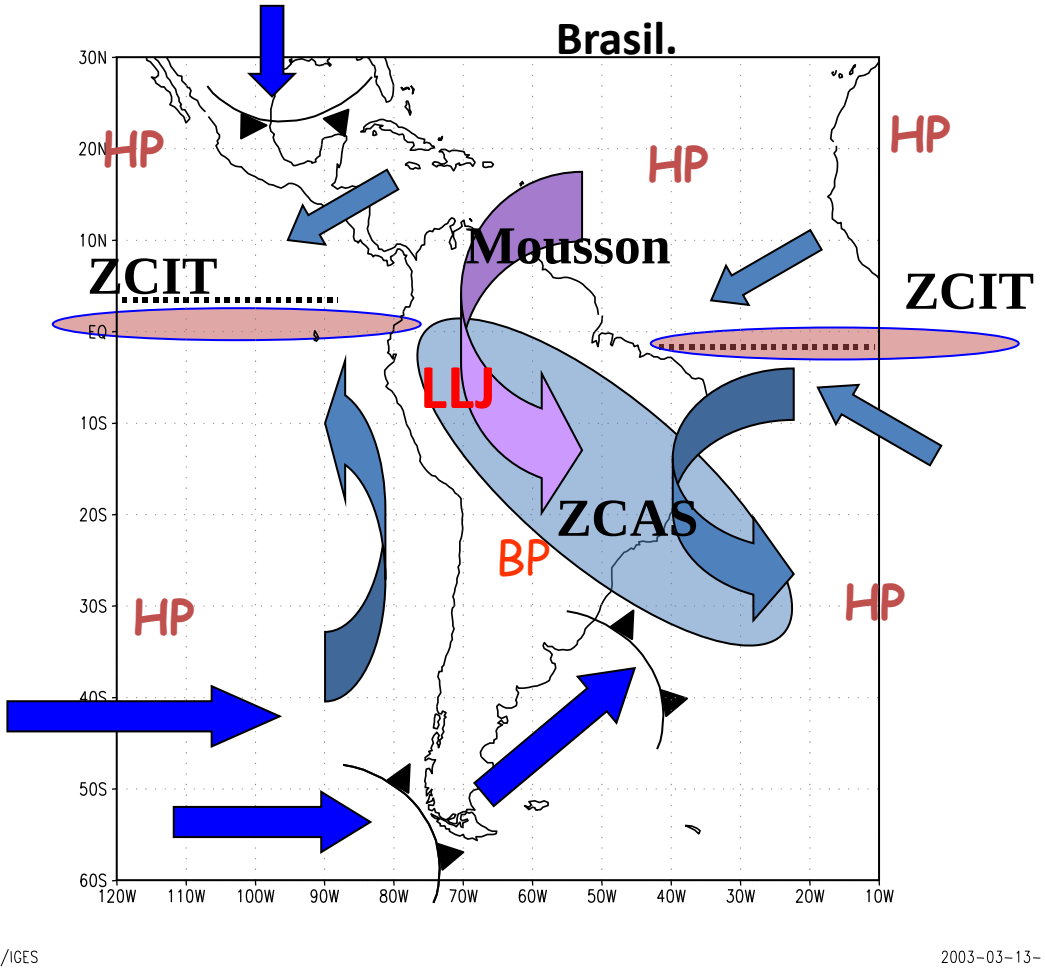


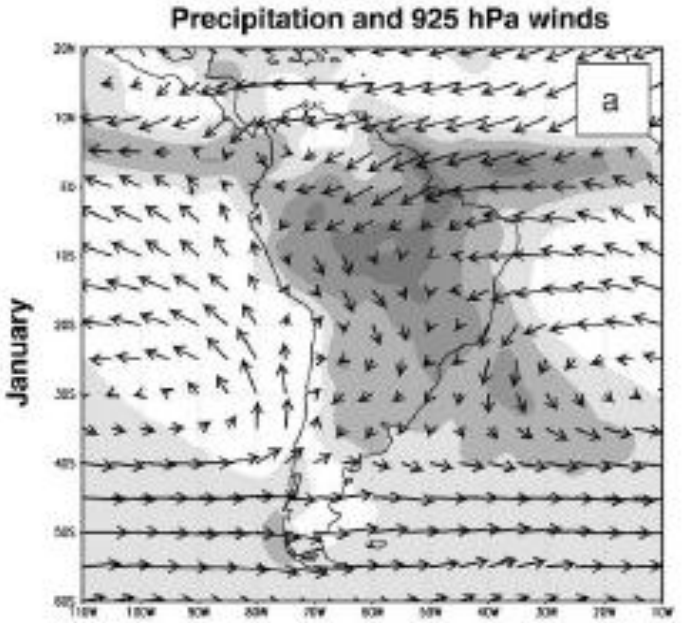
Cruz et al, 2009. Nature Geosciences

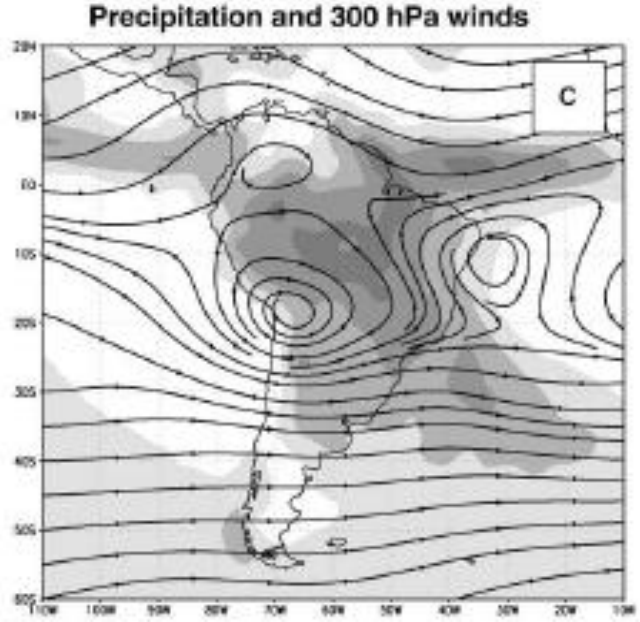
Long-term mean (1979–2000) Climate Prediction Center Merged Analysis of Precipitation seasonal precipitation totals (in mm) for December–February (left) and March–May (right).

Circulación y Precipitaciones

Calor liberado = zona de altas pressões (Alta de Bolivia ~12 km) subsidencia sodre el Nordeste do Brasil.







Circulation extra-tropicale

Alizés

Mousson

Como interpretamos estos registros en el tiempo?

Enriquecido em ^{18}O

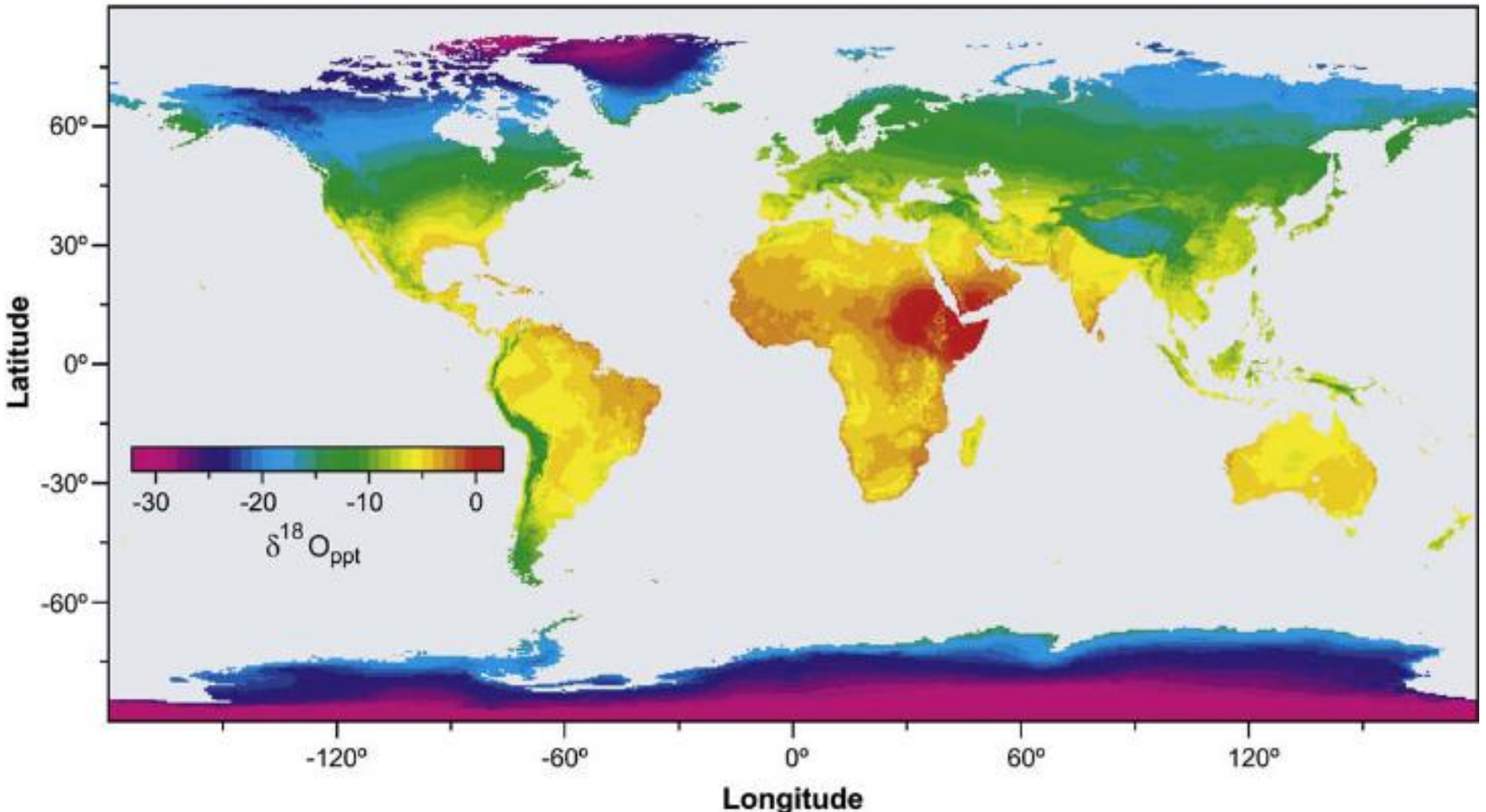
δ (+)

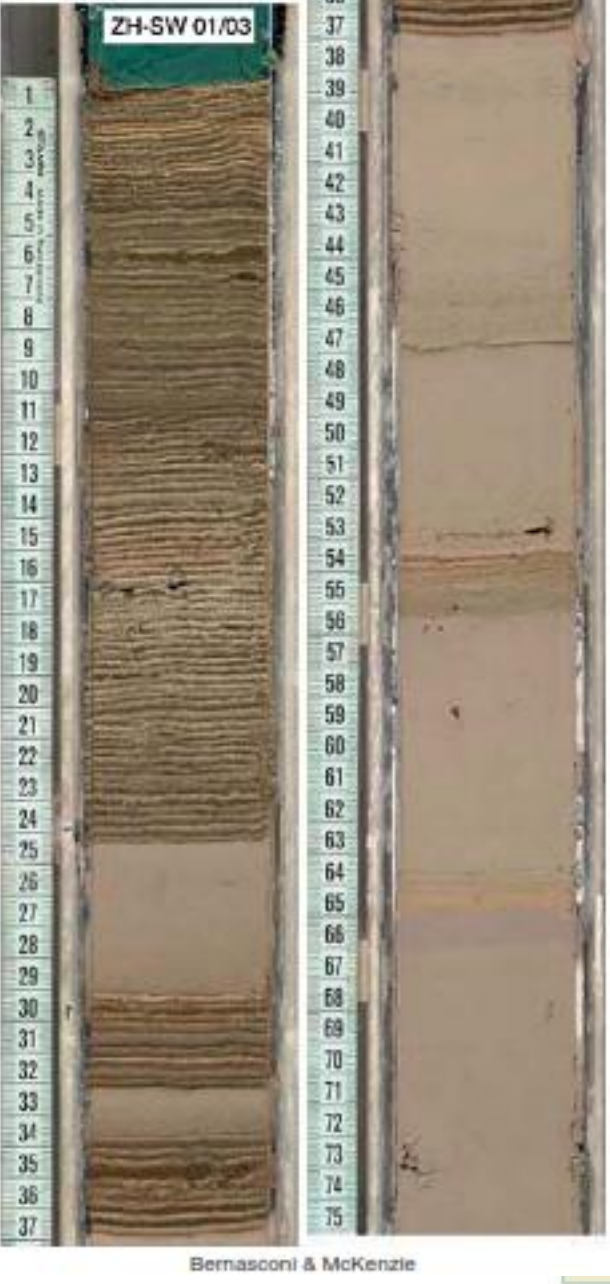
Periodos de atenuación en la actividad convectiva (**Poca lluvias**)

Empobrecido em ^{18}O

δ (-)

Periodos de incrementos en la actividad convectiva (**Aumento de lluvias**)





Ice cores

ake sediments

Coral reefs

Ocean sediments

Continental coastal sediments

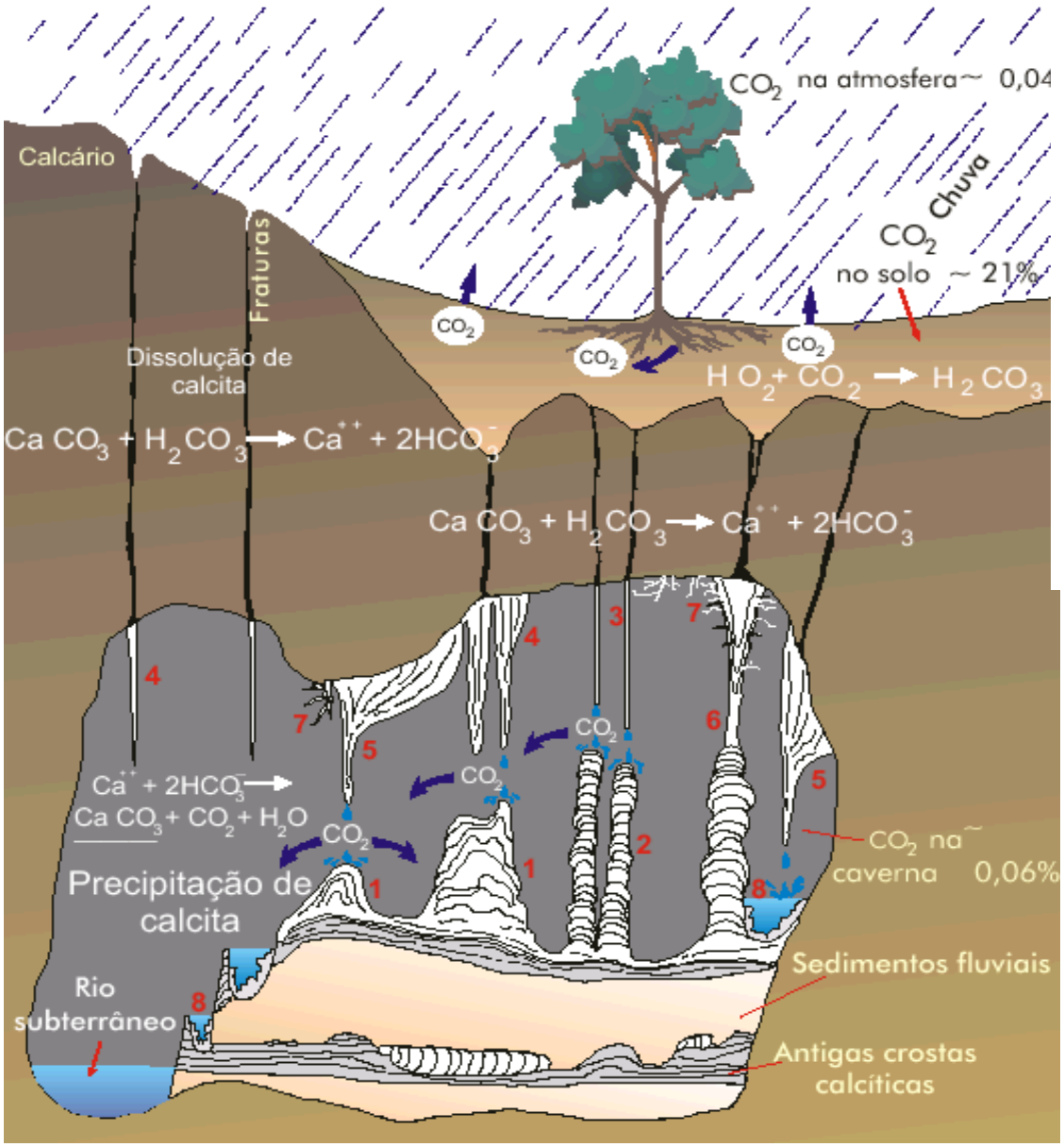
Espeleotemas

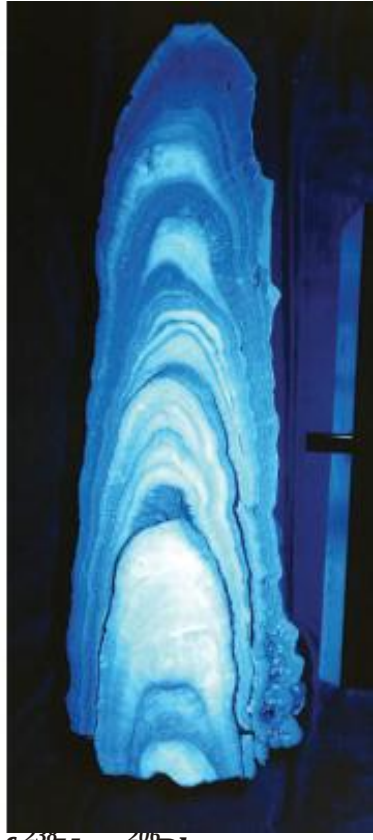
10^8 10^7 10^6 10^5 10^4 10^3 10^2 10^1 1 yr 1 mo

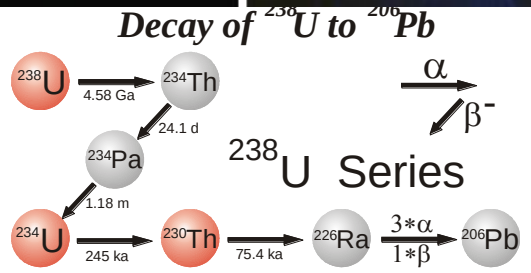
Resolution of record (years)

Retirado de Ruddiman, Earth's Climate – Past and Future, 2nd Ed.

Espeleotemas como indicador paleoclimático e paleoambiental







$CaCO_3$

$\delta^{18}O$

$\delta^{13}C$

Variabilidad Climática del Ultimo Milenio

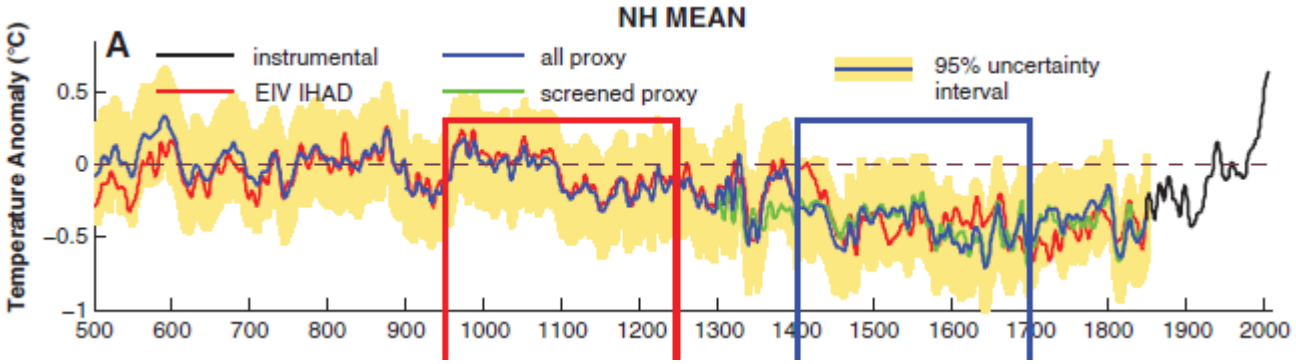
- **Anomalia Climática Medieval (ACM)**
- **Pequeña edad de Hielo (PEH)**

•Importancia de la comprension de los eventos climáticos extremos registrados en este período de tempo.

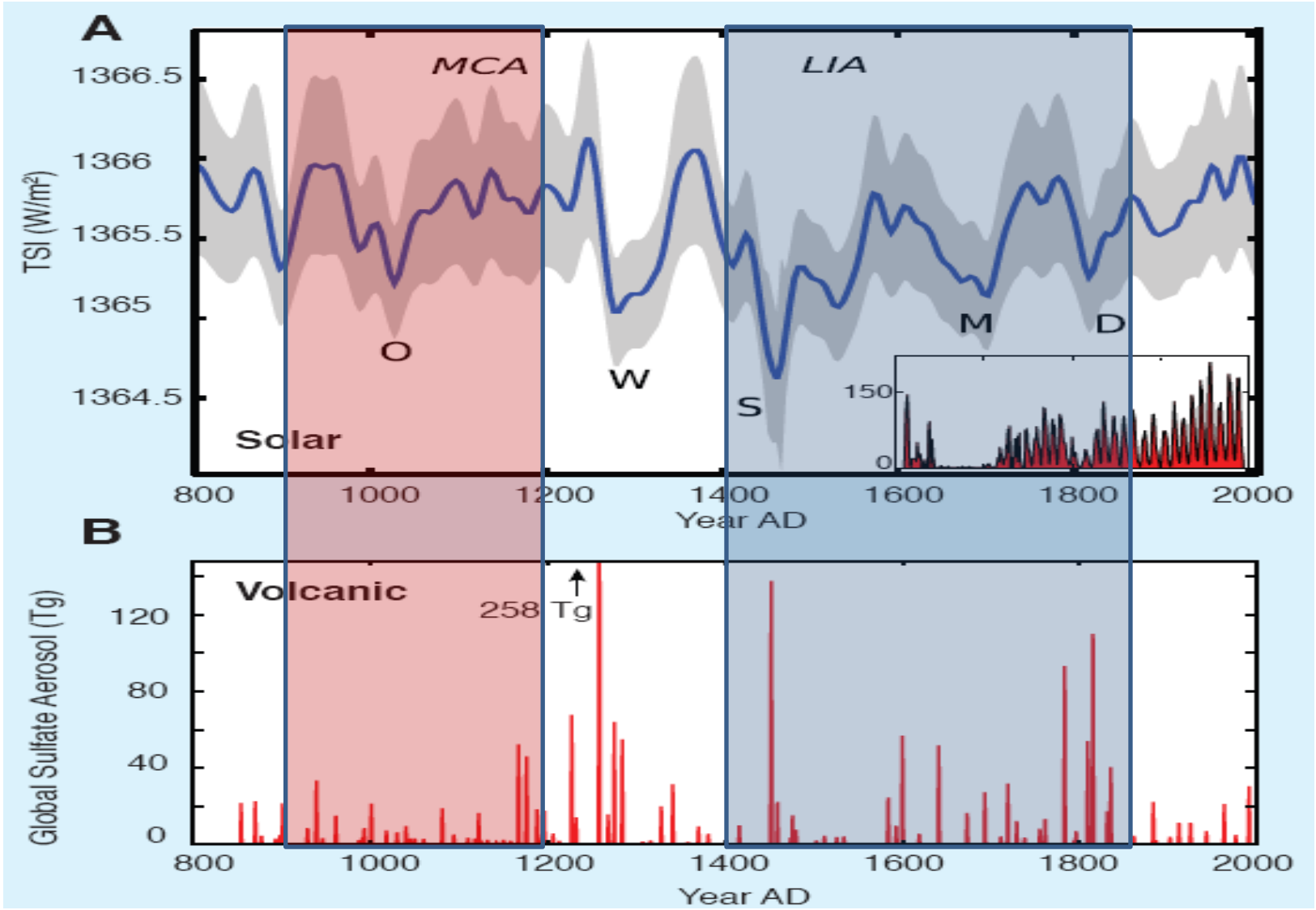
•Variabilidades asociadas a diferentes mecanismos oceano atmosféricos

•Forzantes que pueden haber influenciado em este período de tempo.

Anomalia Climática Medieval **(~800-1200 A.P.)**
Pequeña edad de Hielo **(~1400-1820 A.P.)**



Forzantes Climáticas: Actividad Solar y Vulcanismo

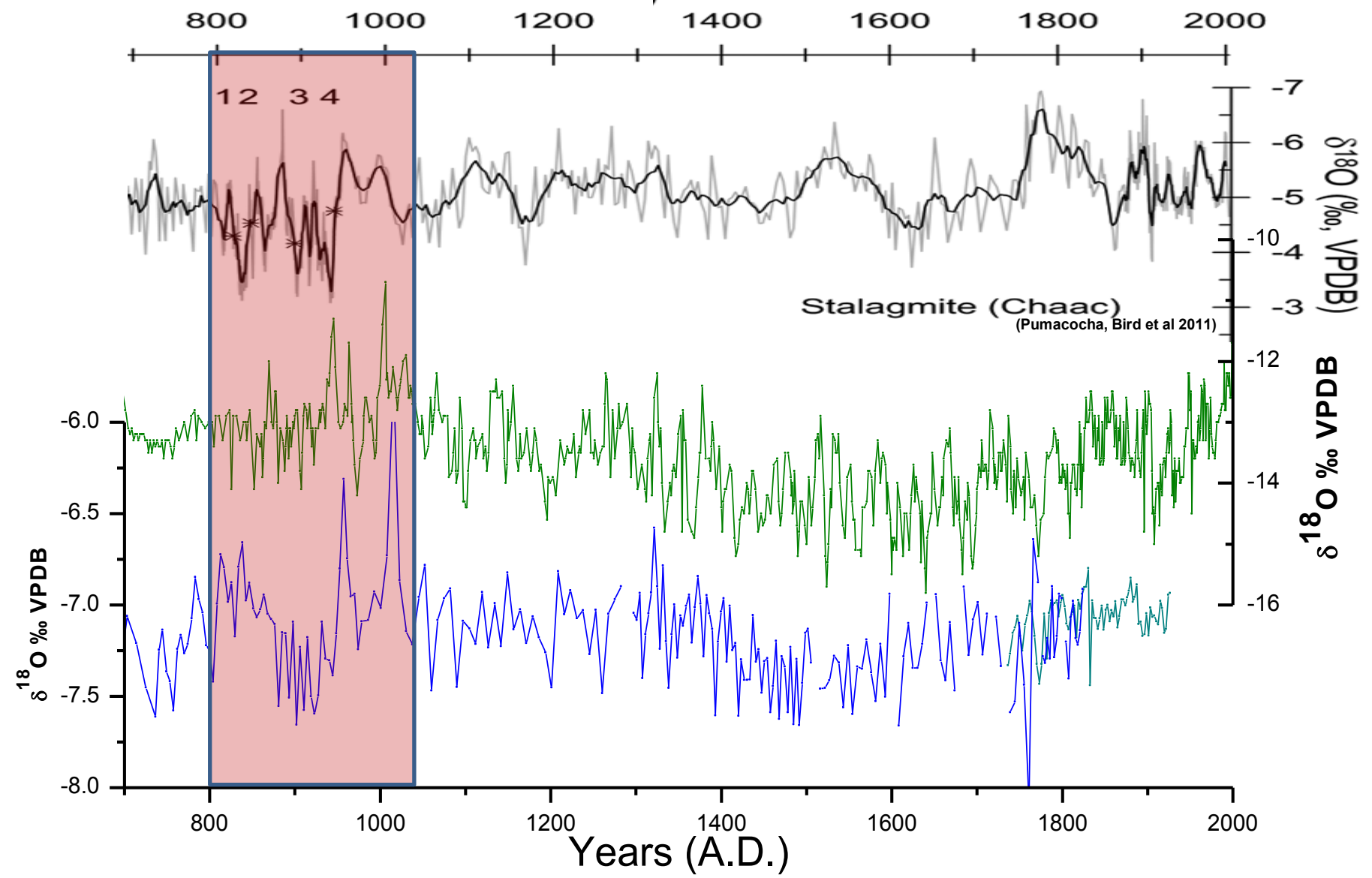


A) Registros de taxa de irradiança Solar (Bard et al, 2000).
B) Sulfatos aerosóis globais produzidos pela atividade vulcânica (Gao et al, 2008)

Collapse of Classic Maya Civilization Related to Modest Reduction in Precipitation

Science, 2012

Martín Medina-Elizalde and Eelco J. Rohling*



Expansión máxima asincronica de los glaciares durante a LIA (PEH)

(Rabatel *et al*., 2008)

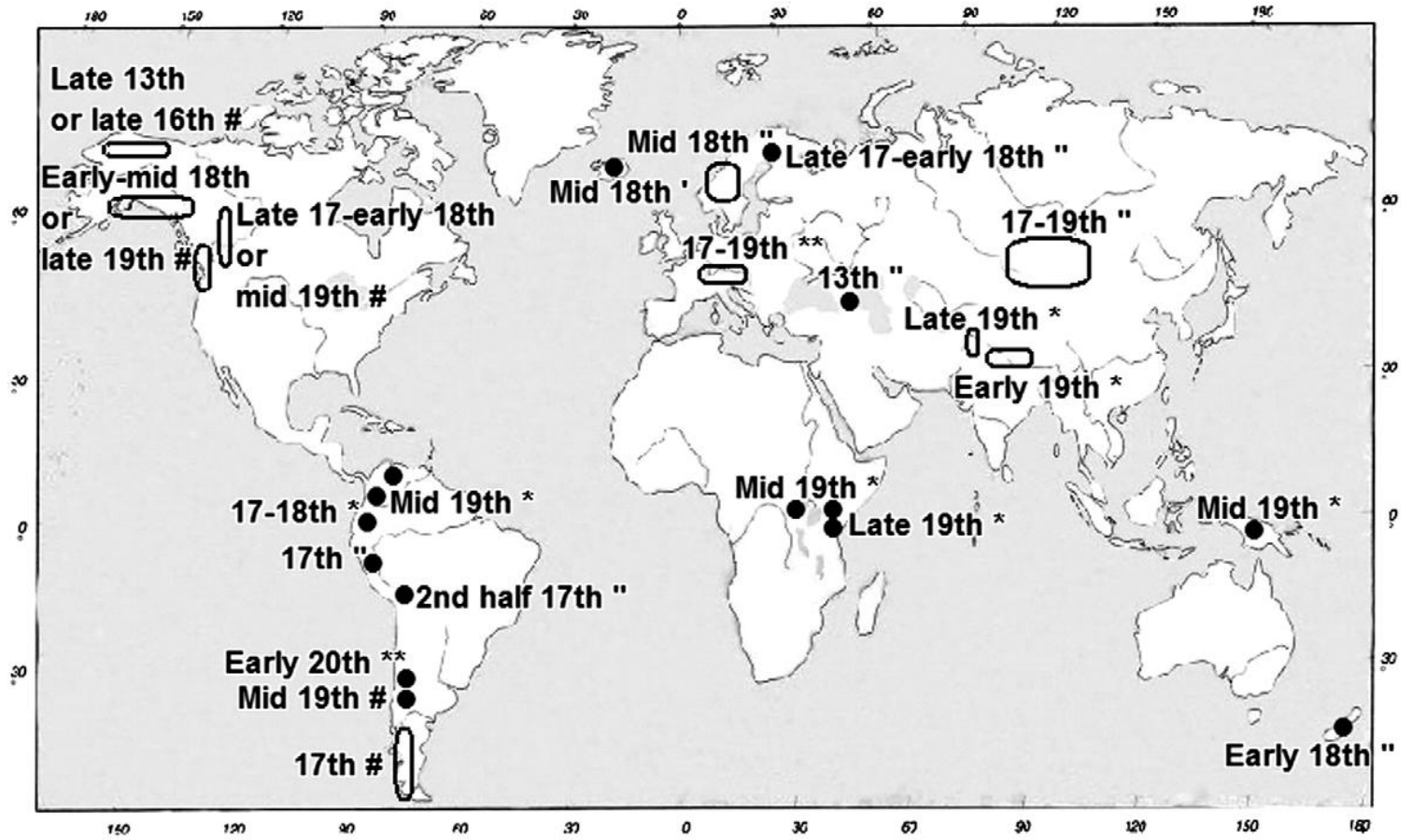
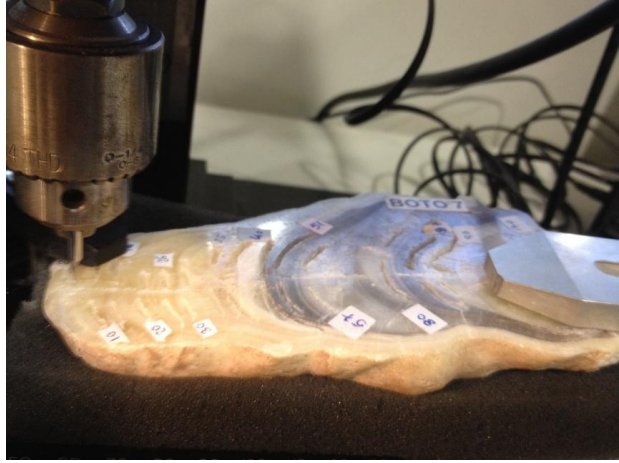
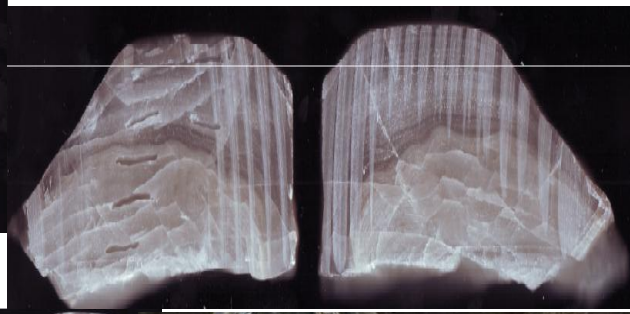


Figura. Datação da LIA *maximum* no Mundo. As datações foram baseadas em métodos diferentes. Liquenometria, documentos historicos, dendrocronologia, tefrocronology'e datas presumidas.

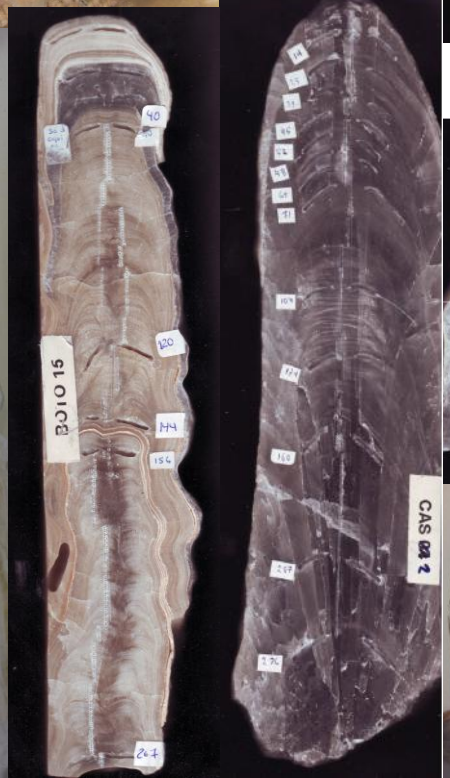
Colectas


03 Sept 2010
Palestina
PAL-4


BOTO 7




TIG 1a


BOTO 15
CAS 02


BOTO 10


PETZL

Caverna Palestina

Fuera de la Caverna

-T °C, HR %

-Precipitaciones: regimen e isotopia

-Aforos de los rios

-Quimica e isotopia del agua del rio Superficial.

CUEVA DE PALESTINA

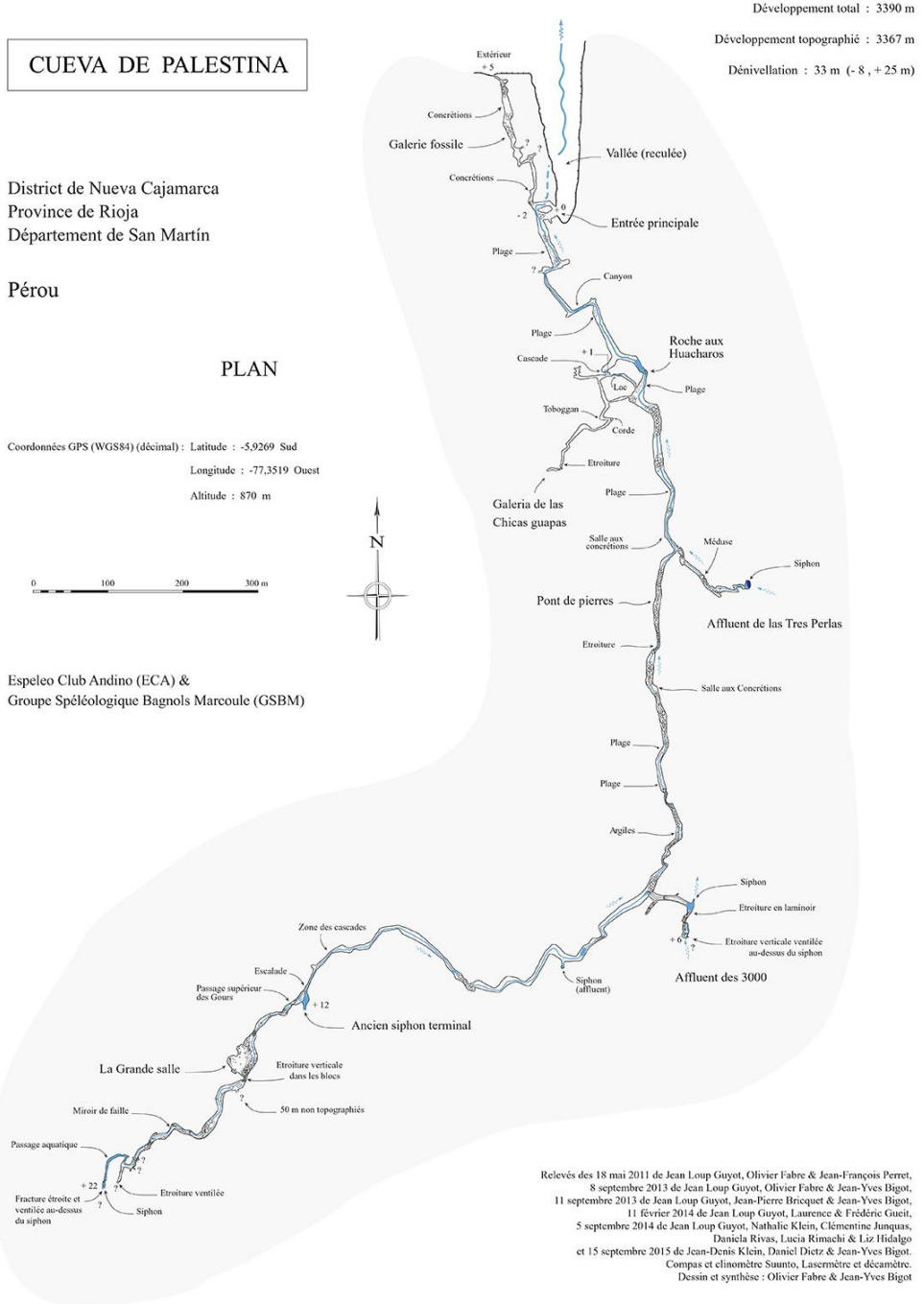
District de Nueva Cajamarca
Province de Rioja
Département de San Martín

Pérou

PLAN

Coordonnées GPS (WGS84) (décimal) : Latitude : -5,9269 Sud
Longitude : -77,3519 Ouest
Altitude : 870 m

Développement total : 3390 m
Développement topographié : 3367 m
Dénivellation : 33 m (- 8 , + 25 m)

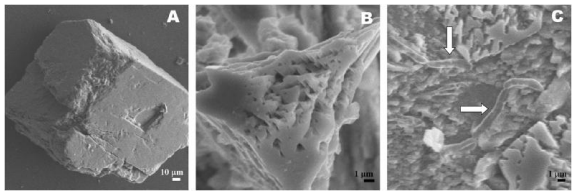


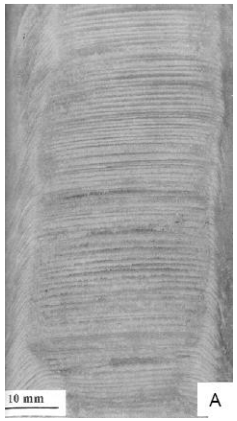
Espeleo Club Andino (ECA) &
Groupe Spéléologique Bagnols Marcoule (GSBM)

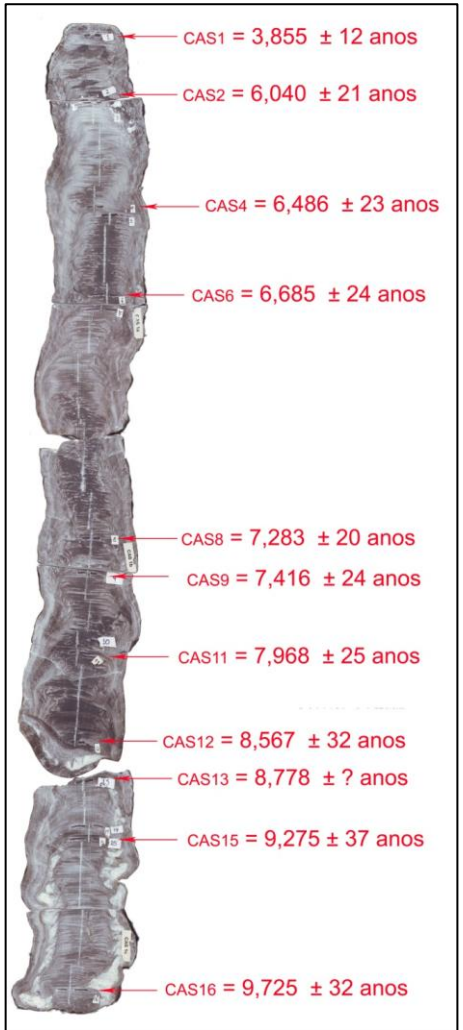
Relevés des 18 mai 2011 de Jean Loup Guyot, Olivier Fabre & Jean-François Perret,
8 septembre 2013 de Jean Loup Guyot, Olivier Fabre & Jean-Yves Bigot,
11 septembre 2013 de Jean Loup Guyot, Jean-Pierre Bricquet & Jean-Yves Bigot,
11 février 2014 de Jean Loup Guyot, Laurence & Frédéric Gueit,
5 septembre 2014 de Jean Loup Guyot, Nathalie Klein, Clémentine Junquas,
Daniela Rivas, Lucia Rimachi & Liz Hidalgo
et 15 septembre 2015 de Jean-Denis Klein, Daniel Dietz & Jean-Yves Bigot.
Compas et clinomètre Suunto, Lasermètre et décamètre.
Dessin et synthèse : Olivier Fabre & Jean-Yves Bigot

Geocronología

$^{234}U/^{230}Th$

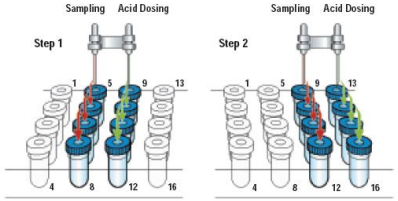




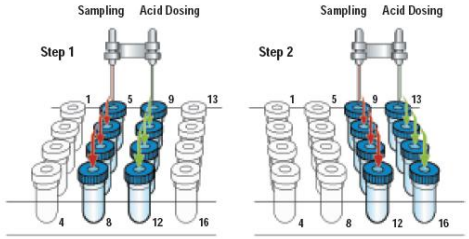


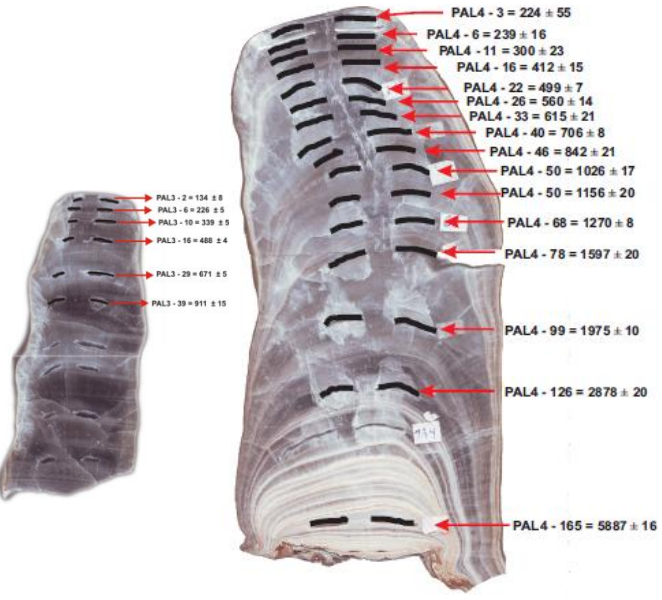
Análisis de Isótopos estables

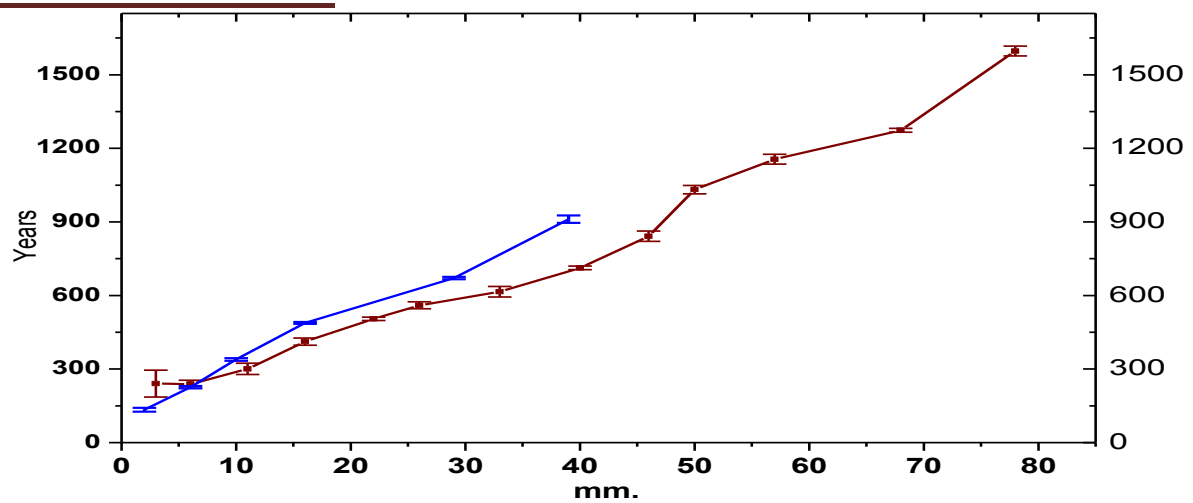
- Isótopos de Oxigeno ($\delta^{18}O$)
- Isótopos de Carbono ($\delta^{13}C$)

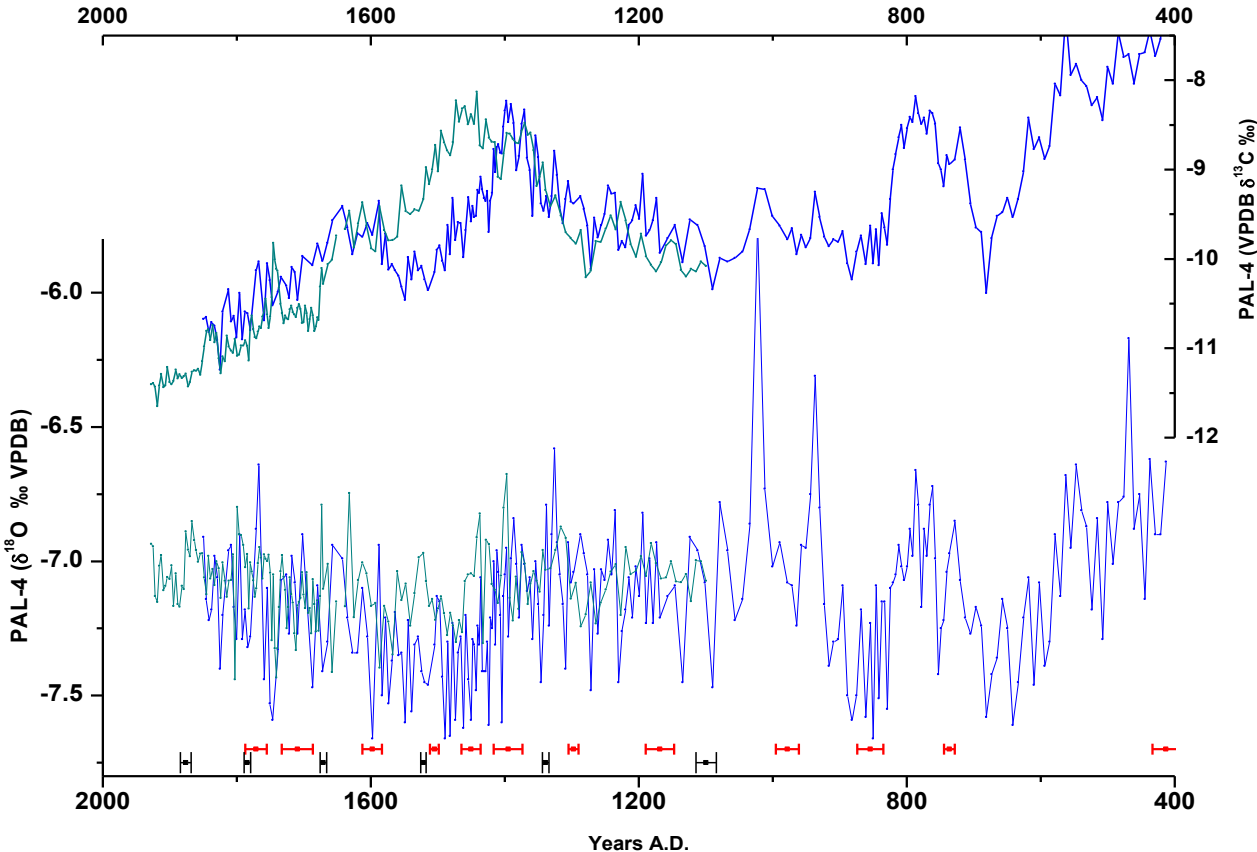


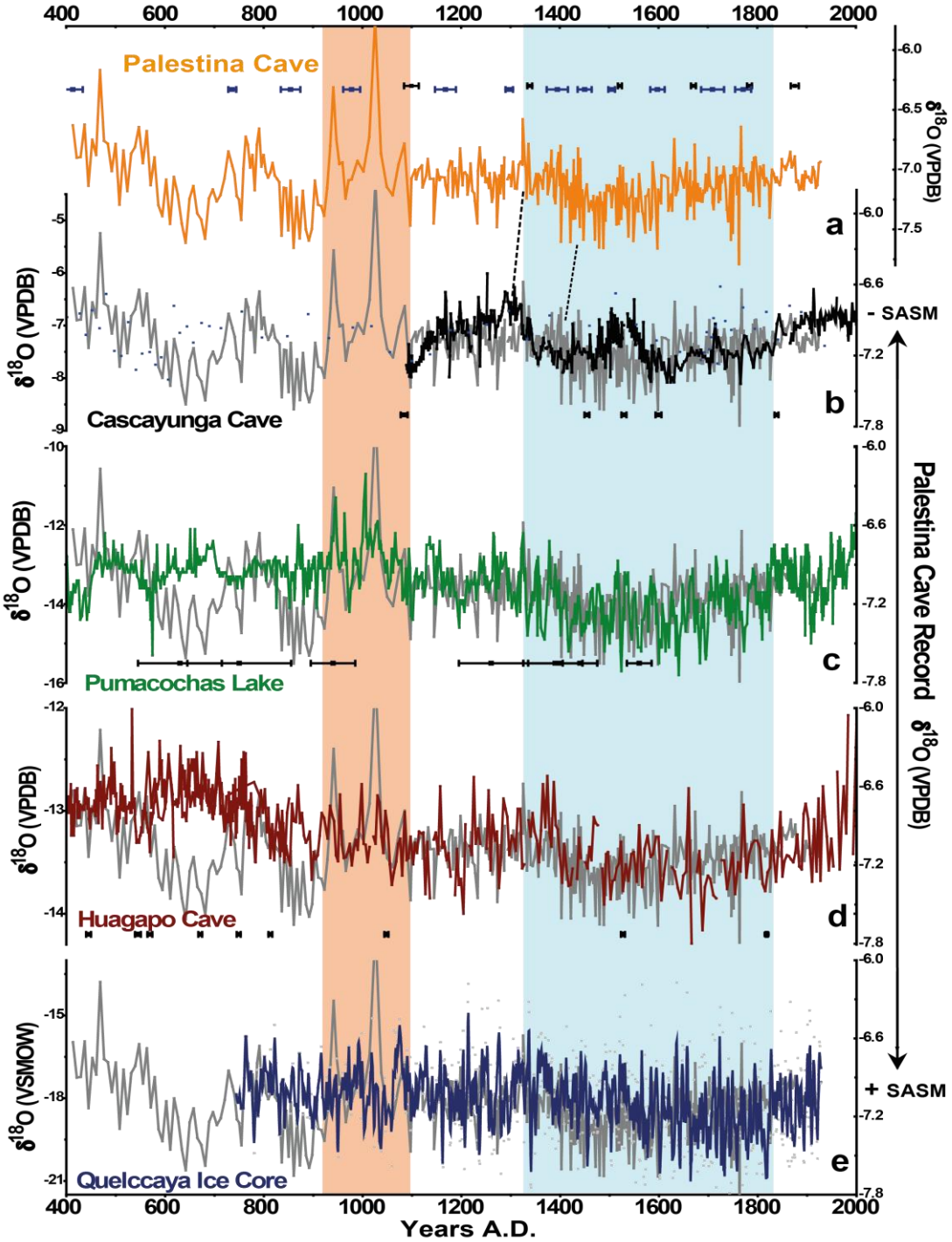
Espeleotemas de la caverna Palestina

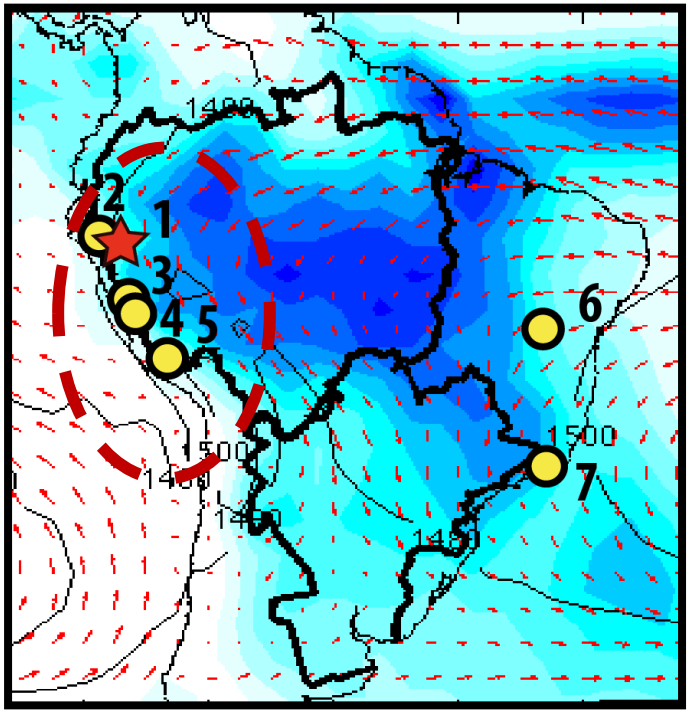




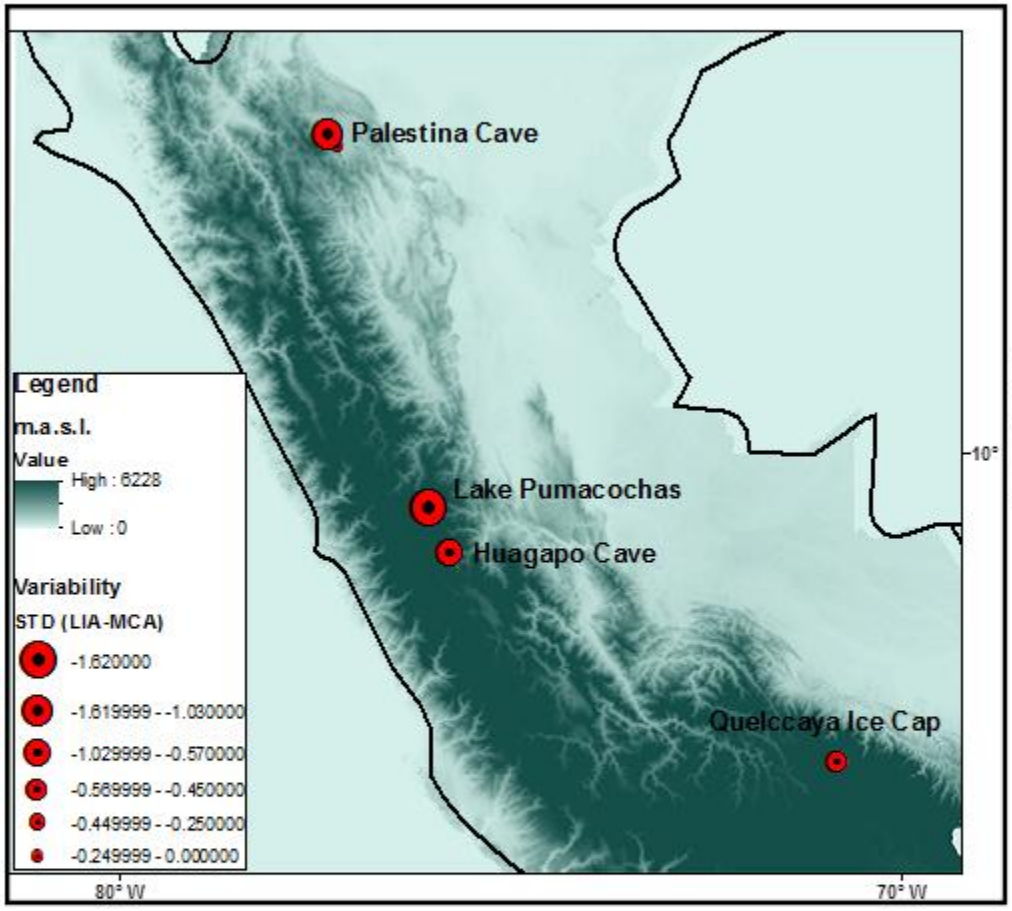




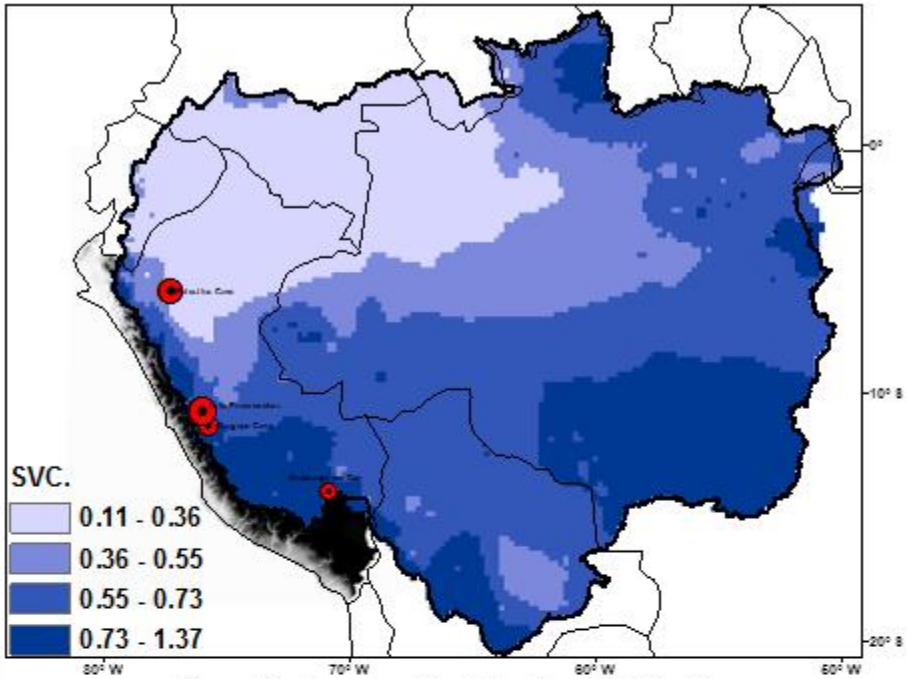




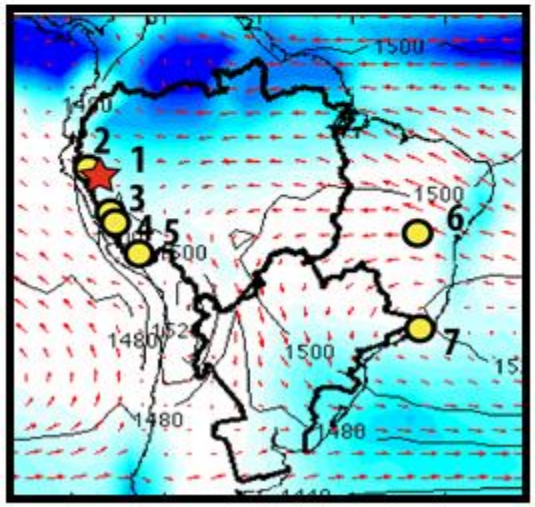
1. **Palestina Cave** (Apaéstegui et al, 2014) (CP)
2. **Cascayunga Cave** (Reuter et al, 2009) (GRL).
3. **Pumacochas Lake** (Bird et al, 2011) (PNAS)
4. **Huagapo Cave** (Kanner et al., 2012)(EPSL)
5. **Quelccaya Ice Cap** (Thompson et al, 1984) (Science)
6. **Diva de Moura Cave (**Novello et al. 2012) (GRL)
7. **Cristal Cave** (Taylor, 2010) (Vuille et al., 2012) (CP).

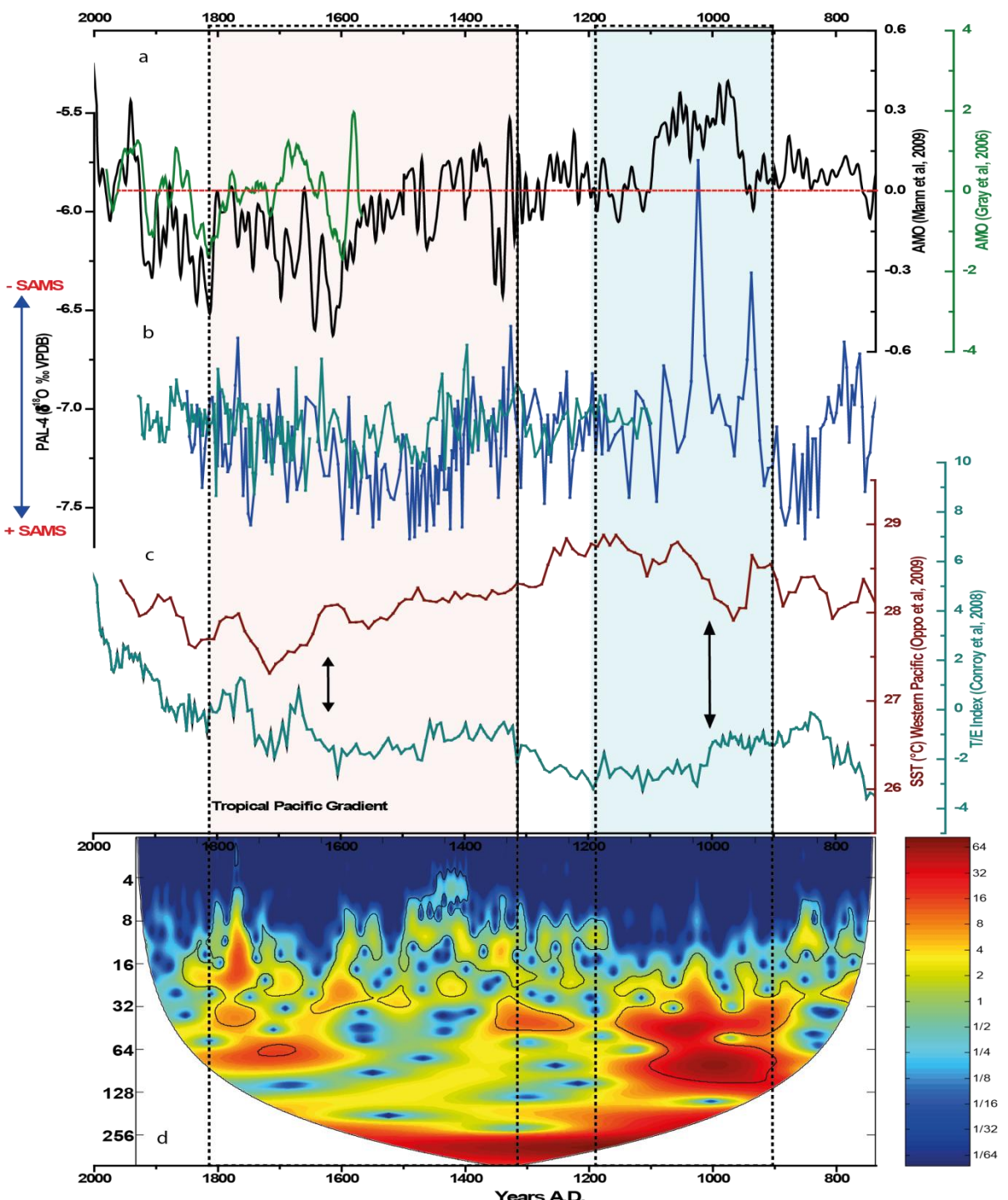


MCA - LIA variability and location of the proxies in the Andean region



Coeficiente de Variabilidad estacional. (Espinoza et al., 2008)

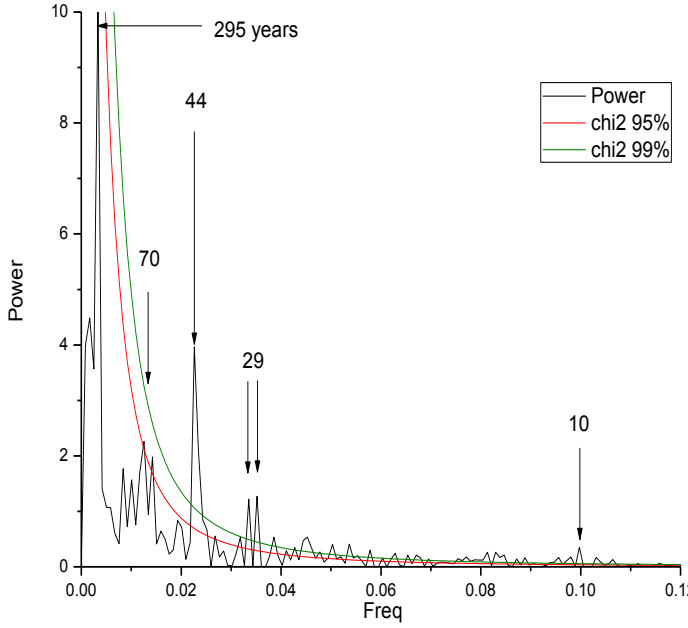




→ 64 años → AMO
→ 25 años → PDO

Influencias en el clima en escala de tiempo multidecadal en el SAMS.

Gradientes de temperatura em el Pacífico tropical
El Niño / Circulación Walker.



Algunas conclusiones del ultimo reporte del Panel Inter gubernamental para el Cambio Climático.

Confidence in the link between changes in North Atlantic climate and low-latitude precipitation patterns has increased since AR4. From new paleoclimate reconstructions and modelling studies, there is *very high confidence* that reduced AMOC and the associated surface cooling in the North Atlantic region caused southward shifts of the Atlantic Intertropical Convergence Zone, and also affected the American (North and South), African and Asian monsoon systems. {5.7}

With *high confidence*, floods larger than those recorded since 1900 occurred during the past five centuries in northern and central Europe, western Mediterranean region and eastern Asia. There is *medium confidence* that modern large floods are comparable to or surpass historical floods in magnitude and/or frequency in the Near East, India and central North America. {5.5.5}

It is *virtually certain* that orbital forcing will be unable to trigger widespread glaciation during the next 1000 years. Paleoclimate records indicate that, for orbital configurations close to the present one, glacial inceptions only occurred for atmospheric CO_2 concentrations significantly lower than pre-industrial levels. Climate models simulate no glacial inception during the next 50,000 years if CO_2 concentrations remain above 300 ppm. {5.8.3, Box 6.2}

There is *high confidence* for droughts during the last millennium of greater magnitude and longer duration than those observed since the beginning of the 20th century in many regions. There is *medium confidence* that more megadroughts occurred in monsoon Asia and wetter conditions prevailed in arid Central Asia and the South American monsoon region during the Little Ice Age (1450 to 1850) compared to the Medieval Climate Anomaly (950 to 1250). {5.5.4 and 5.5.5}

Conclusiones

Los registros paleoclimáticos nos enseñan sobre cambios en el clima que no han sido detectados por los registros instrumentales y que pueden enseñarnos sobre los mecanismos asociados a los eventos extremos y sus variabilidades.

Las variaciones de escala de tiempo de decenas de años, parece ser una característica importante en las precipitaciones del sistema de Monzón Sudamericano.

Por lo tanto es importante incrementar nuestro conocimiento sobre la evolución del clima y la respuestas de los ecosistemas en base a este tipo de indicadores. (espeleotemas, sedimentos lacustres, etc.)

Es importante también entender y empezar a aplicar el uso de nuevos para el estudio de los recursos hídricos en el país.

Gracias por su atención.

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