

Climate and Human History

Stephan Matthiesen

- | | |
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| 26/1 | 2. The Ice Age |
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| 16/2 | 5. Tang and Maya in the 10th century |
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| 15/3 | no class! |
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The Maya



Pyramid in Tikal



Early and Middle Preclassic ca 3000 – 400BC

Early Preclassic (3000-900 BC)

- Development of agriculture
- Population growth

Middle Preclassic (900-400BC)

- Cities and ceremonial architecture
- Long distance trade
- Development of an elite, but still mostly egalitarian

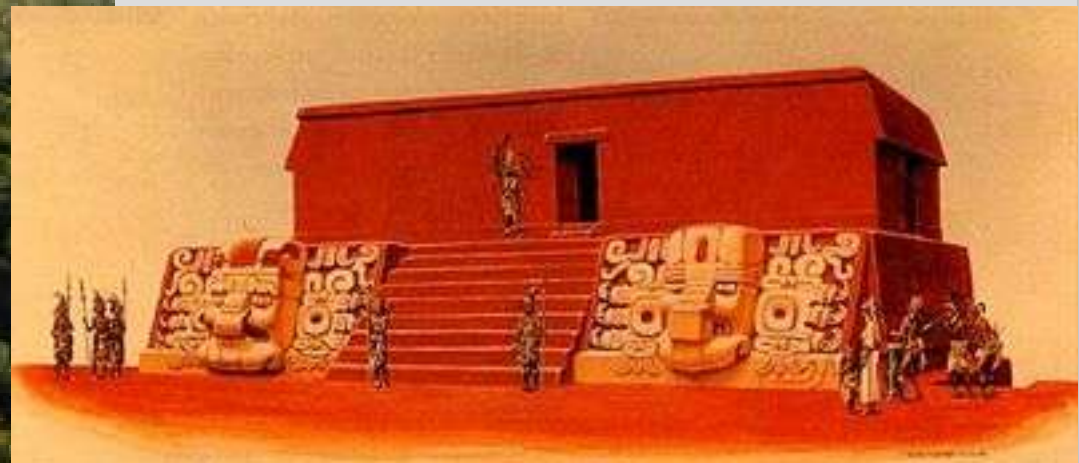
Late Preclassic ca 400BC – 250AD

“Late Preclassic Transition” (200-50BC?)

- Massive building programme
- Change in imagery: symbolic displays on the order of the Universe
- Kings

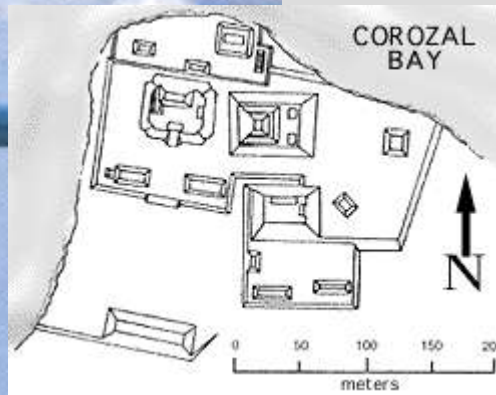


Structure 34, El Mirador, Late Preclassic



Late Preclassic Site (ca 50BC)

Cerro Belize



Early Classic Period ca 250-600 AD

- Population growth again
- Competing City States / Kingdoms
 - Tikal: dynasty founded by Lor Xac-Moch-Xoc (219AD); 360000 people (ca 500 AD)
 - Calakmul: king from ca 500 AD
- 562: War between Tikal and Calakmul

Late Classic Period ca 600-900AD

- Cities with >10000 inhabitants
- Maya culture spreads North
- Foundation of new cities
 - Chichen Itza (650)
 - Uxmal (ca 700)



Collapse and Postclassic Period ca 900-1511



- Central Yucatan abandoned
- Immigration of Toltecs (from Mexico)

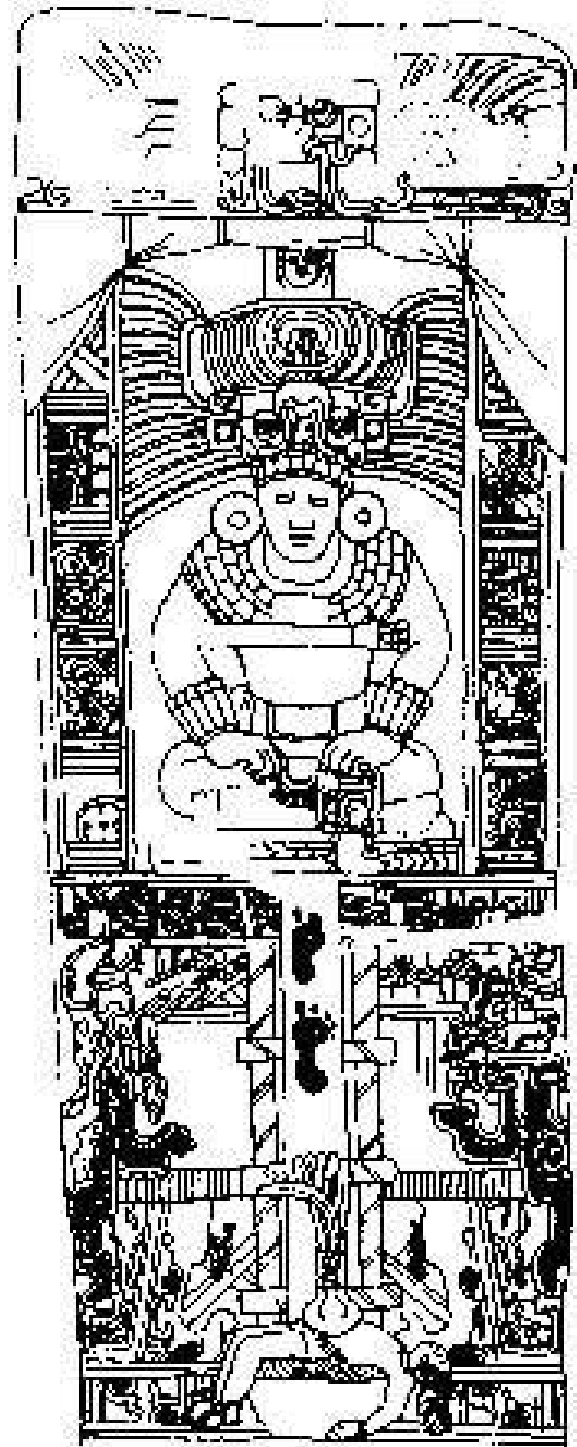


Stela 11 Piedras Negras 22 Aug. 731

- Accession of “Ruler 4” of Piedras Negras



Piedras Negras



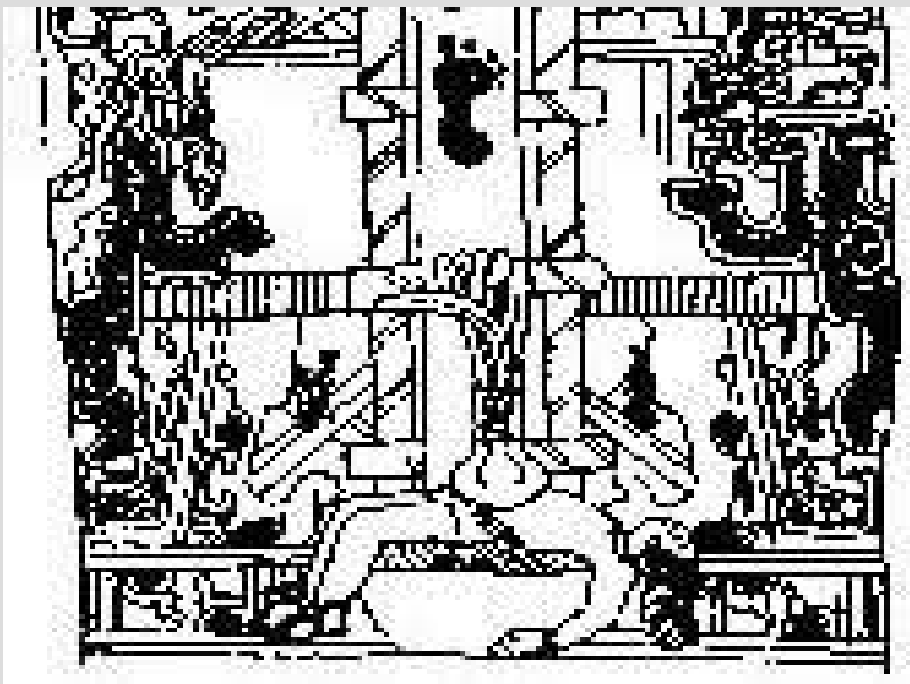
Stela 11

Piedras Negras

22 Aug. 731

Human sacrifice

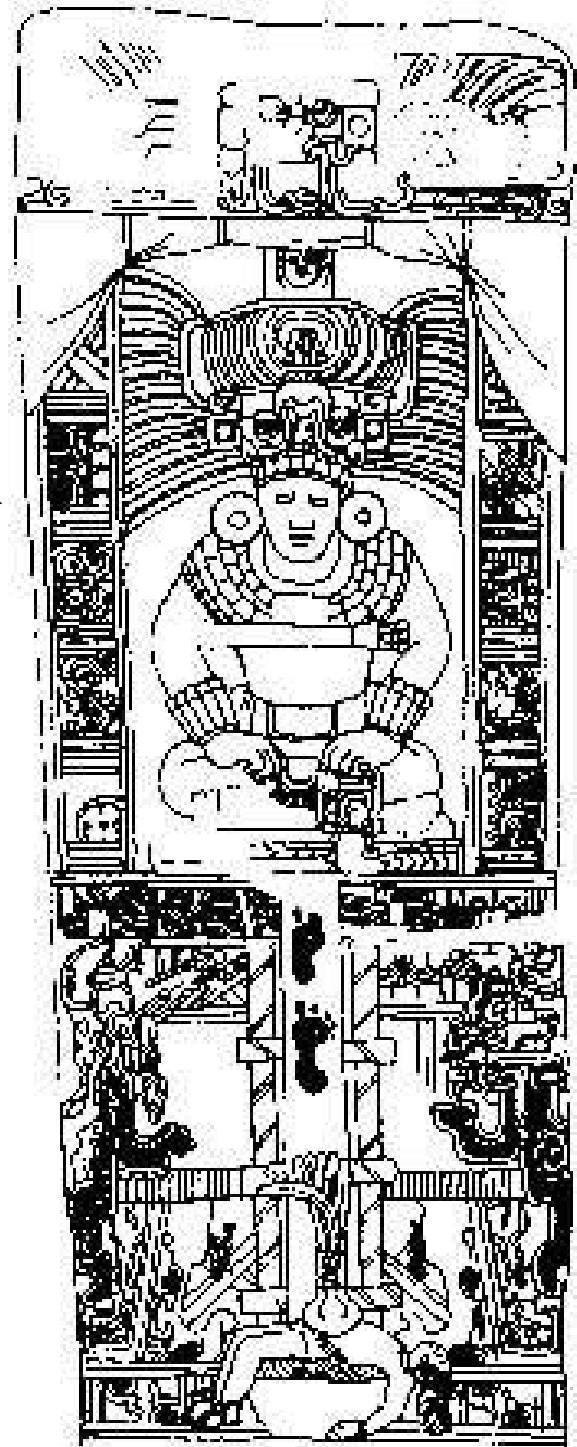
Cloth with bloody footprints



Sacrificial victim on Altar

Sky
band

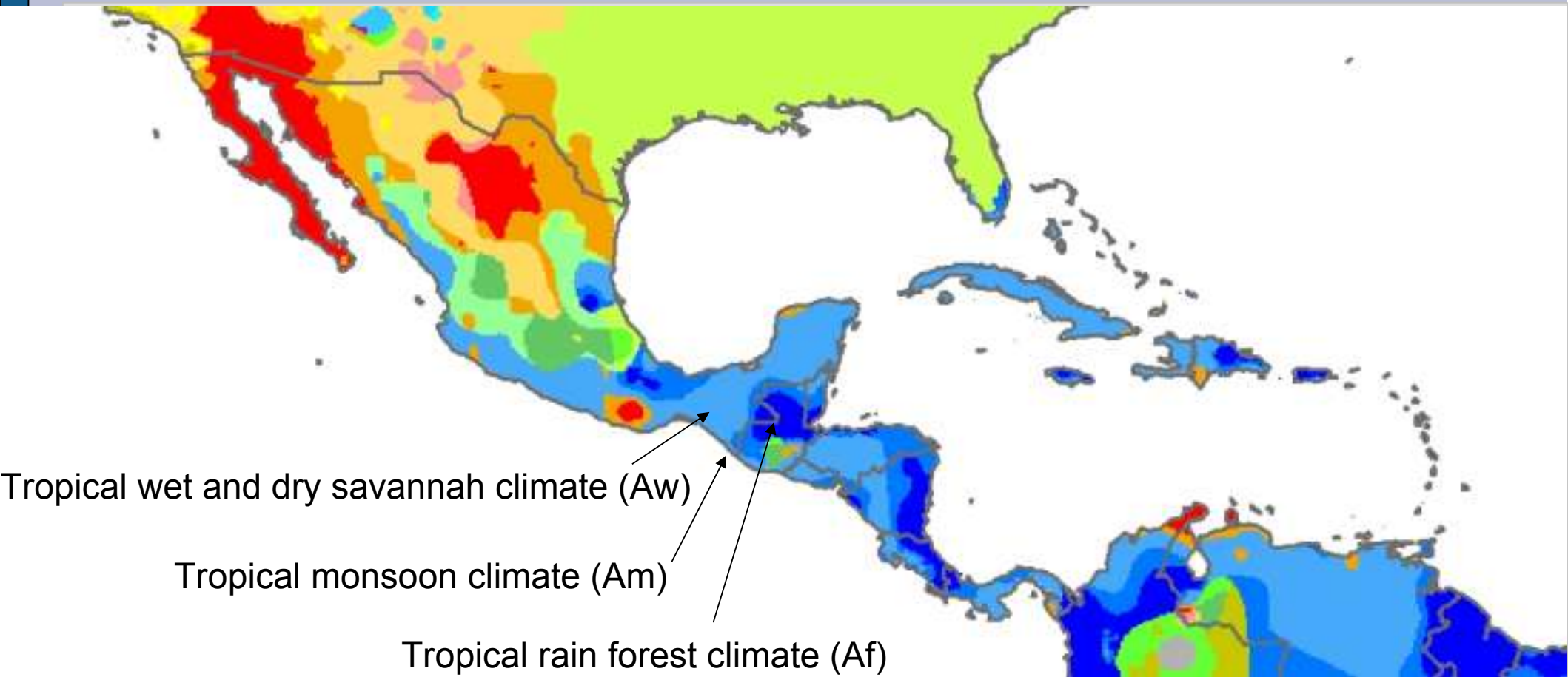
Blood
stream



Maya History

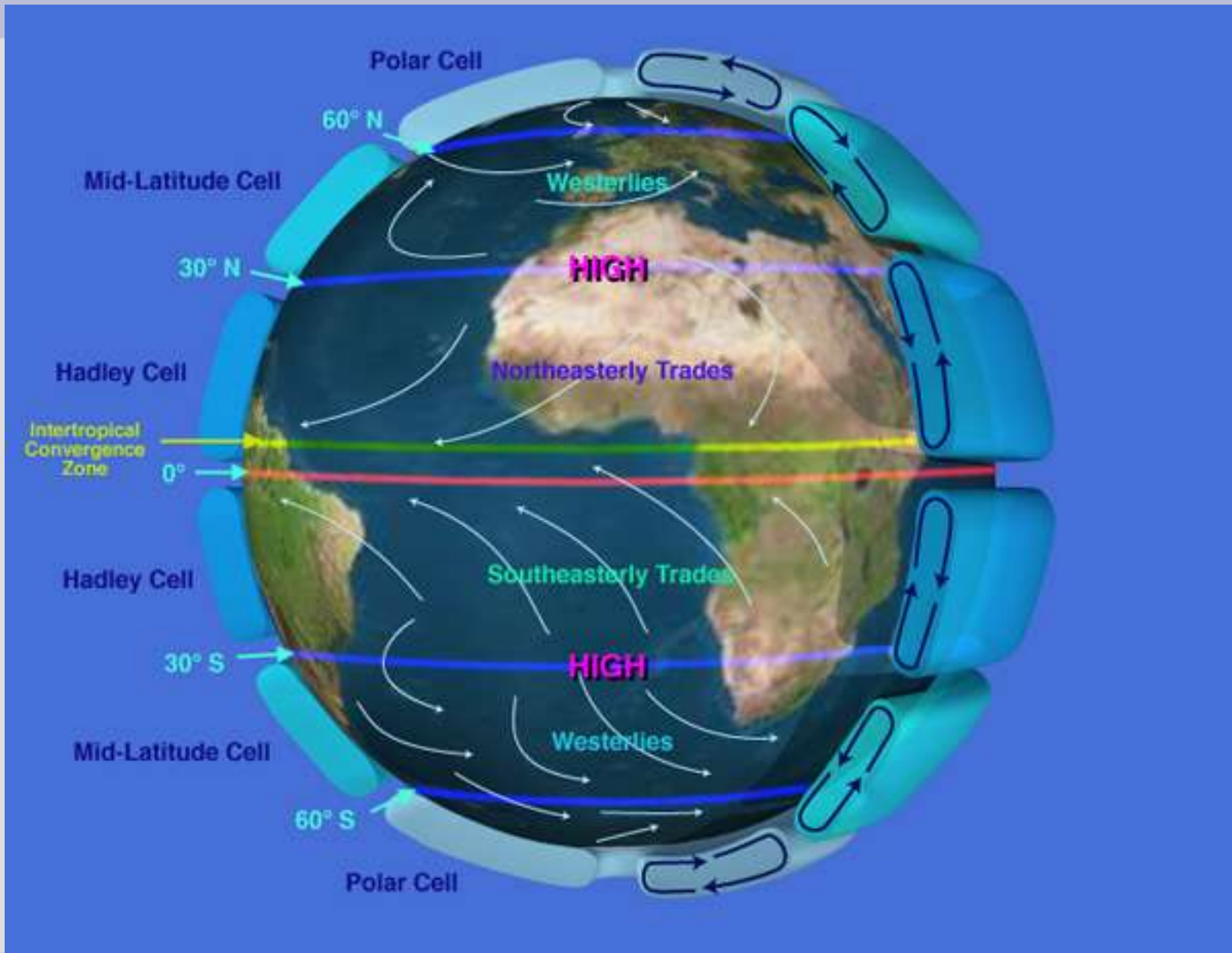
- 3000BC – 400BC Early&Middle Preclassic
Growth and development of Cities
- 400BC – 250AD Late Preclassic
Crisis and Transition
- 250AD – 600AD Early Classic
Growth
- 600AD – 900AD Late Classic
Building activity, but decline
- 900AD – 1511AD Postclassic
Central Yucatan abandoned

Climate in Mesoamerica



Af	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF
Aw	BSk		Cwc	Cfc	Dsc	Dwc	Dfc	
					Dsd	Dwd	Dfd	

Atmospheric Circulation

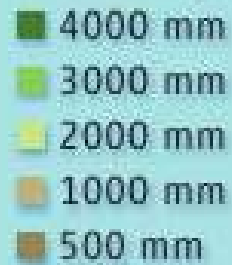


The Intertropical Convergence Zone (ITCZ)

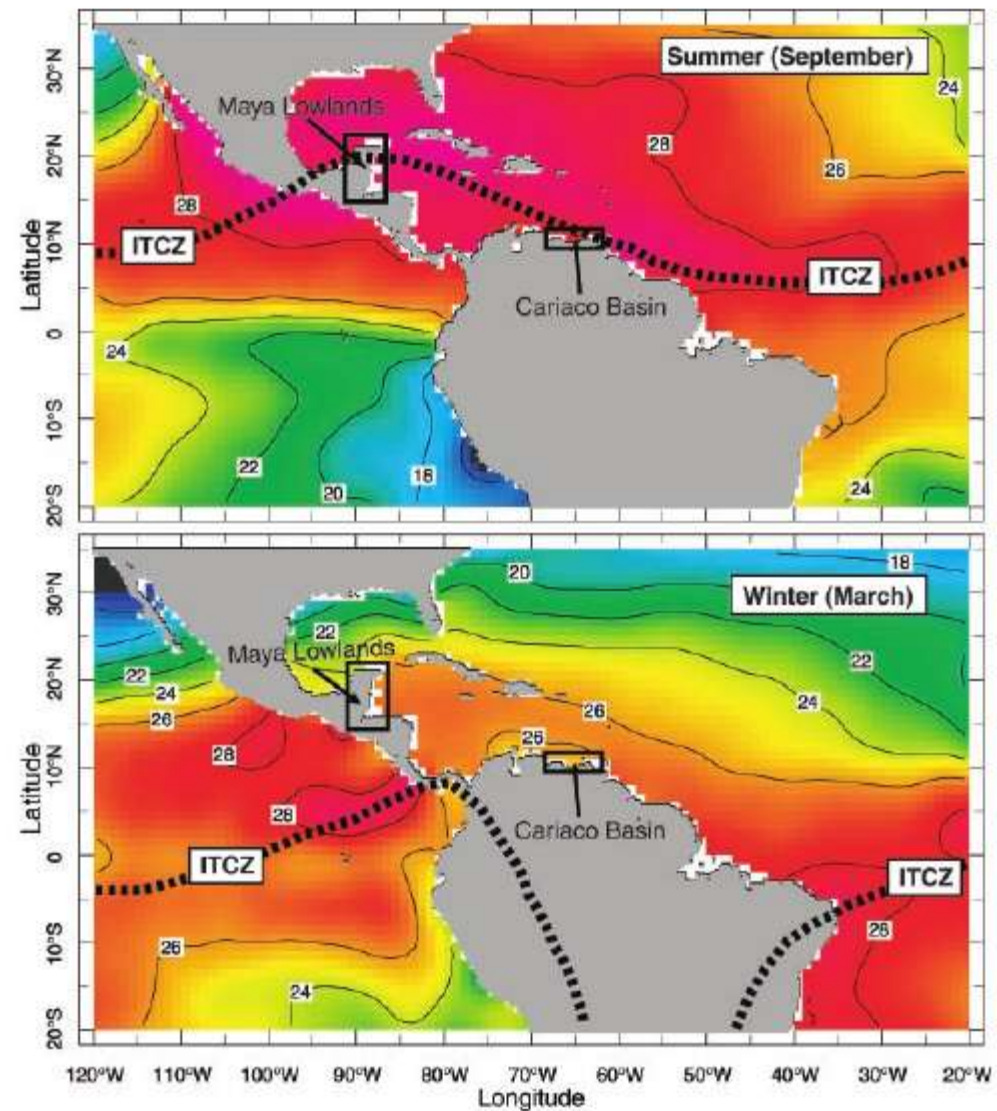
Cariaco Basin



Annual Rainfall Today in the Maya Lands



Wet and dry. The Maya lived in a patchwork of environments, and some cities in wet areas collapsed before drier ones.



Haug et al. (2003). Climate and the collapse of Maya civilization. *Science*, 299 (5613), 1731-1735.

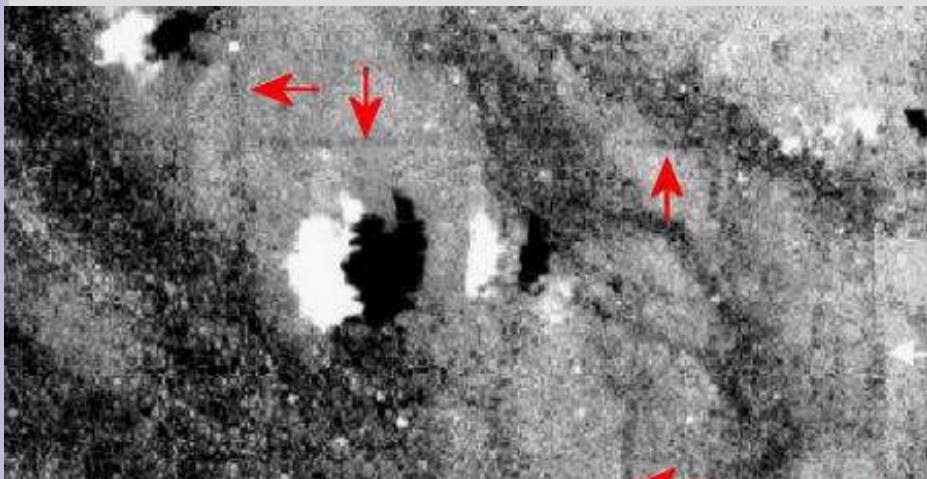
Pringle, H. (2009) *Science*, 324 (5926), 454-456

Agriculture

Slash-and-burn
Milpa system

- Maize
- Beans (nitrogen)
- Gourd (reduces erosion)

Artificial irrigation with
basins and canals



Satellite image from El Mirador, Preclassic

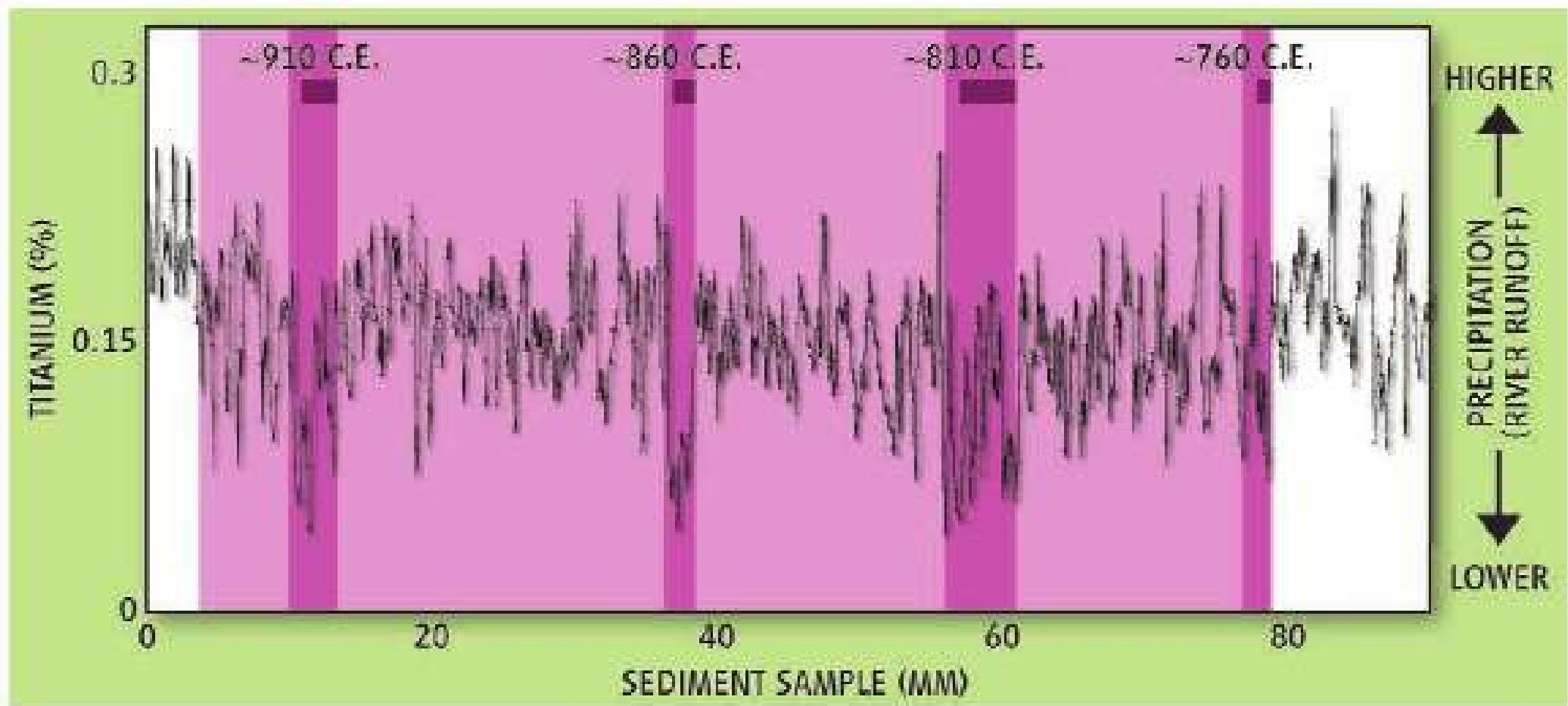
Irrigation systems

Irrigation
channels

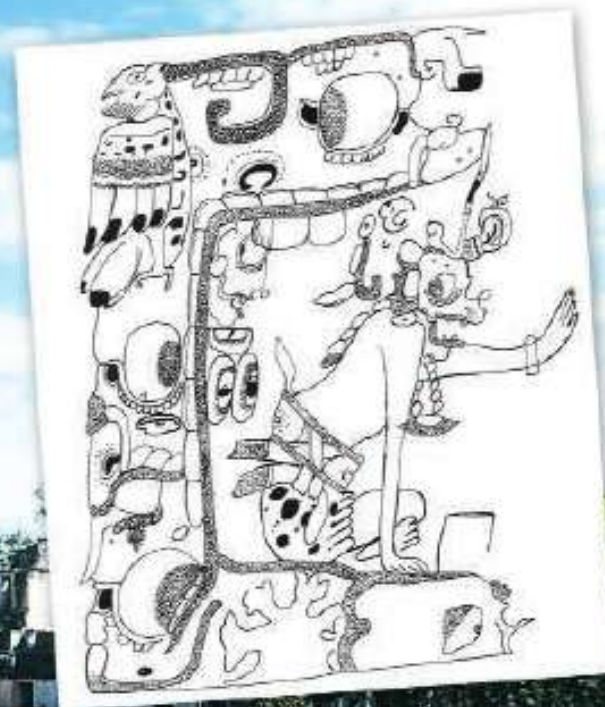


Mascarelli, A. (2010). Mayans converted wetlands to farmland. Nature 5 Nov 2010.

Evidence for droughts



Sign of the times. The amount of titanium in sediment drops when rainfall and water erosion decline. These data from the Cariaco Basin spotlight four dry periods that may have affected the Maya lands.



A New Look at the Mayas' End

Climate researchers have fingered drought in the collapse of the great Maya civilization, but many archaeologists say it doesn't fit their data. Ultralocal paleoclimate indicators may spark a resolution

Pringle, H. (2009). A new look at the Mayas' end. *Science*, 324 (5926), 454-456.

Chinese History

- 1122 – 221 BC: Zhou dynasty
- 771 – 221 BC: Eastern Zhou dynasty
at the end: Warring Period, Confucius
- 221 – 206 BC: Qin dynasty
Emperor Qin Shihuang Di
Great Wall, Terracotta Army
- 206BC – 220 AD: Han dynasty
wars against the huns in the West
- 220 – 581 AD: Period of Division (“Disunity”)
- 581 – 618 AD: Sui dynasty
- 618 – 907 AD: Tang dynasty
“Golden age of civil and artistic development”

Tang Dynasty (618-907)

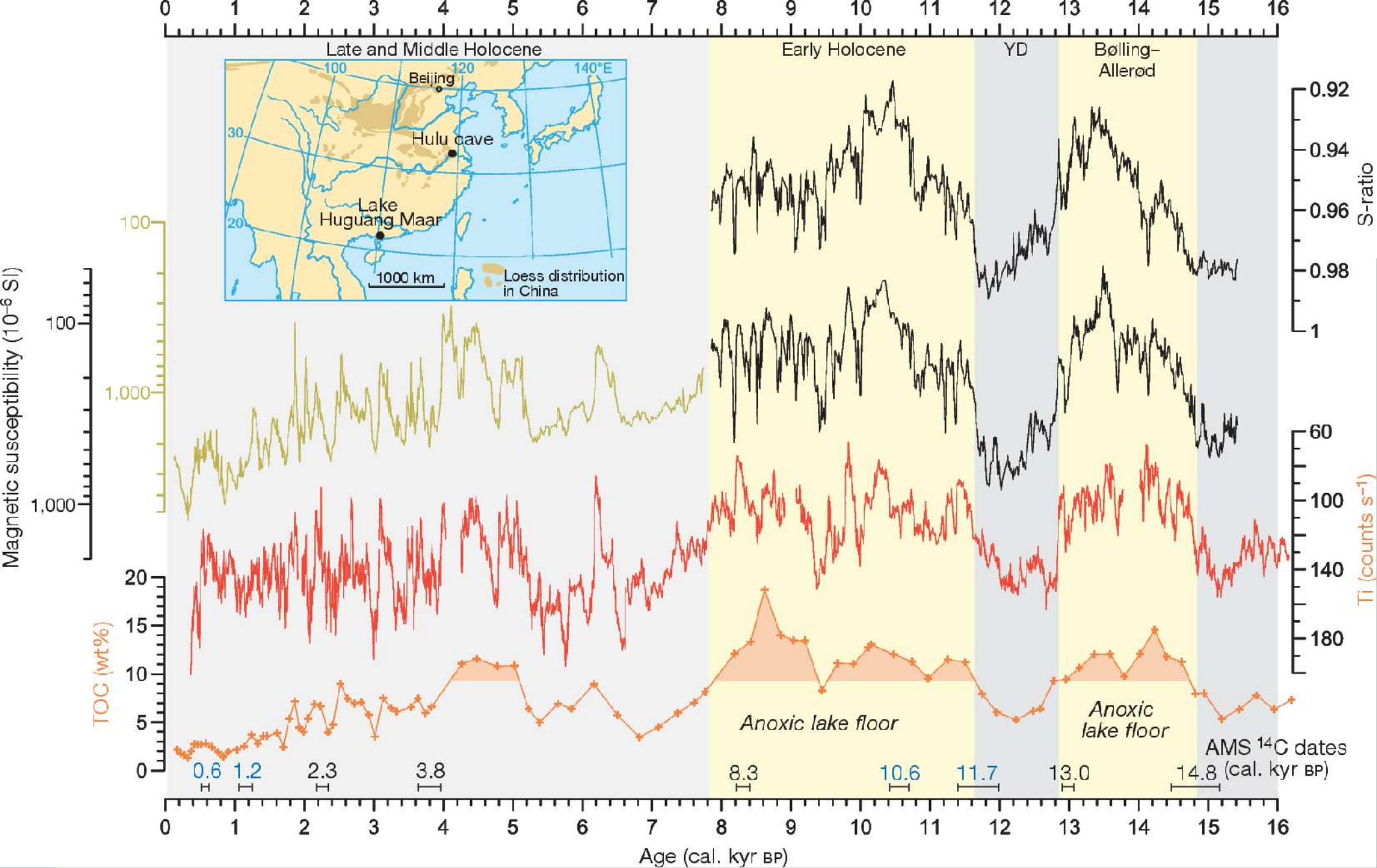
- International connections
 - Buddhism
 - Islam
 - ...
- Literature and arts
- Inventions
 - Printing
 - Gunpowder

The End

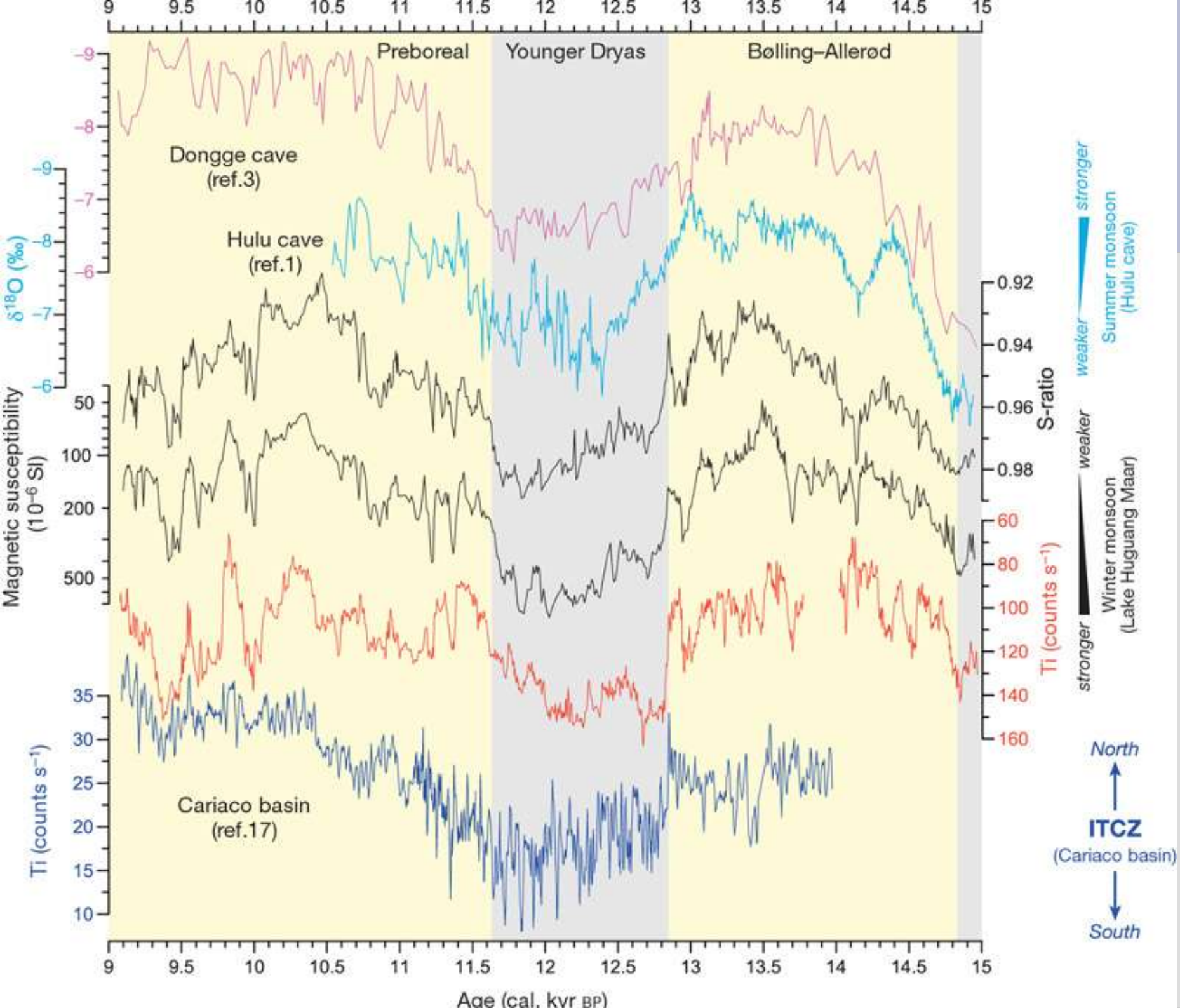
- 751: Arabs win the battle of Taras
- Defeat in the South West
- 755: Revolt
- 805-820: Stability under Xianzong
- 820: Xianzong murdered
- 840-846: Wuzong
 - Fanatical Daoist
 - Destruction of Buddhist monasteries (4600)
- Last emperors powerless; military commanders have real power

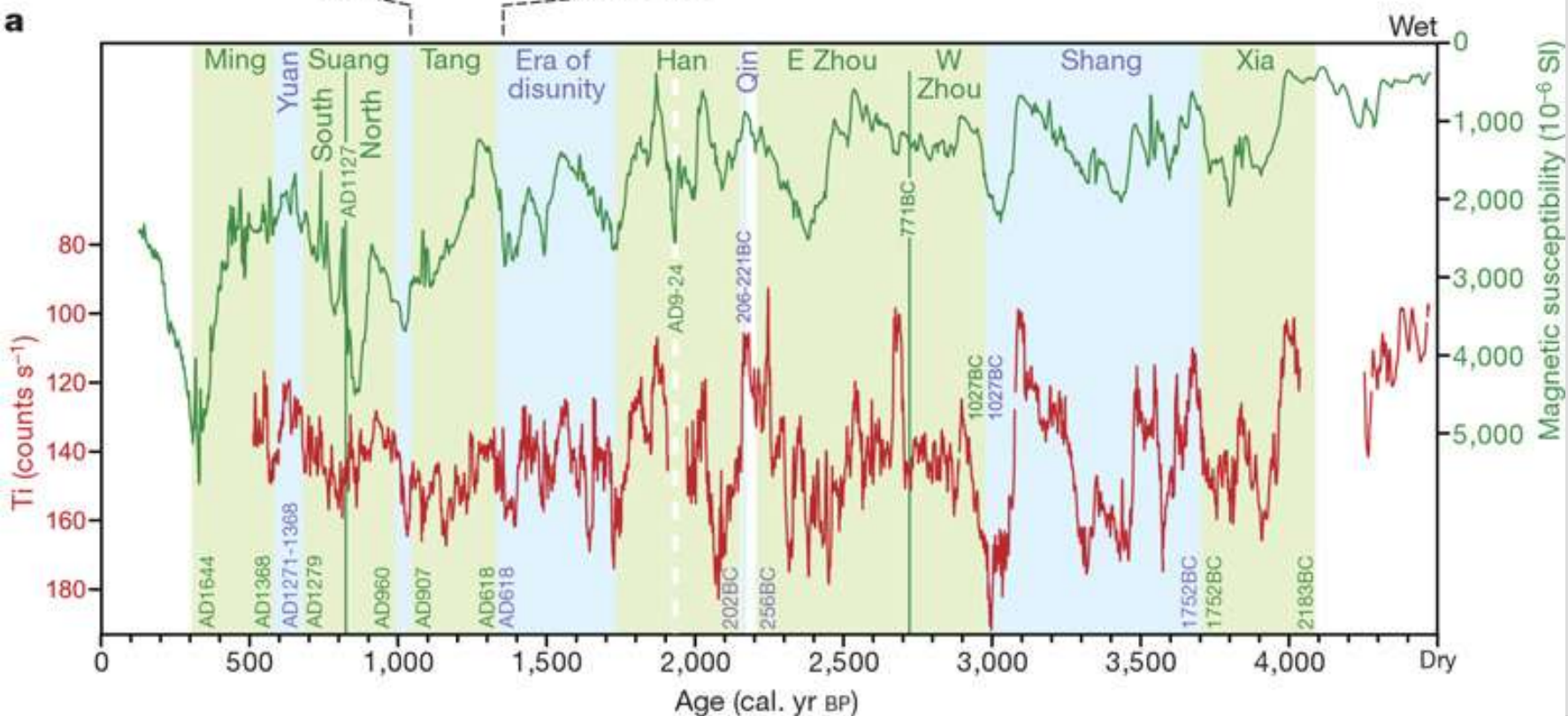
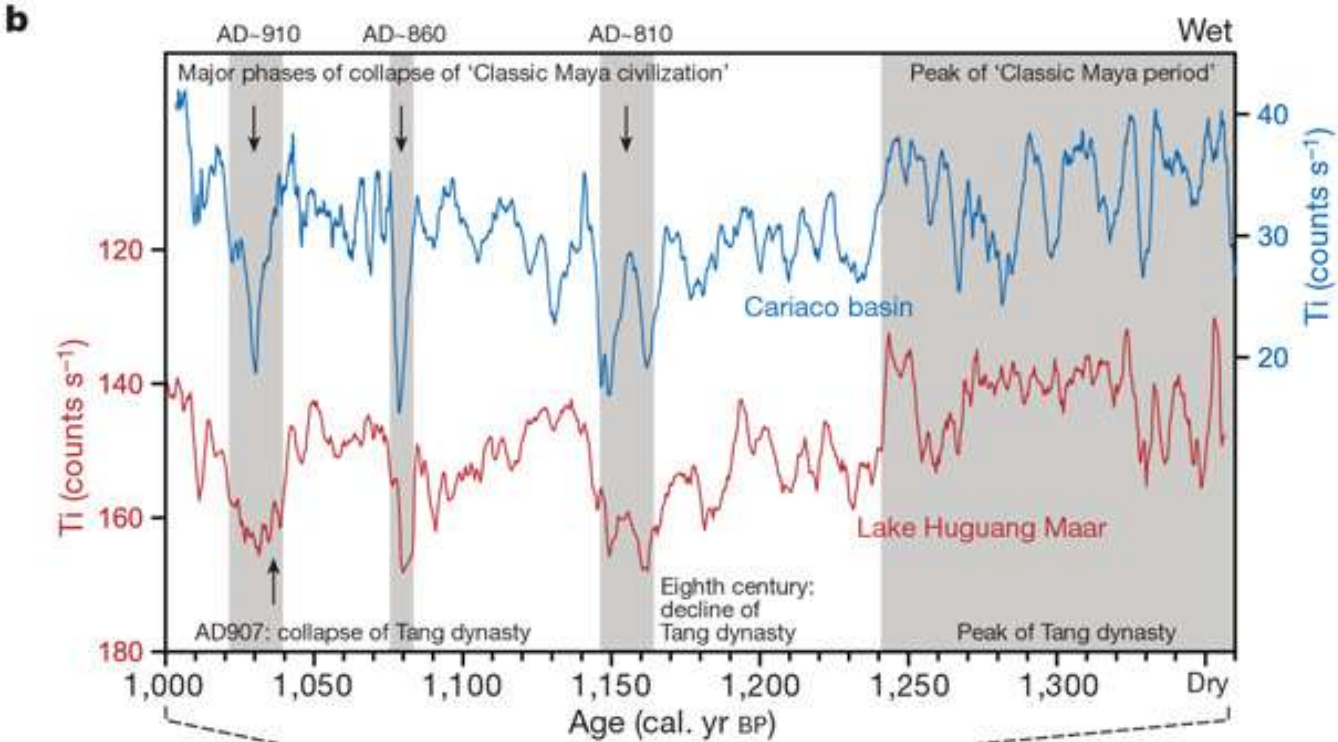
Measuring the Monsoon Lake Huguang Maar

- Accumulation of wind-blown material:
 - Titanium content (dust from deserts in the north)
- Indicators of water-column mixing (wind stress):
 - S-ratio (abundance of magnetite): high when oxygen is available at lake bottom
 - TOC (total organic carbon): low in oxic conditions
- Combination of both:
 - magnetic susceptibility (iron input from dust, but also chemical redox conditions)

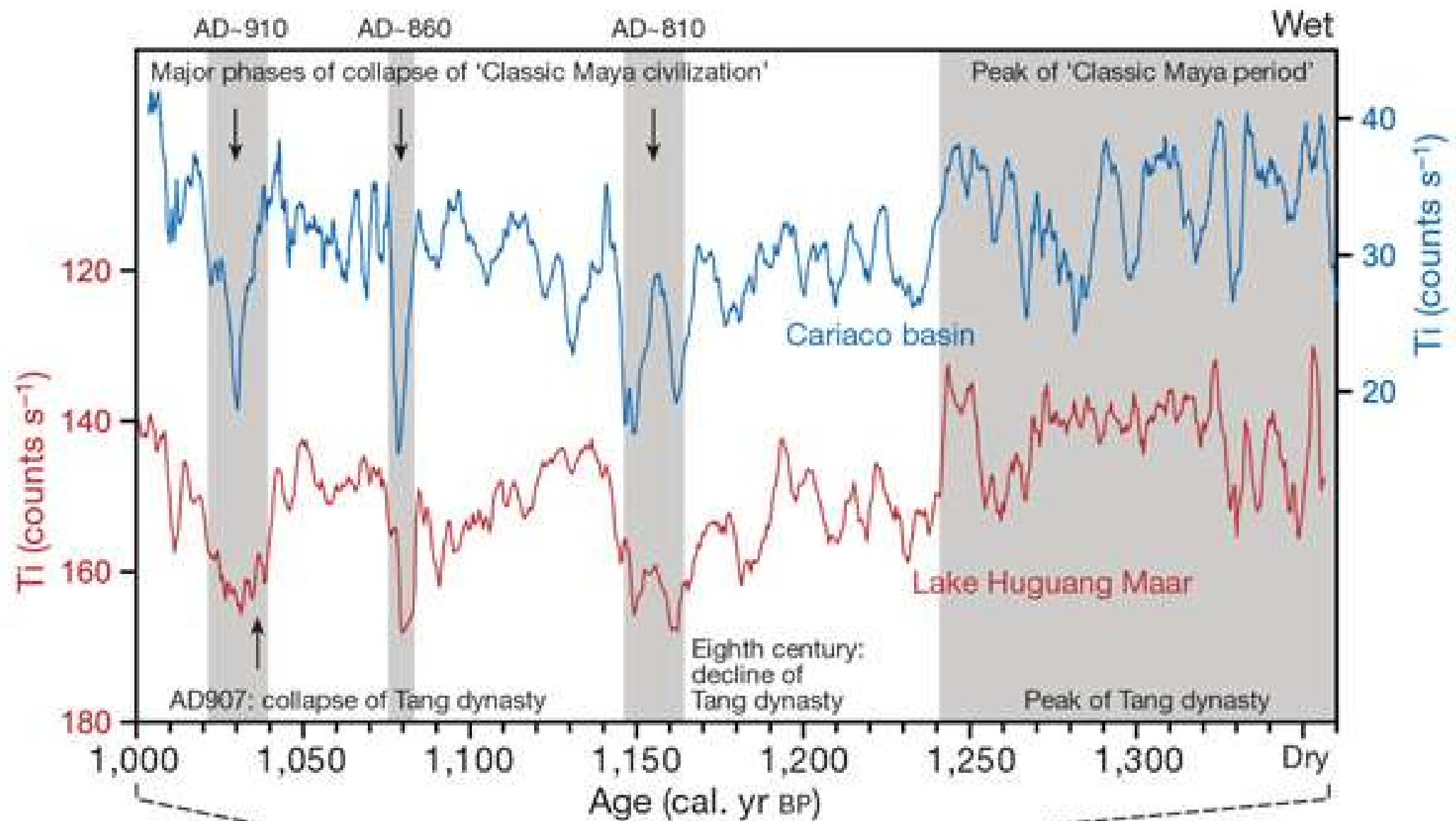


Yancheva et al. (2007): Influence of the intertropical convergence zone on the East Asian monsoon. Nature 445, p. 74-75

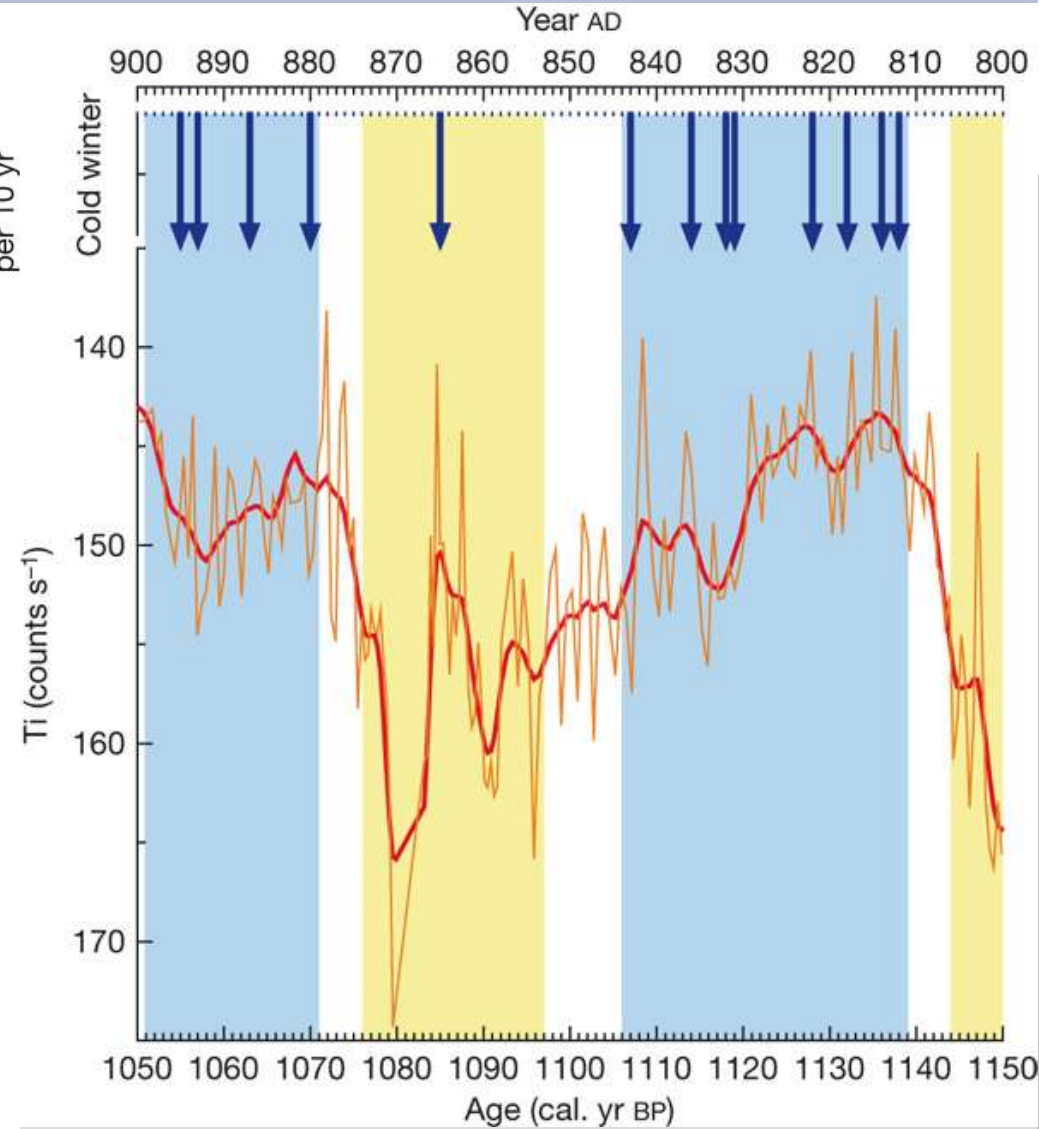
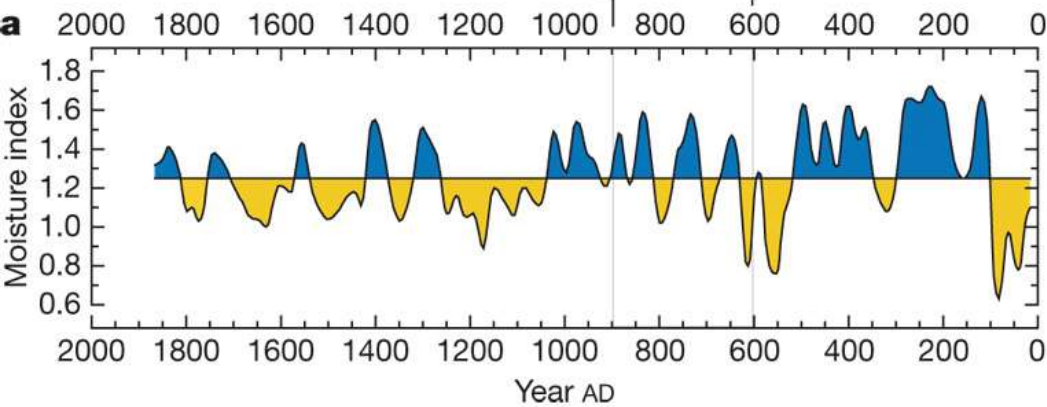
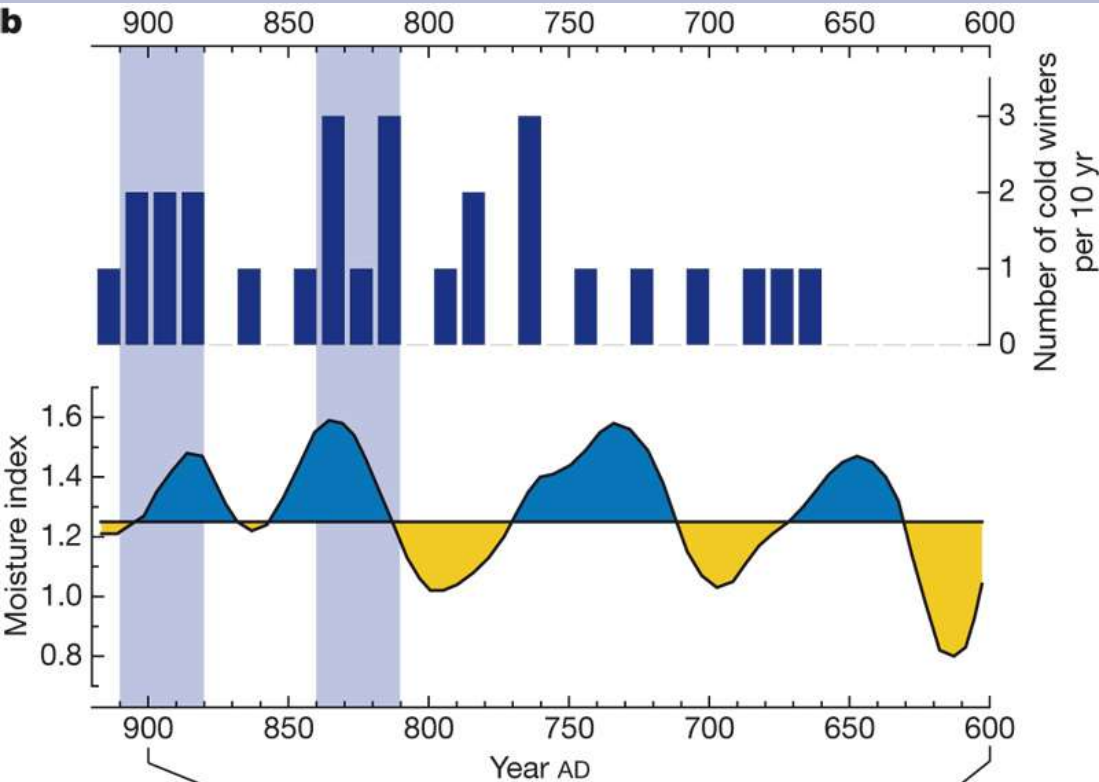




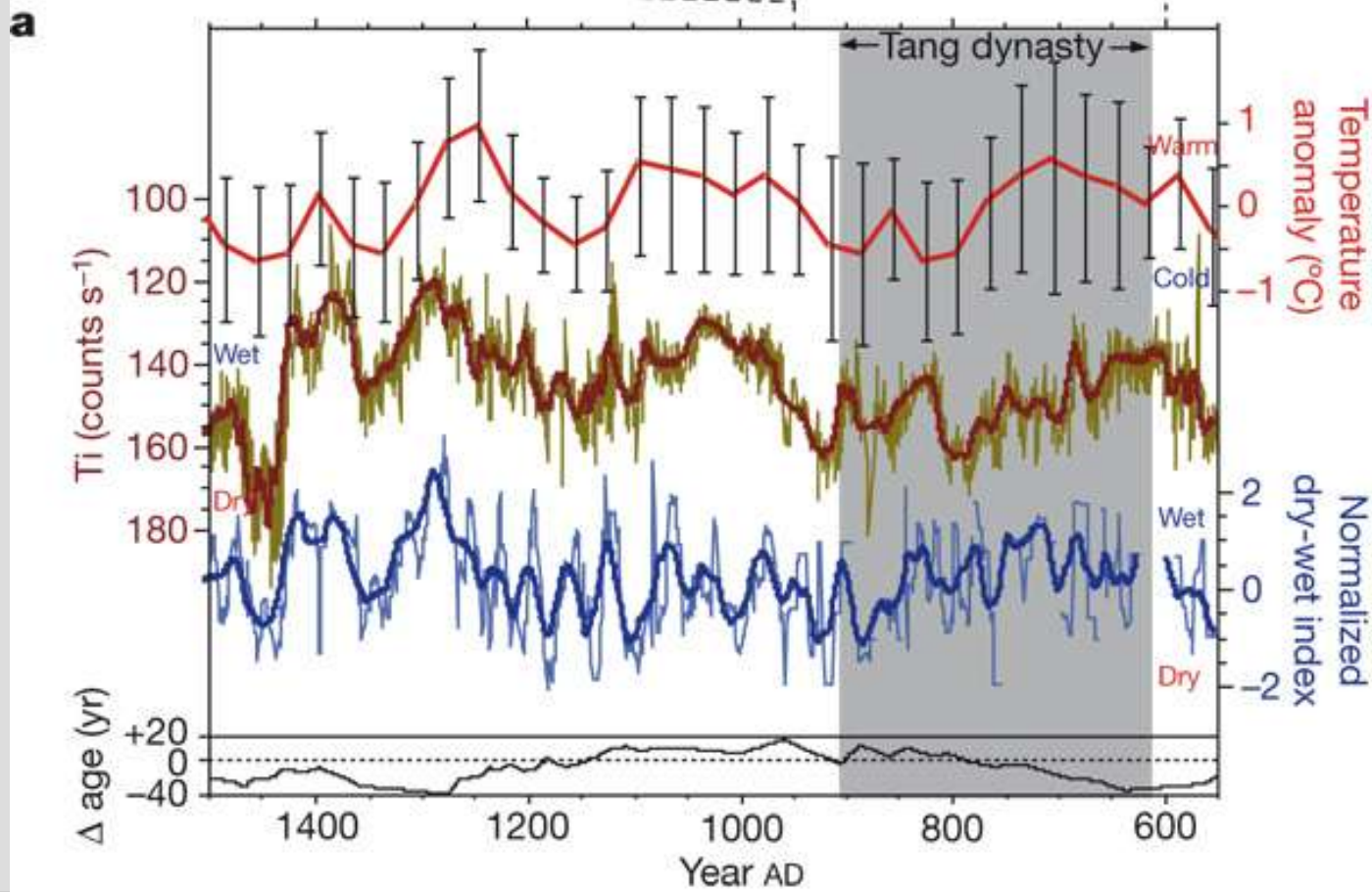
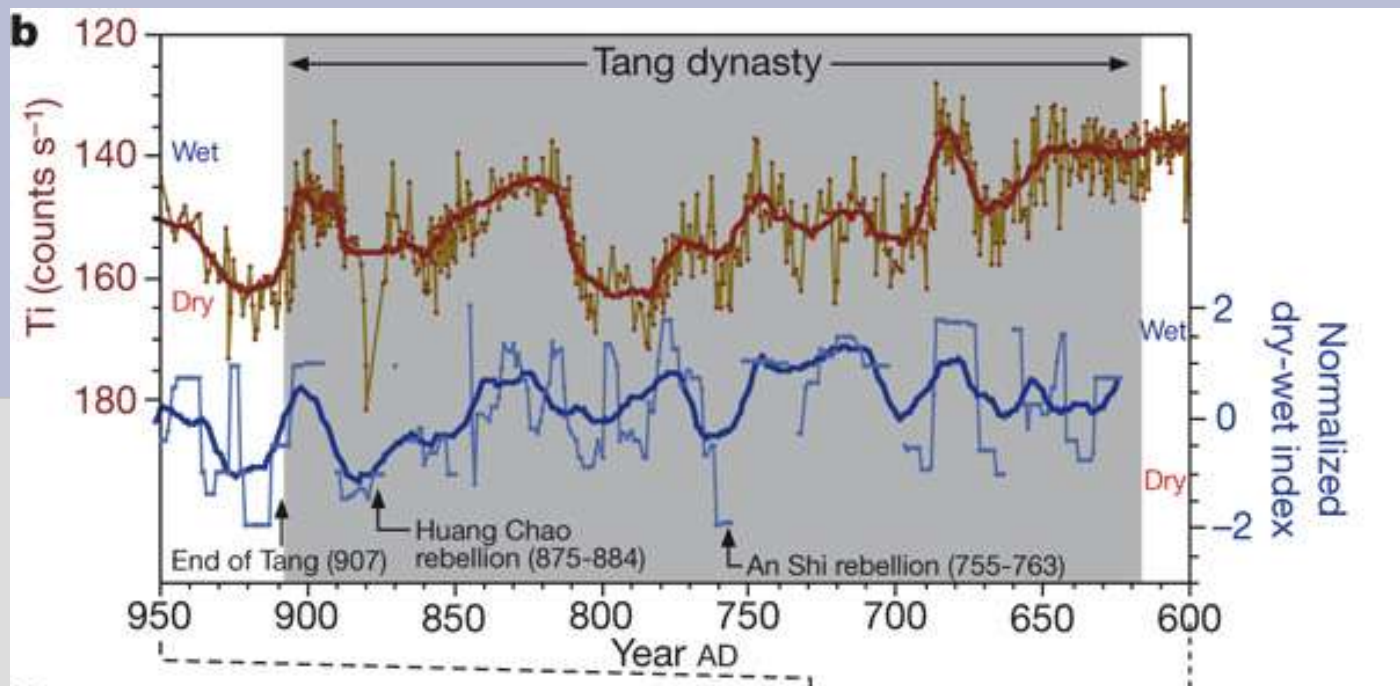
Maya, Tang and the Monsoon



Or cold winters in China?



Zhang, Lu (2007): Nature 450, E7



Yancheva et al.
(2007), Nature 450,
E8-E9

Song dynasty 960 – 1279 AD

- Population doubled during 10-11th century
- Standing navy
- Banknotes
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