

# Climate and Human History

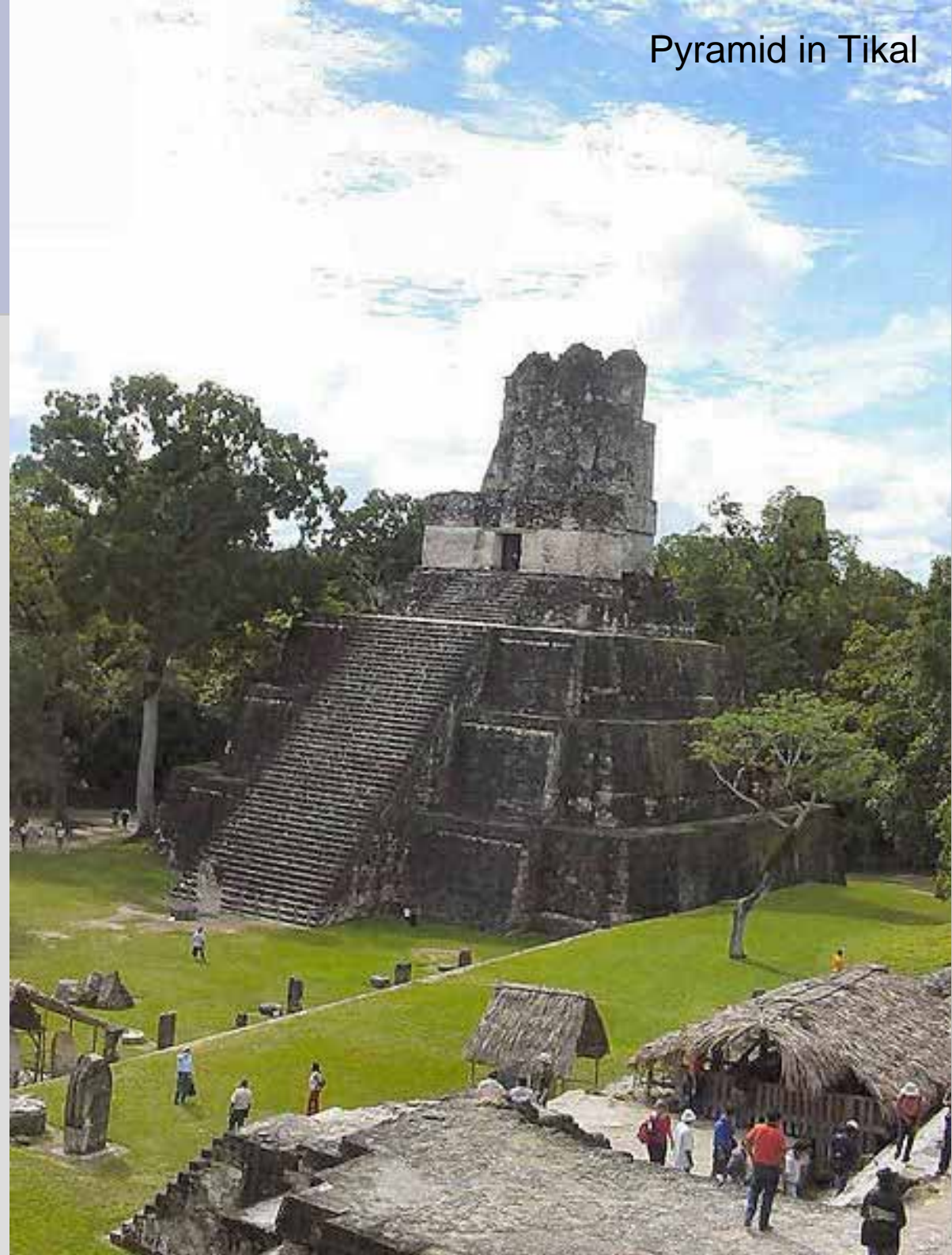
## Stephan Matthiesen

1. Climate and climate history
2. The Ice Age
3. Farming and City States
4. The Roman Empire
5. Tang and Maya in the 10th century
6. Mediaeval Optimum and Little Ice Age
7. El Niño through the ages
8. Miscellaneous topics
9. Current and future changes
10. Summary and re-cap

# 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?)

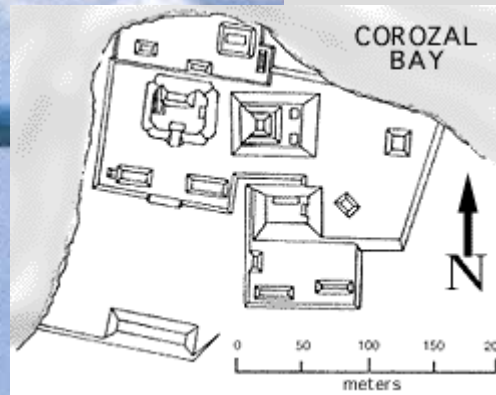
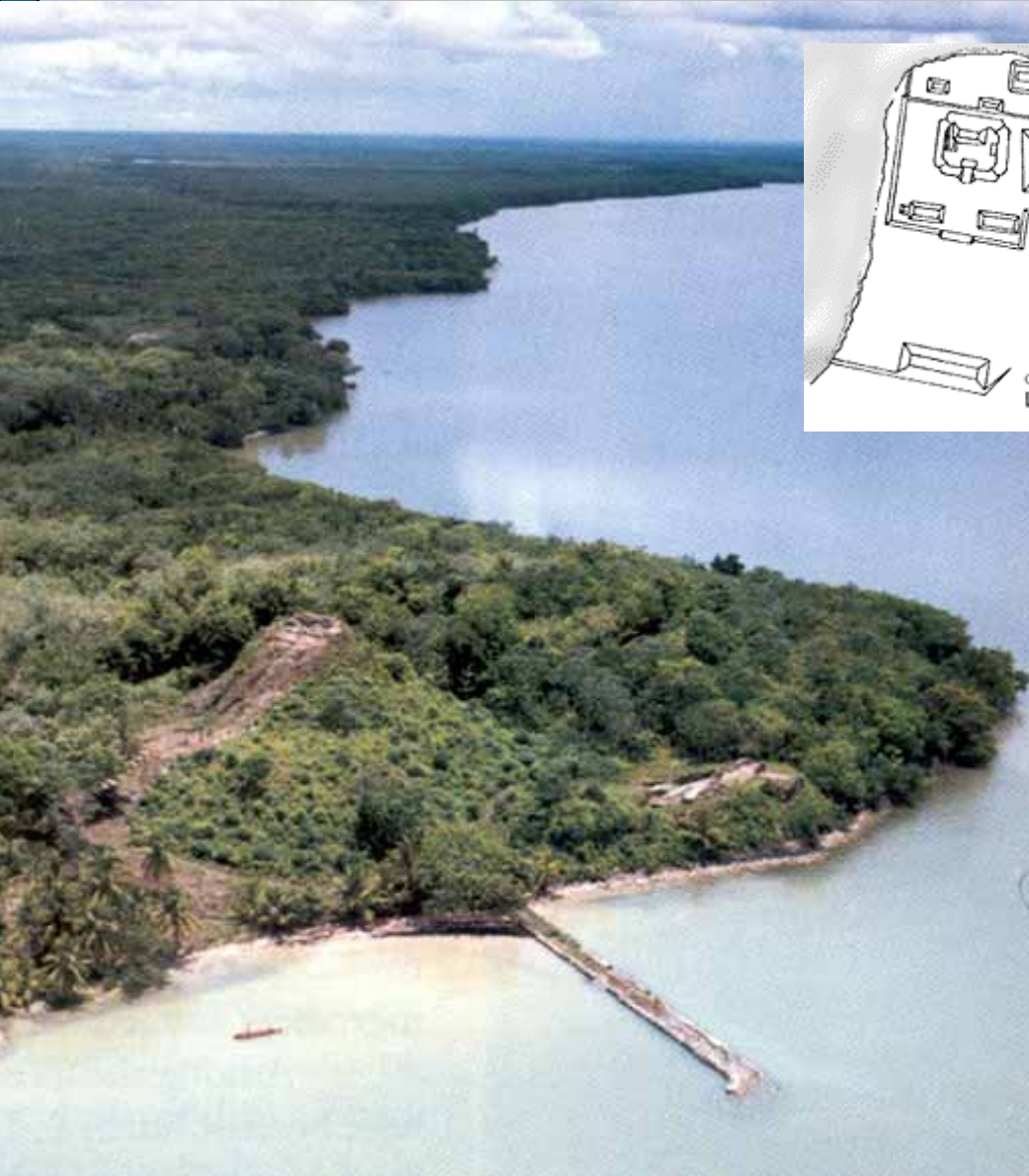
- Massive building programme
- Change in imagery: symbolic displays on the order of the Universe
- Kings

Structure 34, El Mirador, Late Preclassic





# Late Preclassic Site (ca 50BC) Cerro, Belize



Structure 5C-2nd, ca. 50BC

# 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

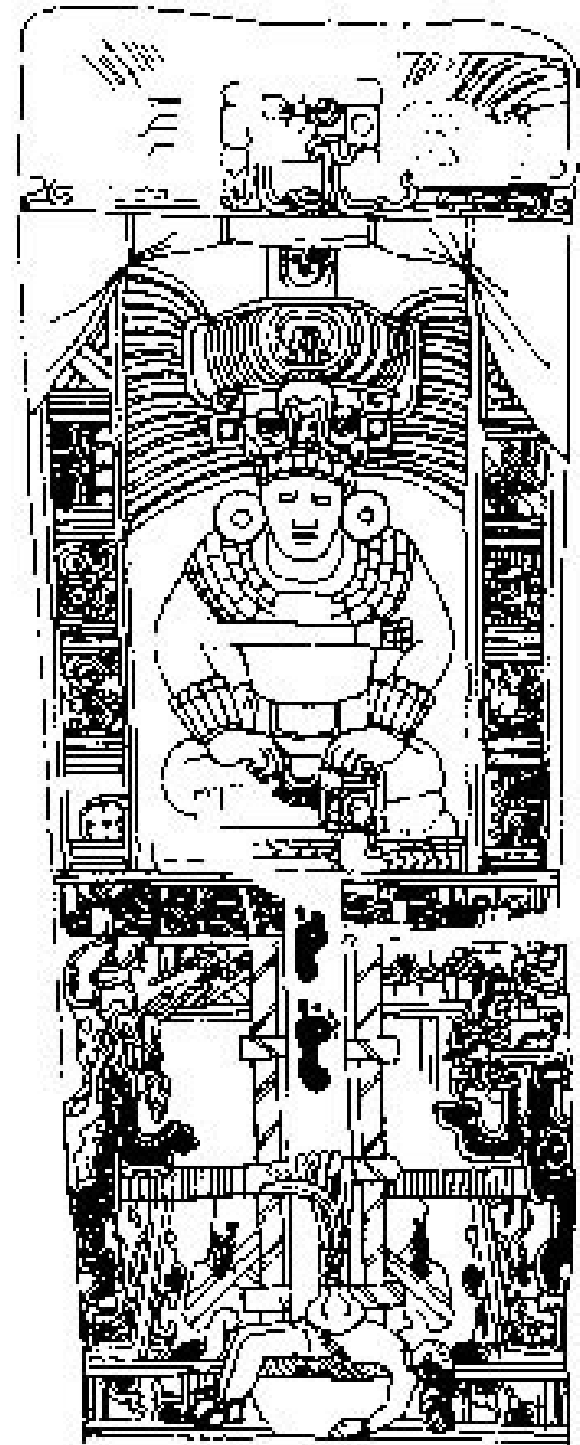
## Piedras Negras

### 22 Aug. 731

- Accession of “Ruler 4” of Piedras Negras



Piedras Negras



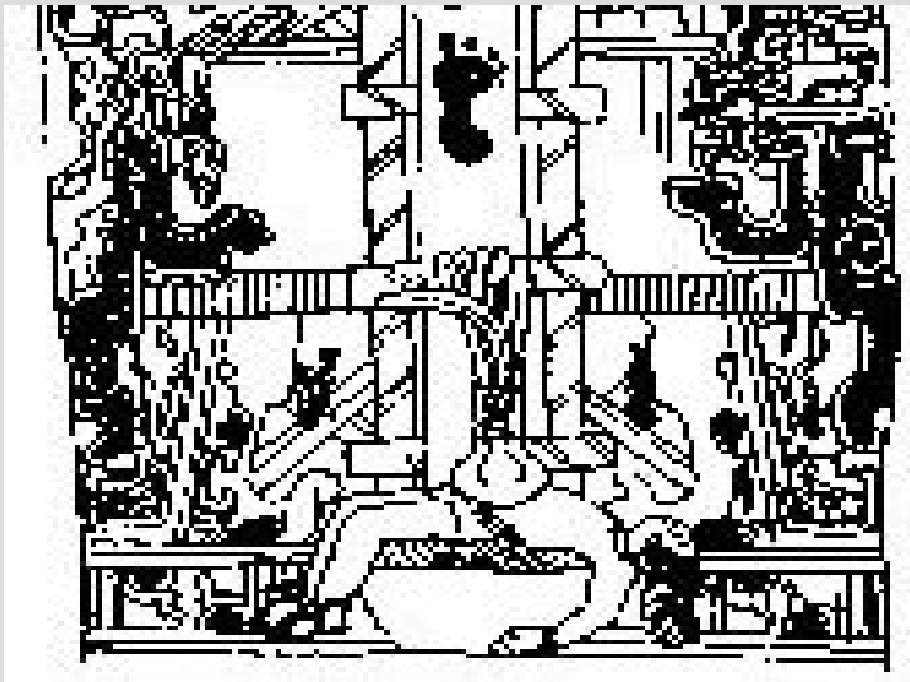
# Stela 11

## Piedras Negras

### 22 Aug. 731

Human sacrifice

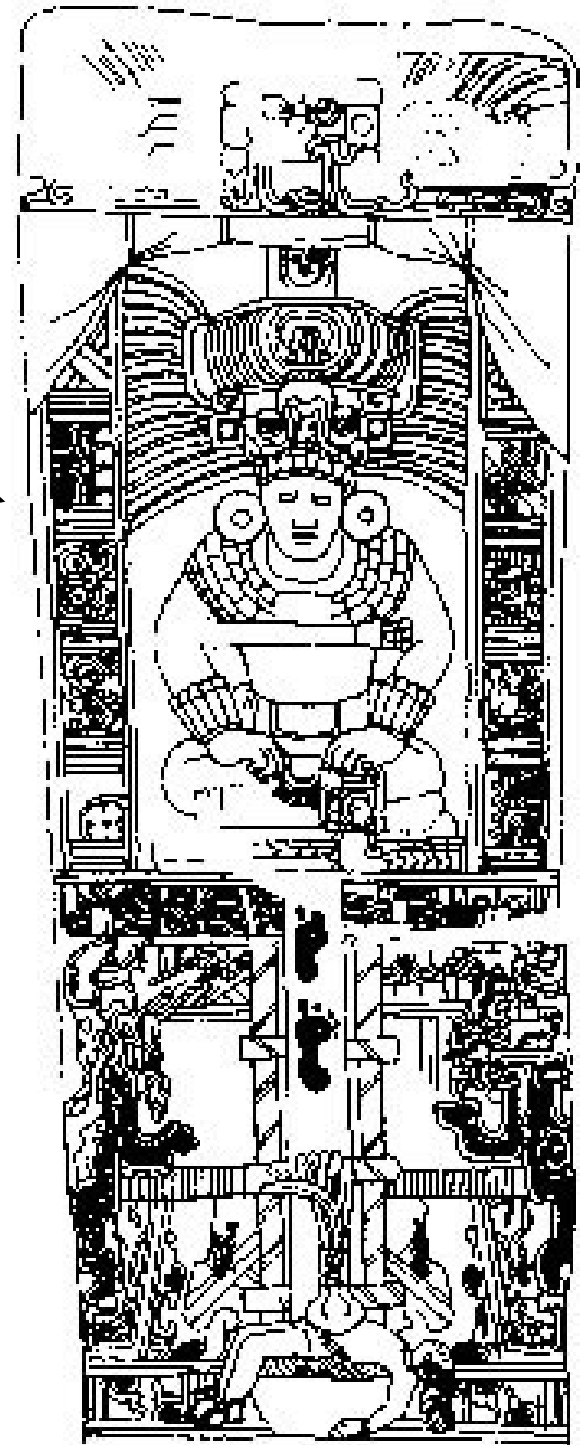
Cloth with bloody footprints



Sacrificial victim on Altar

Sky  
band

Blood  
stream

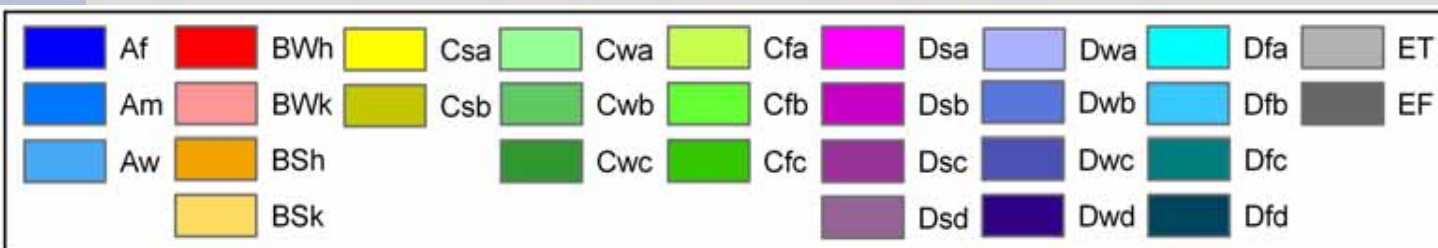
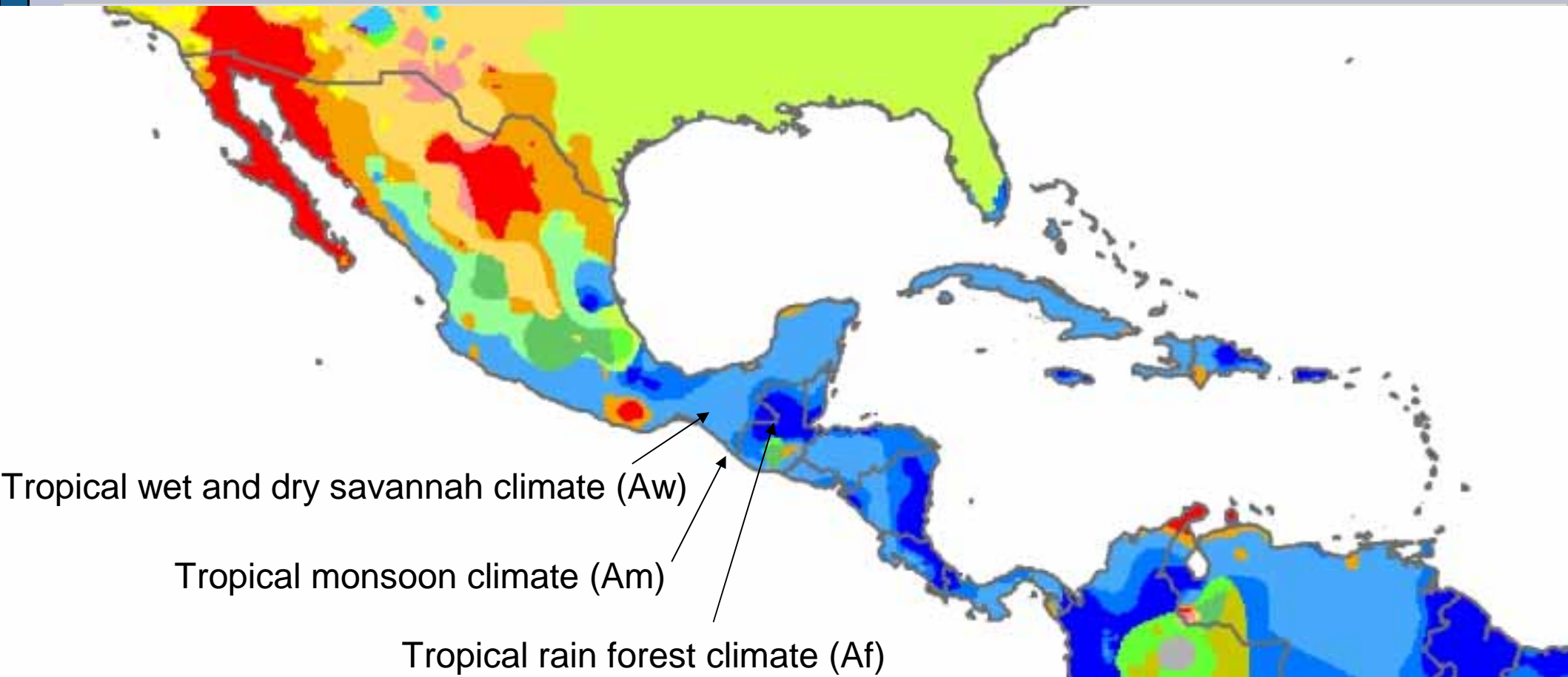


# Maya History

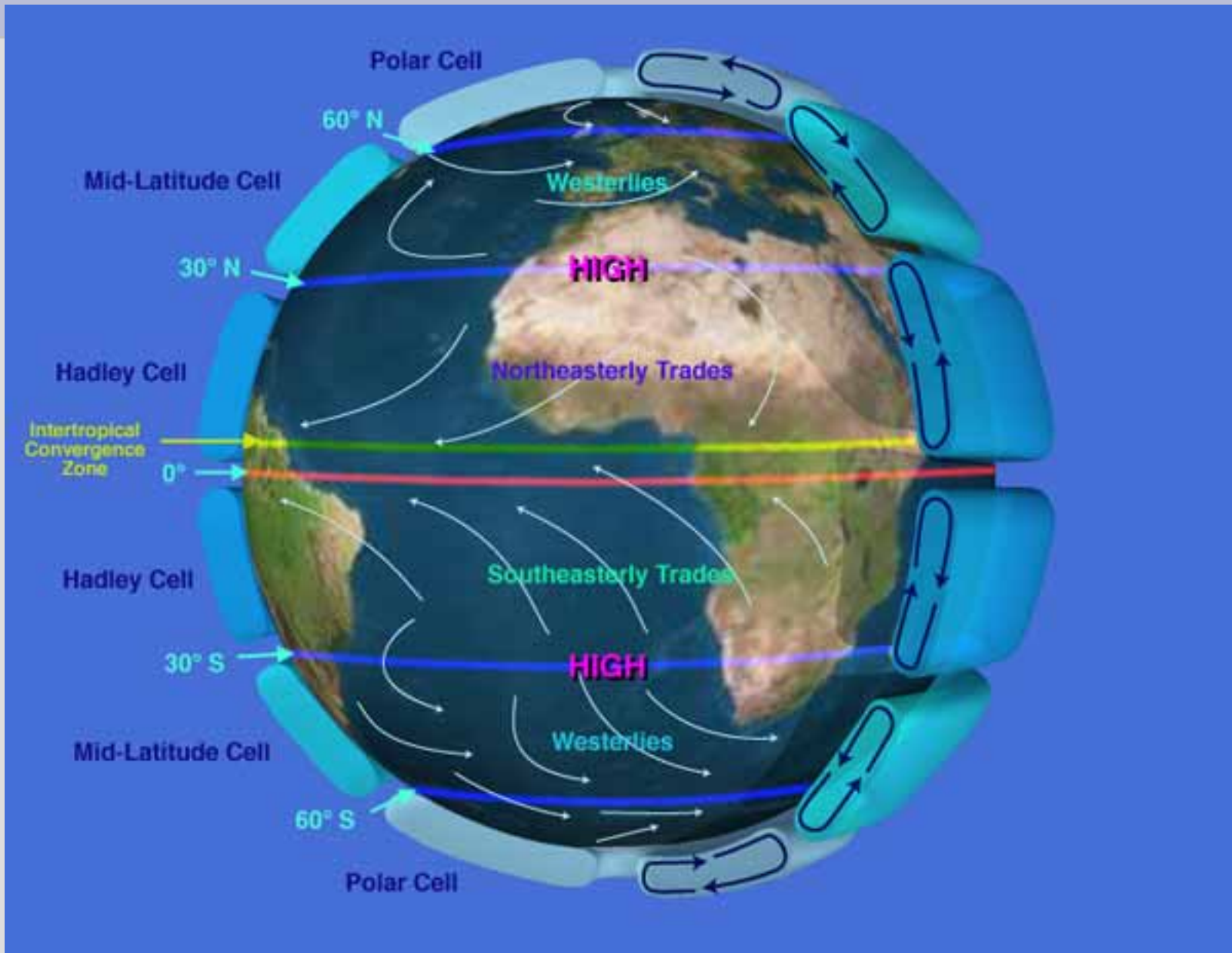
- 3000BC – 400BC Early&Middle Preclassic  
Growth and development of Cities
- 400BC – 250AD Late Preclassic  
Crisis and Transition
- 250AD – 600AD Early Classic  
Growth
- 600AD – 900AD Late Classic  
Building activity, but decline
- 900AD – 1511AD Postclassic  
Central Yucatan abandoned



# Climate in Mesoamerica



# Atmospheric Circulation





# The Intertropical Convergence Zone (ITCZ)

Cariaco Basin



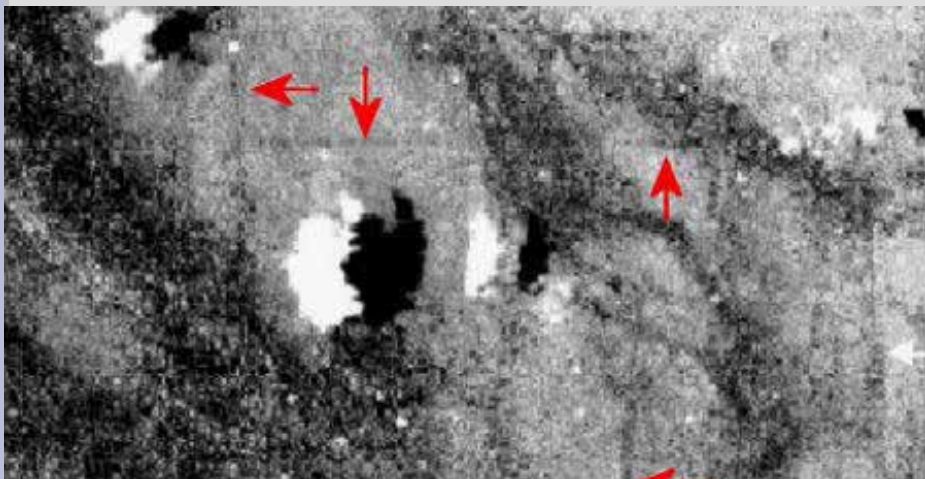


# Agriculture

Slash-and-burn  
Milpa system

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

Artificial irrigation with  
basins and canals



Satellite image from El Mirador, Preclassic

# 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



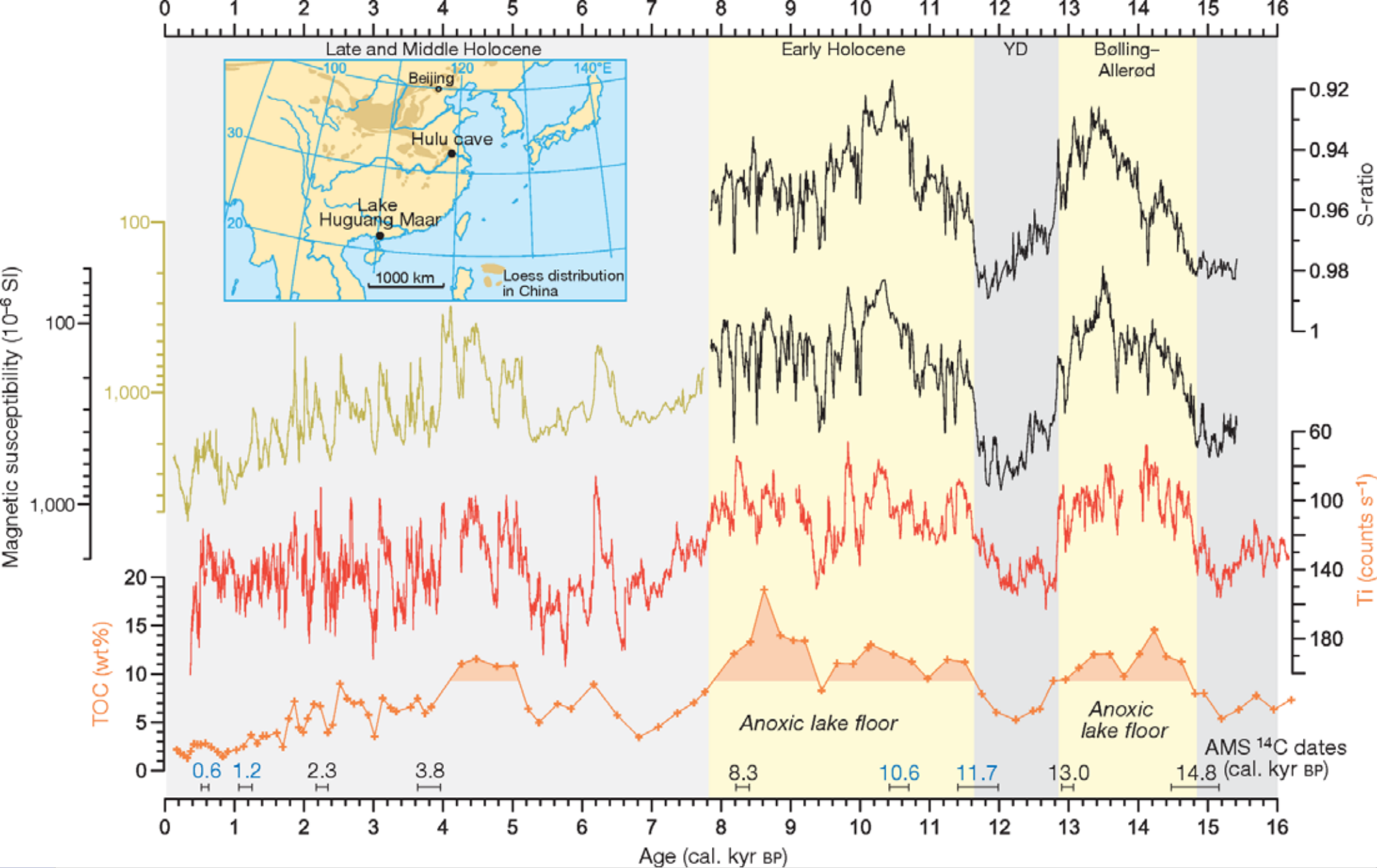
# The End

- 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

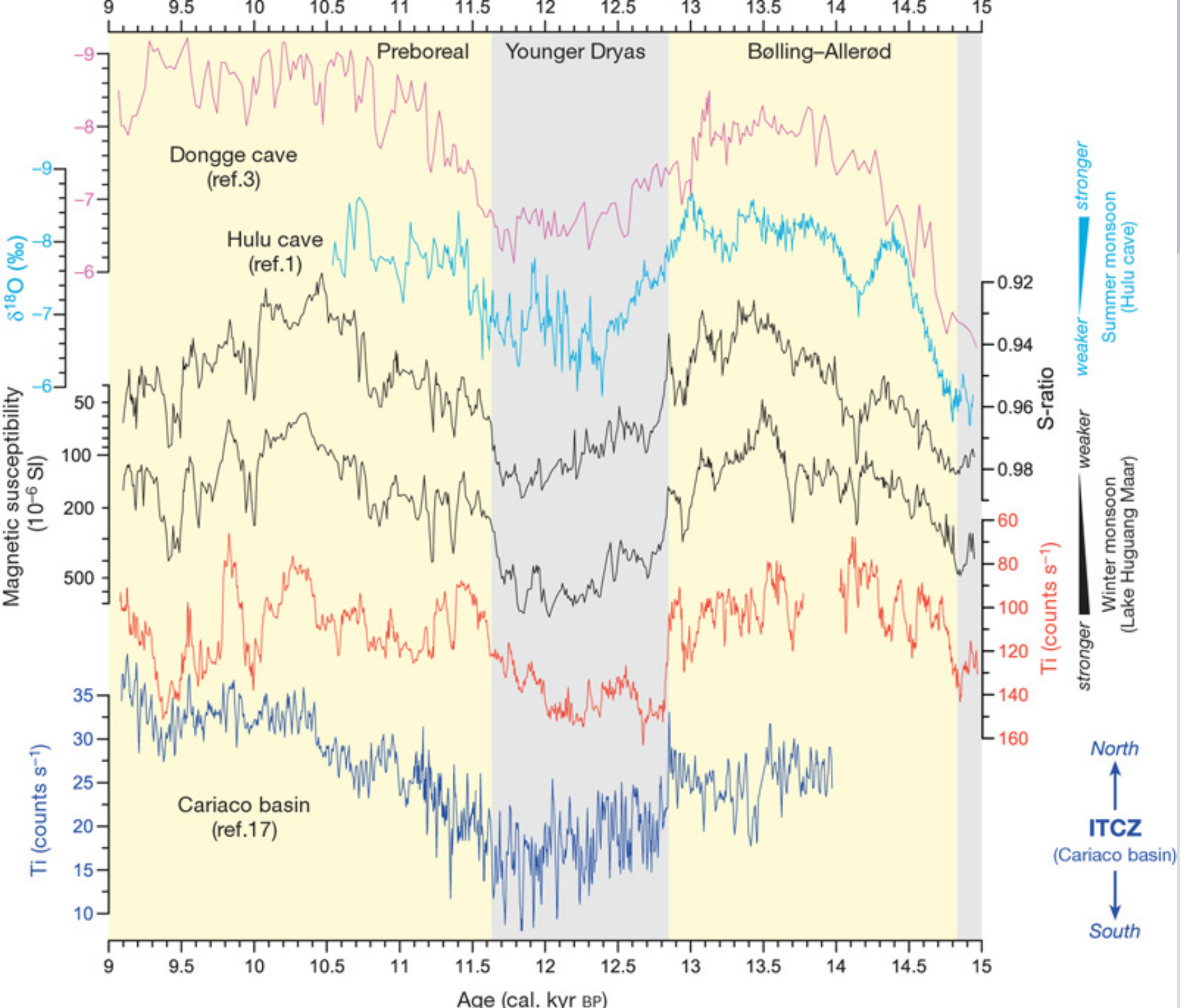
## Lake Huguang Maar

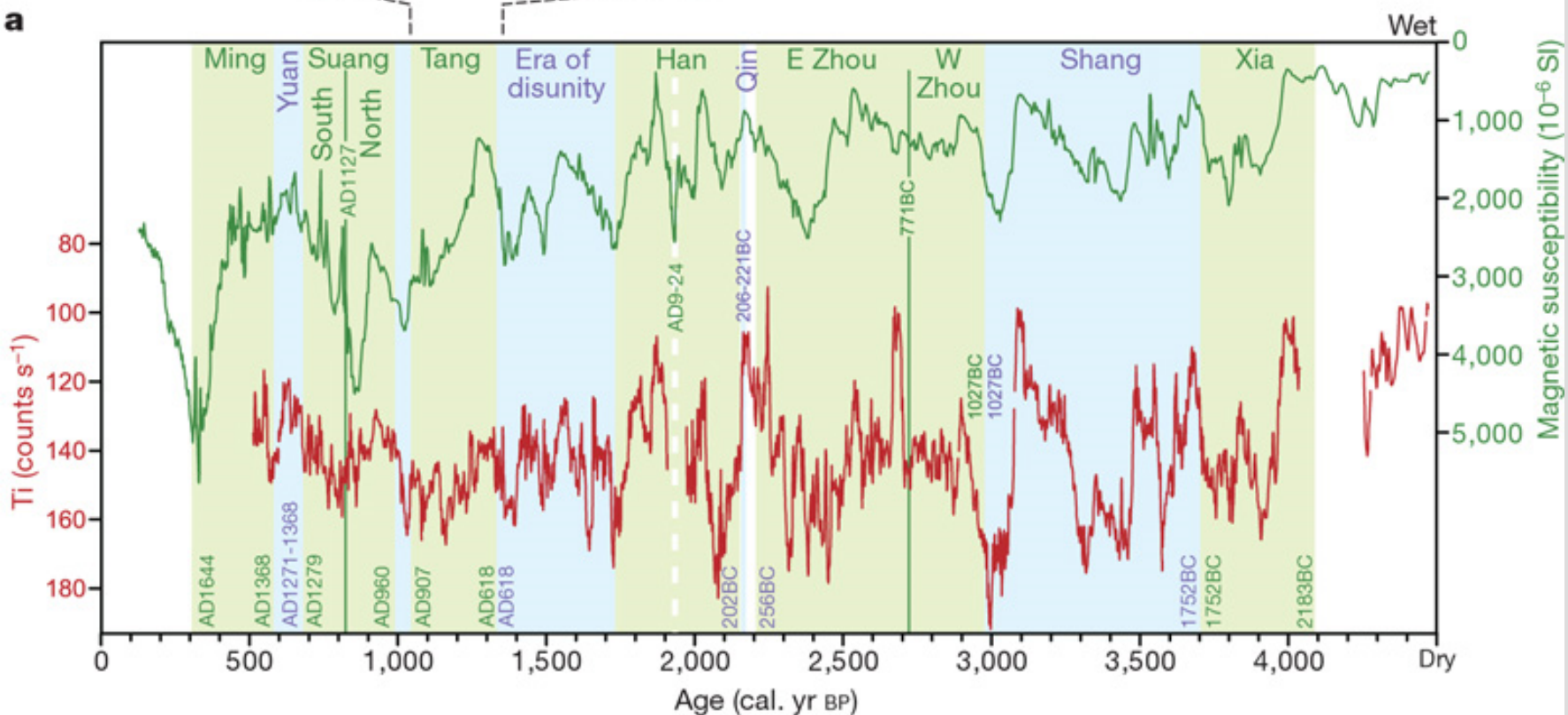
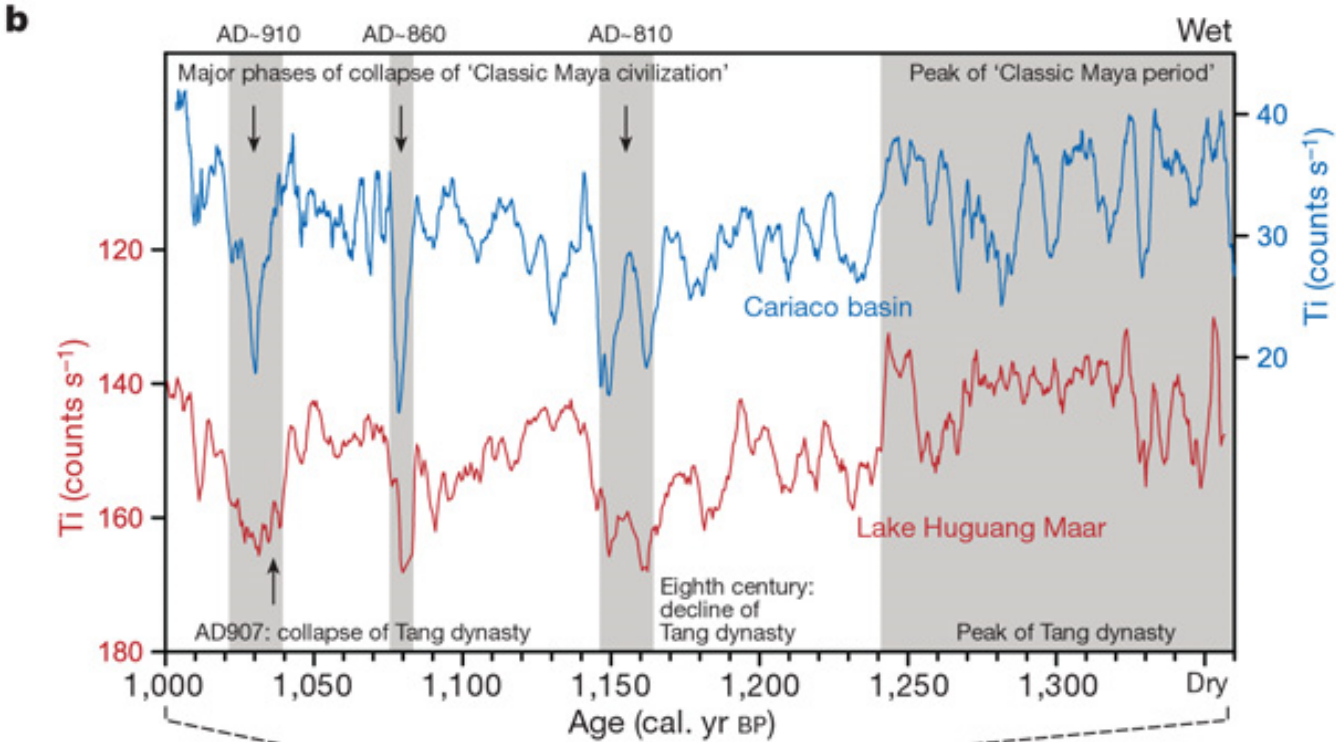
- Accumulation of wind-blown material:
  - Titanium content (dust from deserts in the north)
- Indicators of water-column mixing (wind stress):
  - S-ratio (abundance of magnetite): high when oxygen is available at lake bottom
  - TOC (total organic carbon): low in oxic conditions
- Combination of both: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



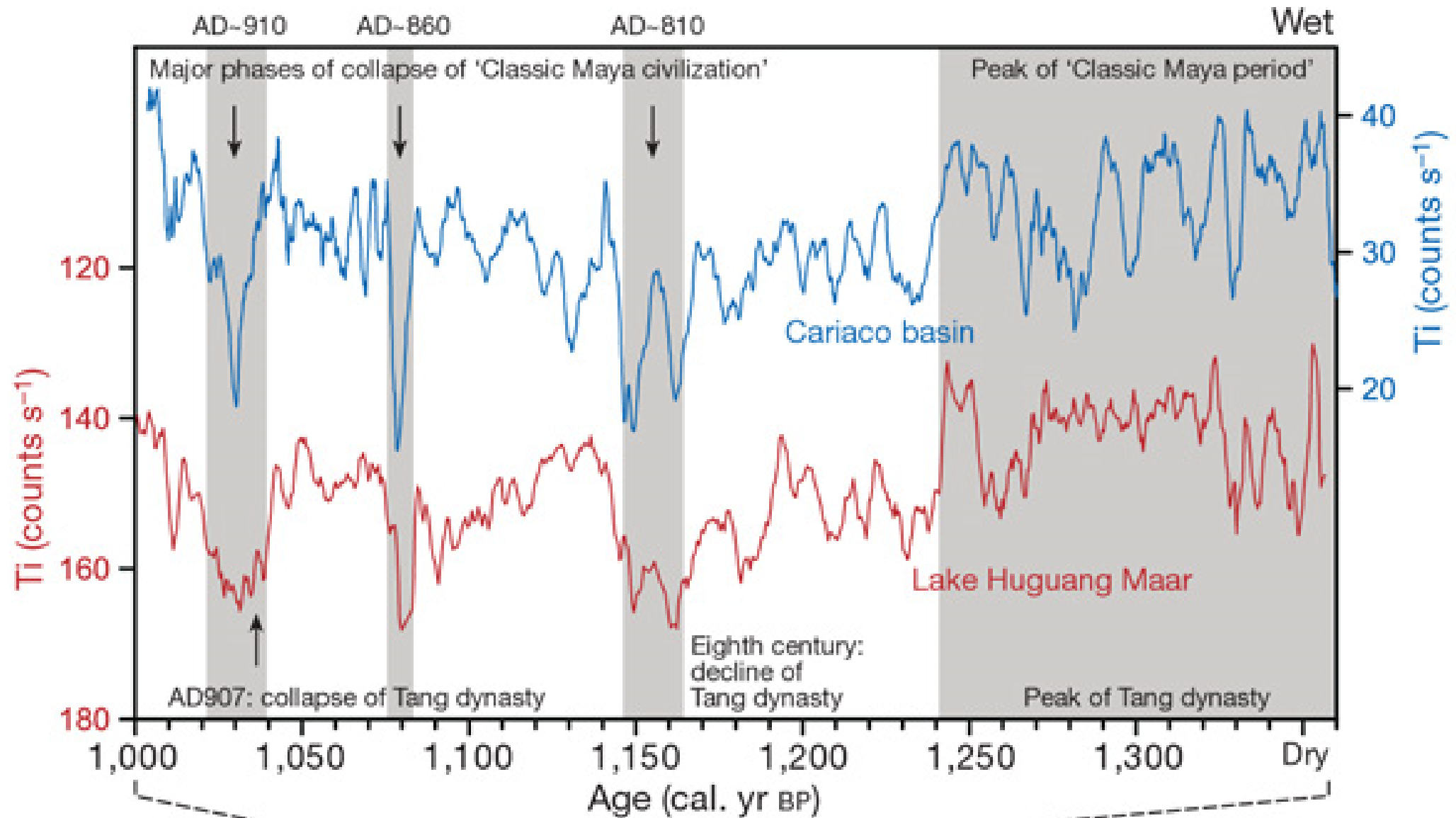
Yancheva et al. (2007): Influence of the intertropical convergence zone on the East Asian monsoon. Nature 445, p. 74-75



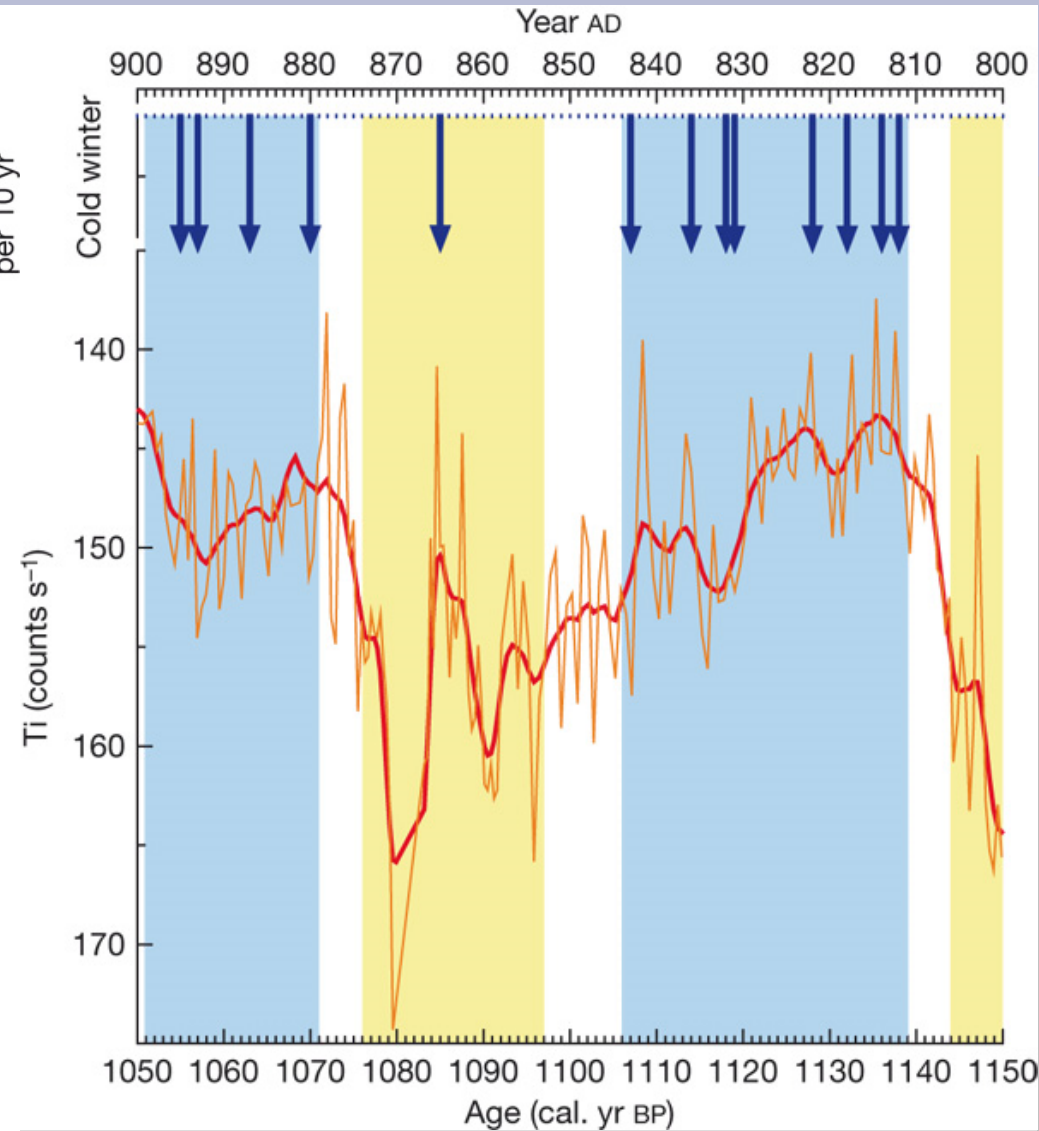
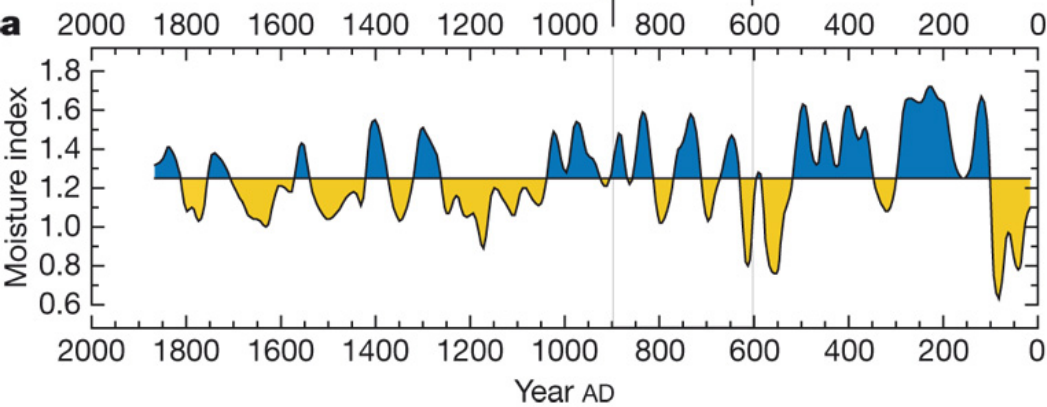
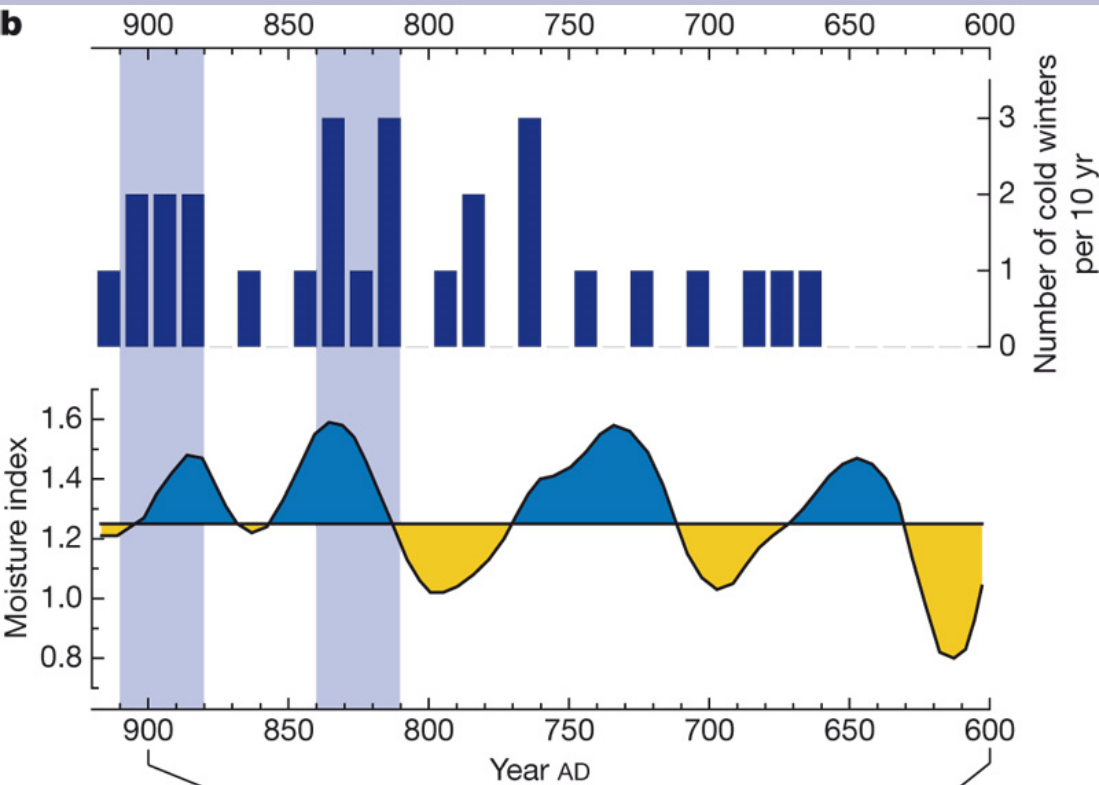




# Maya, Tang and the Monsoon

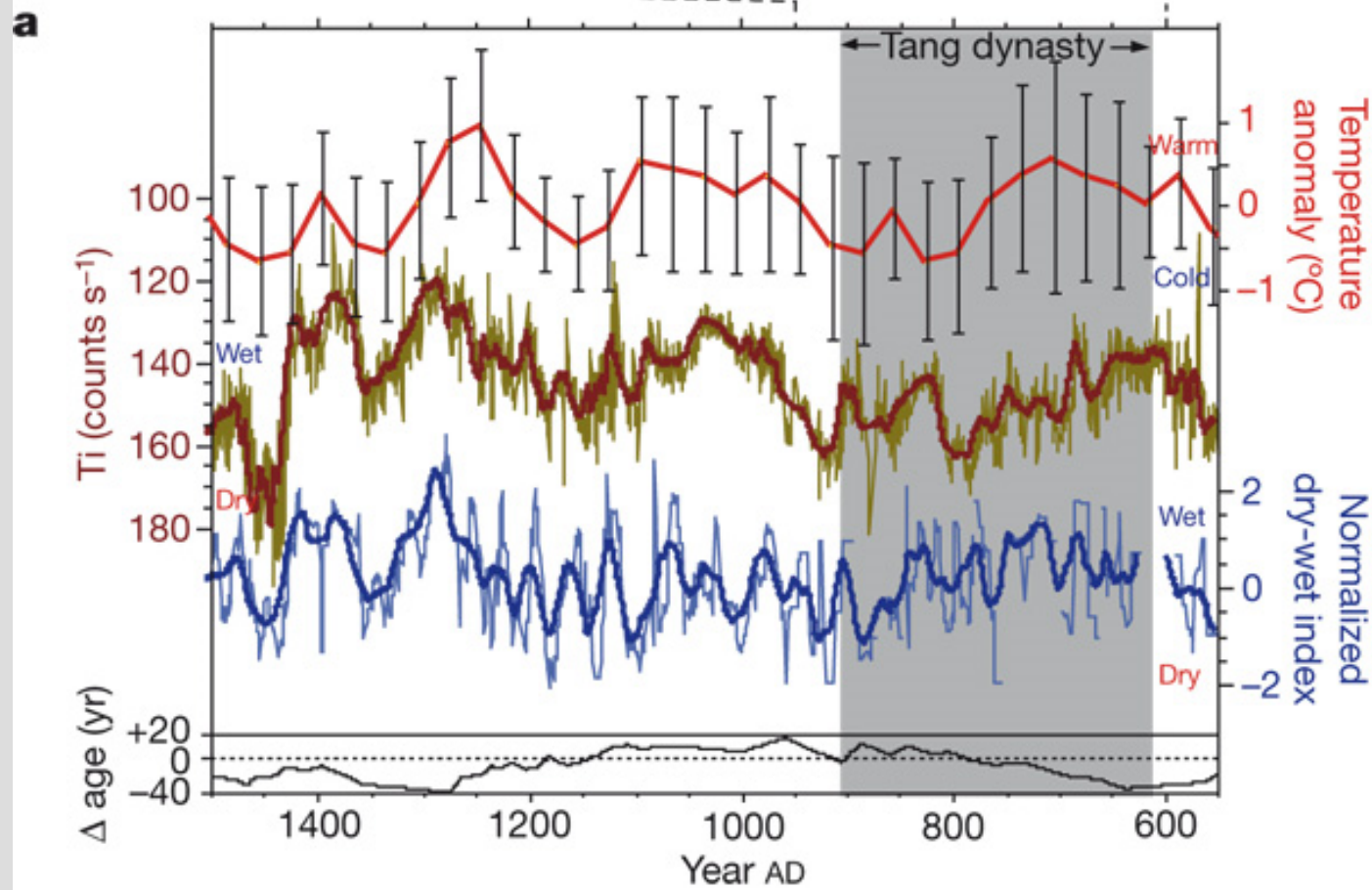
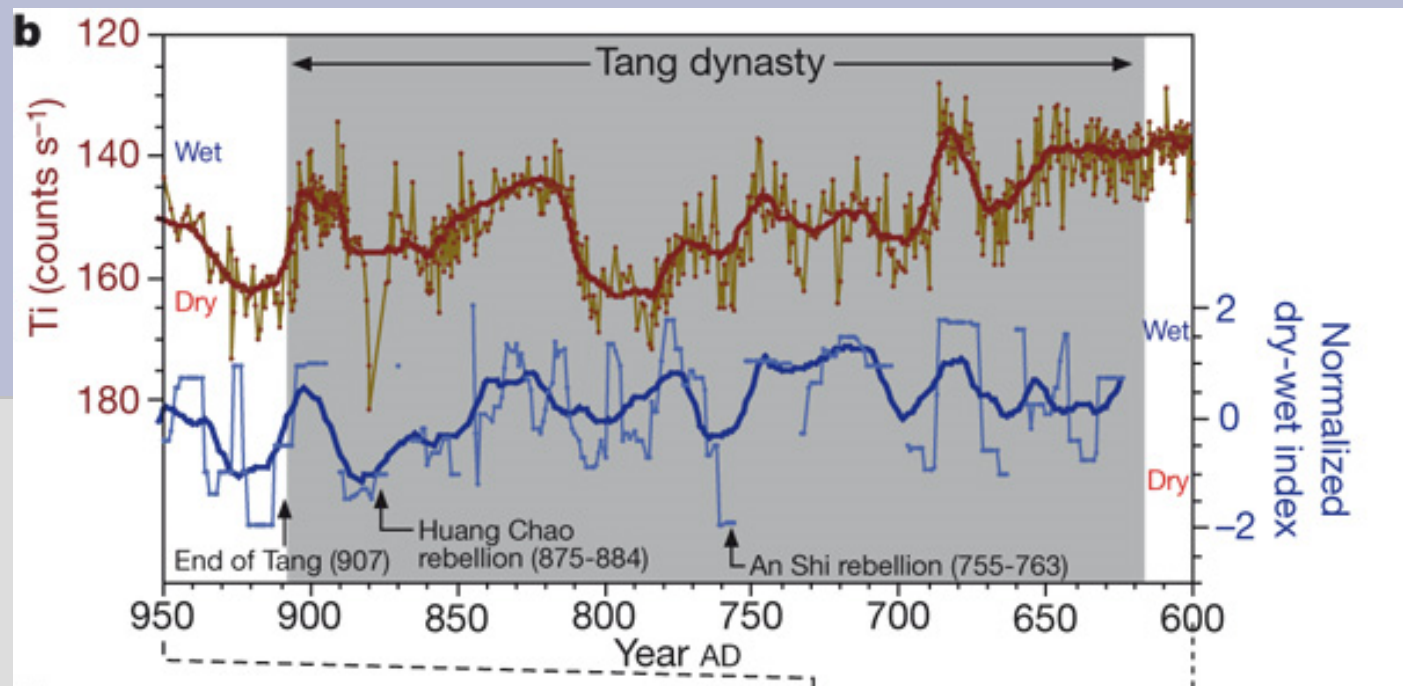


# Or cold winters in China?



Zhang, Lu (2007): Nature 450, E7





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

# Song dynasty

## 960 – 1279 AD

- Population doubled in size during 10-11<sup>th</sup> century
- Standing navy
- Banknotes
- ....



# Literature

- Fagan (2004): The Long Summer.
- Yancheva et al. (2007): Nature 445, p. 74-75
- Schele, Miller (1986): The Blood of Kings.