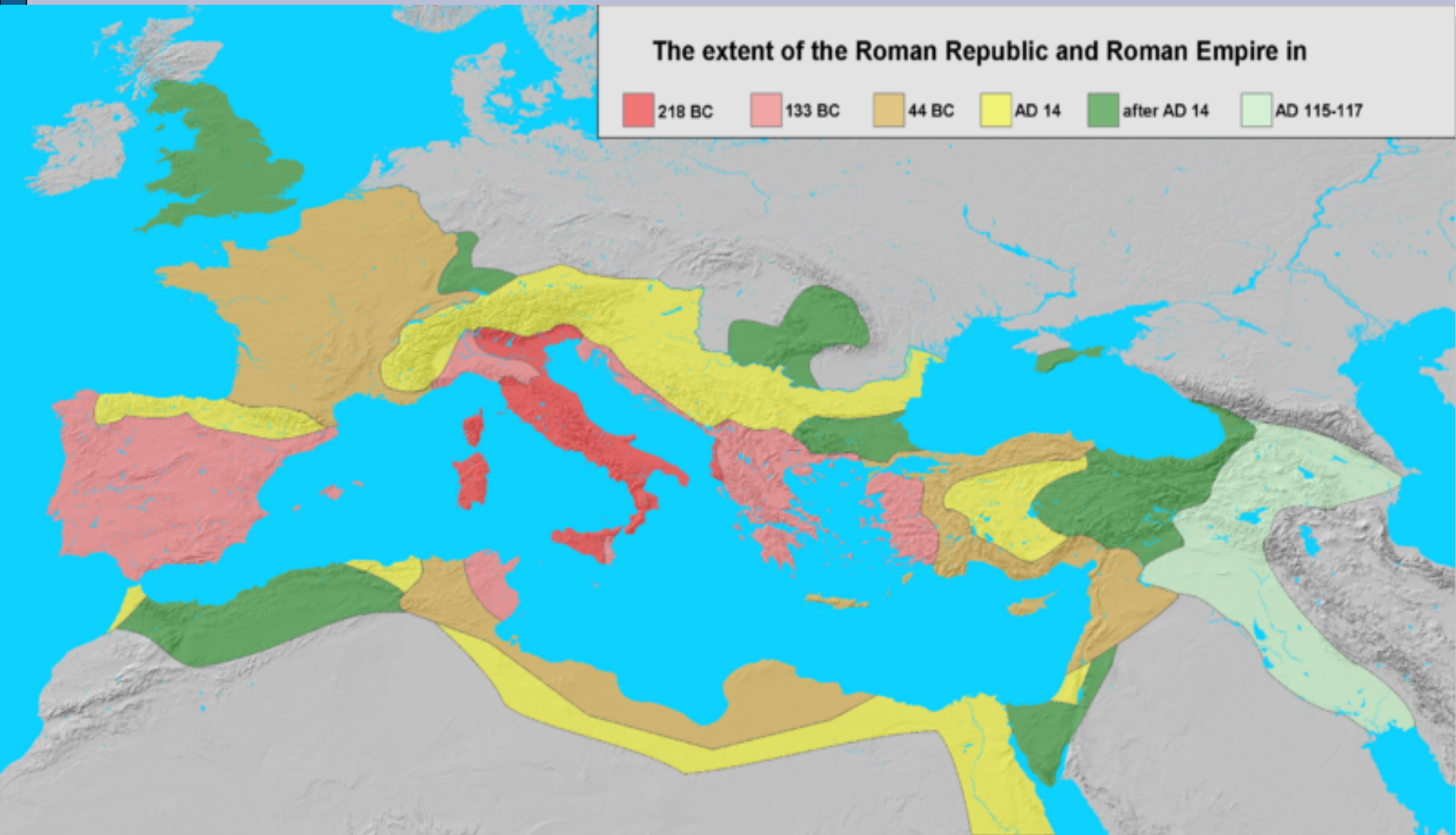


# Climate and Human History

## Stephan Matthiesen

1. Climate and climate history
2. The Ice Age
3. Farming and City States
4. **Roman Times**
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 Roman Empire

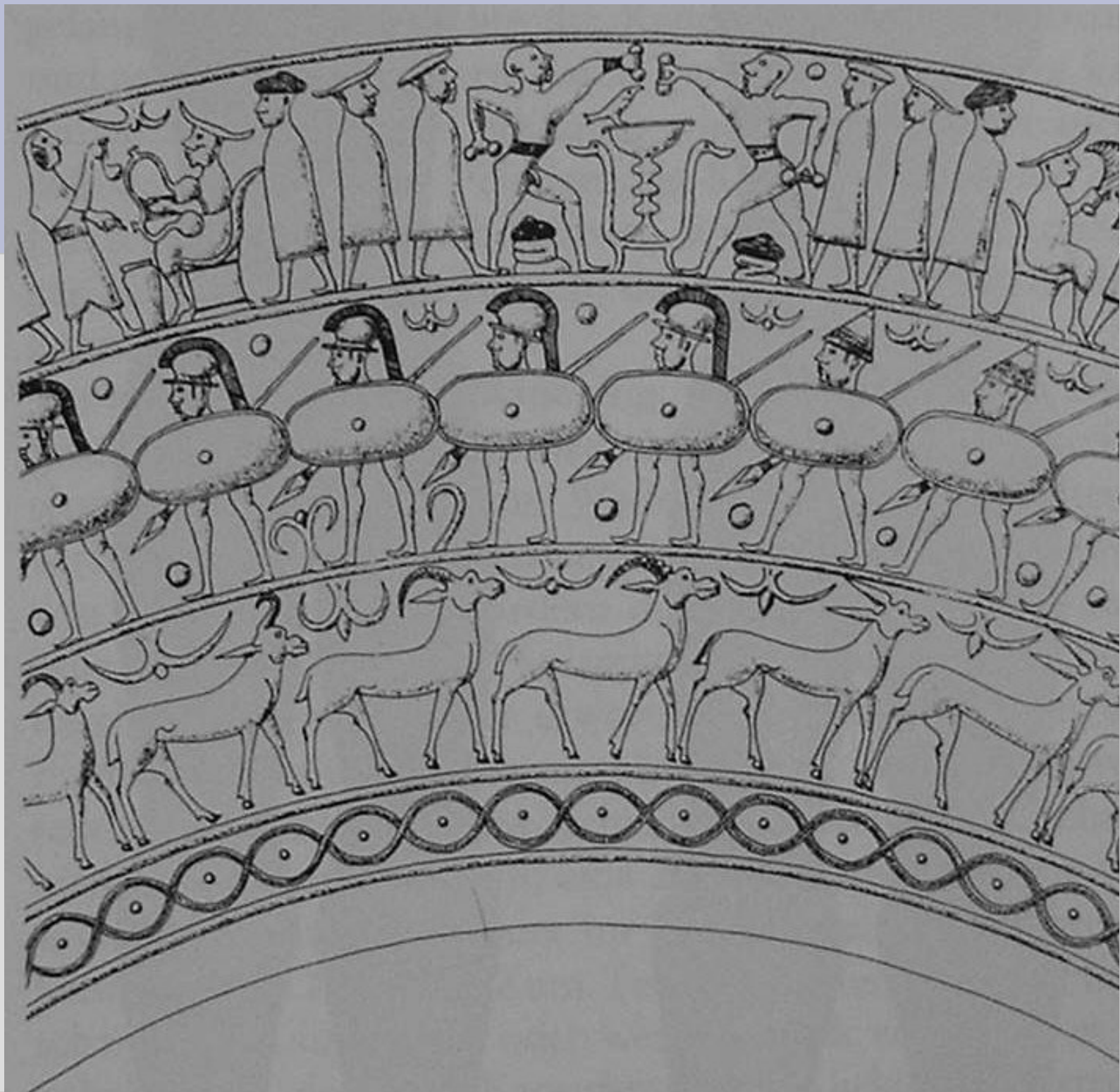


# Rome and the Celts

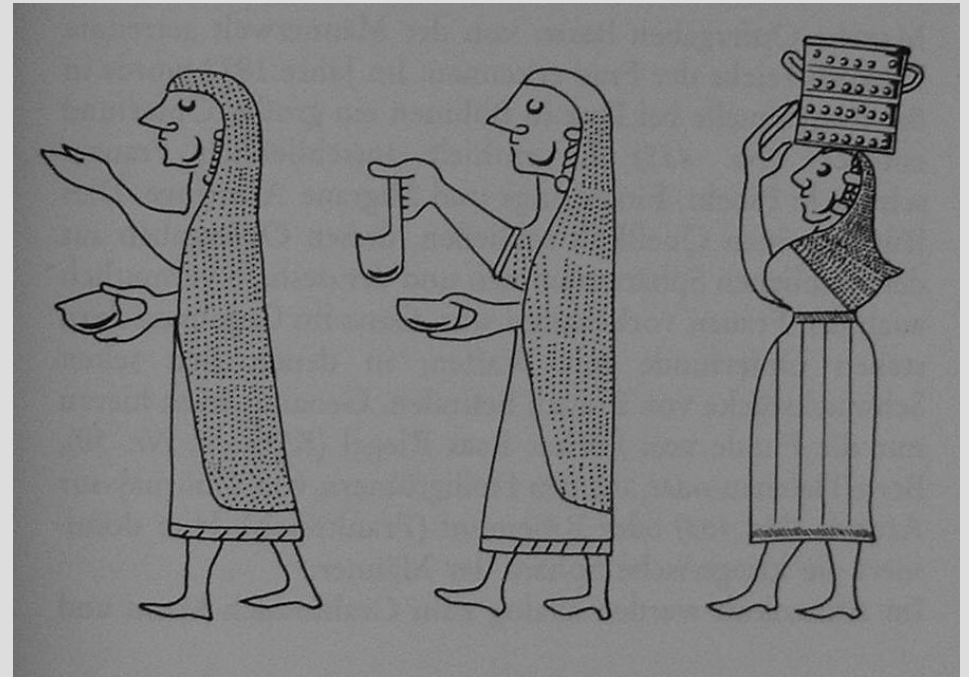
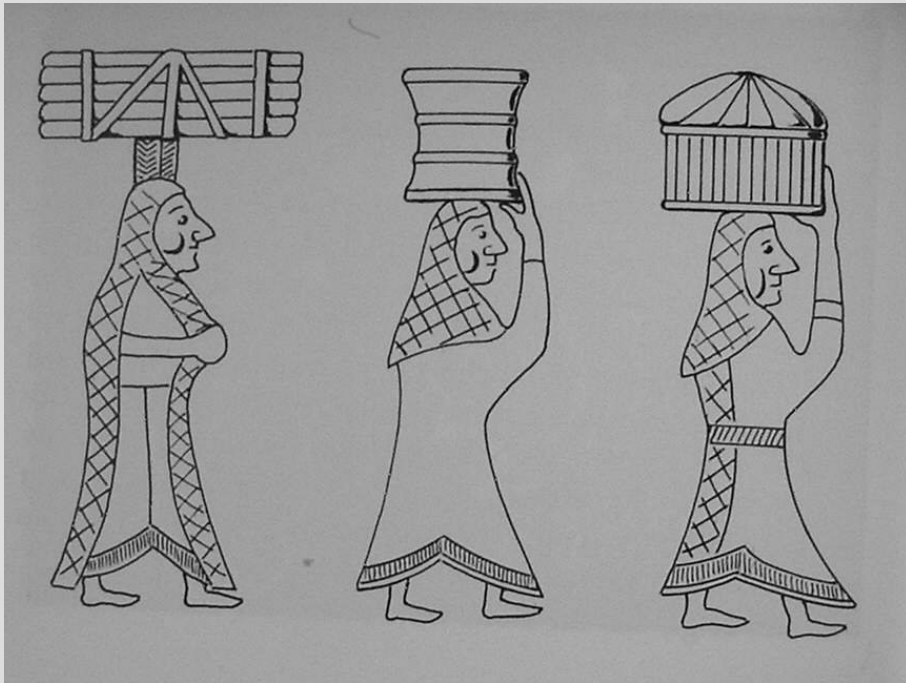




# Celts



# The Celts





# Hochdorf (6<sup>th</sup> cent. BC)





# Chieftain of Hochdorf (6<sup>th</sup> c. BC)



# Climate Zones in Europe

Maritime temperate  
climates without  
dry season(Cfb)

Continental climates (D)  
(Dfb: warm summer continental)

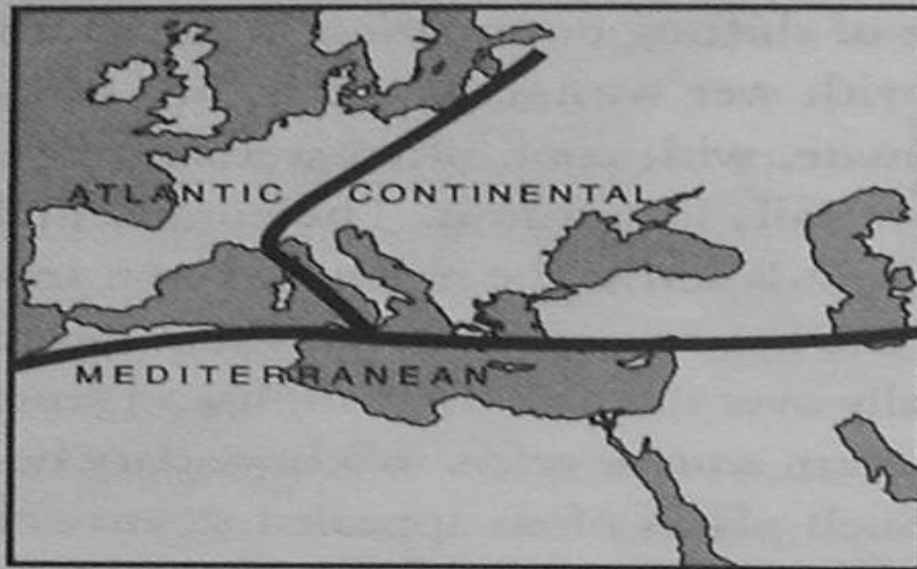
Mediterranean climates (Cs)



Peel (2007), Hydrol. Earth Sci. Disc. 4, 439-473  
[www.hydrol-earth-syst-sci-discuss.net/4/439/2007/](http://www.hydrol-earth-syst-sci-discuss.net/4/439/2007/)



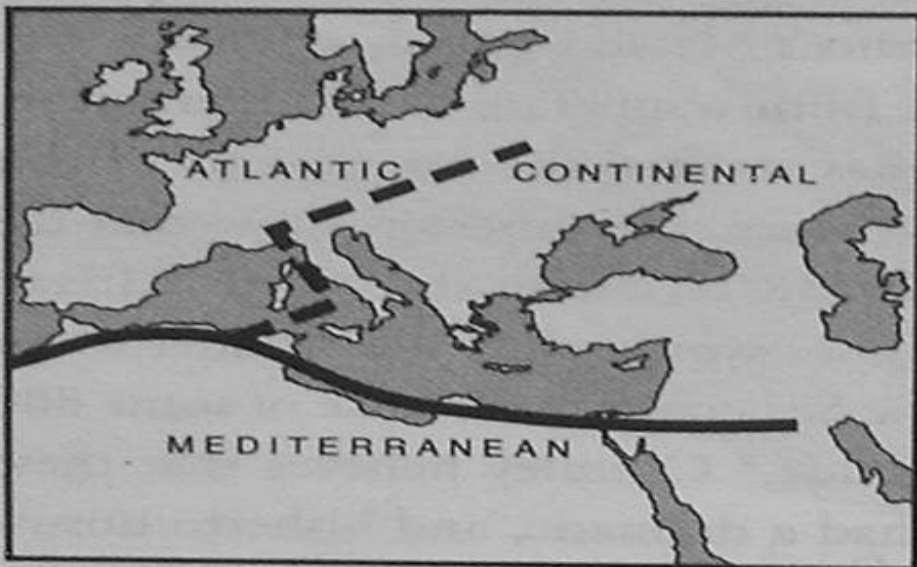
# Climate Change 1200BC - 900AD



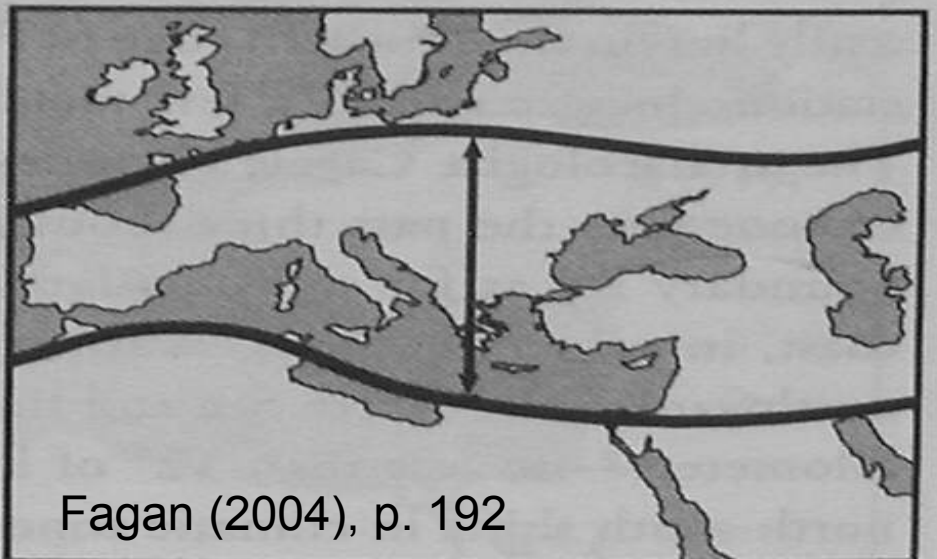
Relative position of air masses,  
1200–300 B.C.



Relative position of air masses,  
ca. 300 B.C.–A.D. 300



Relative position of air masses,  
A.D. 500–900



Fagan (2004), p. 192

Late Holocene range of the Temperate-Mediterranean ecotone

# Holocene climatic change and past Irish societal response

Turney et al. (2006), Journal of Archaeological  
Science 33, p. 34-38

“The extent to which North Atlantic Holocene climatic  
perturbations influenced past human societies is an  
**area of considerable uncertainty and fierce  
debate**

...

Irish bog and lake tree populations provide unambiguous  
evidence of major shifts in surface moisture through the  
Holocene ...

To test for human response to these cycles we summed  
the probabilities of 465 radiocarbon ages obtained from  
Irish archaeological contexts ...”



bog pines  
grow below  
current water  
levels

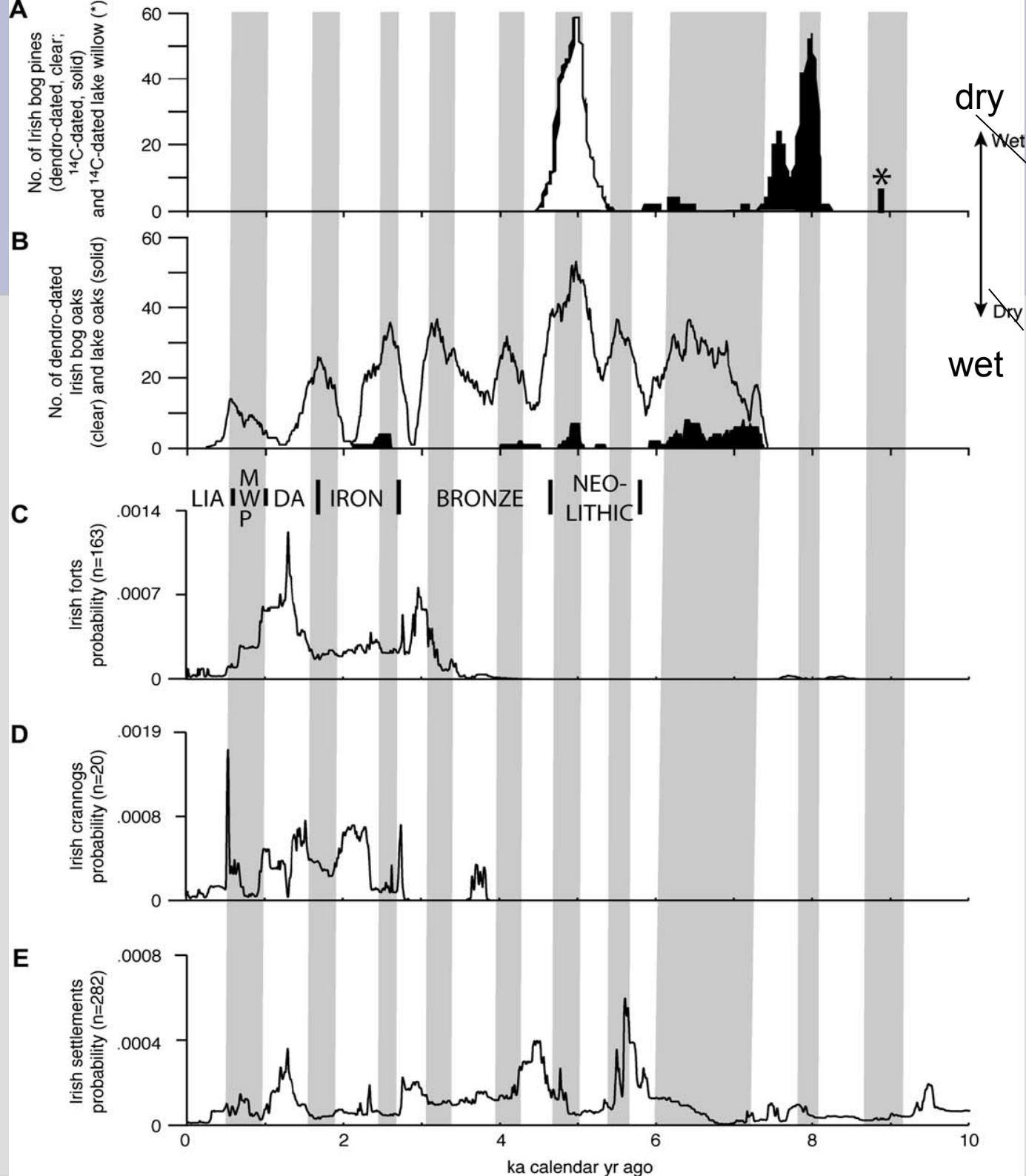
bog oaks

forts

crannogs

settlements

**Grey** zonation denotes  
inferred **dry** phases in  
Ireland.



# Holocene climatic change and past Irish societal response

“These results suggest either increasing density of human populations in **key, often defensive locations**, and/or the development of **subsistence strategies** to overcome changing conditions, the latter recently proposed as a significant factor in avoiding societal collapse.

Regardless, we demonstrate environmental change is a significantly more important factor in influencing human activity in the landscape than has hitherto been acknowledged.”

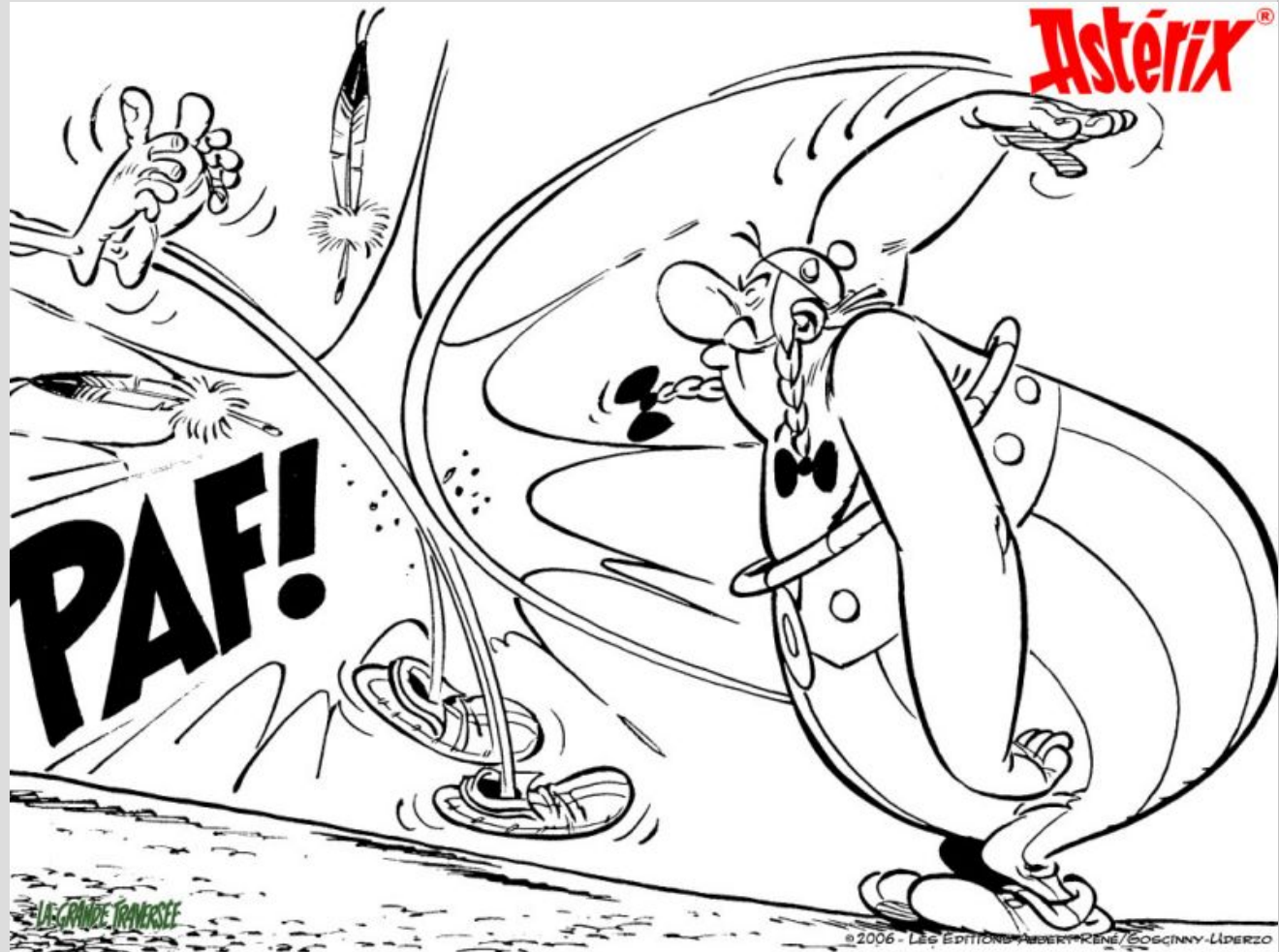


# Celts in the 1st Millennium AD

- Agricultural resources stretched to the limit
- Warrior society

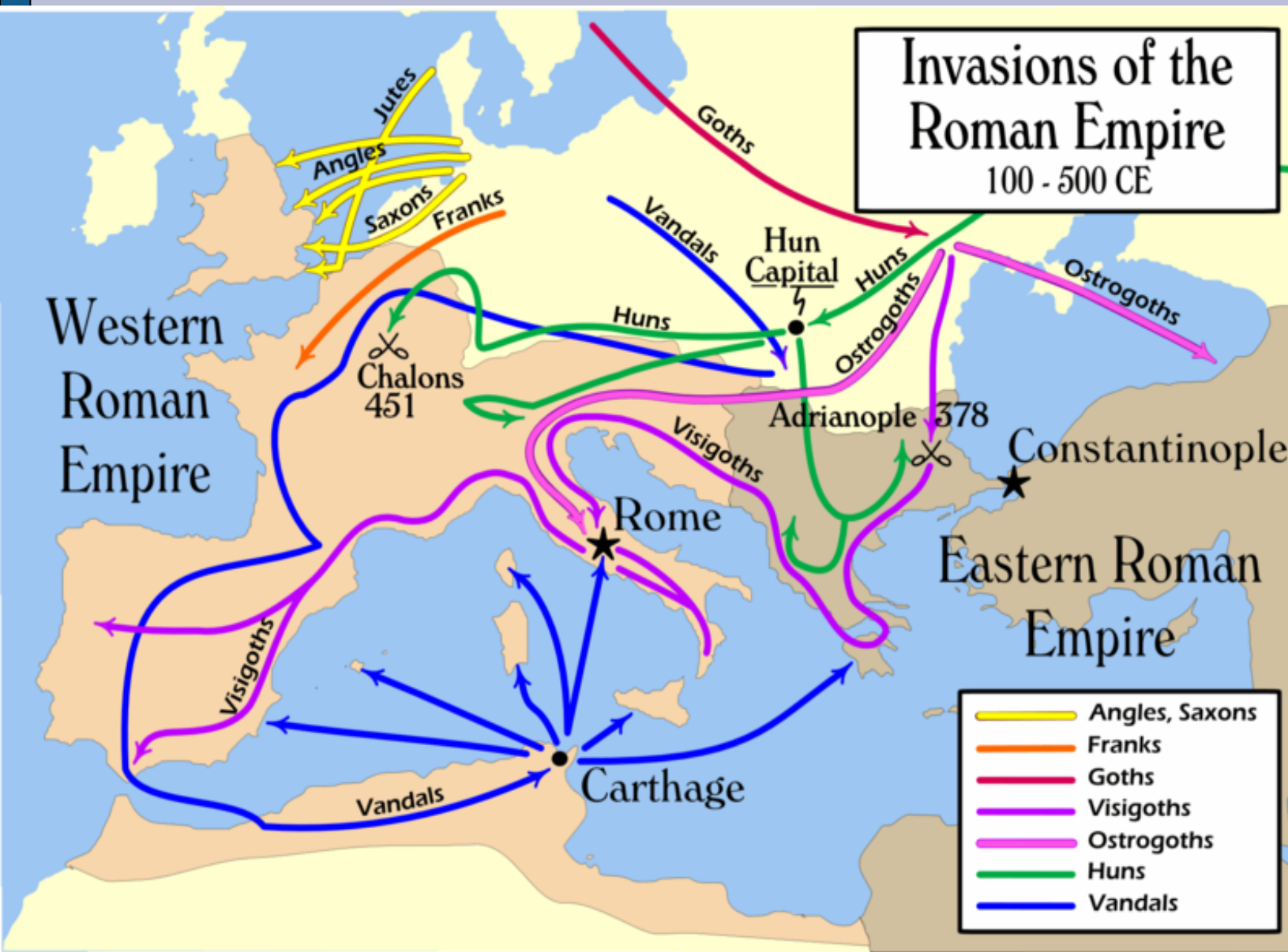
# The Celts

“The whole race  
is madly fond of  
war, high-  
spirited, and  
quick to battle.”  
(Strabo, 1<sup>st</sup>  
century BC)



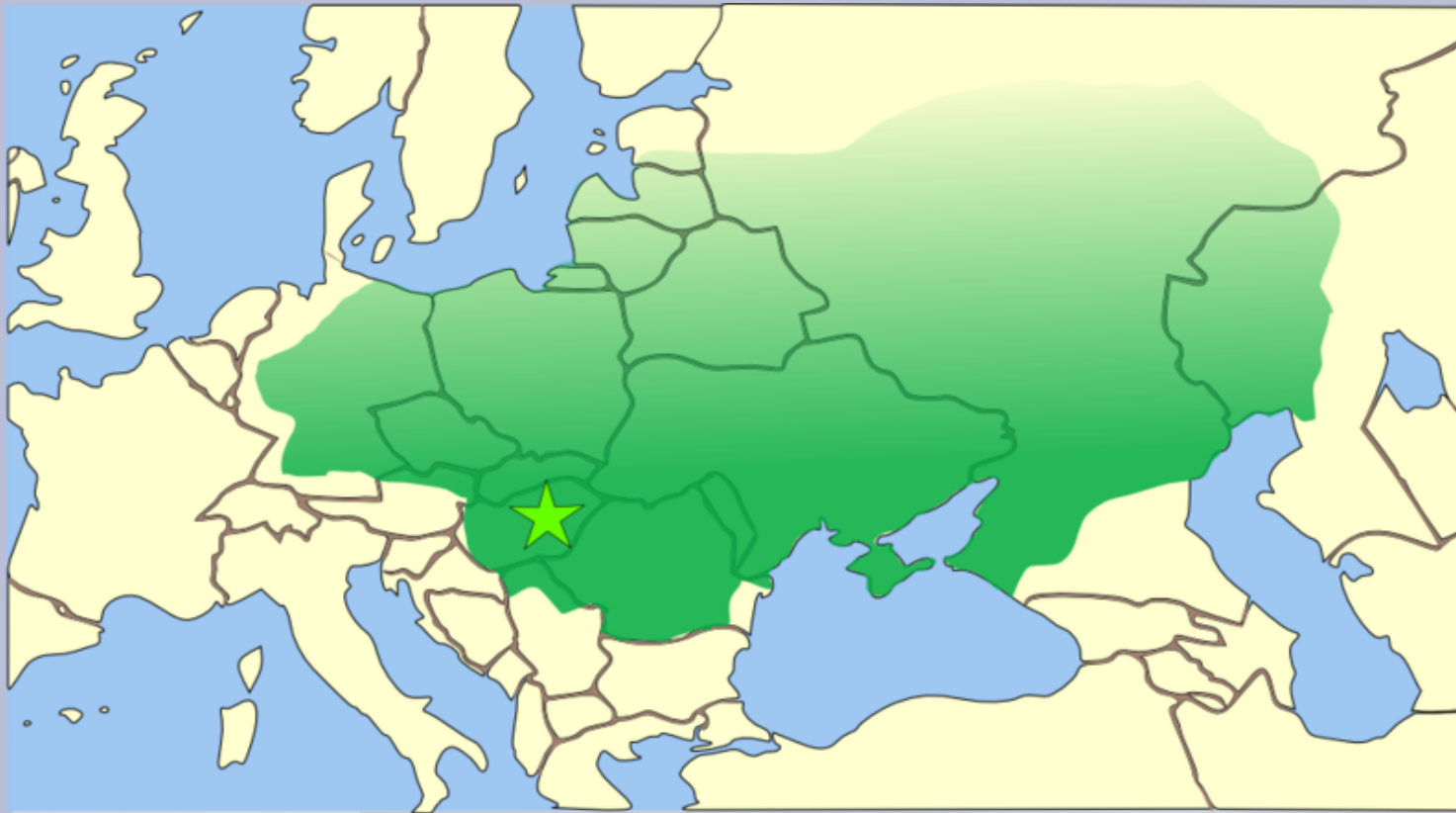


# “Barbarian Invasions” “Völkerwanderung” (“Migration”)



Bronze, Mongolia

# The Huns



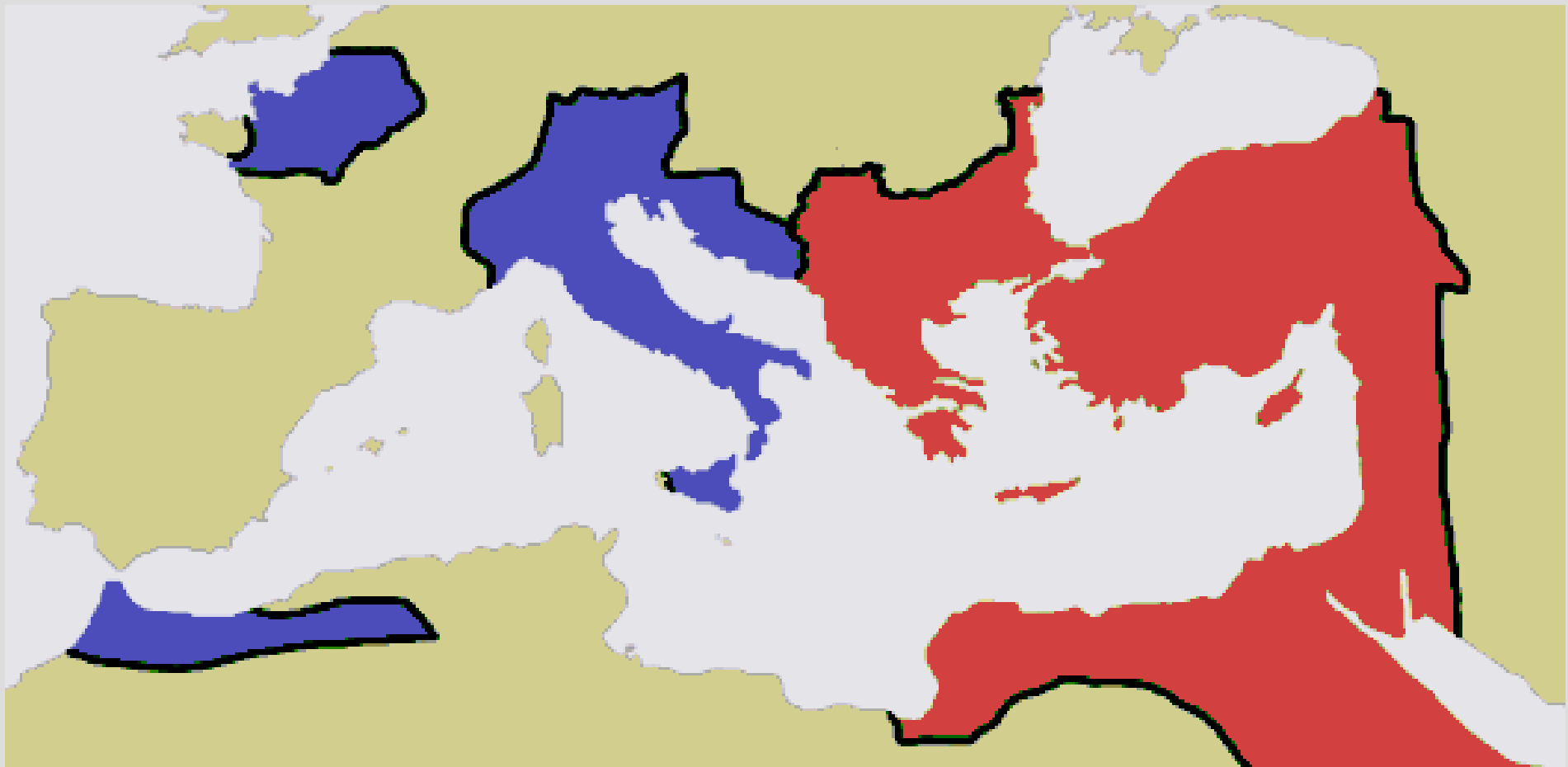
Bronze, Mongolia

Women headdress(diadem)  
from Csorna, Hungary





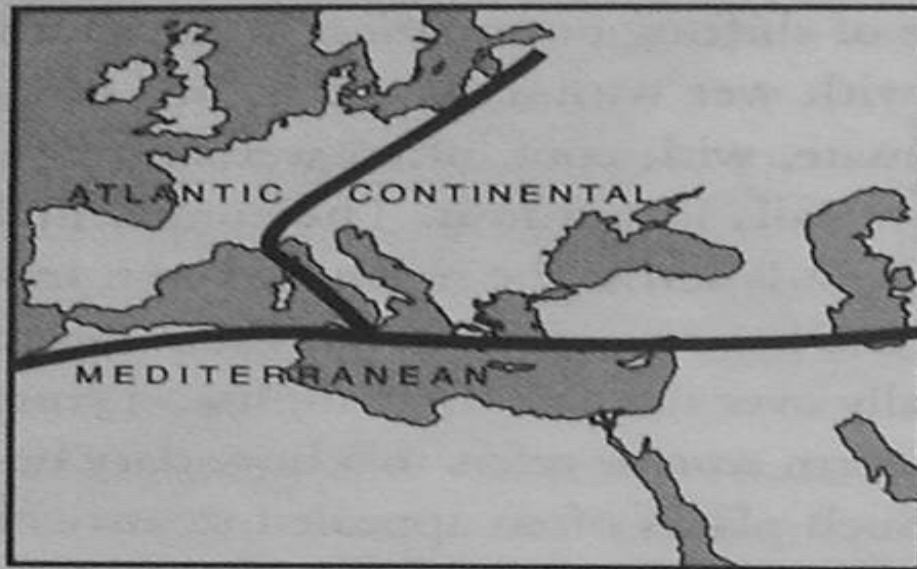
# The Roman Empire AD 476



# Europe AD 486



# Climate Change 1200BC - 900AD



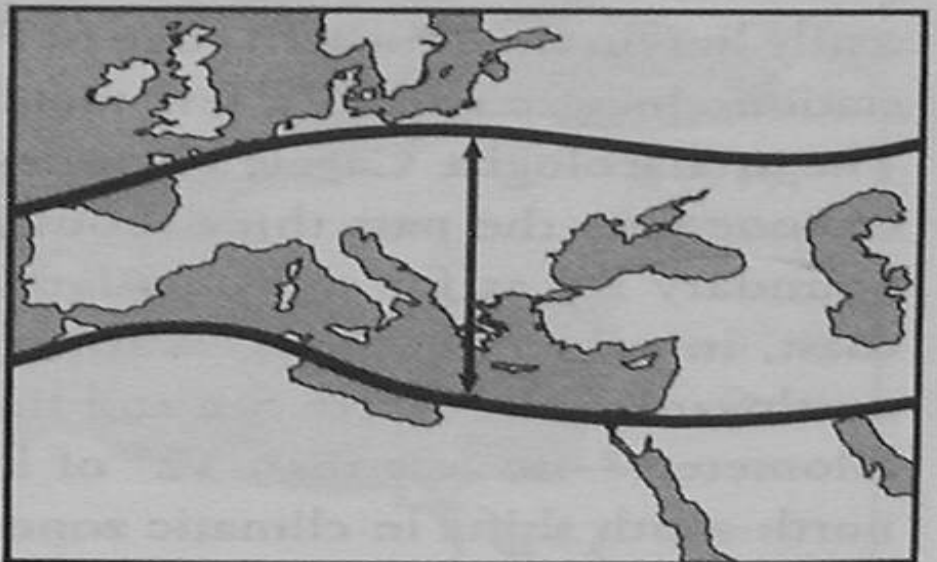
Relative position of air masses,  
1200–300 B.C.



Relative position of air masses,  
ca. 300 B.C.–A.D. 300



Relative position of air masses,  
A.D. 500–900



Late Holocene range of the Temperate-Mediterranean ecotone



# Qin&Han Dynasty

## 221BC-206BC-220AD



Qín Shǐhuángdì







## Great Wall in Qin Dynasty



Mean temperature

Droughts

Floods

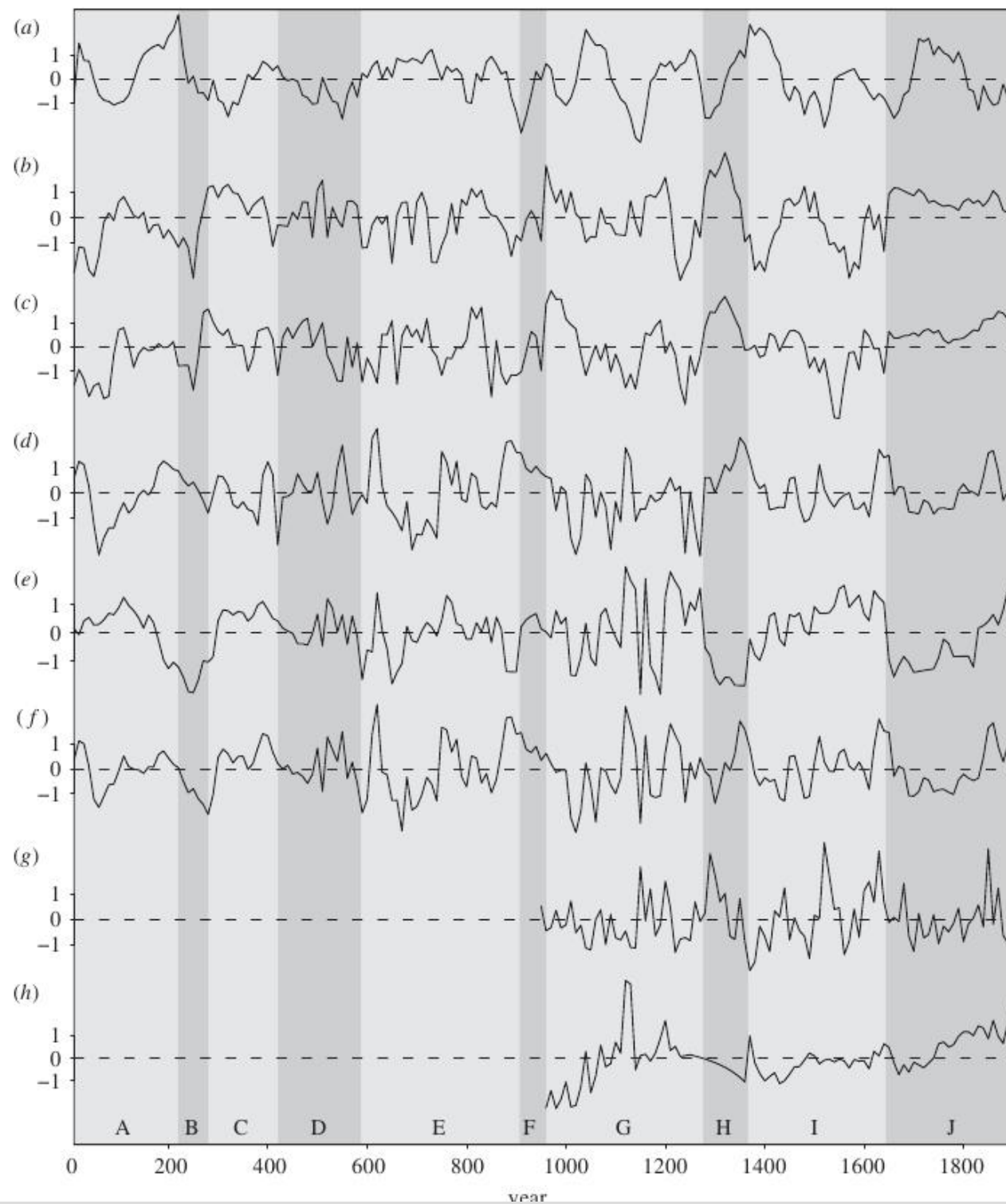
Internal wars

External aggression wars

All wars

Locust plagues

Rice price





# Climate and war in China

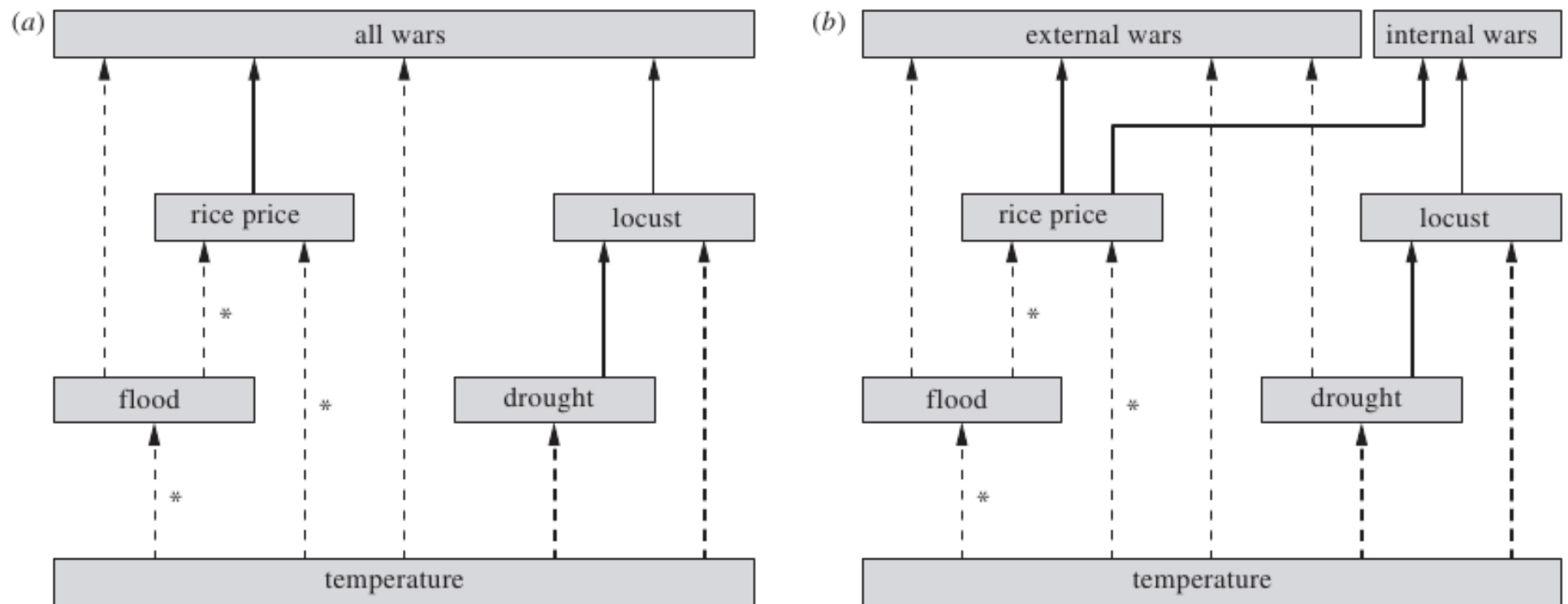


Figure 2. Possible causal links of temperature and temperature-associated rice price, locust plagues, droughts and flood with frequencies of (a) all wars and (b) external aggression wars or internal wars. Solid (positive effect) or dashed (negative effect) lines denote the maxima of CCF values with significant ( $p < 0.05$ ) or near-significant ( $p < 0.1$ ) levels in the electronic supplementary material, table S1s. Asterisks denote near-significant associations ( $p < 0.1$ ). Line width denotes significant maxima of CCF values.

Zhang, Z. Et al. (2010). Periodic climate cooling enhanced natural disasters and wars in China during AD 10–1900. *Proceedings of the Royal Society B*, 277 (1701), 3745-3753.

# The Fall/D Decline of the Roman Empire

- The influx of Germanic mercenaries affected the discipline and loyalty of the military (Vegetius, 4<sup>th</sup> cent.)
- “[T]he decline of Rome was the natural and inevitable effect of immoderate greatness. Prosperity ripened the principle of decay; the causes of destruction multiplied with the extent of conquest; and as soon as time or accident had removed the artificial supports, the stupendous fabric yielded to the pressure of its own weight,” (Edward Gibbon, 1737-94)

# The Fall/D Decline of the Roman Empire – external factors

- Climate changes?
- Pressure from the migrating peoples
- Invention of horseshoe (ca AD 200) gave military advantage
- Antonine plague (since 165 AD) and other epidemics



# The Fall/D Decline of the Roman Empire – internal factors

- The Empire was too large and complex to coordinate efficiently – roots of feudalism developed
- Institutions developed during Republican times no longer appropriate
- No budgetary system, economy largely based on plundering or taxes
- Free trade system in the 1<sup>st</sup> & 2<sup>nd</sup> cent. but uneconomic price laws later

# The Fall/D Decline of the Roman Empire

Or was there no “fall”, but simply a transformation of the existing institutions?



Bishop's church, Kaiseraugst, Burgundy, ca 470

# Literature

- Fagan (2004): The Long Summer
- Die Völkerwanderung. Archäologie in Deutschland Sonderheft 2005.