

A 1,600 year record of
paleoseasonality from the
neotropics of Central
America and its implications
for rainfall predictability in
agricultural societies

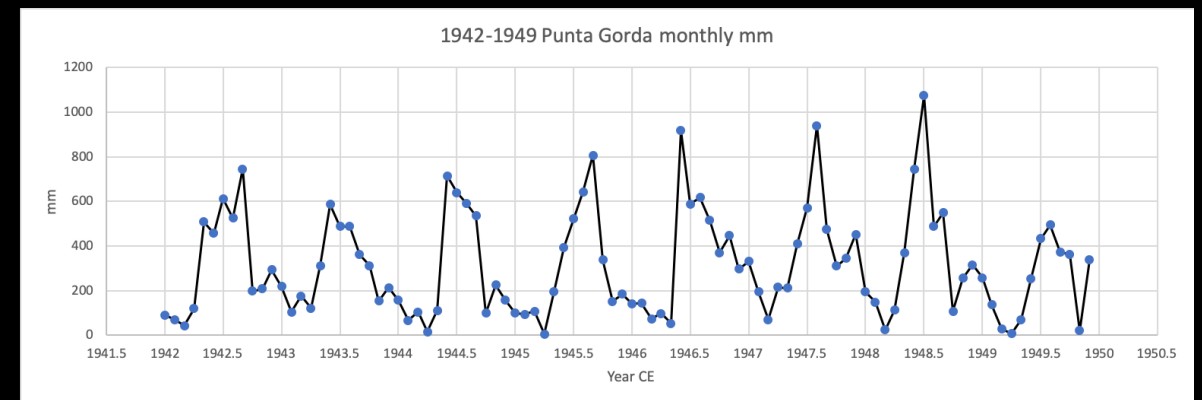
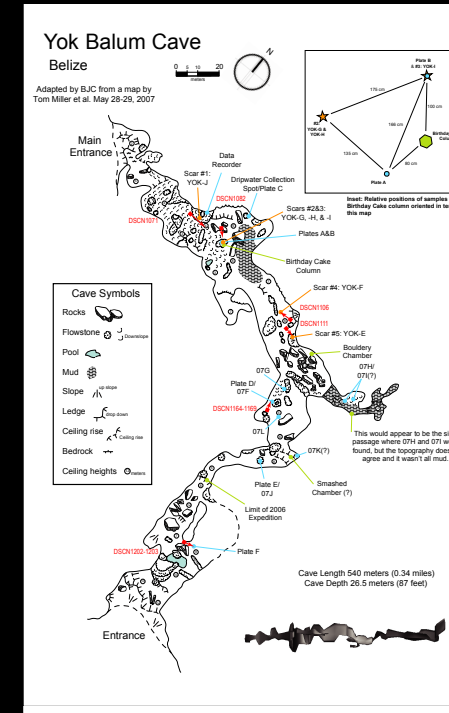
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Baldini, Tobias Braun, Erin Ray, Lisa Baldini,
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Norbert Marwan, Douglas Kennett, and
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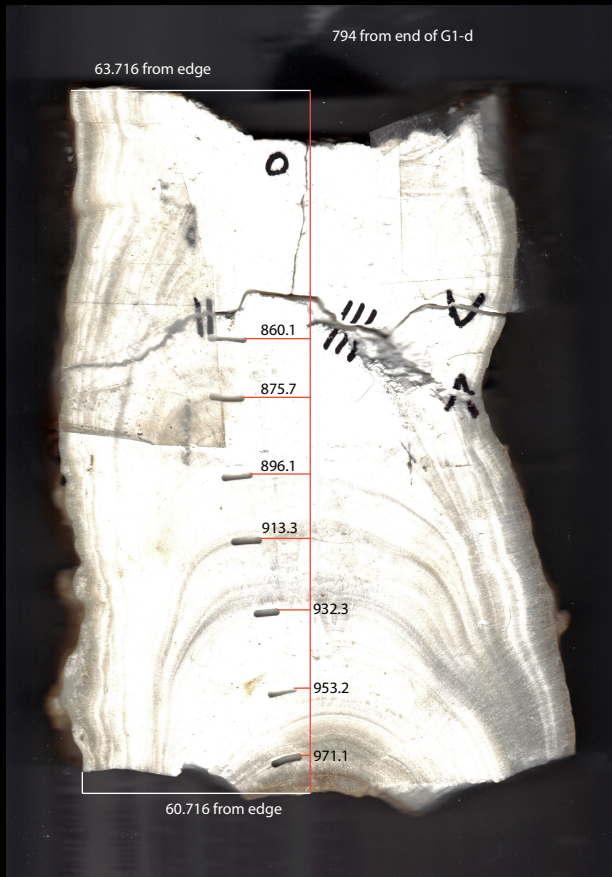
BY

Yok Balum Cave, Belize Central America

- In 2006 we removed stalagmite Yok G from a cave in southern Belize
- Modern climate high precipitation ($>3000\text{mm/yr}$), $>80\%$ during summer (JJAS)
- Pronounced seasonality



Yok G, Fast growing aragonitic speleothem

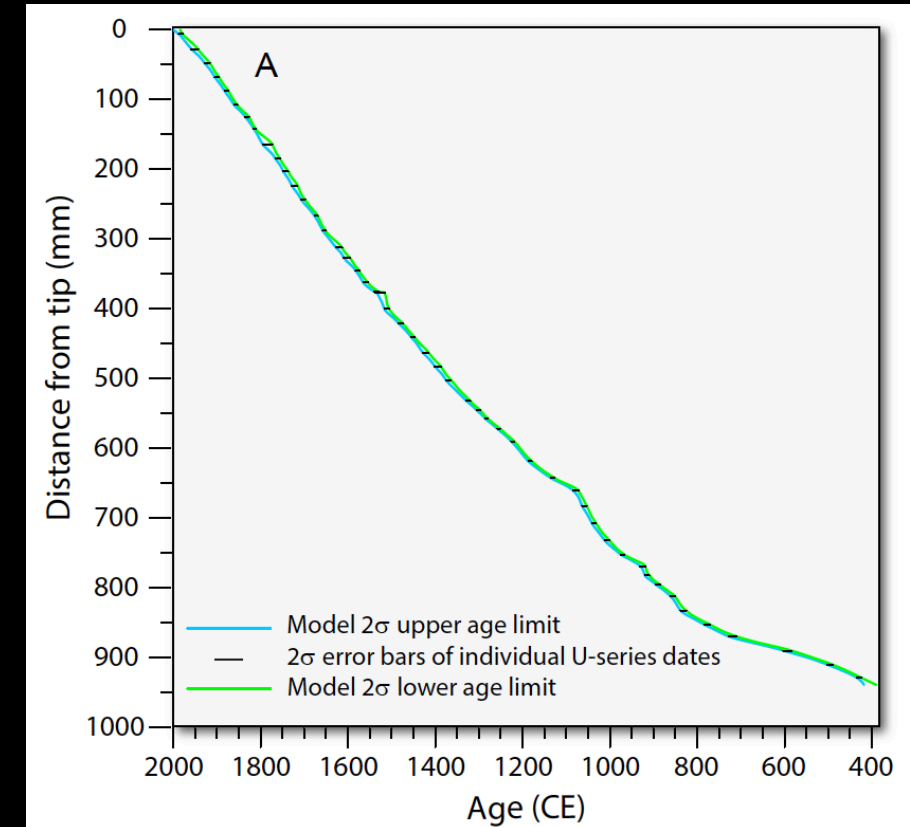


High U and low Th 937mm sample grew from 400 to 2006 CE

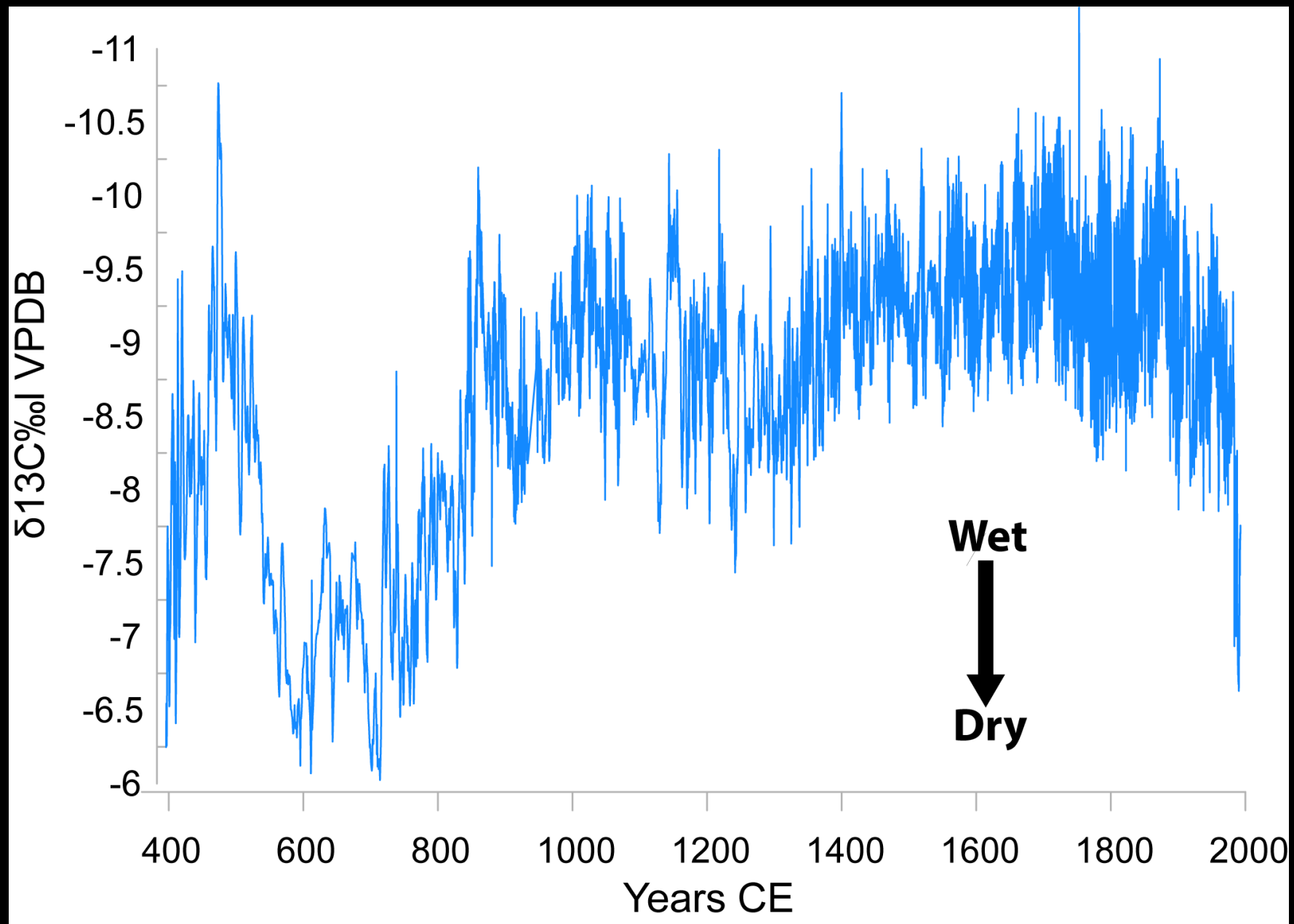
52 U/Th dates with <7 yr mean uncertainty (2σ)

7151 samples measure for $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$, mean sampling resolution 0.22 yrs.

$\delta^{13}\text{C}$ precipitation proxy validated against 450 elemental U measurements ($r=0.714$, $P<0.001$)



Y. Asmerom et al. 2020



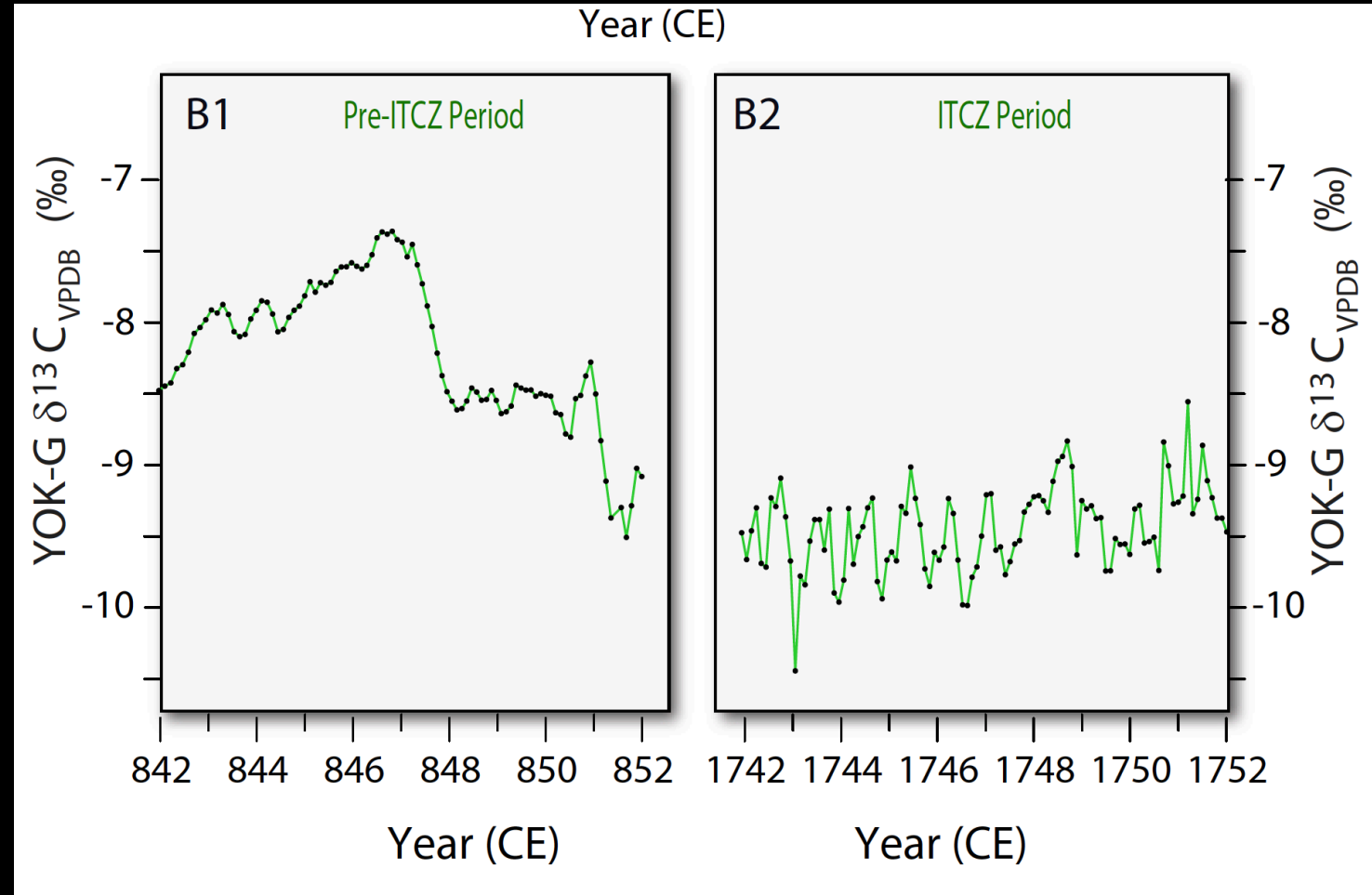
Yok G

400-1400 CE low seasonal oscillation 1400-1984 CE higher seasonal oscillation

The record is characterized by a change in the seasonal distribution of rainfall between the early part of the record (~400-1000 CE) and the most recent part of the record (~1400-modern, CE), with a transitional period between 1000-1400 CE.

The early part of the record is by little annual variation in the distribution of rainfall (low seasonality). [B1]

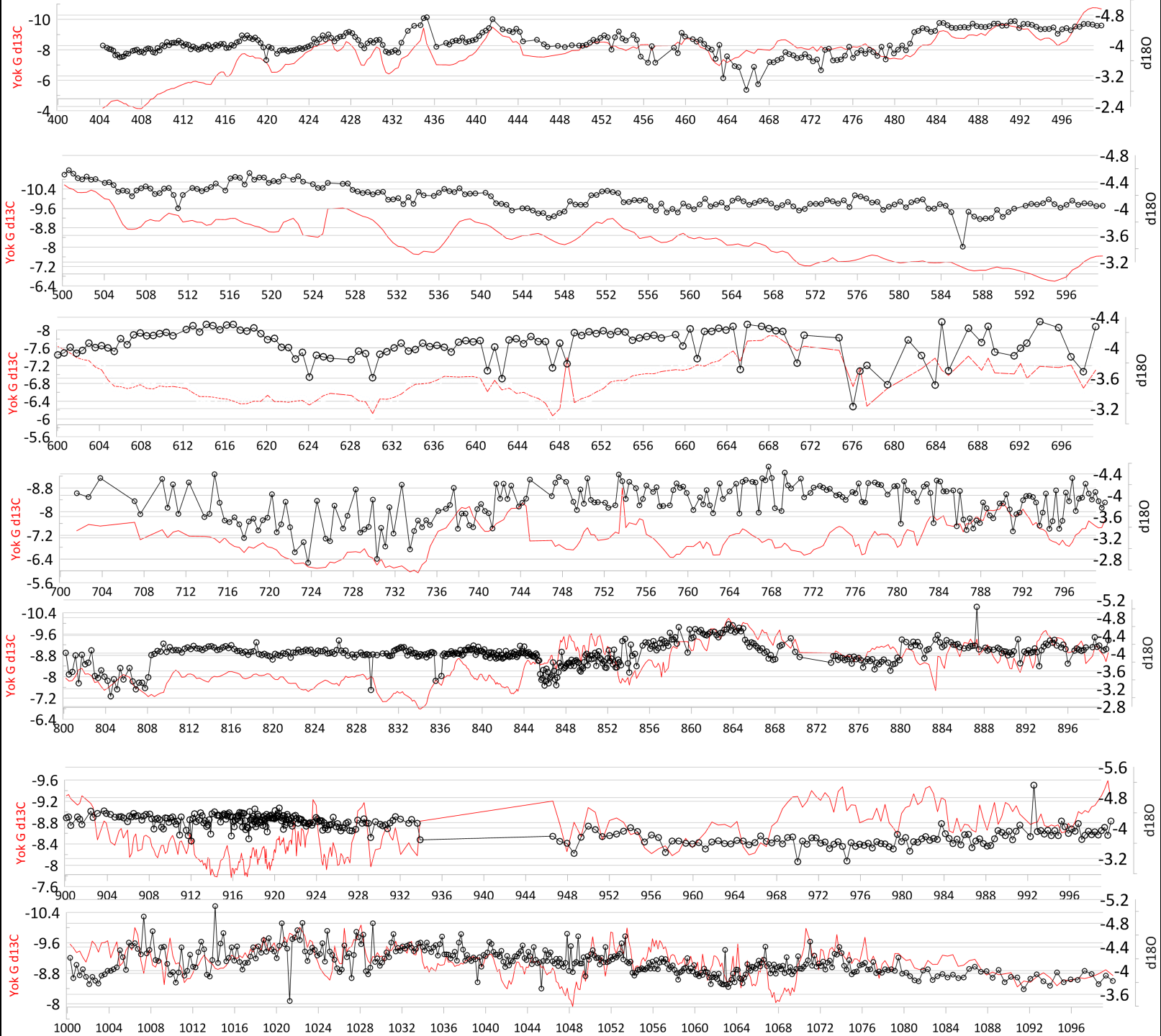
The later part of the record is characterized by high intraannual variations in rainfall (high seasonality) [B2] that are similar to instrumental records.



**Low
Seasonality**

Years CE

**Episodic
Seasonality**



Wet



Dry

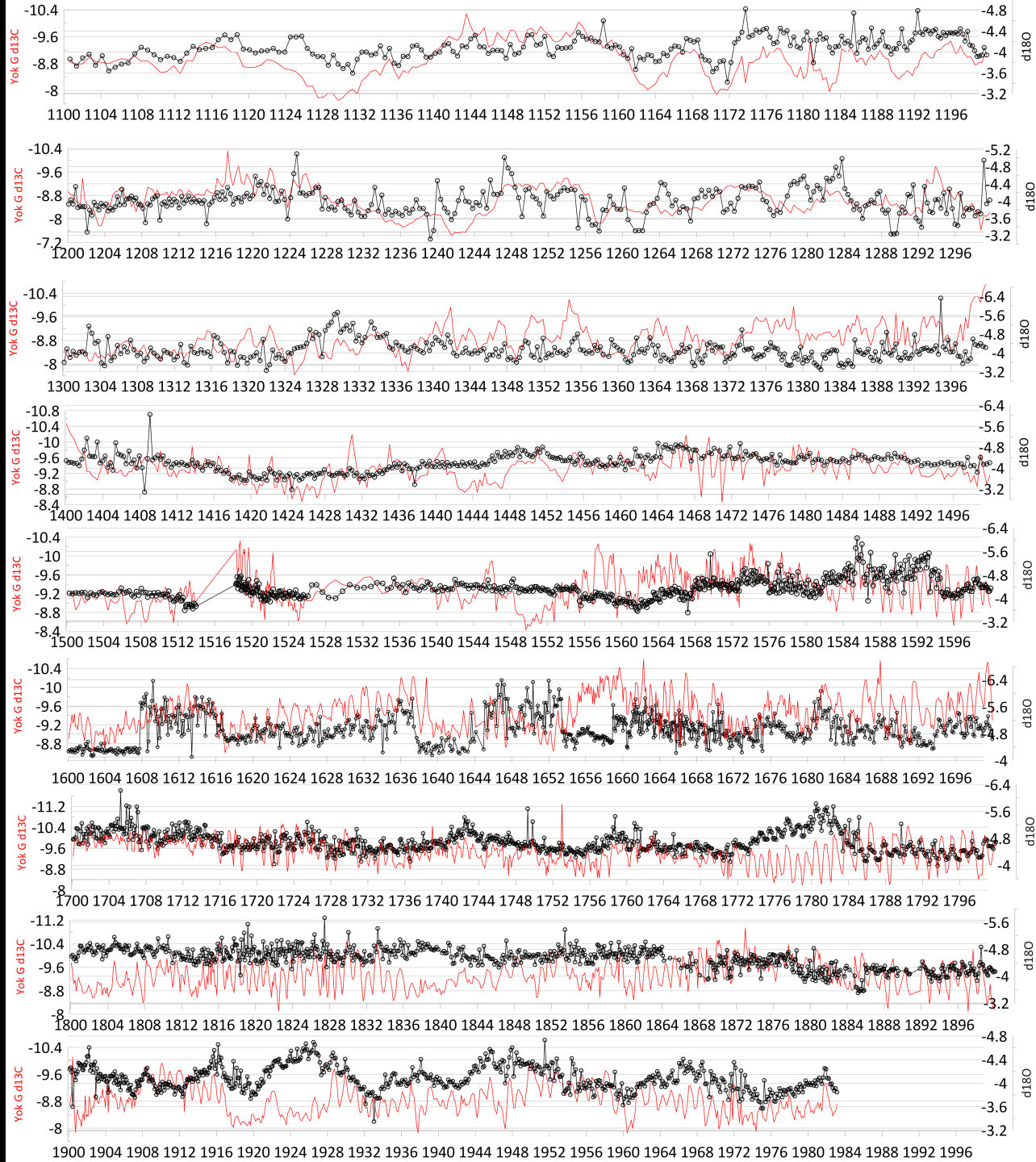


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**Episodic
Seasonality**

Years CE

**"Modern"
Seasonality**



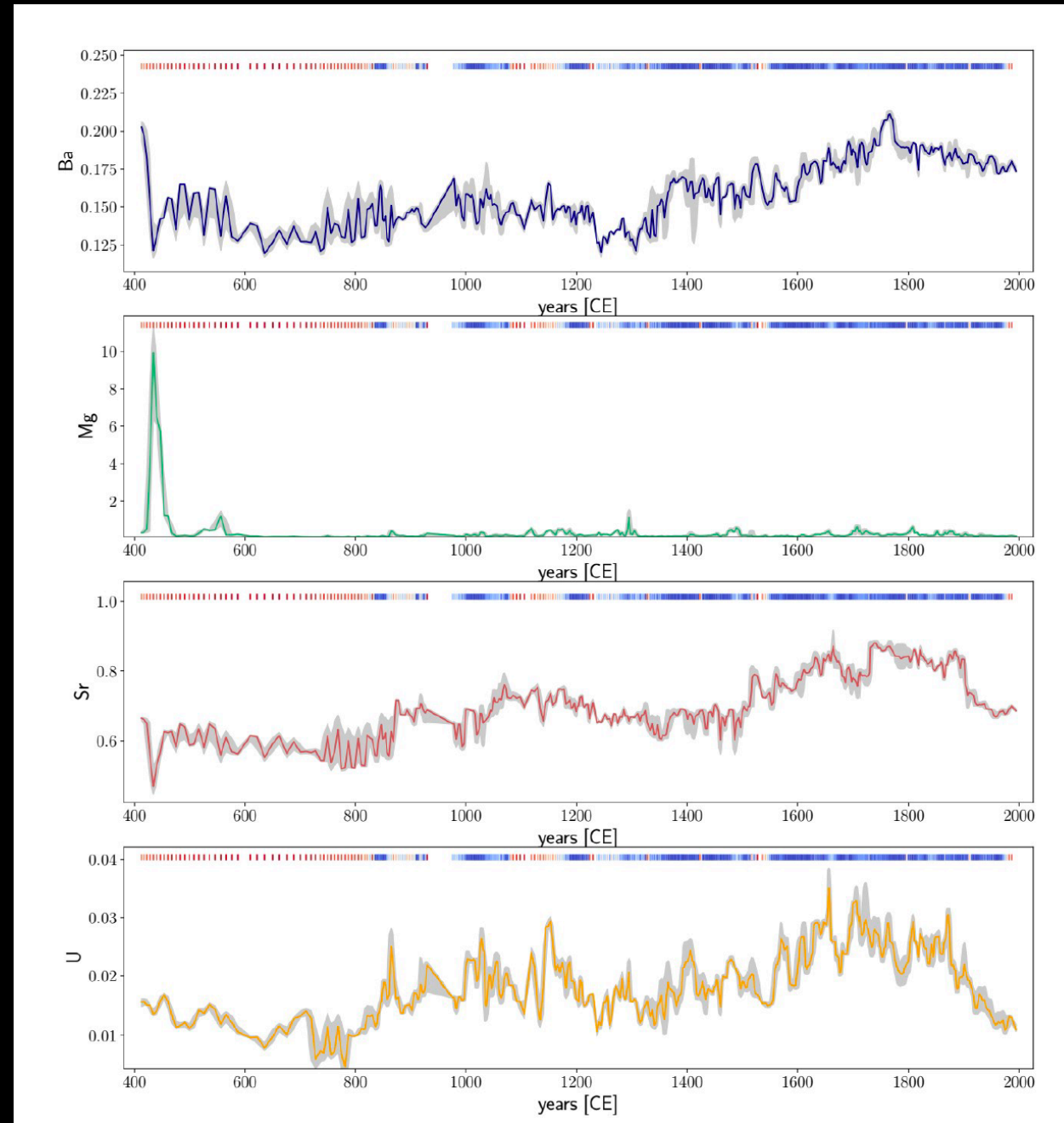
Wet



Dry

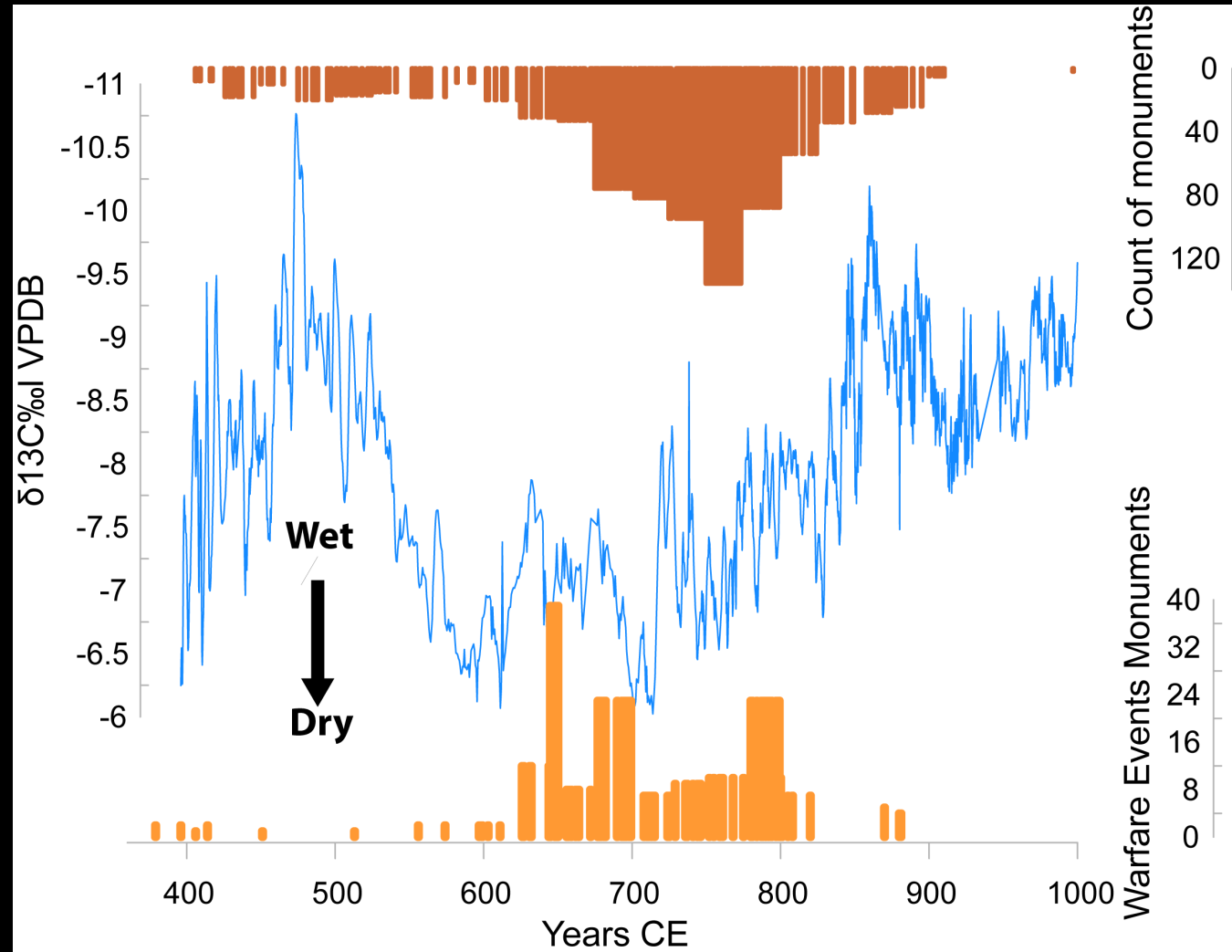
- Question? Does apparent shifts in seasonality in carbon reflect landscape use changes in the Classic Period (i.e. maize planted on top of cave)?

- 450 elemental measurements of Ba/Ca, Sr/Ca, Mg/Ca, and U/Ca suggest probably not.
- These are probably related to hydroclimate.
- Additional work ongoing



Links to Classic Period Maya?

- Hieroglyphs from the Maya Classic Period as a window to adaptation
 - Count of monuments is total carved monuments attesting to political dominance in a region
 - Total warfare events is a proxy for geopolitical conflict
 - Conflict increases during driest interval between 600-800 CE as does political testimonies of dominance



Thank you everyone and STAY SAFE!

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