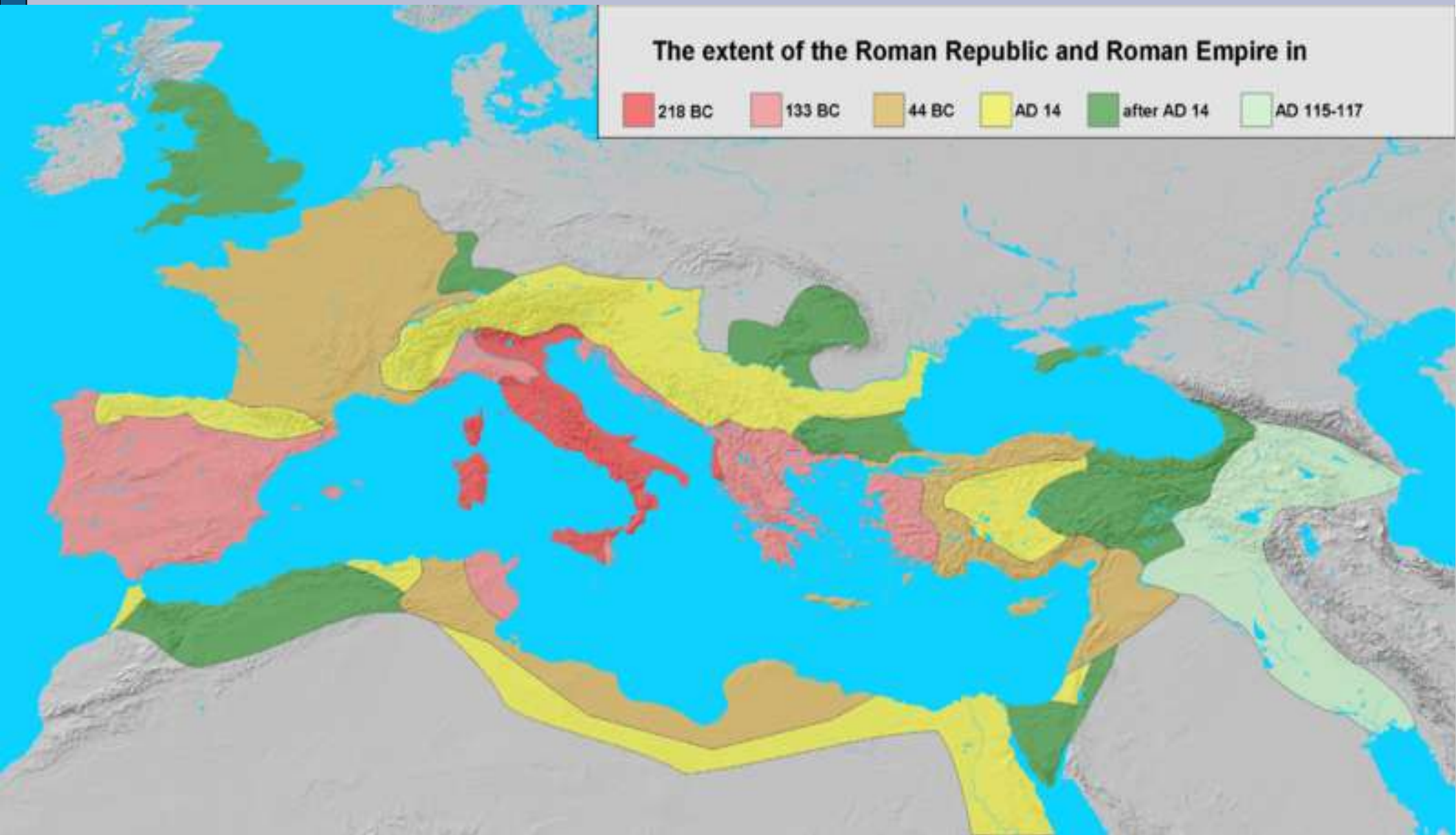
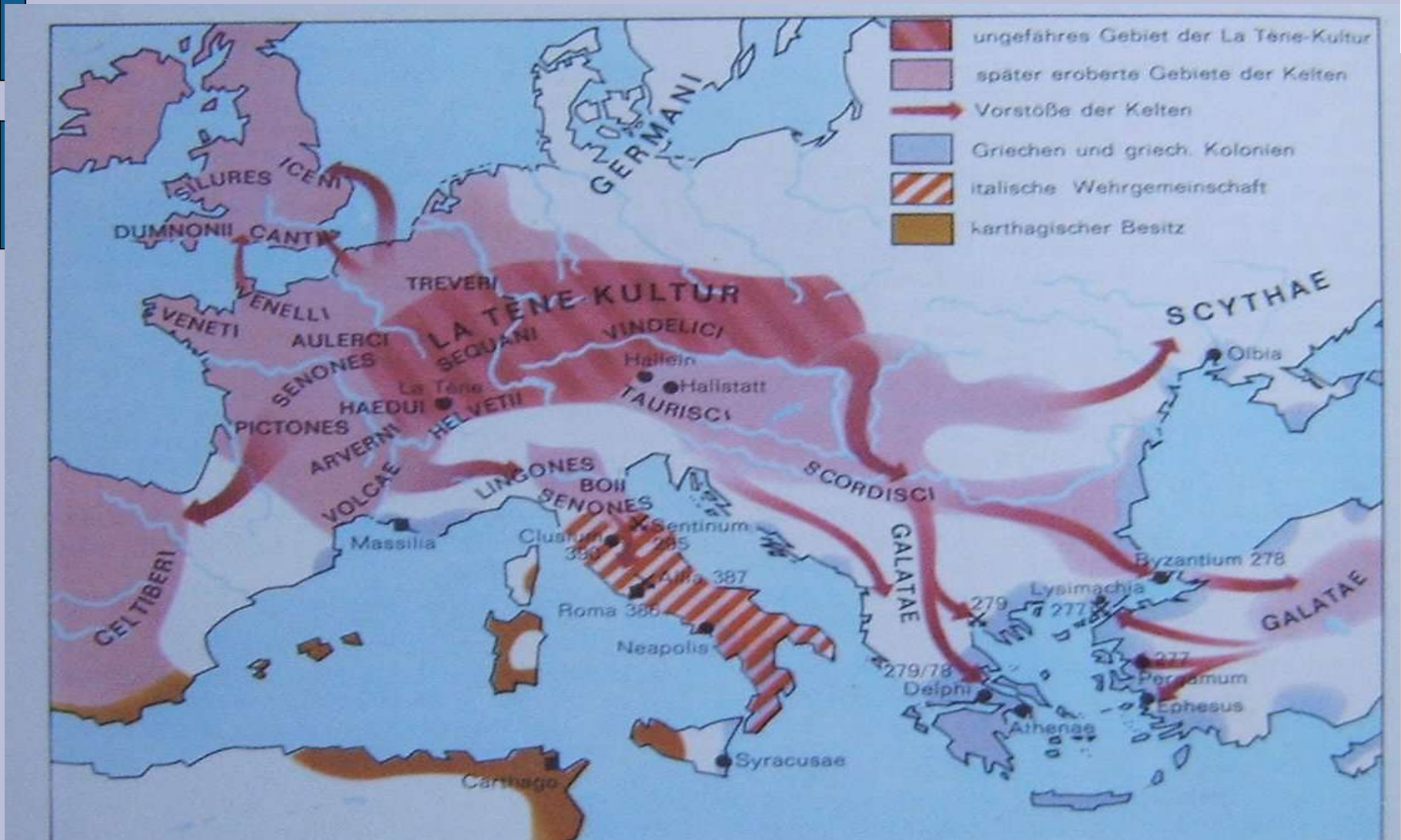
Climate and Human History
Stephan Matthiesen

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

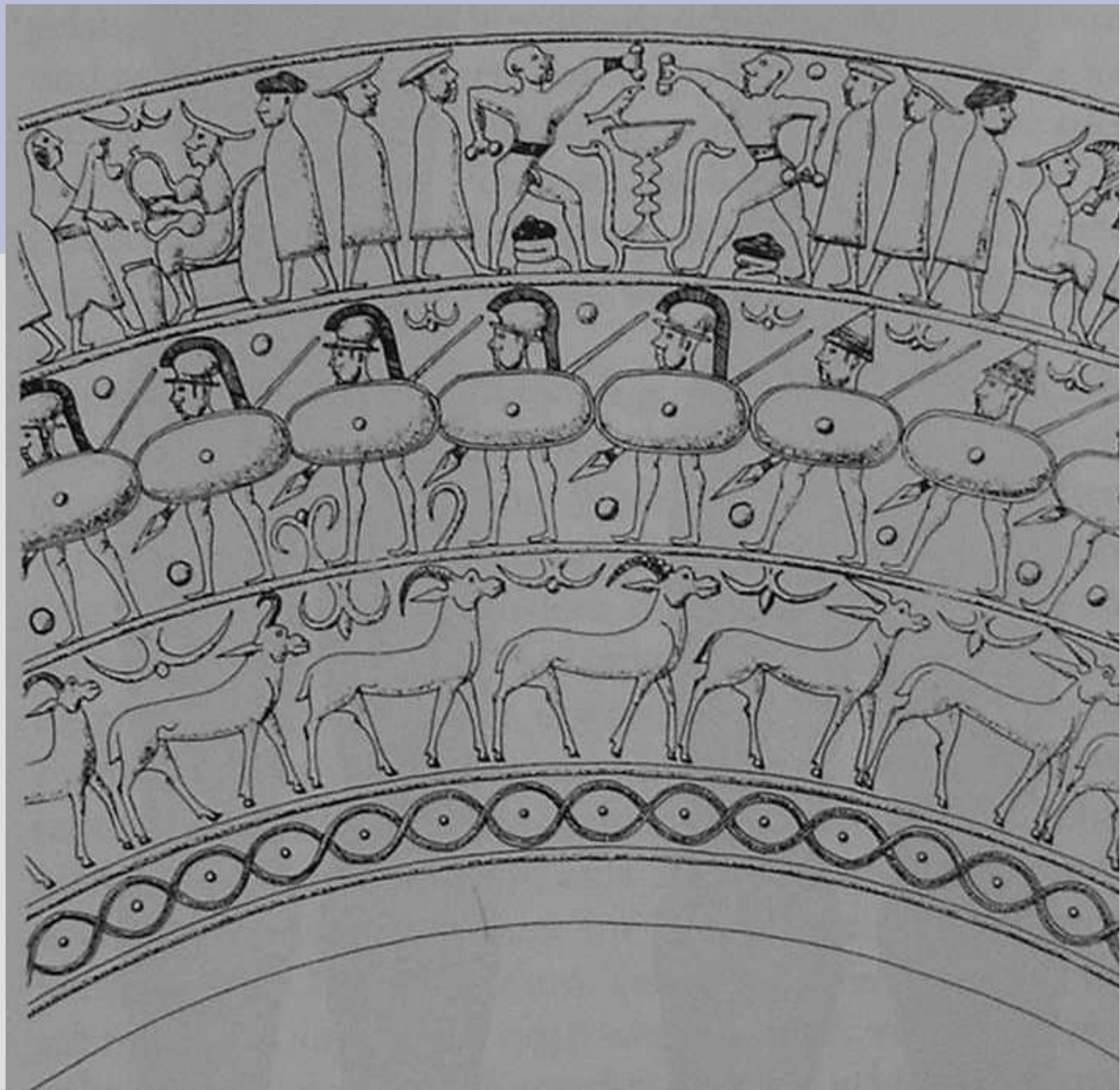
The Roman Empire



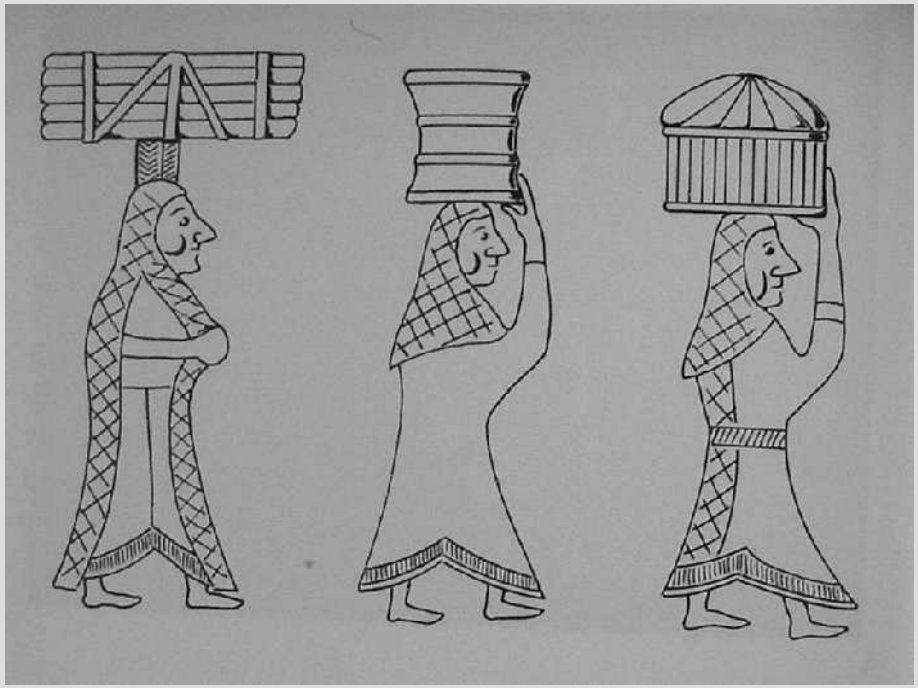
Rome and the Celts

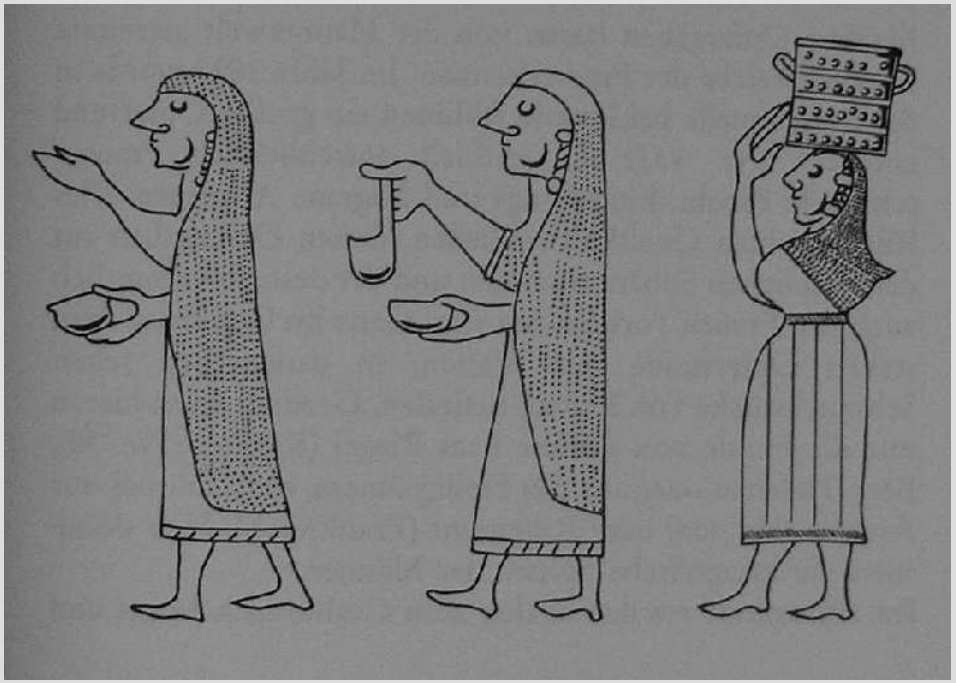


Celts



The Celts

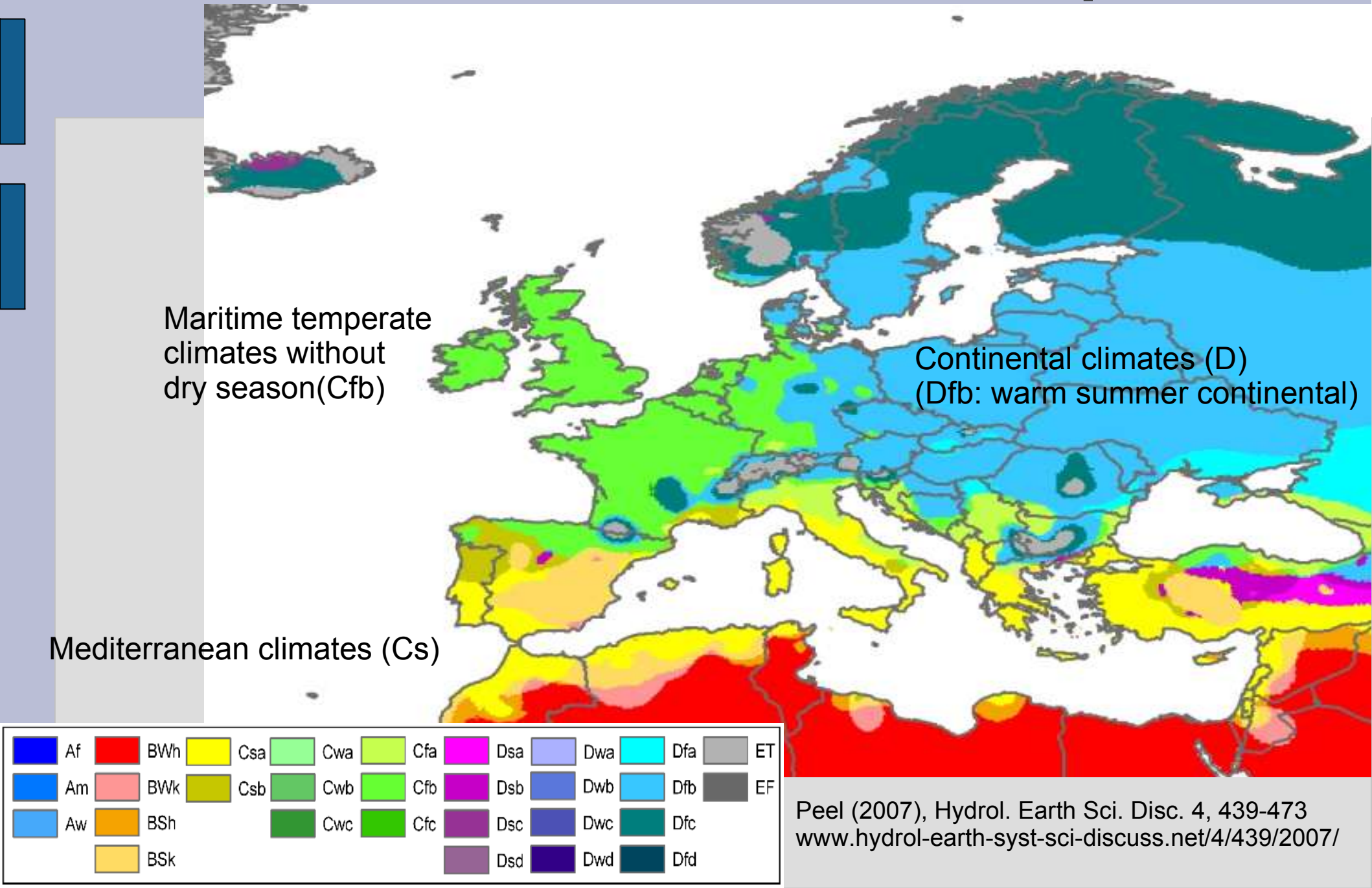




Hochdorf (6th cent. BC)

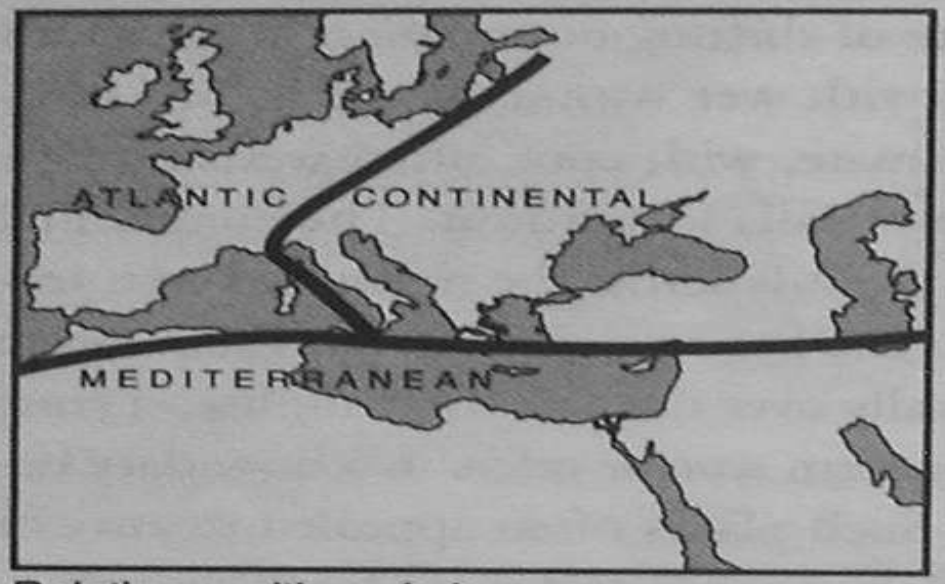
Chieftain of Hochdorf (6^{th} c. BC)

Climate Zones in Europe



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

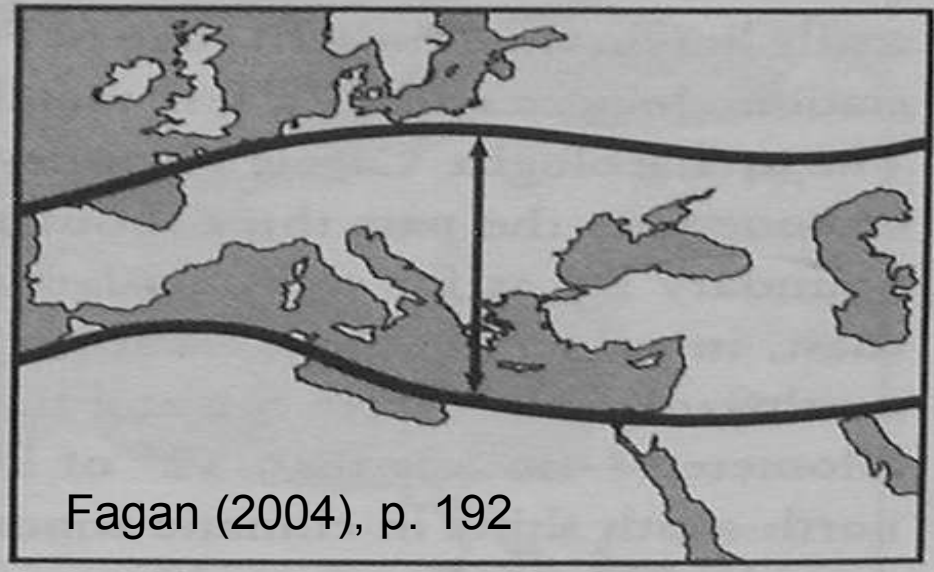
Climate Change 1200BC - 900AD



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

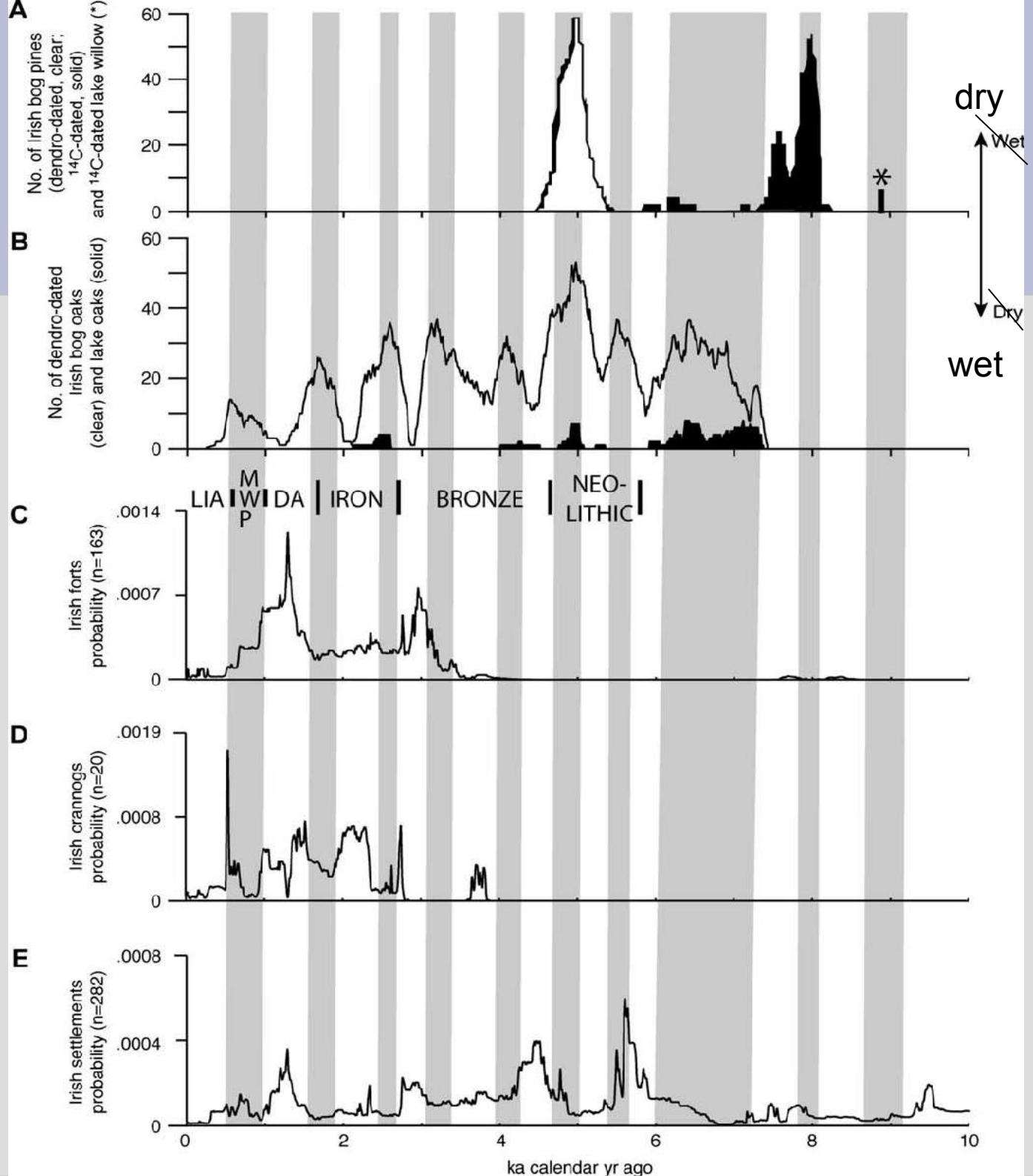
grow below current water levels

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.

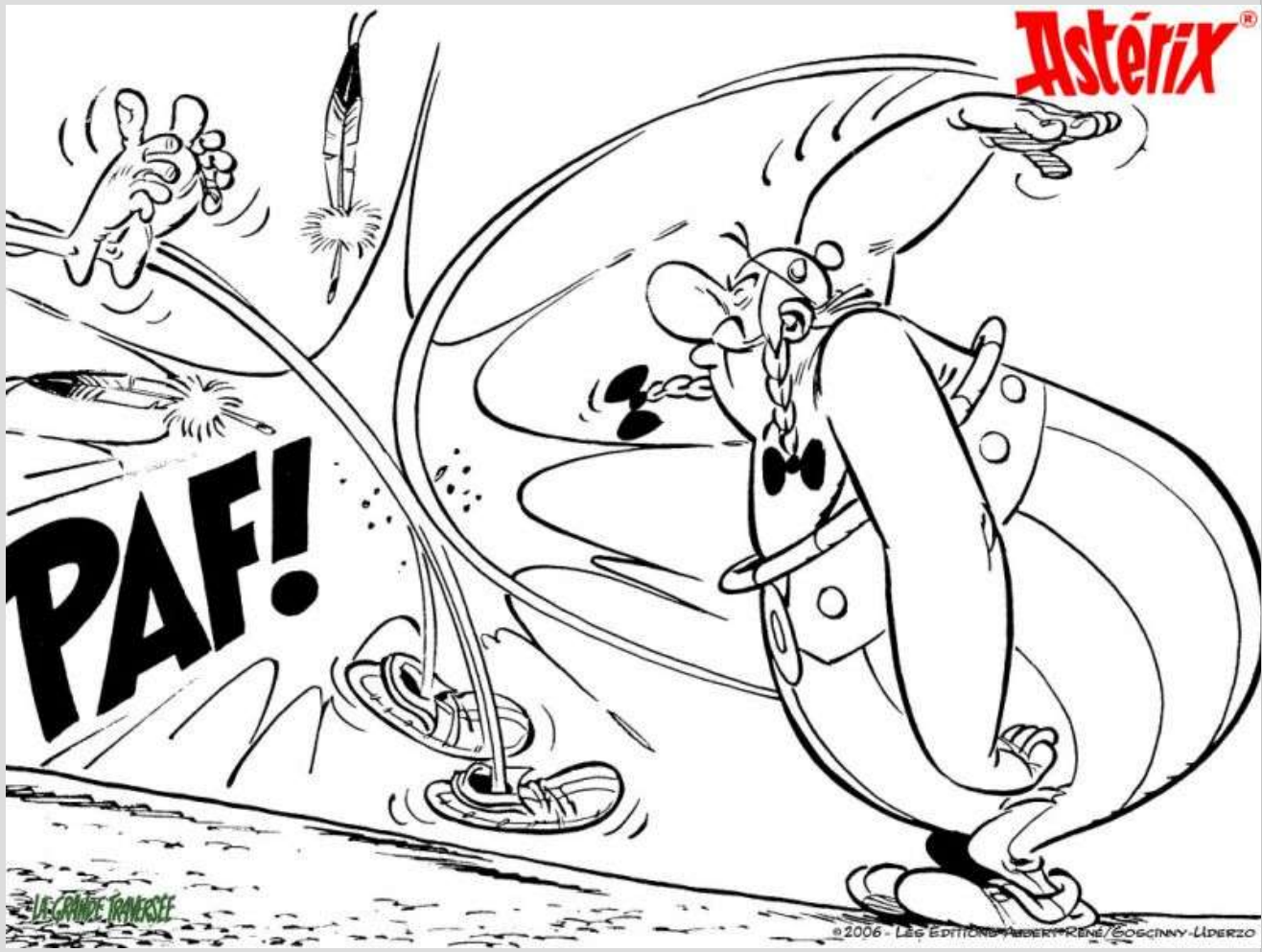
Regardless, we demonstrate environmental change is a significantly more important factor in influencing human activity in the landscape than has hitherto been acknowledged."

Celts in the 1st Millennium AD

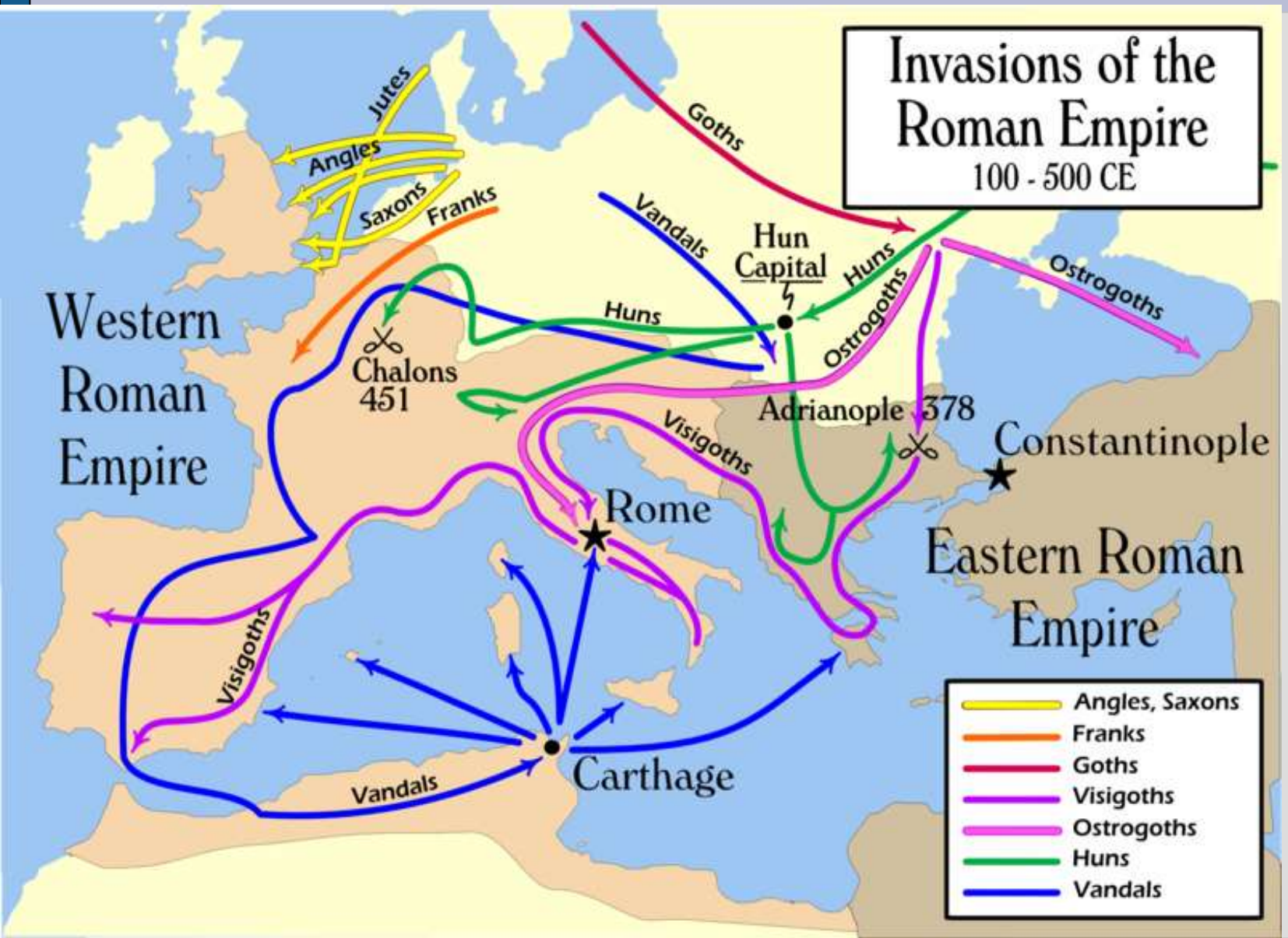
- Agricultural resources stretched to the limit
- Warrior society

The Celts

"The whole race is madly fond of war, high-spirited, and quick to battle." (Strabo, 1st century BC)

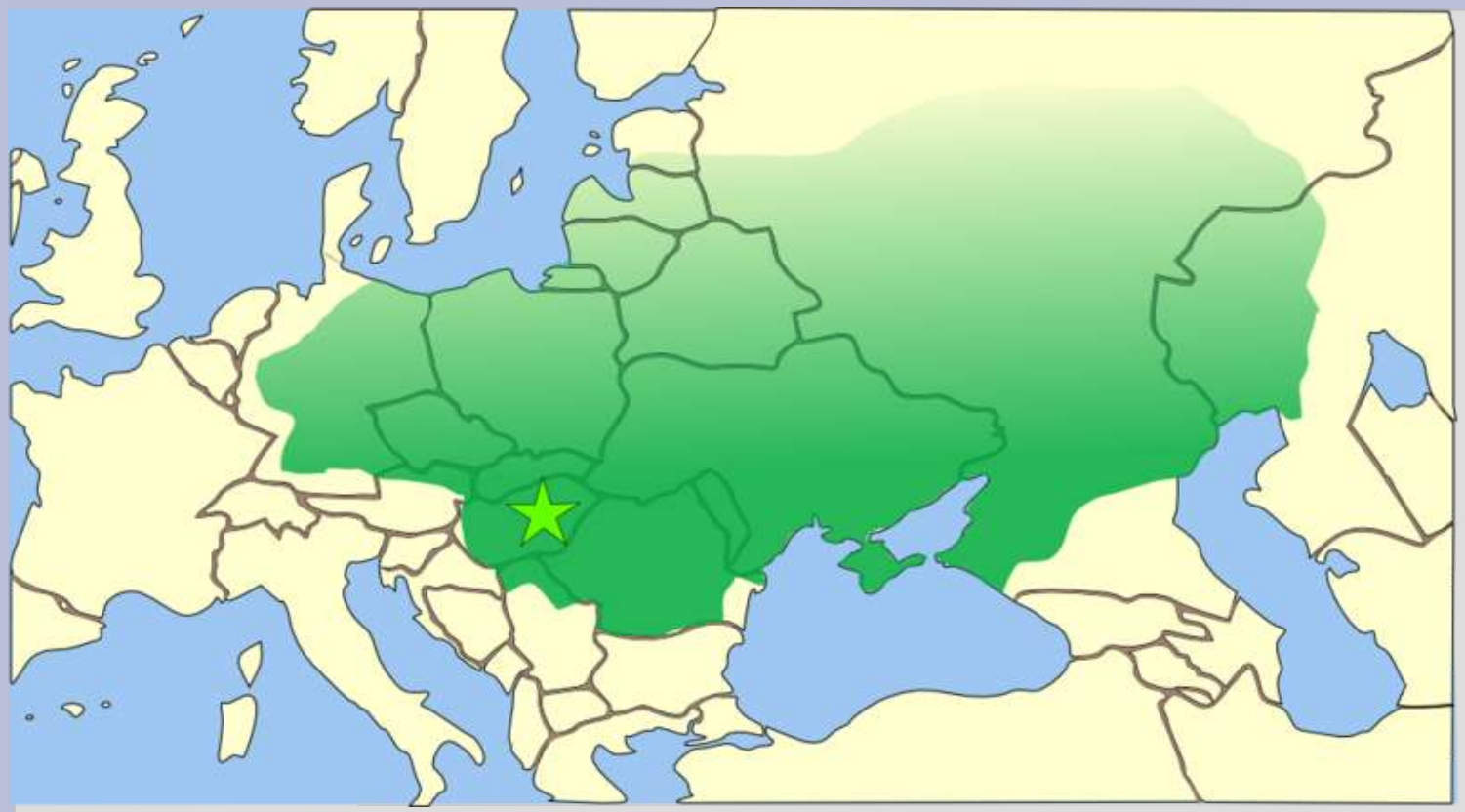


“Barbarian Invasions”
“Völkerwanderung” (“Migration”)



Bronze, Mongolia

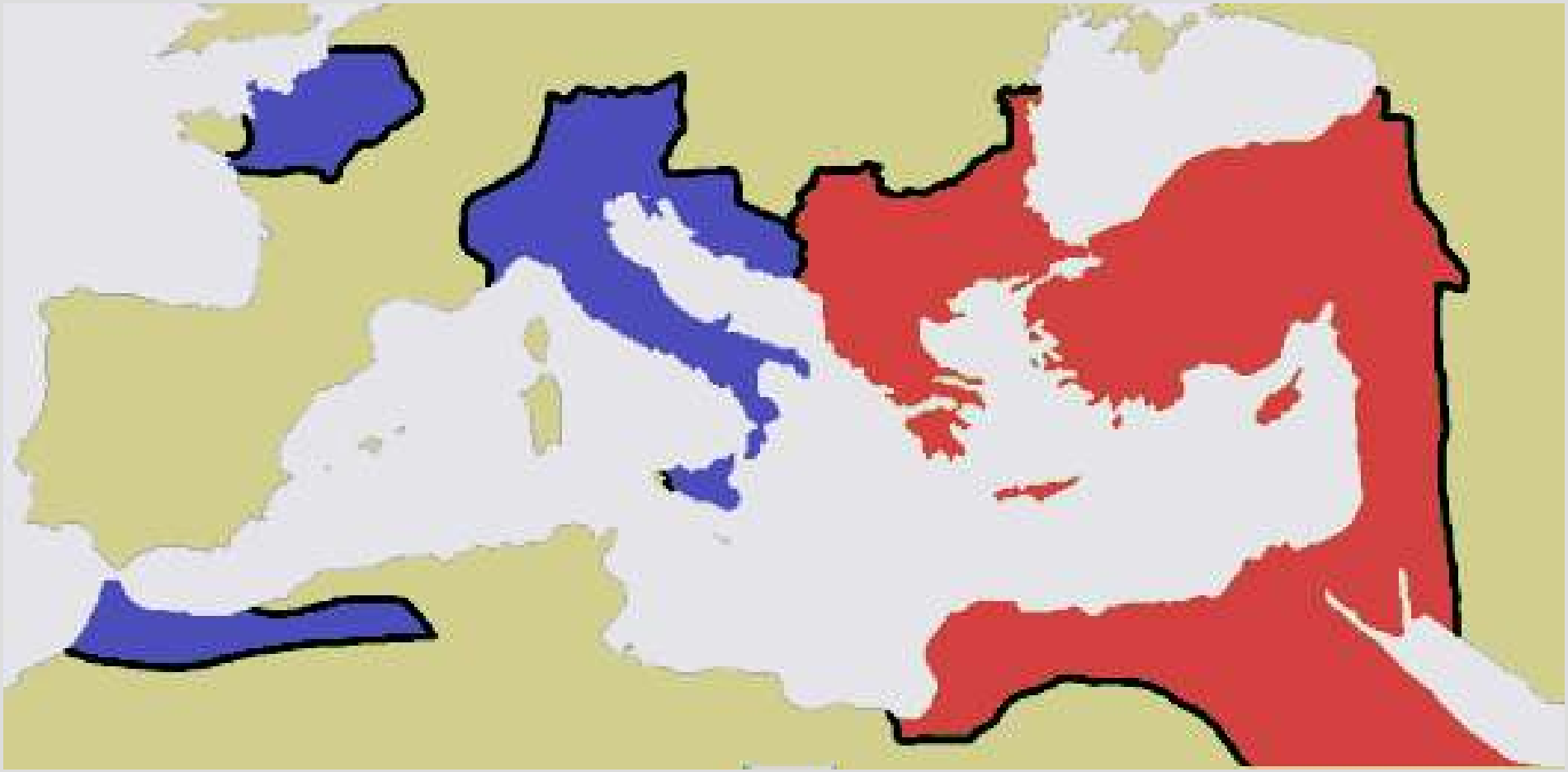
The Huns



Bronze, Mongolia

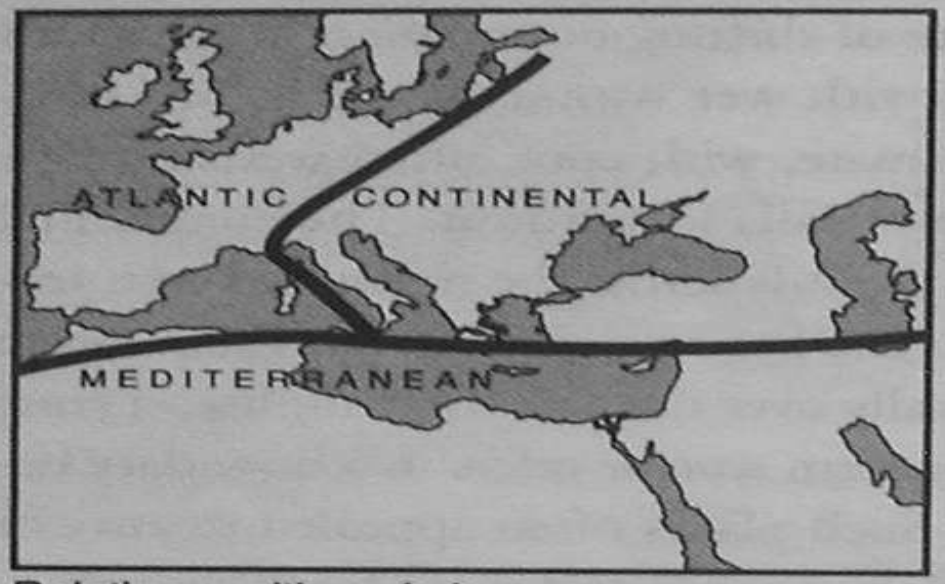
Women headdress(diadem)
from Csorna, Hungary

The Roman Empire AD 476



Europe AD 486

Climate Change 1200BC - 900AD



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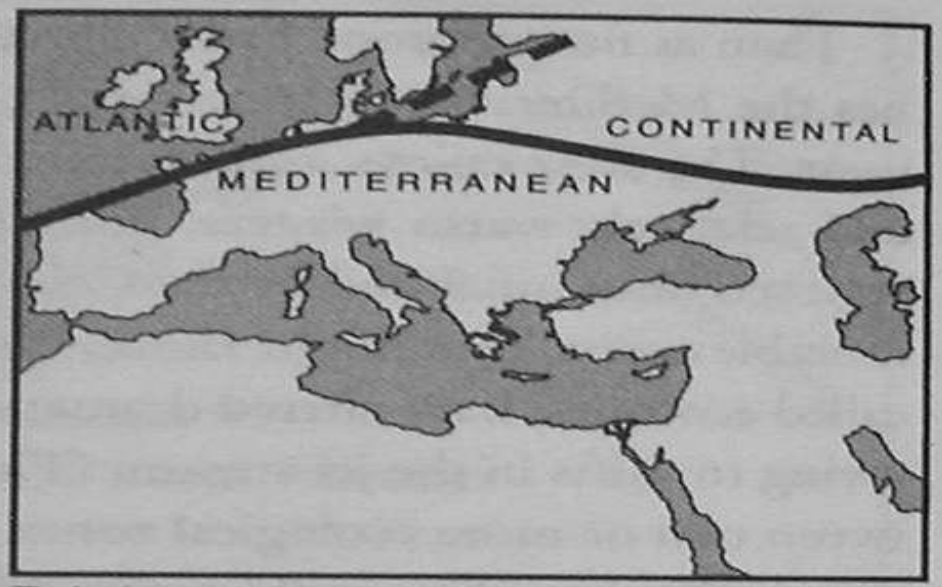

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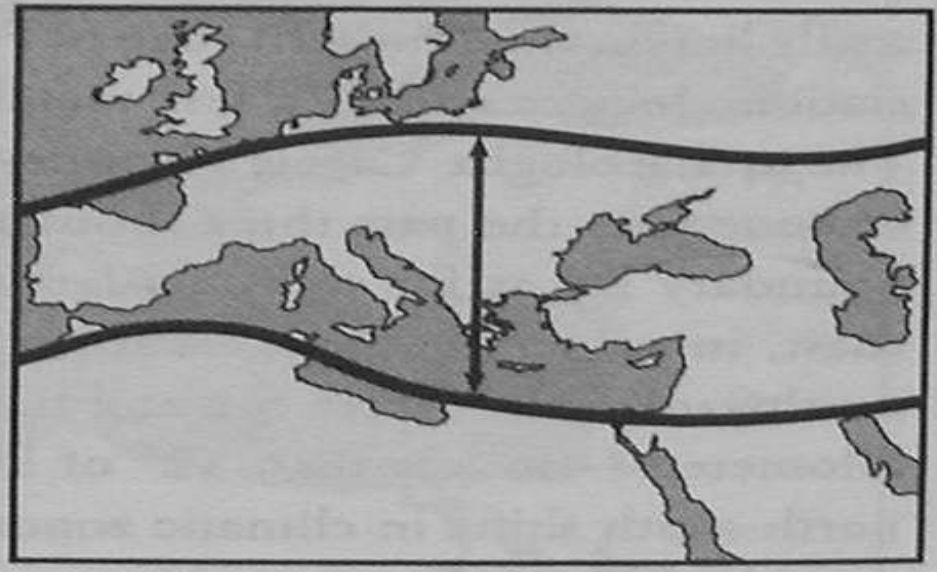
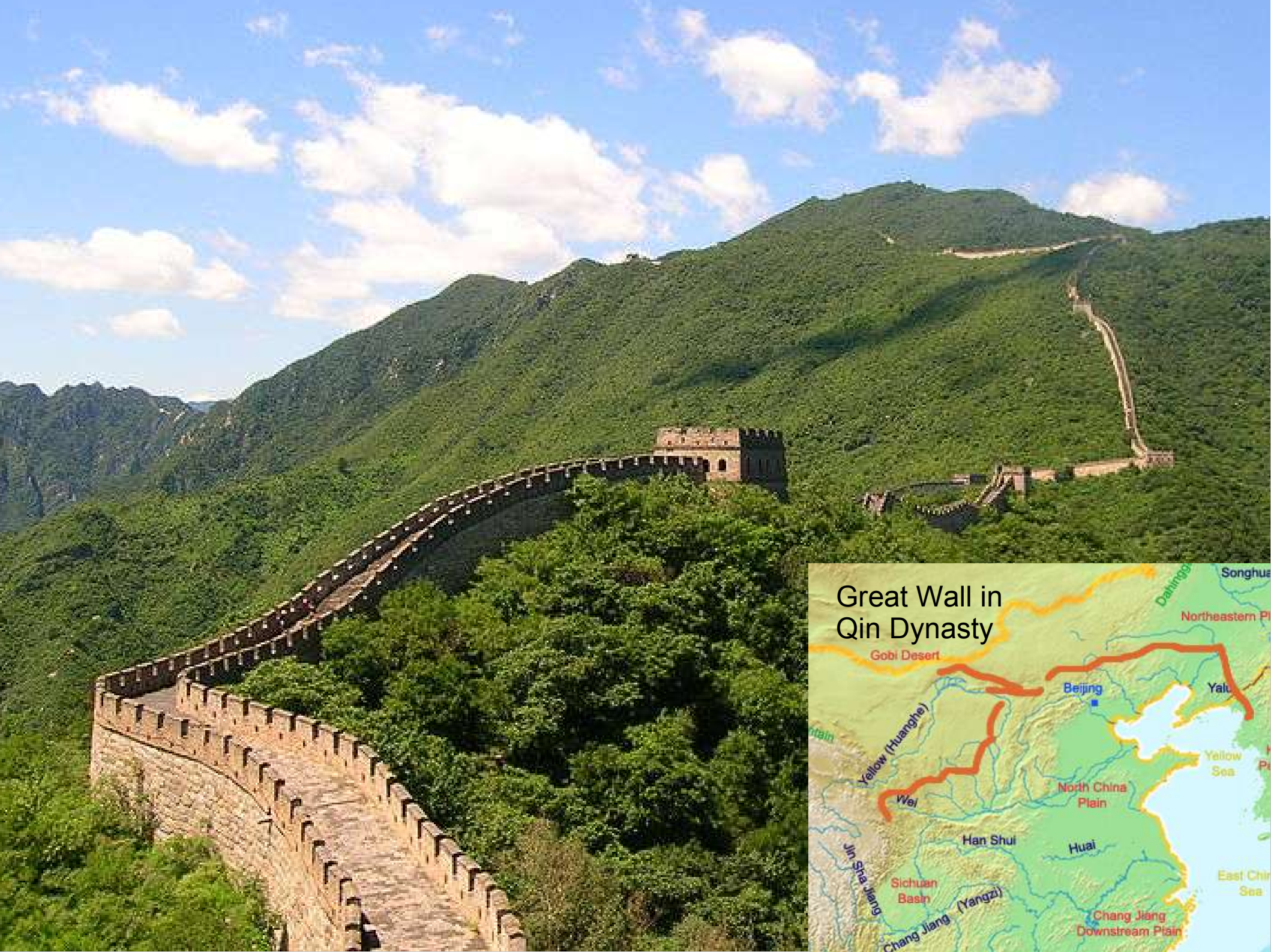


Late Holocene range of the Temperate-Mediterranean ecotone

Qin&Han Dynasty
221BC-206BC-220AD


Great Wall in
Qin Dynasty
Gobi Desert
Beijing
Yellow (Huanghe)
Wei
Han Shui
Huai
North China
Plain
Yellow
Sea
Sichuan
Basin
Chang Jiang
(Yangzi)
Chang Jiang
Downstream Plain
Jin Sha Jiang

Mean temperature

Droughts

Floods

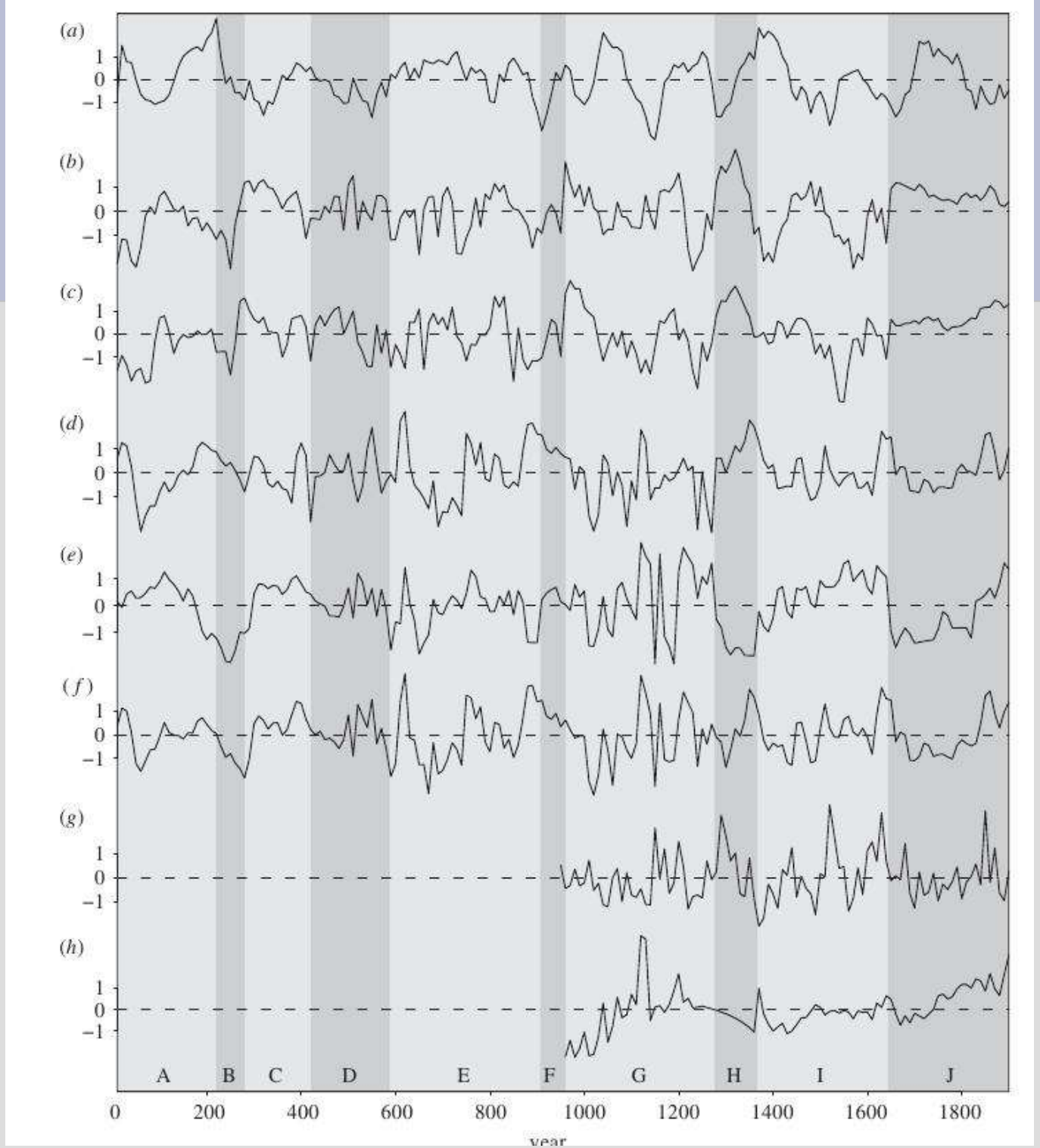
Internal wars

External aggression wars

All wars

Locust plagues

Rice price



Han Jin Sui&Tang Song Ming

Climate and war in China

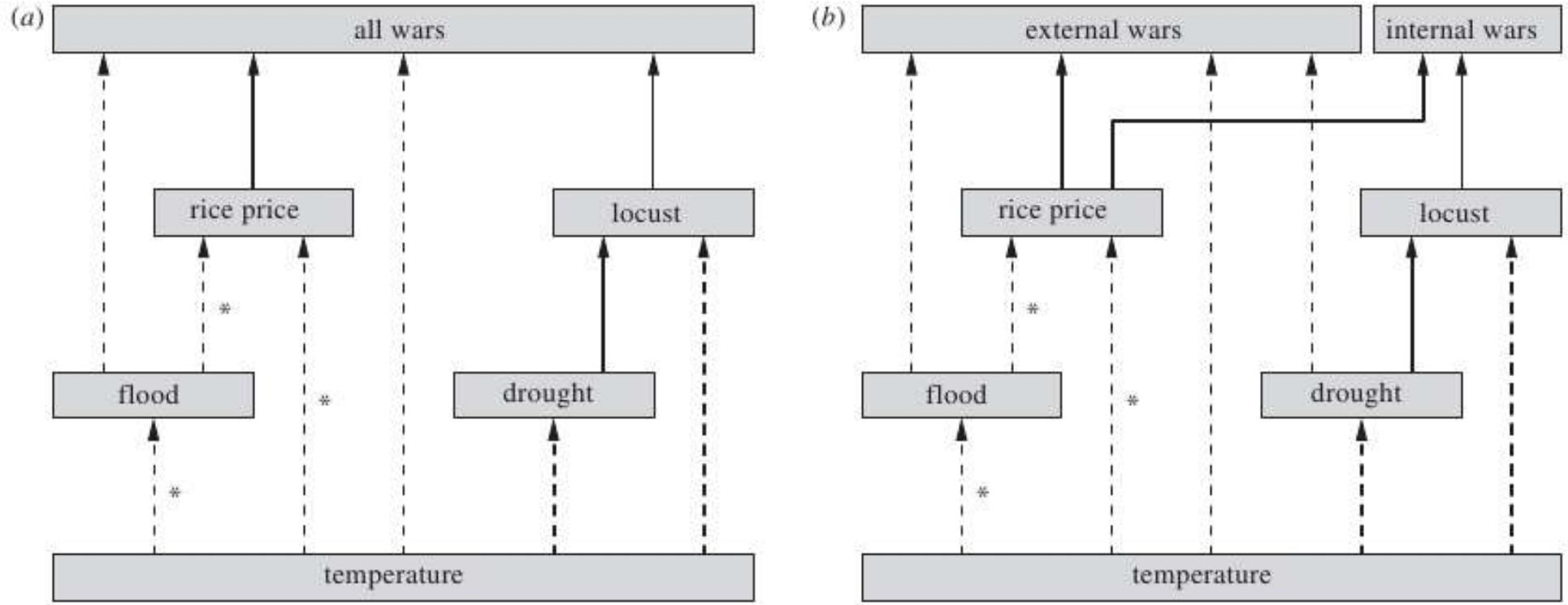


Figure 2. Possible causal links of temperature and temperature-associated rice price, locust plagues, droughts and flood with frequencies of (*a*) all wars and (*b*) external aggression wars or internal wars. Solid (positive effect) or dashed (negative effect) lines denote the maxima of CCF values with 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/Decline of the Roman Empire

- The influx of Germanic mercenaries affected the discipline and loyalty of the military (Vegetius, 4th 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/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 epidemies

The Fall/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 1st&2nd cent. but uneconomic price laws later

The Fall/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.