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Monitoreo de la cueva Sao Bernardo en Brazil central y variación de $\delta^{18}O$ en espeleotema durante el último siglo: un estudio de calibración de un paleopluviómetro

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Referencia : **Moquet et al.**, *Calibration of speleothem $\delta^{18}O$ records against hydroclimate instrumental records in Central Brazil*, 2016, Global and Planetary Change Journal v.139, p.151-164

Cueva Sao Mateus
Goias - Brasil

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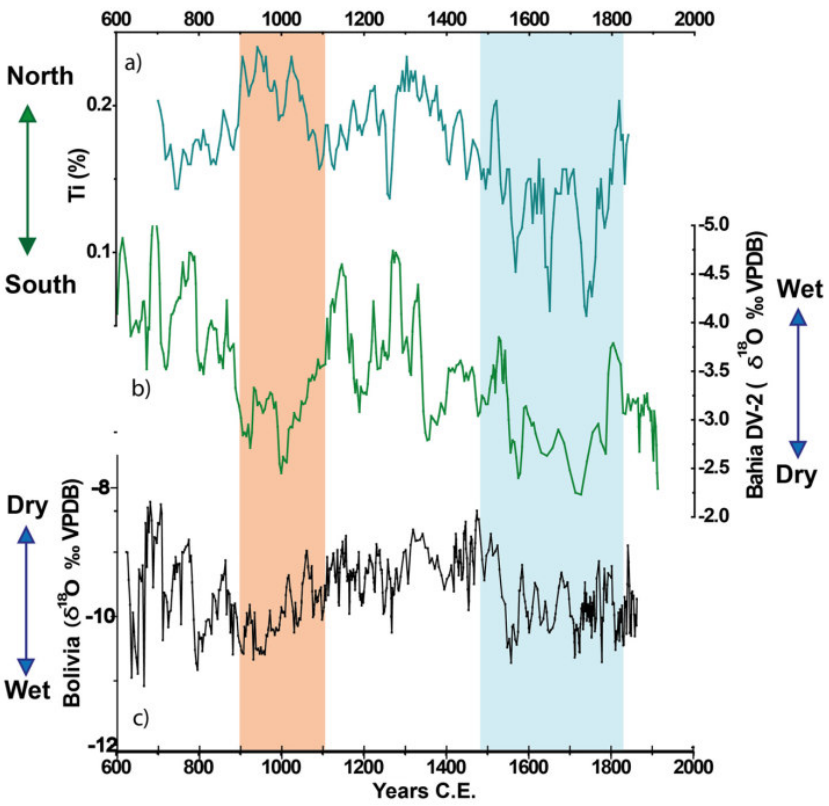
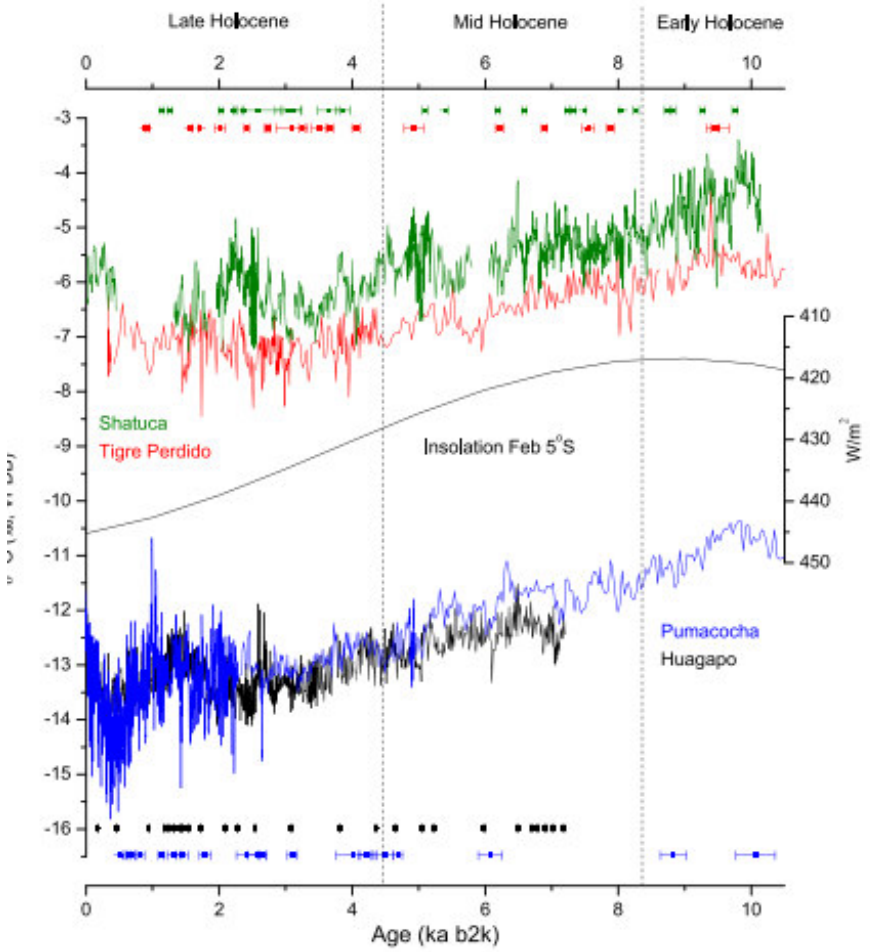
INTRODUCCION

$\delta^{18}O$ en espeleotemas : un proxy potente en paleoclimatologia



Apaestegui et al., 2018



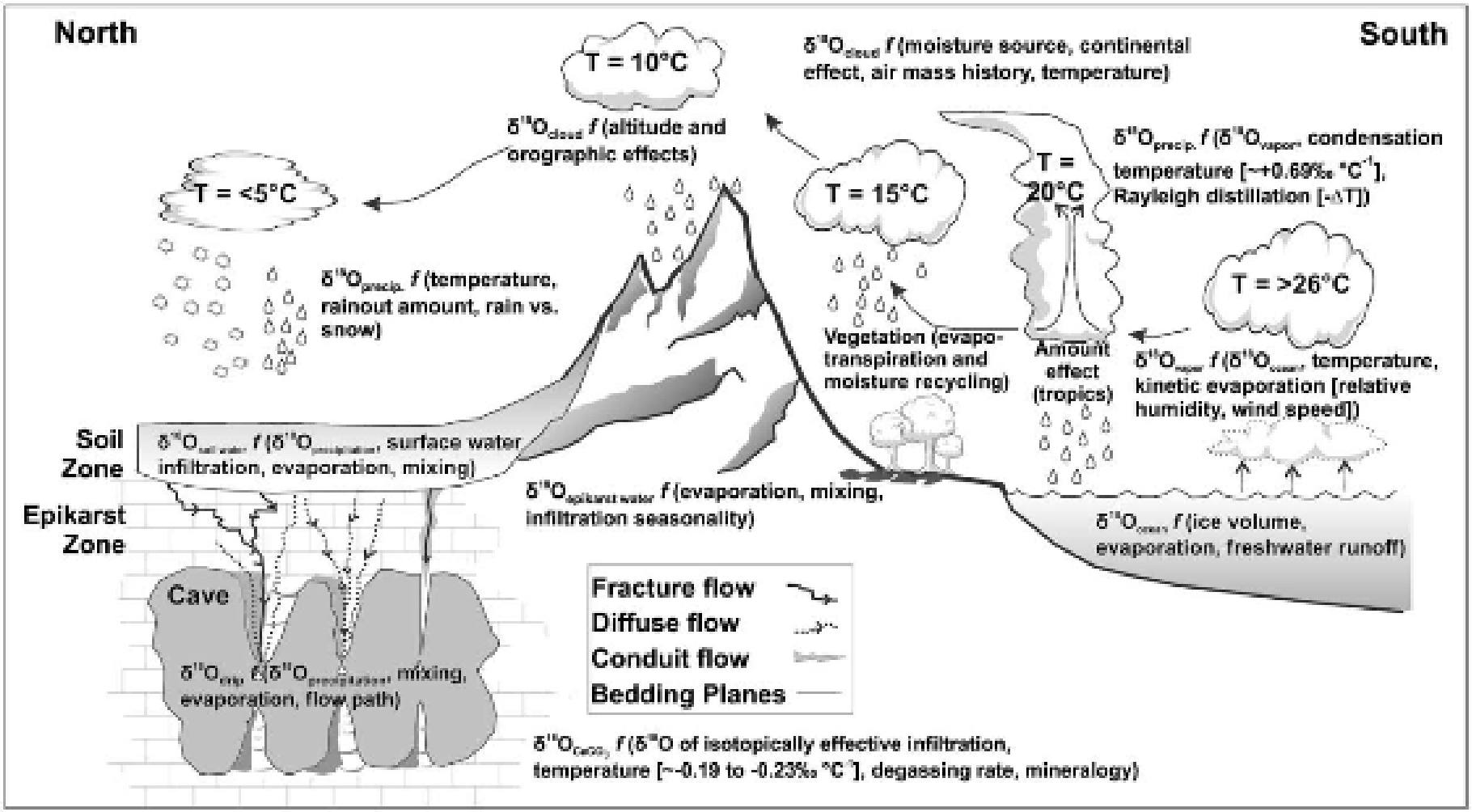
Bustamante et al., 2016

➔Otro desafio : reconstruir variaciones cuantitativas de paleoprecipitacion

→Monitoreo de cueva (mecanismo)

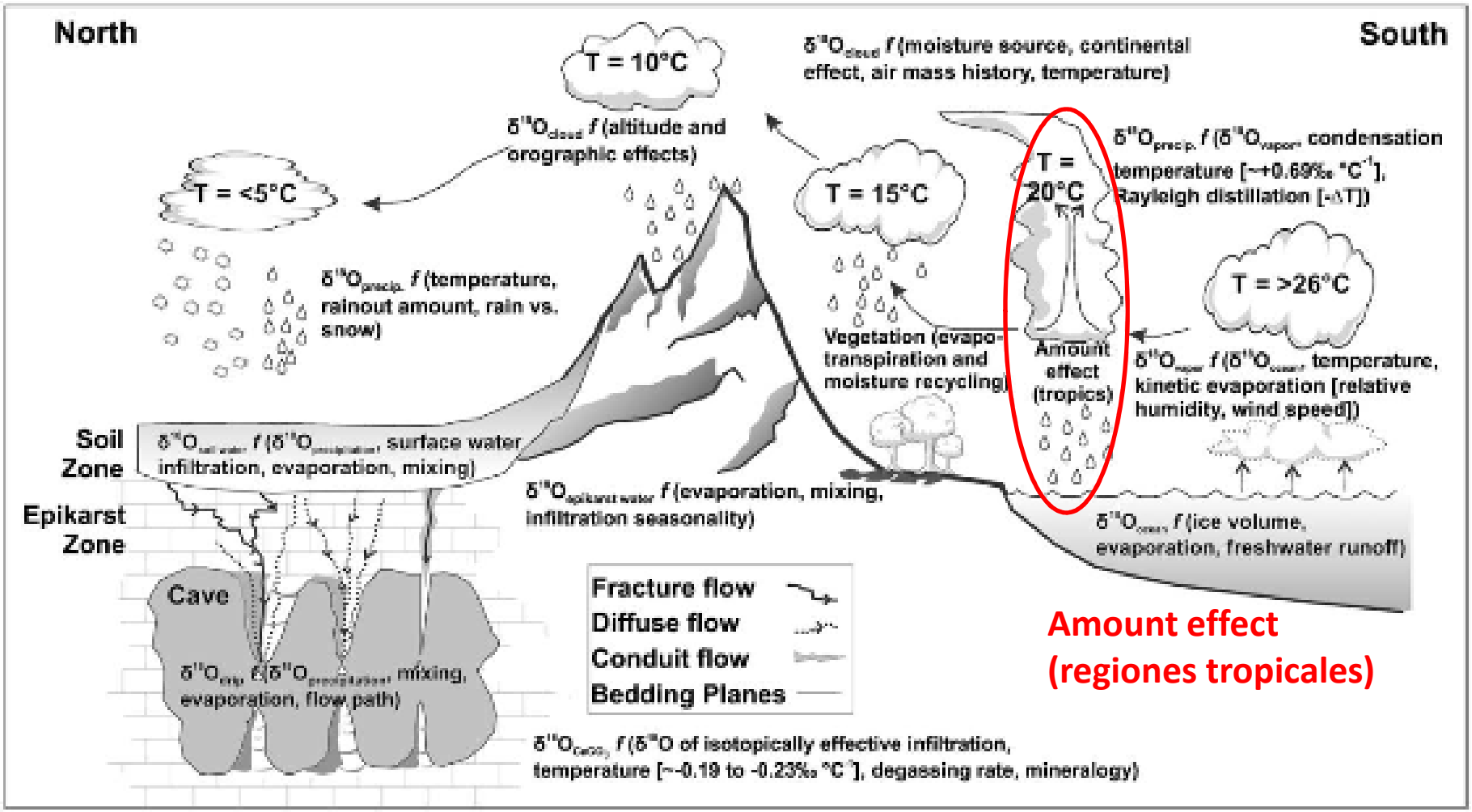
→comparacion estalagmitas vs registros historicos (empirismo)

Control del $\delta^{18}O$ en espeleotemas



Lachniet et al., 2009

Control del $\delta^{18}O$ en espeleotemas

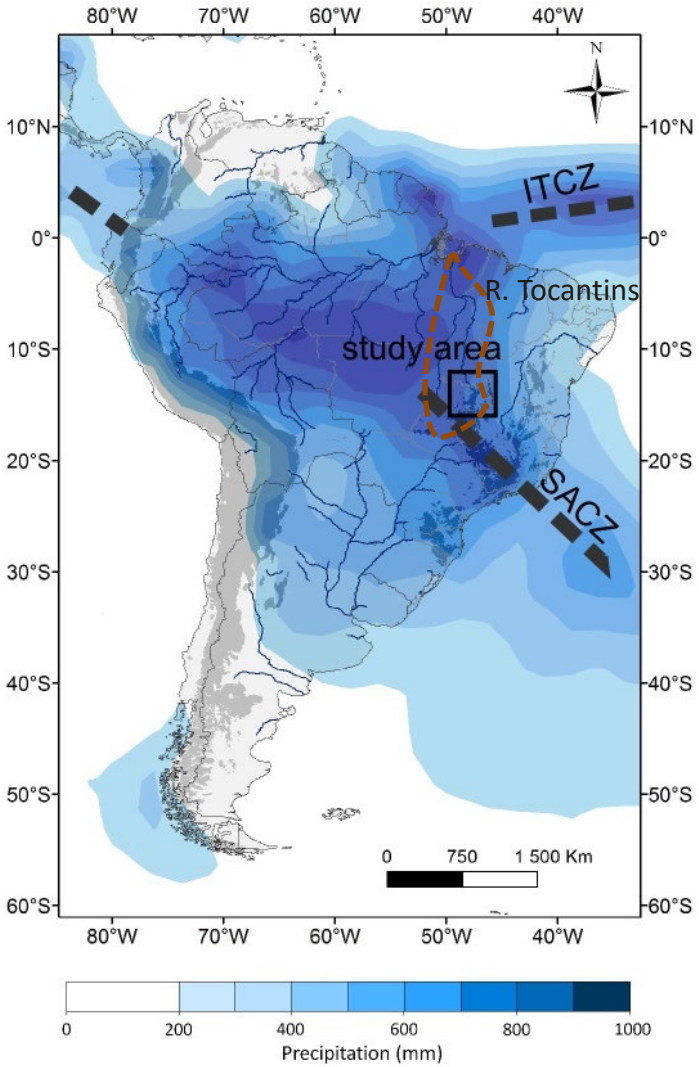


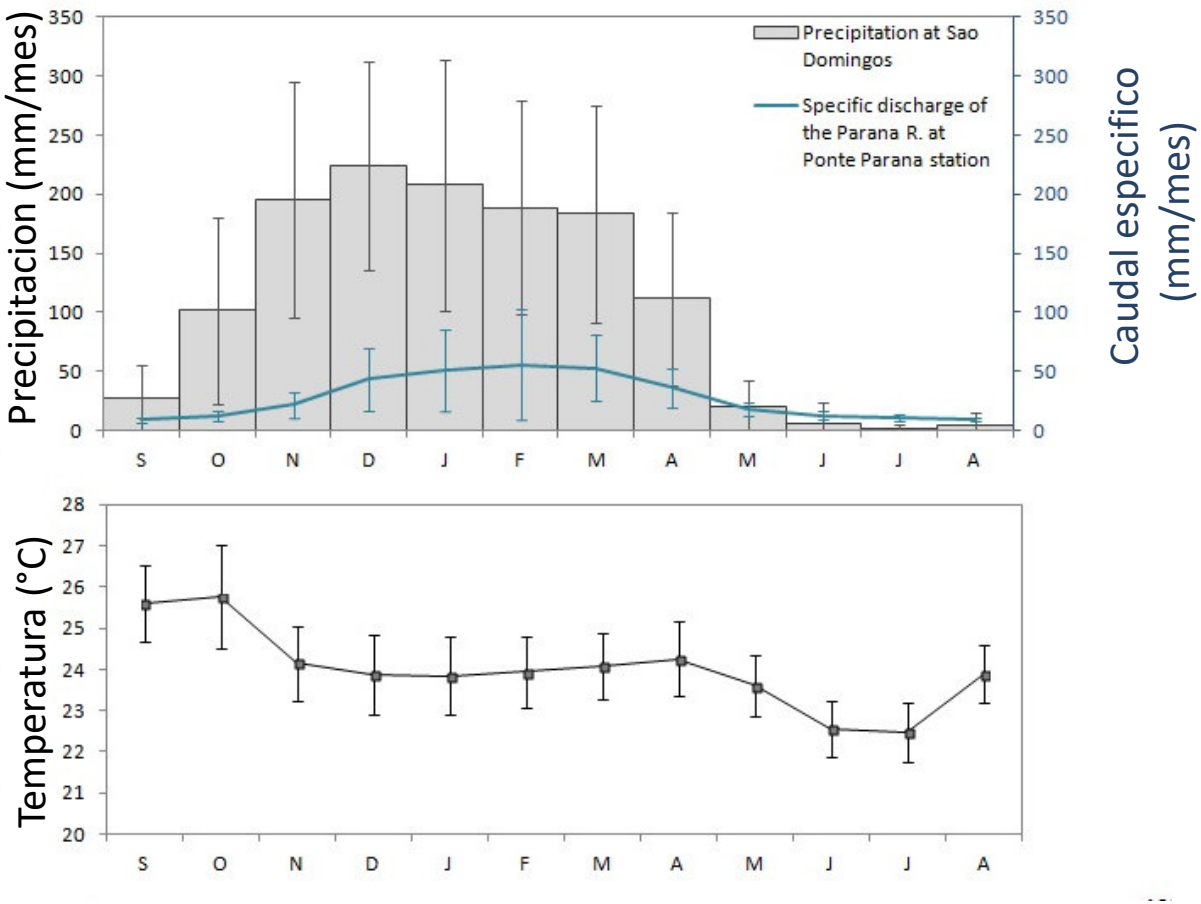
Amount effect (regiones tropicales)

Lachniet et al., 2009

Area de estudio

- Cueva Sao Bernardo – Parque Terra Ronca – Goias – Brasil
- Cuenca del Rio Tocantins
- Clima : tropical semi-humido (monzonal : SMSA)



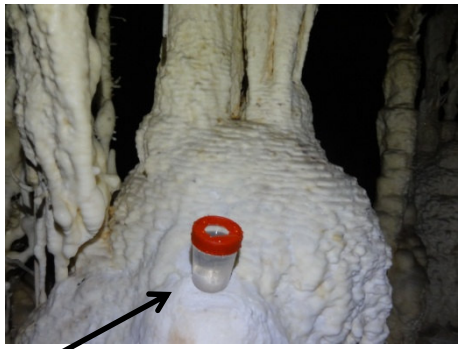


lluvia : 1270mm/ano

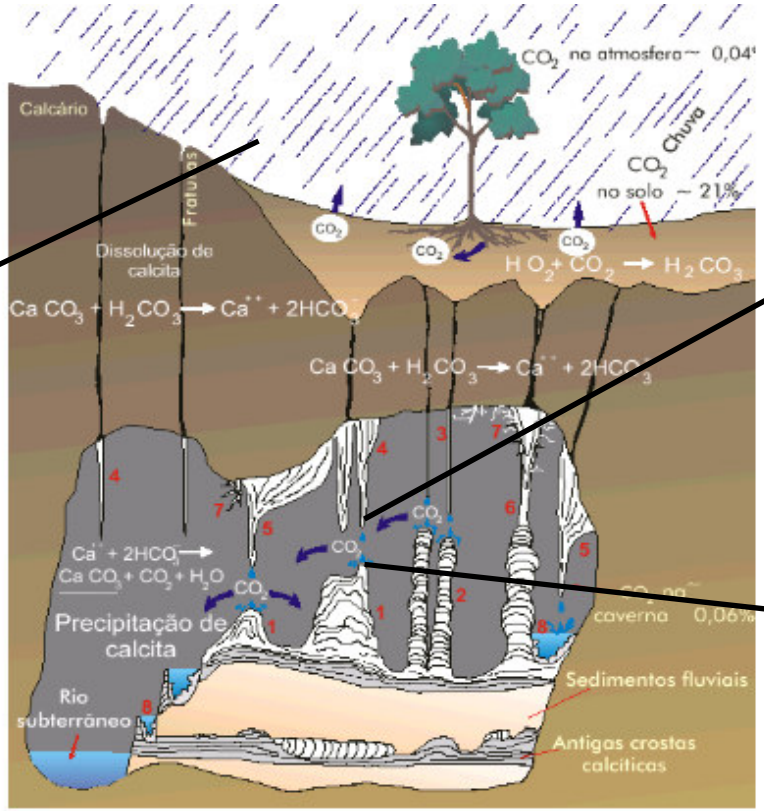
Temperatura anual : 24°C

Monitoreo cueva Sao Bernardo – Parque Terra Ronca Brazil
01/2012 – 06/2014

Collecta de agua de **goteo** (cada 15 dias)

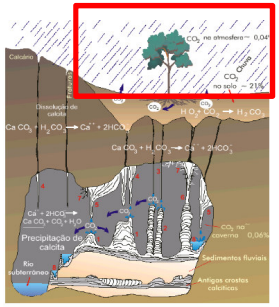


Collecta de agua de **lluvia** (cumulado 7 dias)

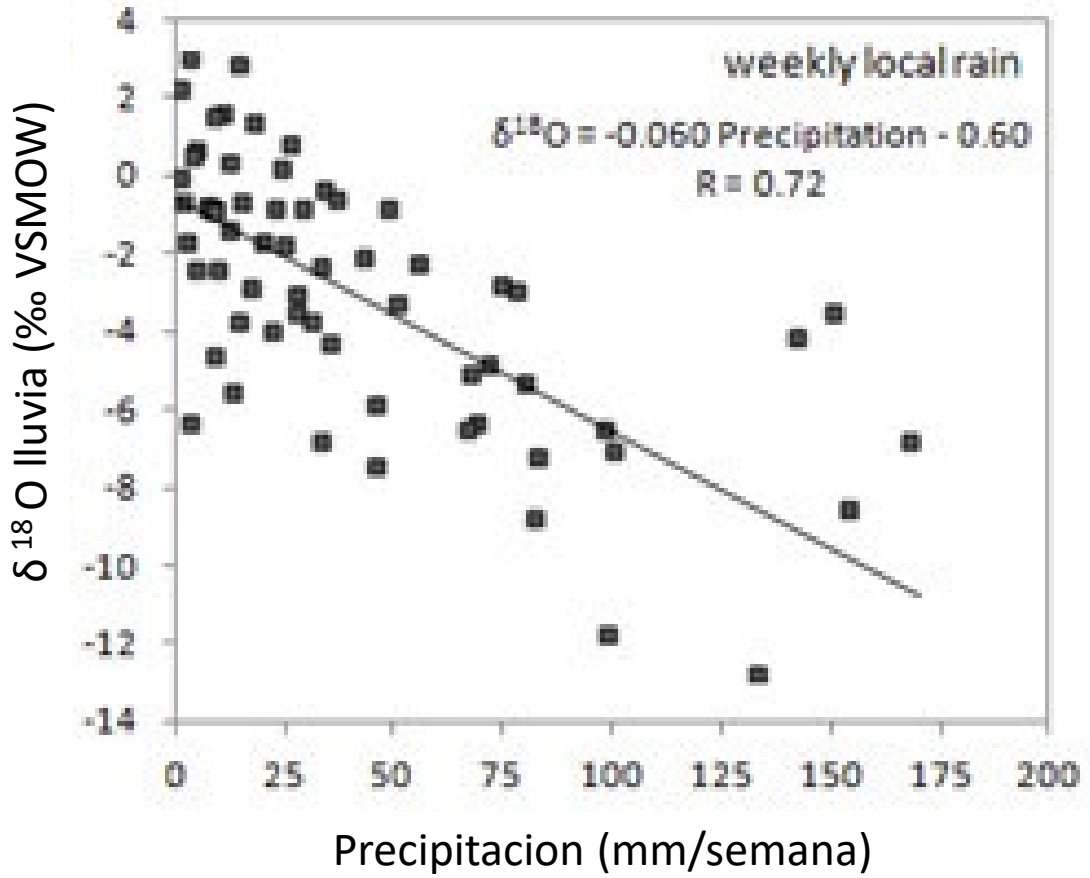


Collecta de **carbonato** (Cumulado 15-90 dias)

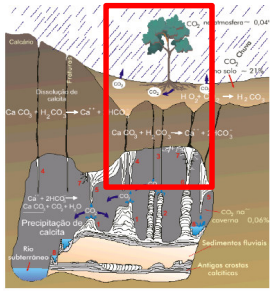
+ Monitoreo parametros hidroclimaticos (pluviometria, temperatura)



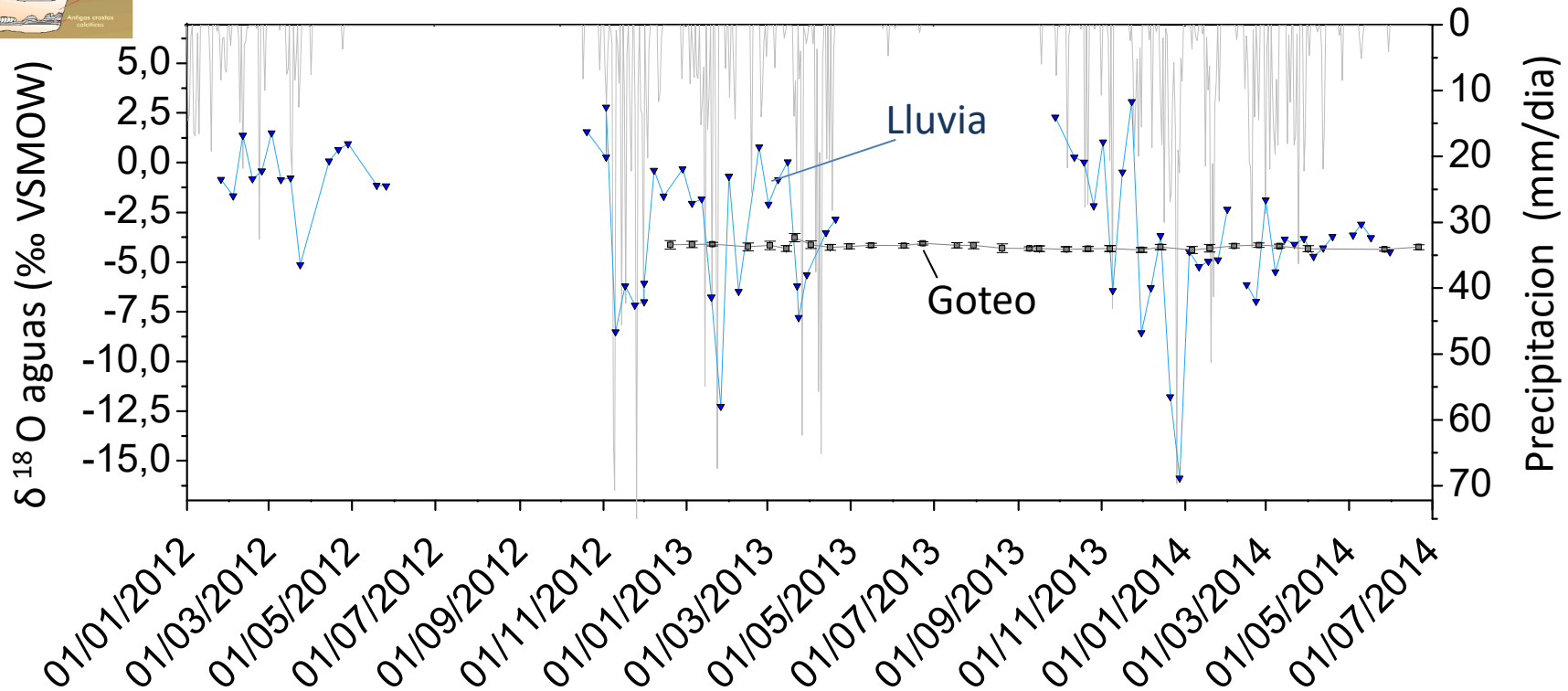
Relacion entre volume y $\delta^{18}O$ de lluvia



➔ δ^{18} Agua lluvia responde al « Amount effect »

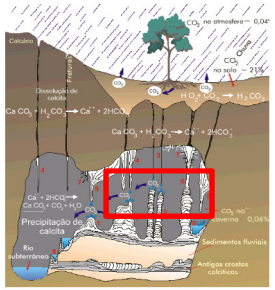


$\delta^{18}O$
agua de lluvia vs goteo

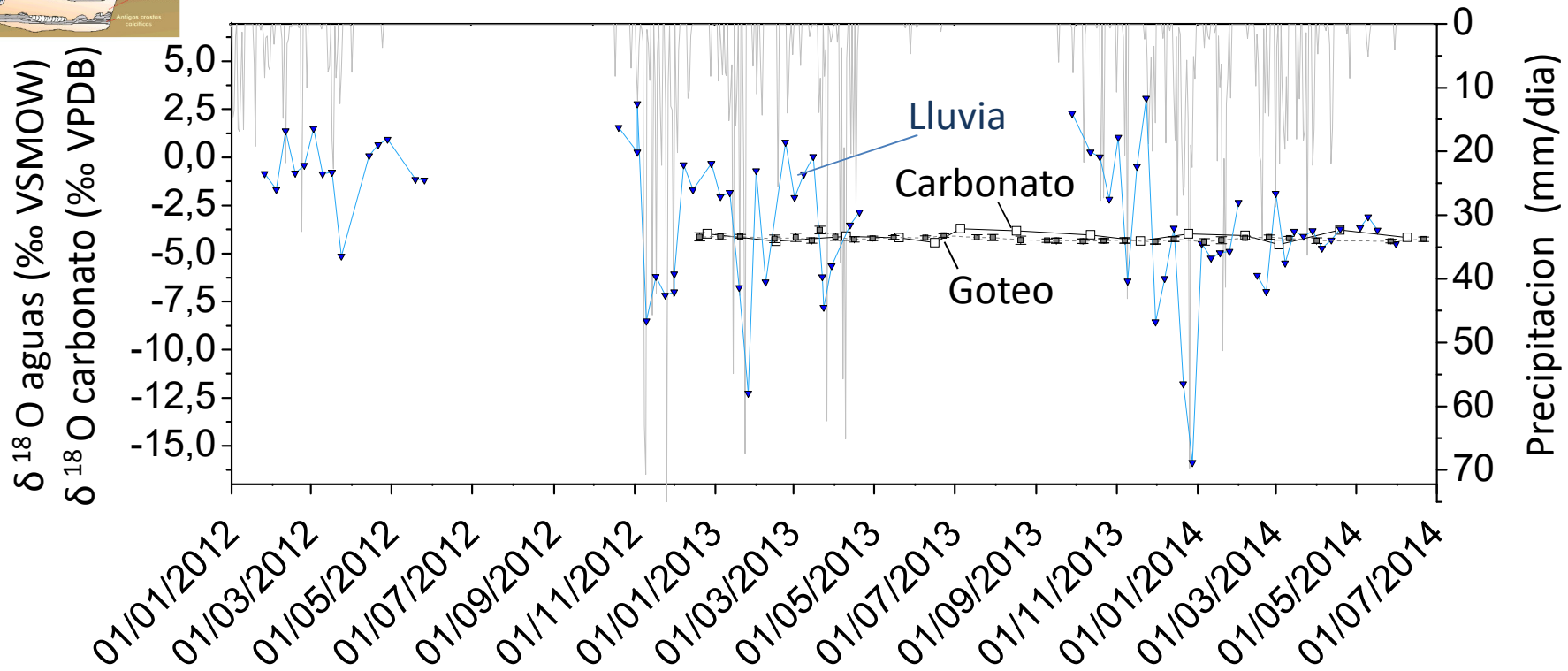


➔ No hay variacion de $\delta^{18}O$ goteo

→Hypothesis : Efecto bufer/reservatorio del epikarst



$\delta^{18}O$
Agua de goteo vs carbonato

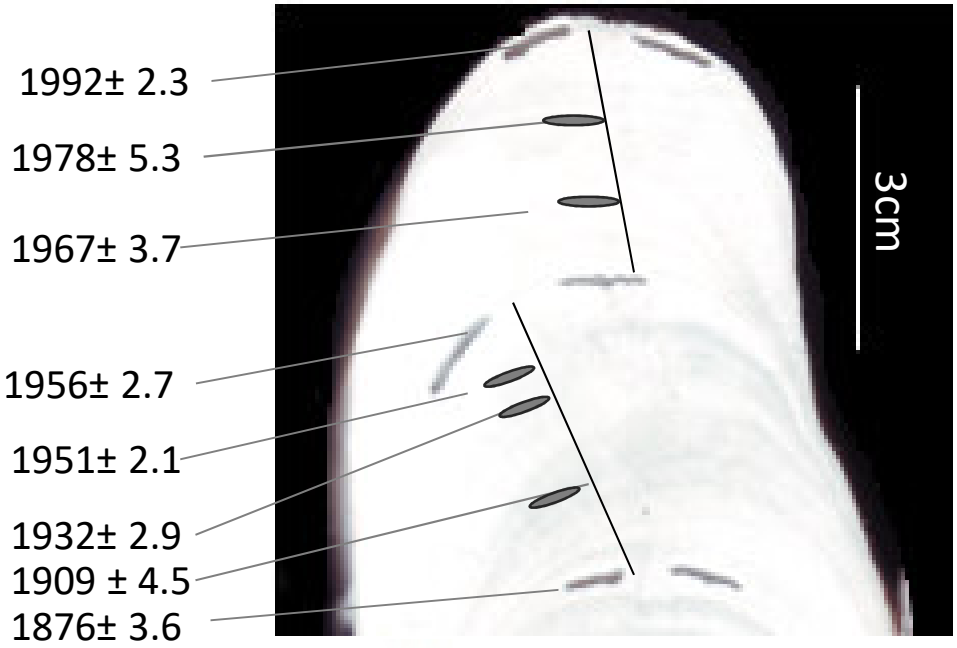


➔ variacion $\delta^{18}O$ goteo y carbonato : debil

→Hypothesis : Efecto bufer/reservatorio del epikarst

➔ Tiene variacion a largo prazo?

Espeleotema SBE3



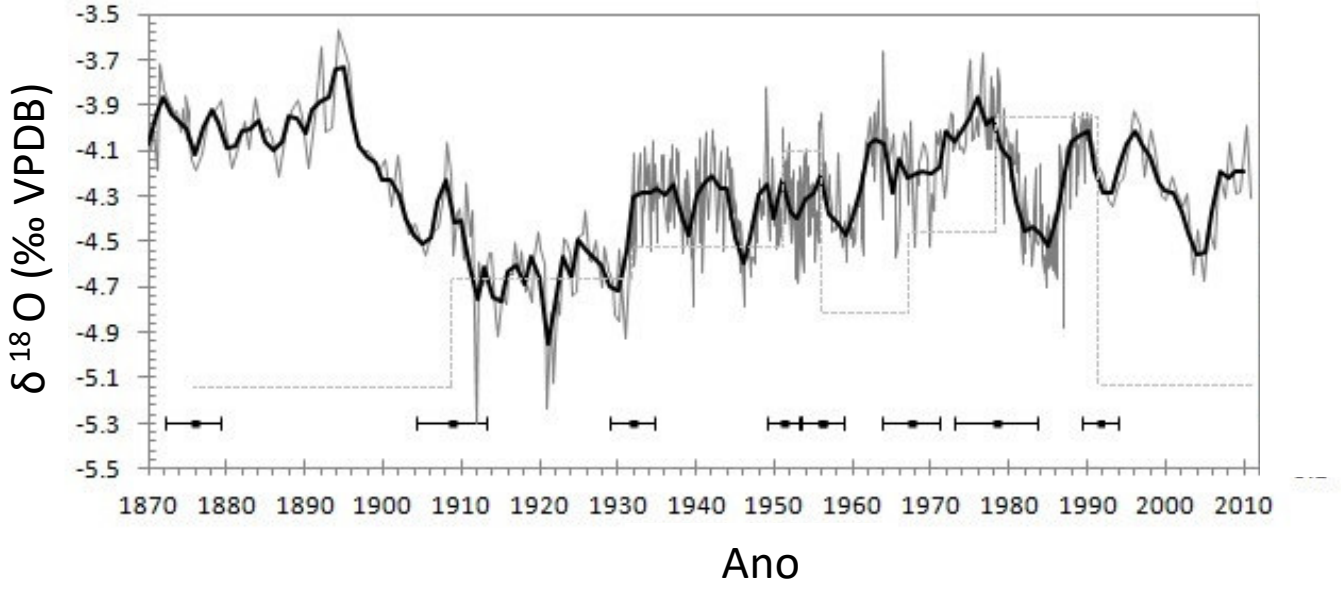
Mineralogia : Aragonita

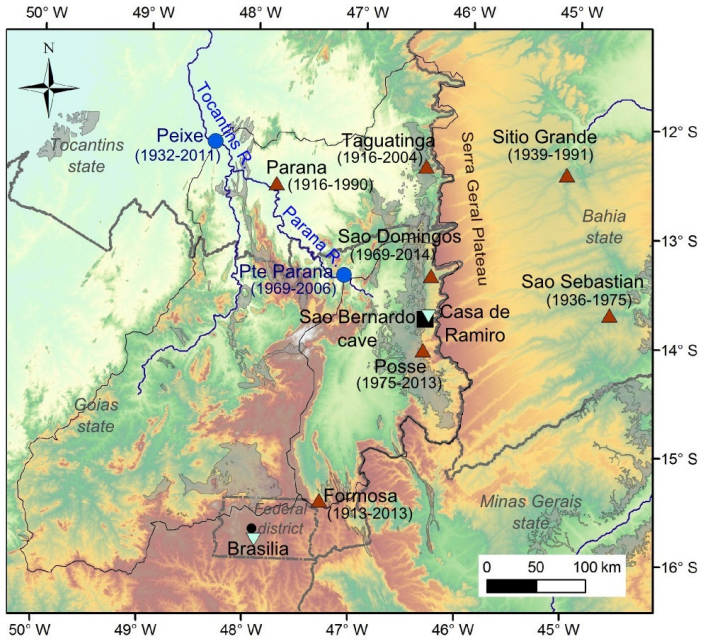
→8 dataçoes U/Th

Alta tasa de crecimiento ~ 0.5mm/ano

→563 analysis de $\delta^{18}O$ (0.125mm)

Alta resolucion: 3-5 analisis/ano





Datos hidro-climaticos hiostoricos

Pluviometria

7 estaciones pluviometricas (fuente : ANA, INMET)

→Tratamiento HYDRACCESS (Vauchel et al., 2005)

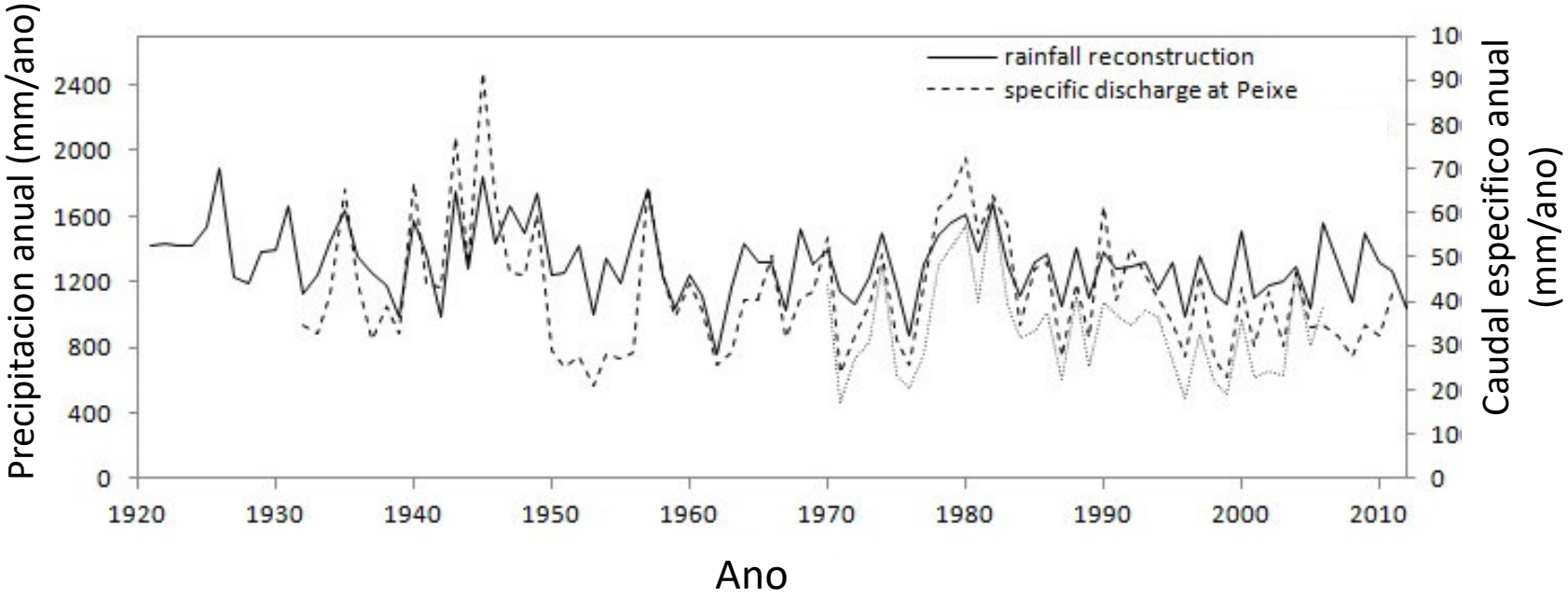
1921-2011

Caudal :

2 estaciones hidrologicas (fuente : ANA, ONS):

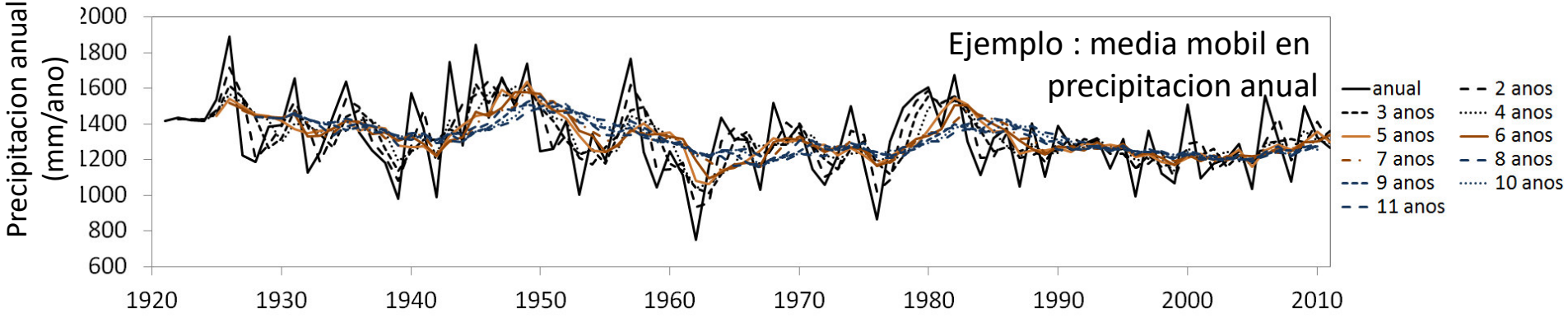
1931-2011 (Rio Tocantins)

➔ Series de datos anual, DJF, DJFM, NDJF, NDJFM



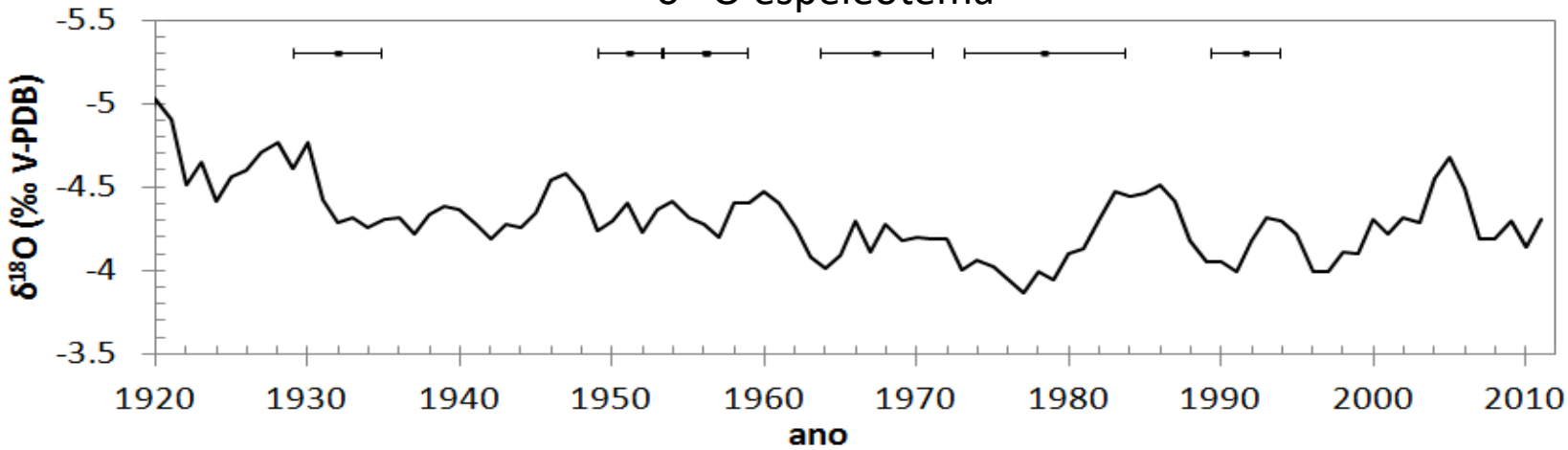
Media mobil lluvia y caudal : 2→ 11 anos / anual, DJF, DJFM, NDJF, NDJFM

→ 110 series de datos historicos



VS

$\delta^{18}O$ espeleotema

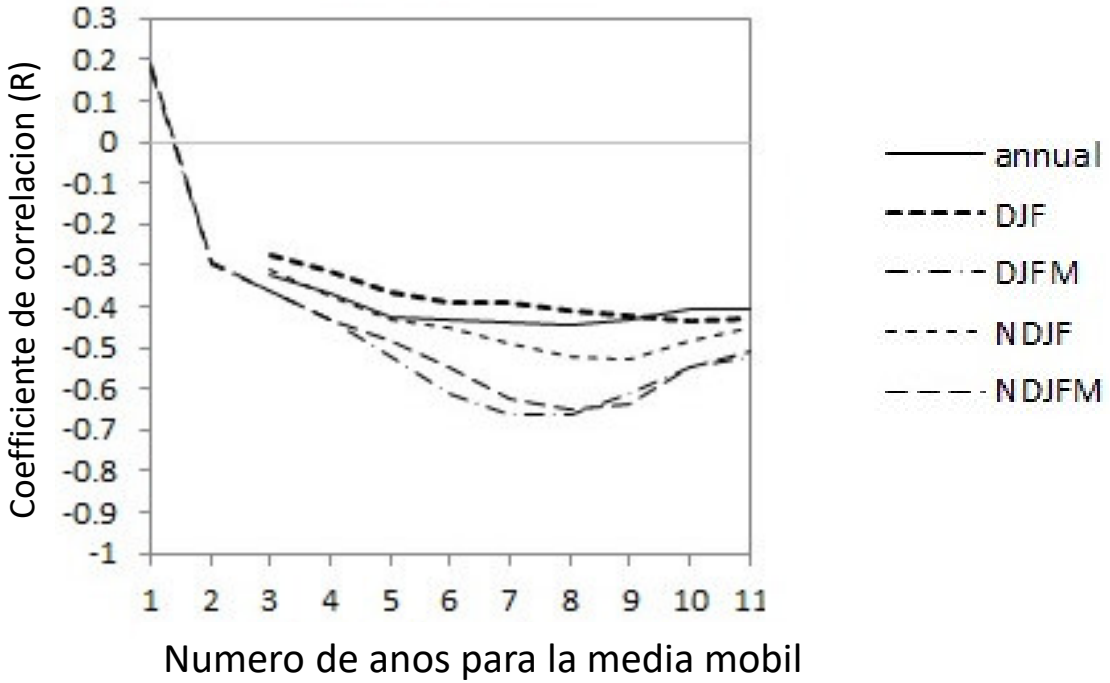


→Analisis de correlacion

→ No correlacion significativa entre $\delta^{18}O$ espeleotema y el registro de caudal de rio

Comparacion

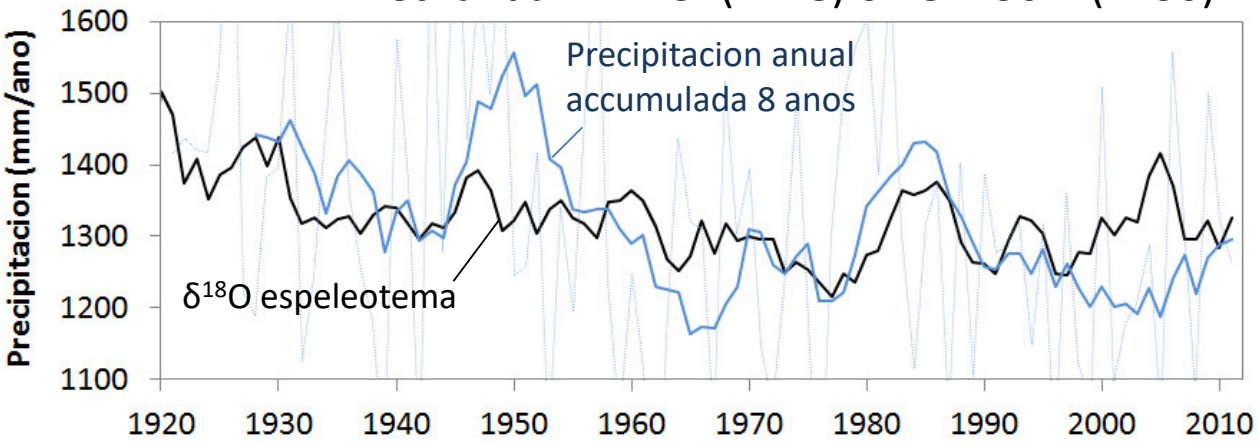
$\delta^{18}O$ espeleotema
vs
media mobil (2-11 anos) precipitacion

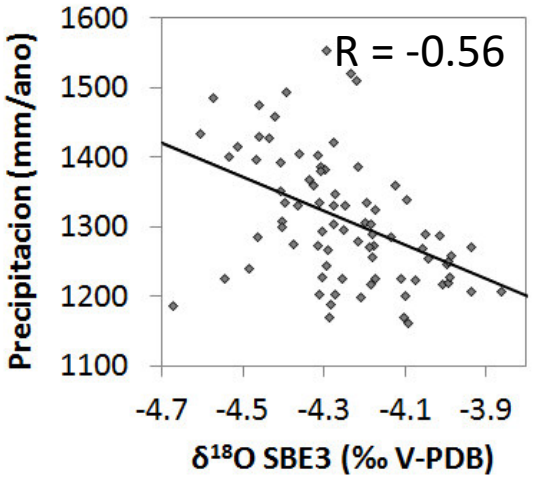


➔Mejor correlacion : $\delta^{18}O$ espeleotema vs media mobil lluvia DJFM (monzon) de 7-8 anos :
R = -0.70

➔ Espeleotema = registro de monzon sub-decadal

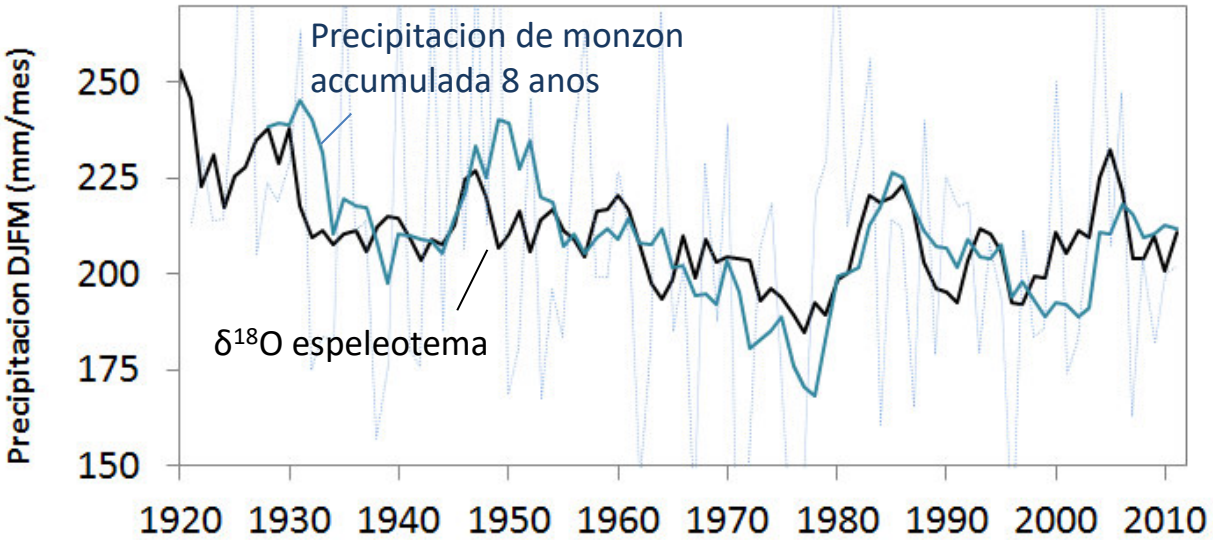
Prec. anual = -1154(±118) $\delta^{18}O$ – 3612(±130)

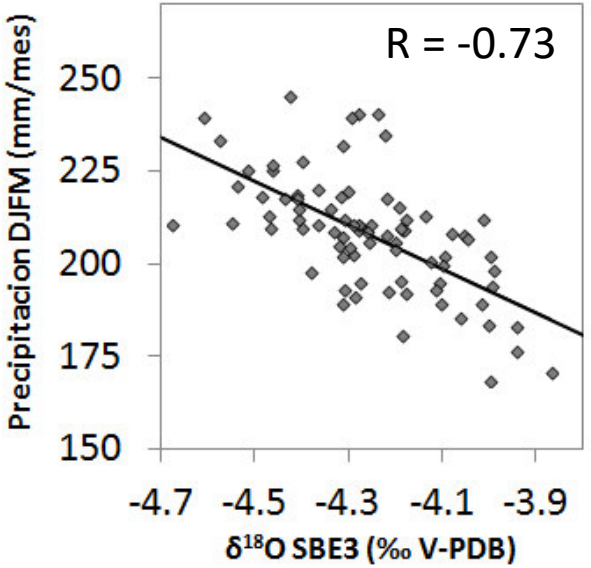




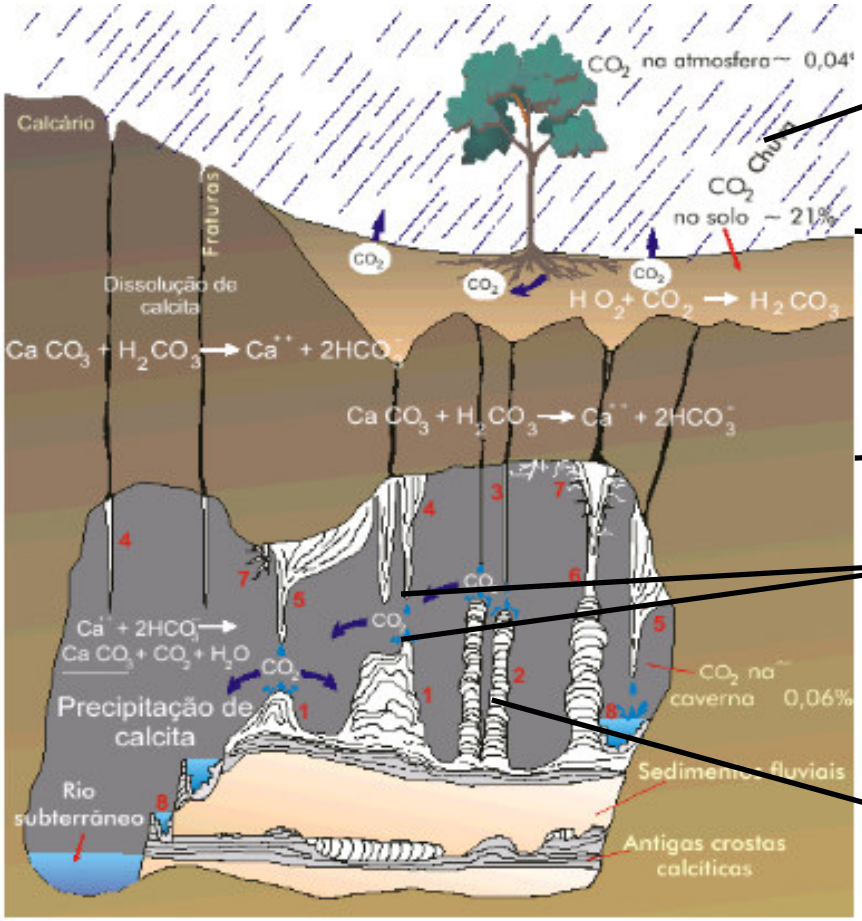
$\delta^{18}O$ espeleotema

Prec. DJFM = -132(±13) $\delta^{18}O$ – 354(±20)





Síntesis



δ^{18}O **lluvia** : « amount effect »

Epikarst : effecto « buffer » / reservatorio
→ 7-9 anos

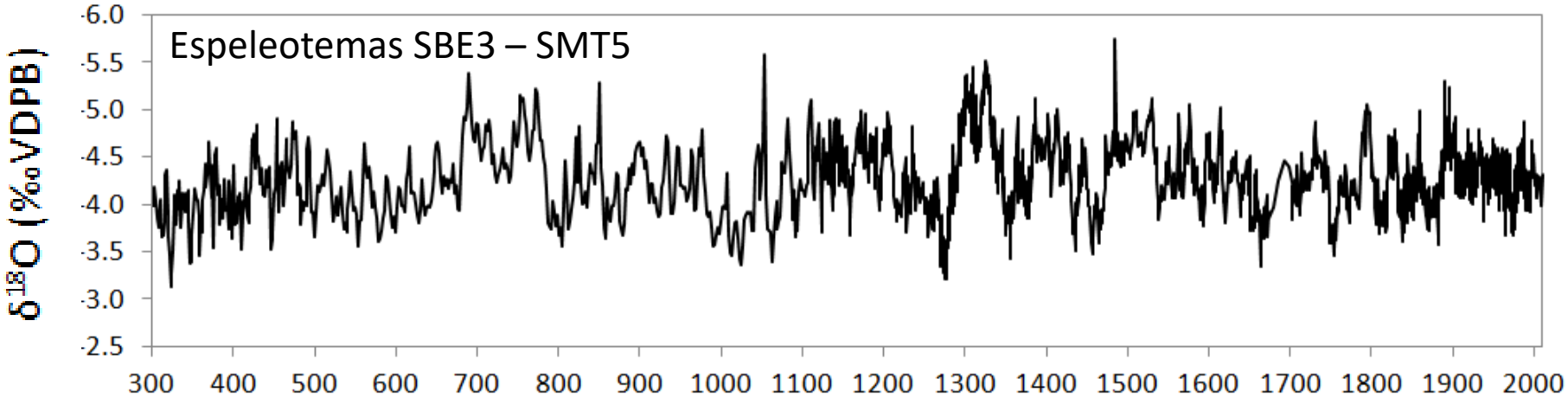
Goteo y carbonato:
δ^{18}O : constante durante el ciclo hidrologico
Desequilibrio agua-carbonato estacional no affecta a relacion empirica sub-decadal

δ^{18}O **espelotema** :
Reflete variación 7-9 anos de lluvia acumulada

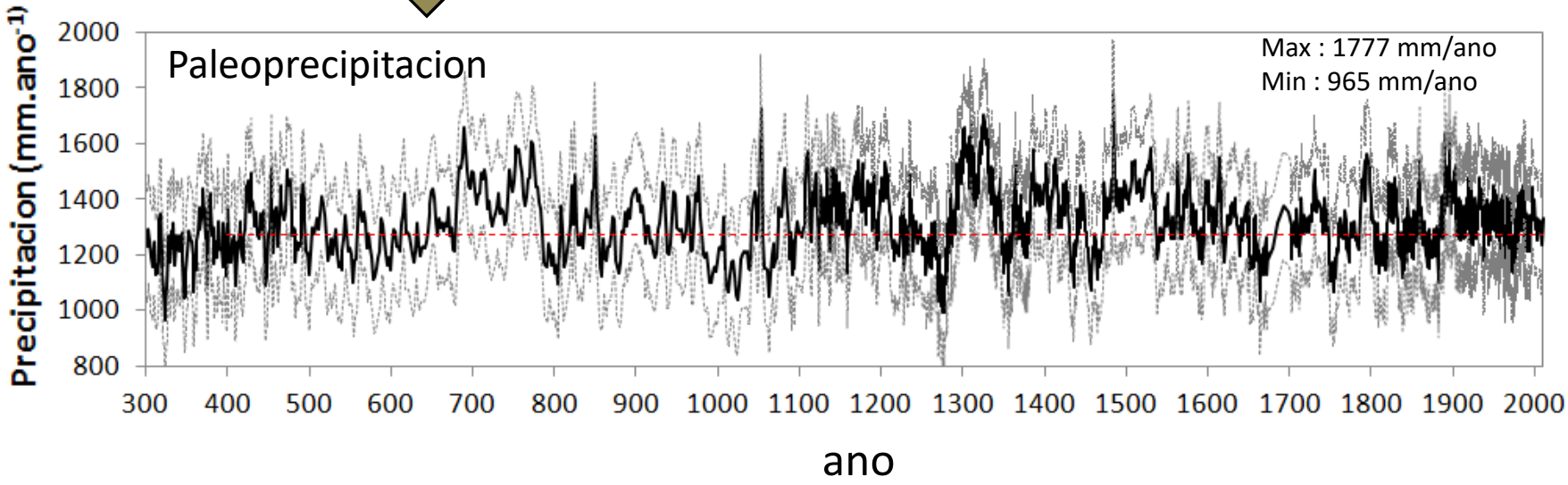
➔ Ley empirica de variacion sub-decadal de lluvia a partir de registro de espeleotema

Perspectivas

Cuantificacion de variaciones de paleoprecipitacion



Precipitacion annual = -1154(±118) $\delta^{18}O$ – 3612(±130)



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