

The social metabolism of past societies.

A new approach to environmental changes and societal responses in the territory of Sagalassos (SW Turkey)



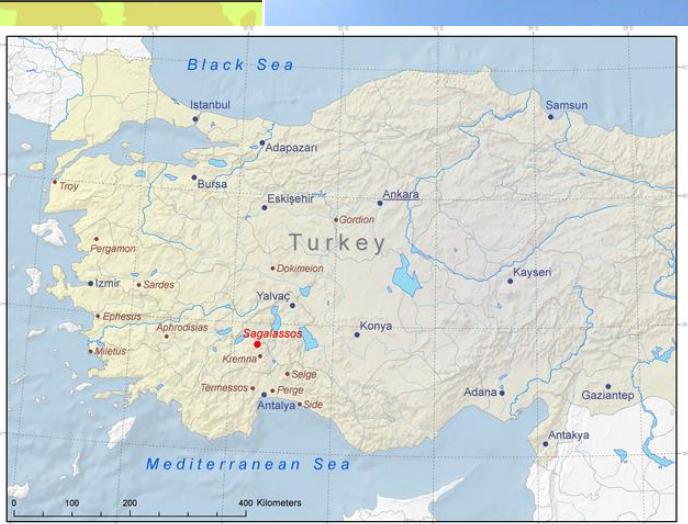
SuRP+ Project

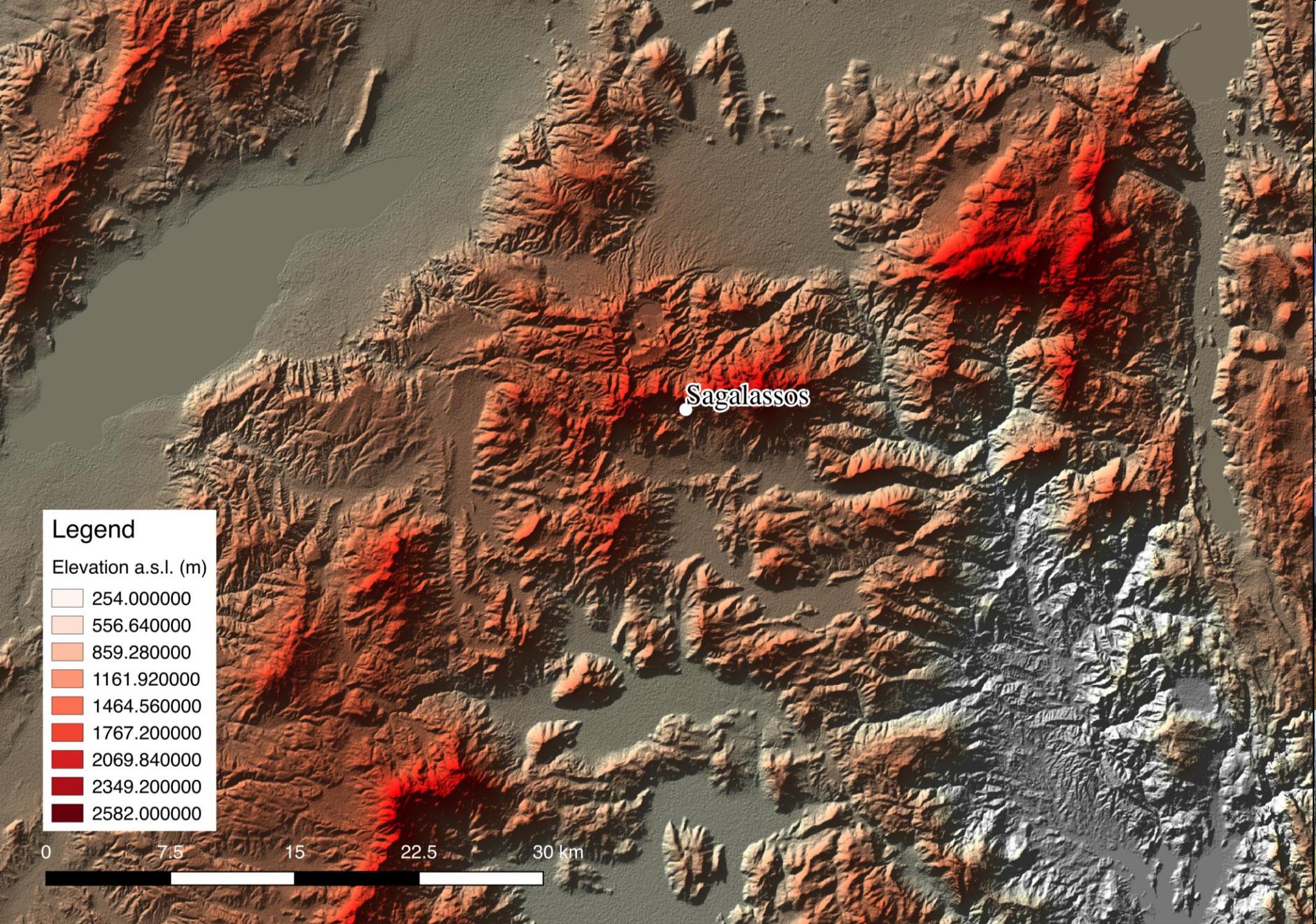
- *Sustainability and Resilience in Past and Present Populations (SuRP+)*
- <https://www.arts.kuleuven.be/surplus>
- *Idealab* project funded by the Academic Foundation Leuven
- Interdisciplinary approach:
 - Archaeology
 - Environmental Sciences
 - Demography
 - Geography
 - Forestry



Aims

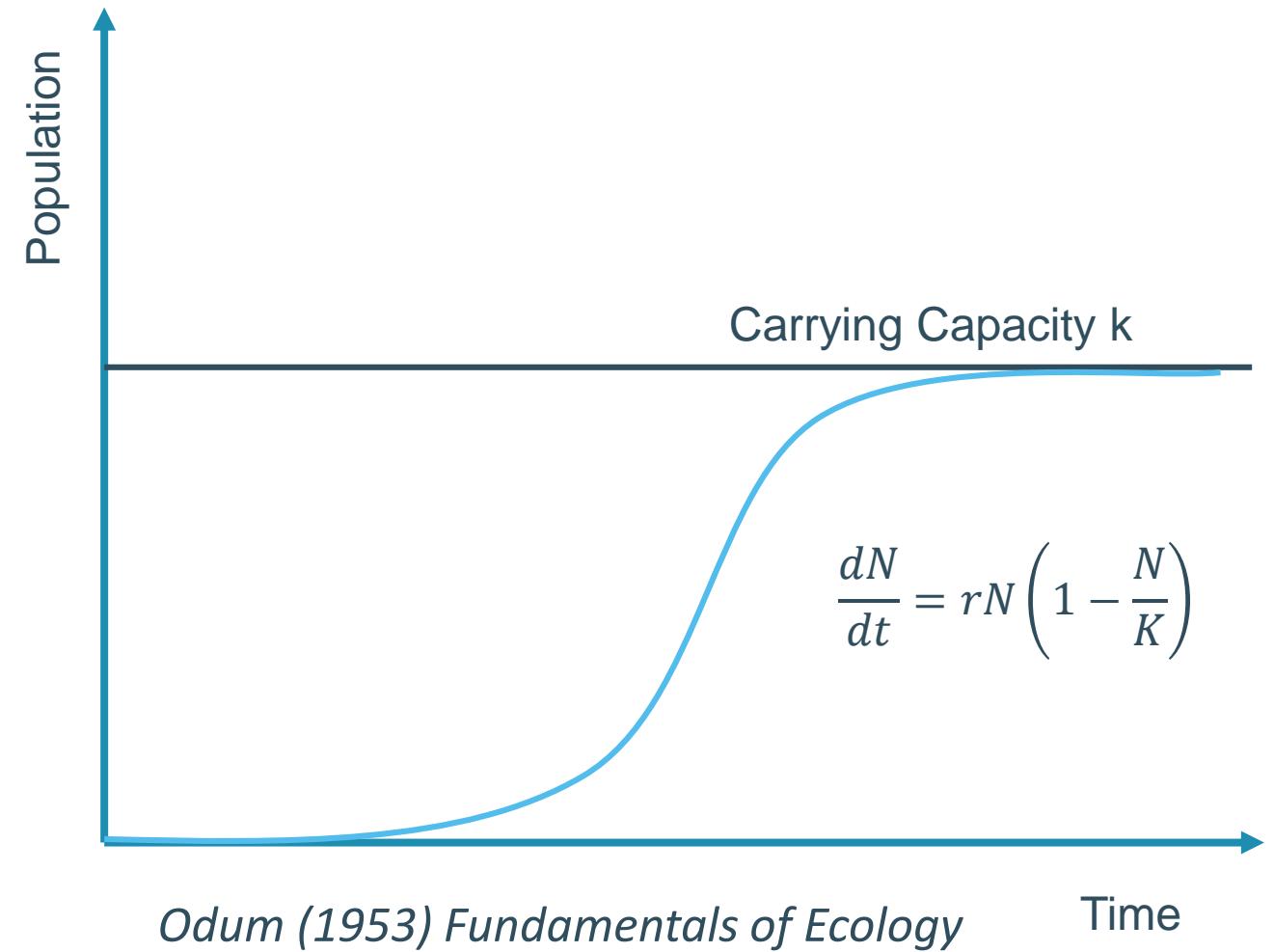
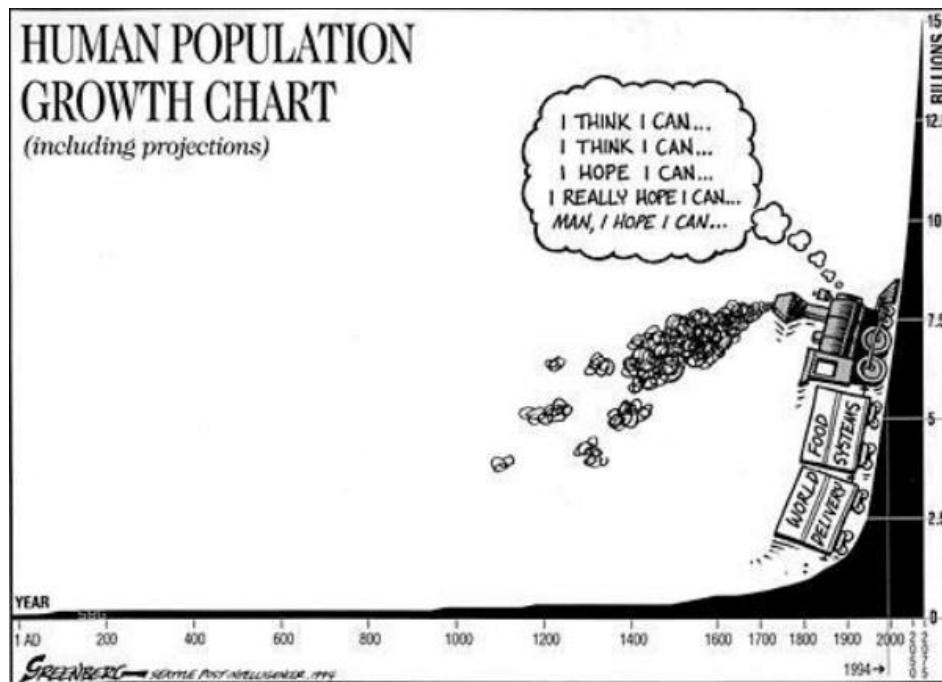
- 1) Developing new approaches to study long-term human-environment interactions in the past
 - Linking and confronting carrying capacity with the concept of **social metabolism**
- 2) Applying methodologies to datasets from the Sagalassos Project
 - Comparing two phases of environmental change and societal responses:
 - (Onset of) Beyşehir Occupation phase (1550 BCE - 650 CE)
 - Medieval Climate Anomaly (950 - 1300 CE)



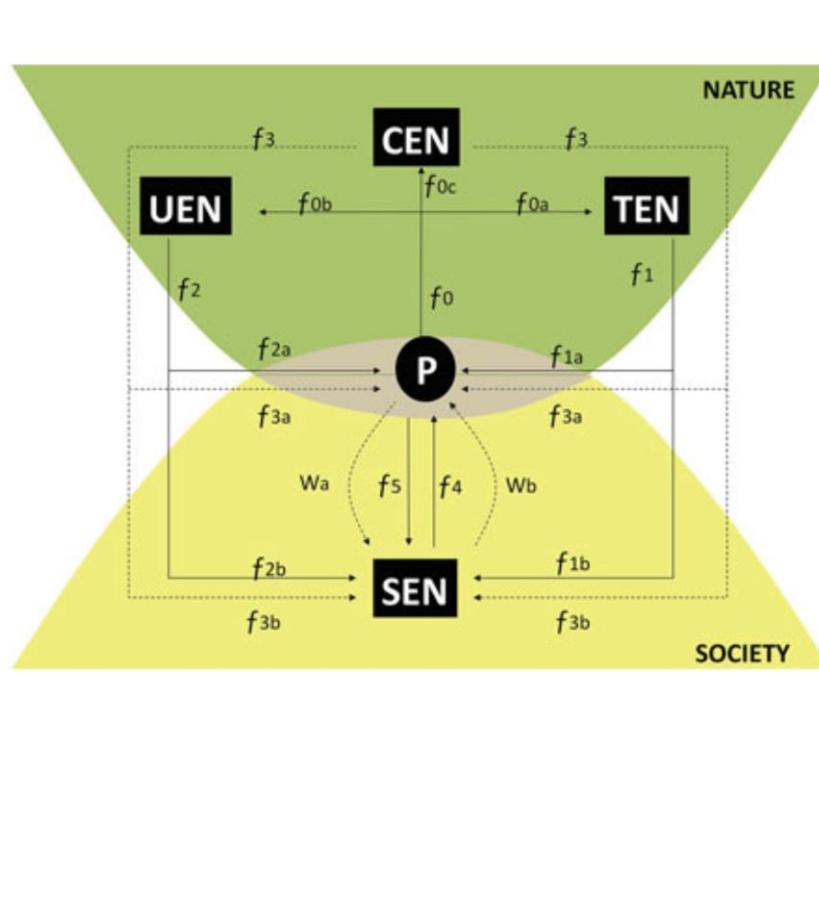


Carrying capacity: A definition

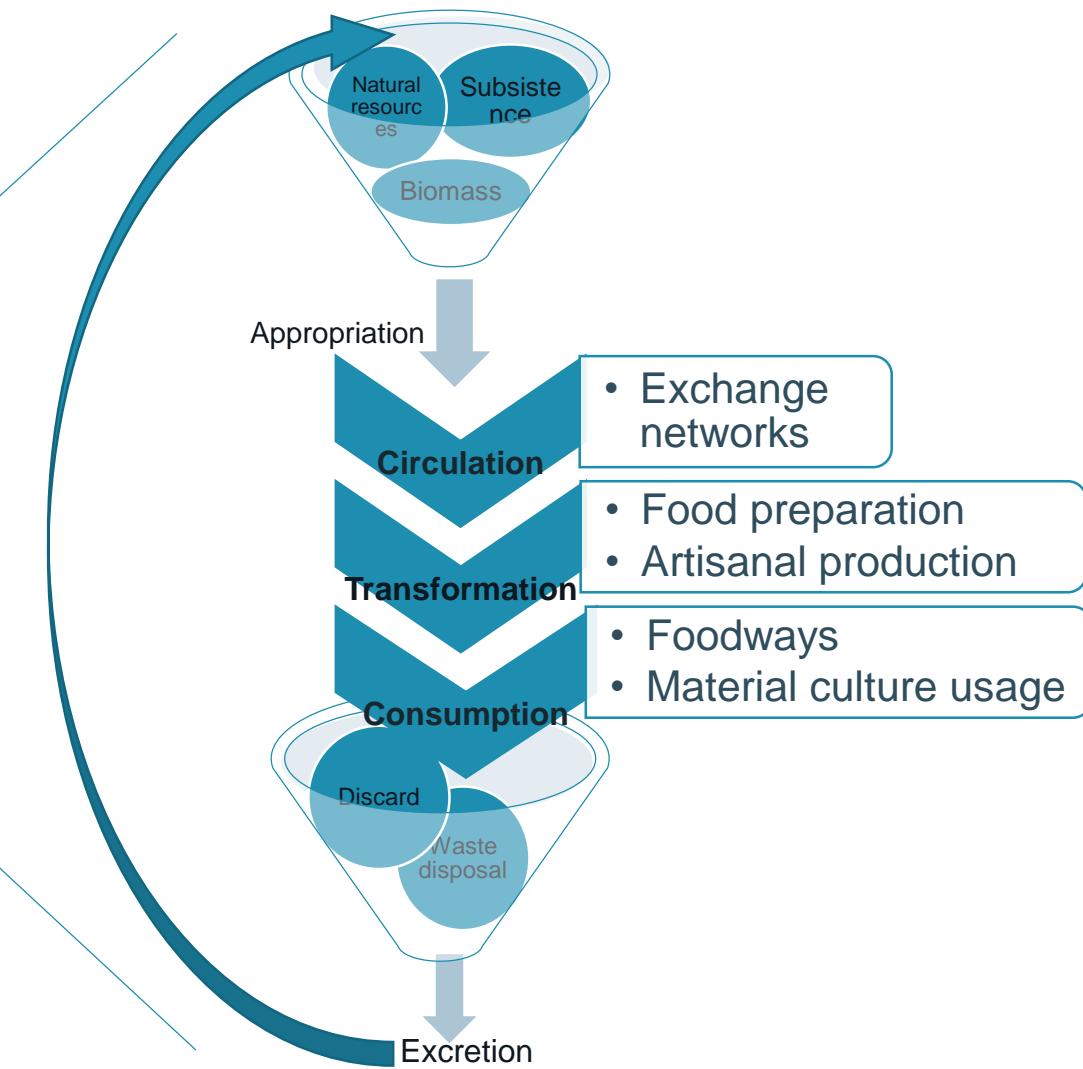
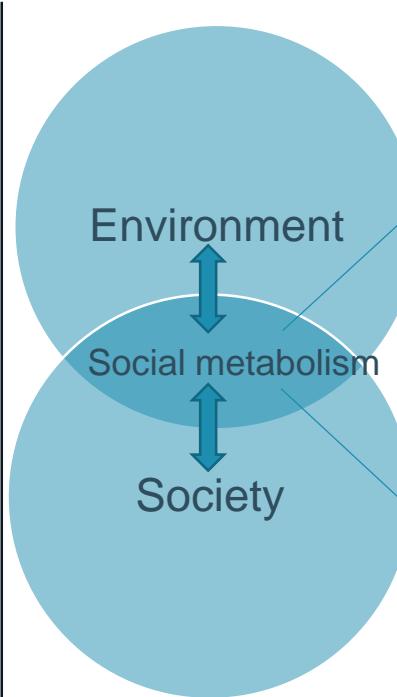
“The maximum population of a given organism that a particular environment can sustain”



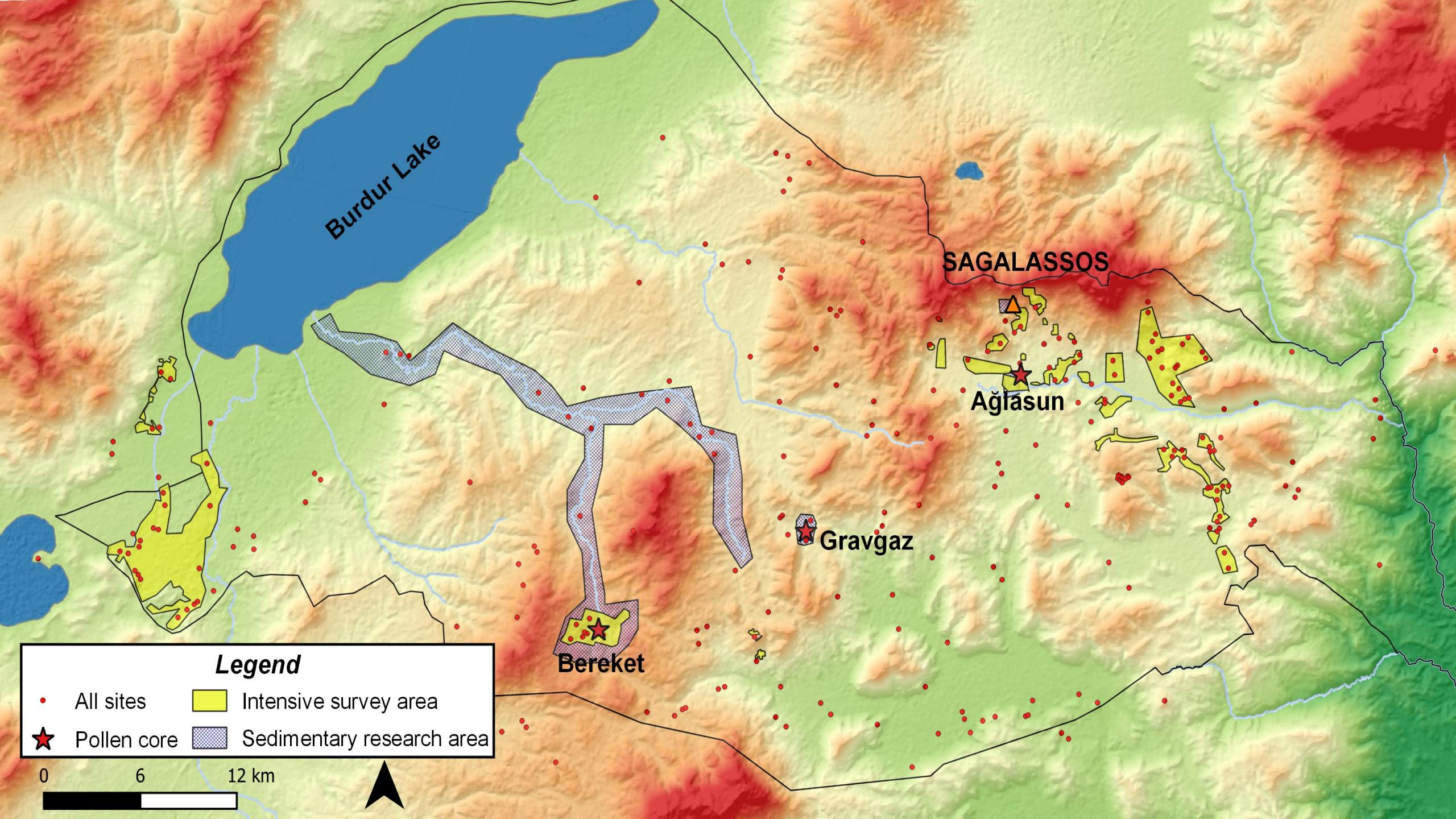
Social Metabolism



Endosomatic
vs.
Exosomatic

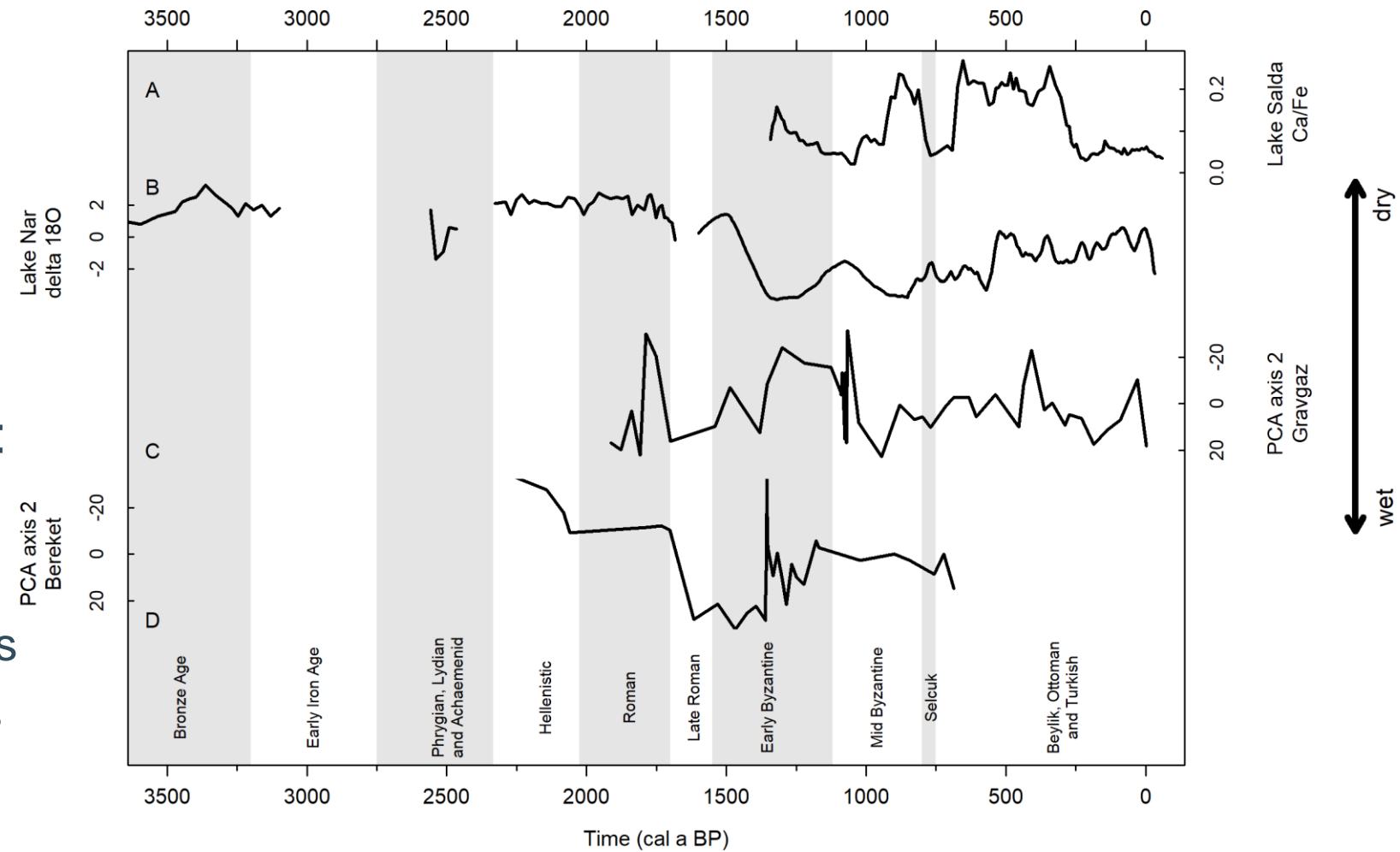


De Molina and Toledo (2014) *The Social Metabolism*



Climate proxies

- No uniform patterns in Anatolia
- No direct, independent climate proxy for Sagalassos region
- Distant + indirect proxies:
 - A) Lake Salda Ca/Fe data
 - B) Lake Nar $\delta^{18}\text{O}$ data
 - C) PCA of Gravgaz pollen records
 - D) PCA of Bereket pollen records



Bakker et al. 2012; Danladi et al. 2018; Jones et al. 2006

Land Use

BOP

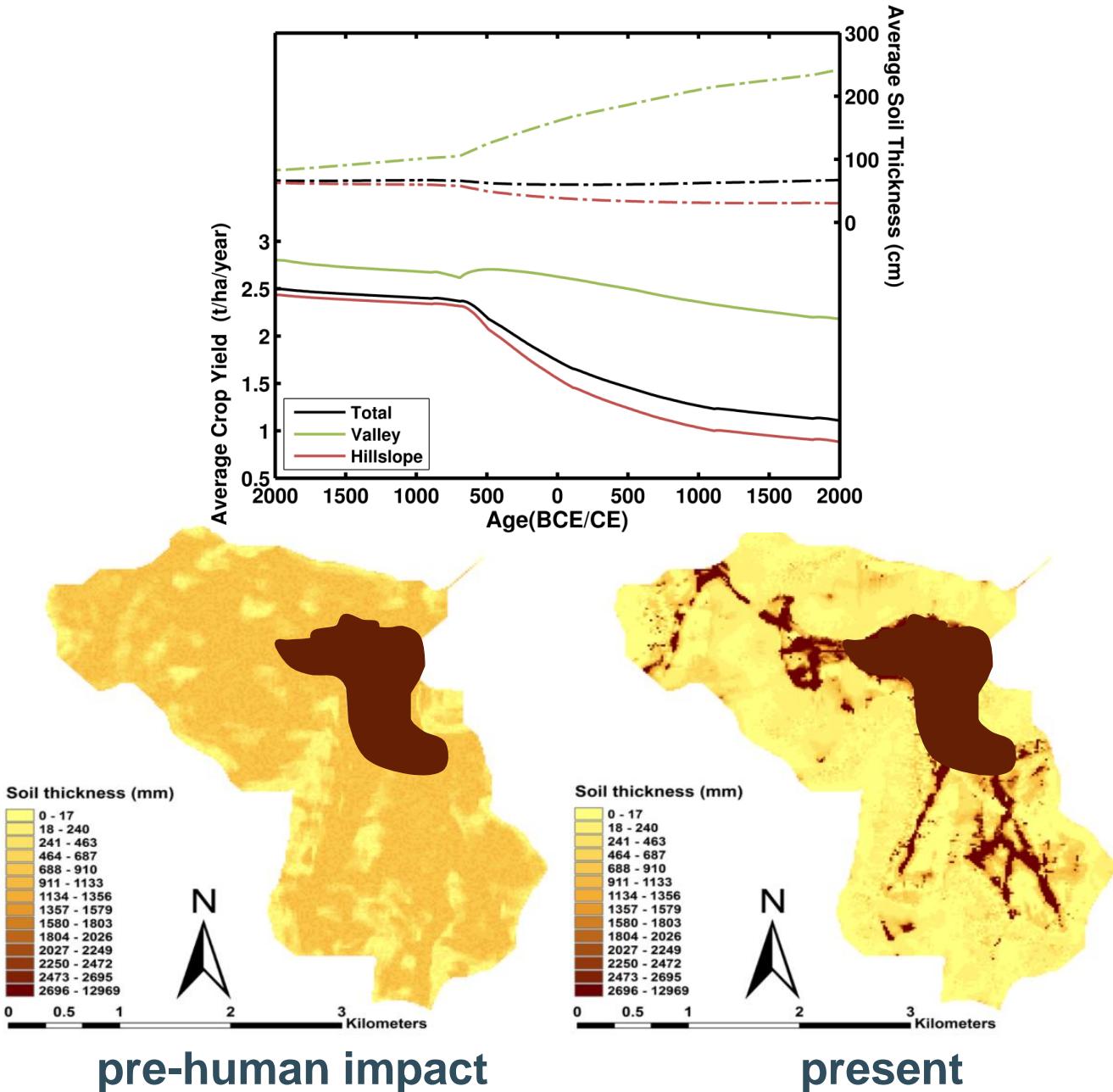
- Rise in primary anthropogenic indicators and Cerealia with timing differing between sites.
- High level of these two indicators until ca 300 CE.
- Evolution towards grazing and eventually pine forest.

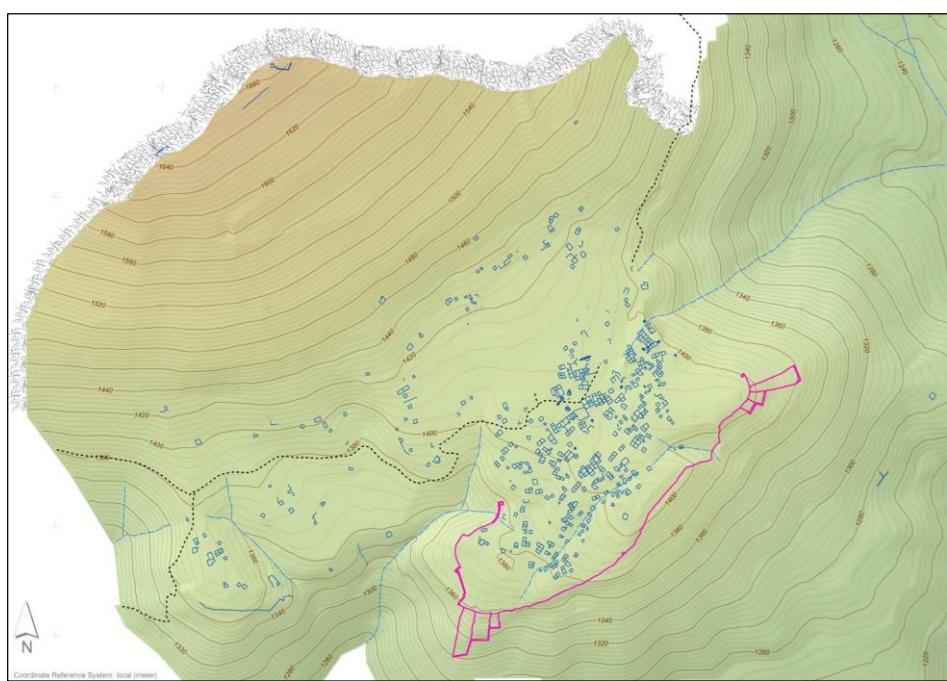
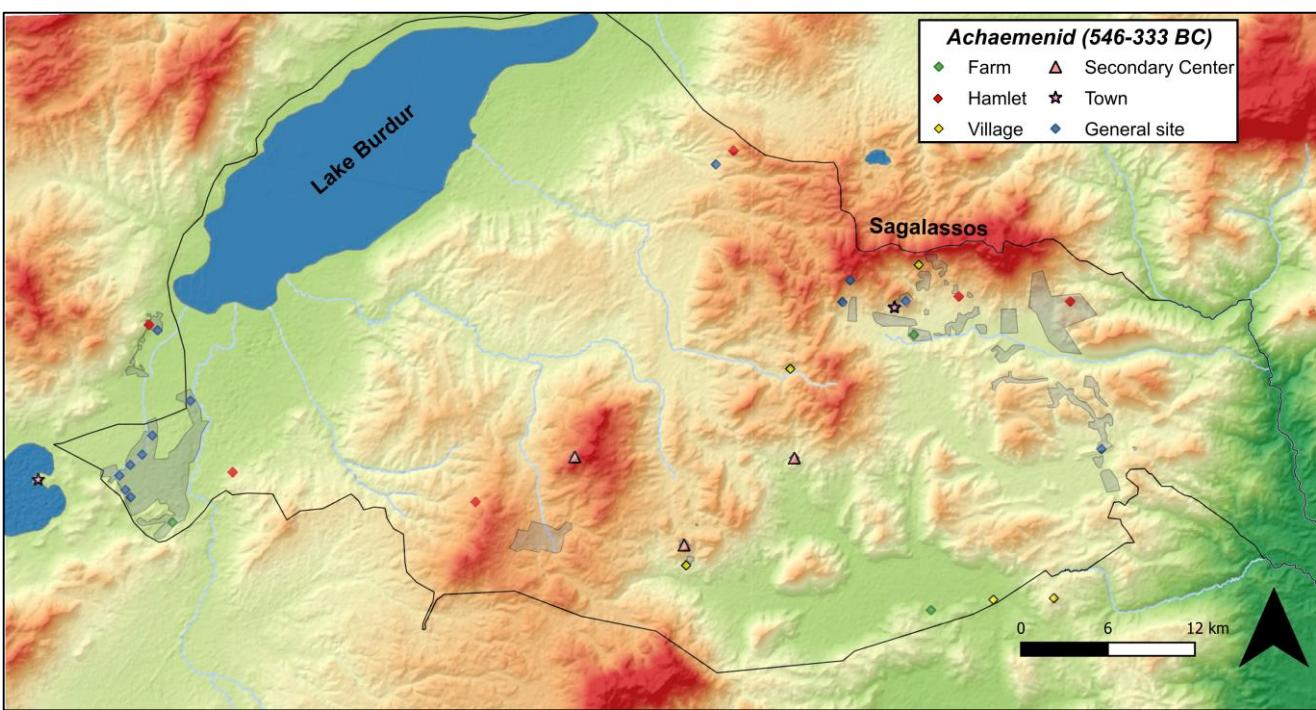
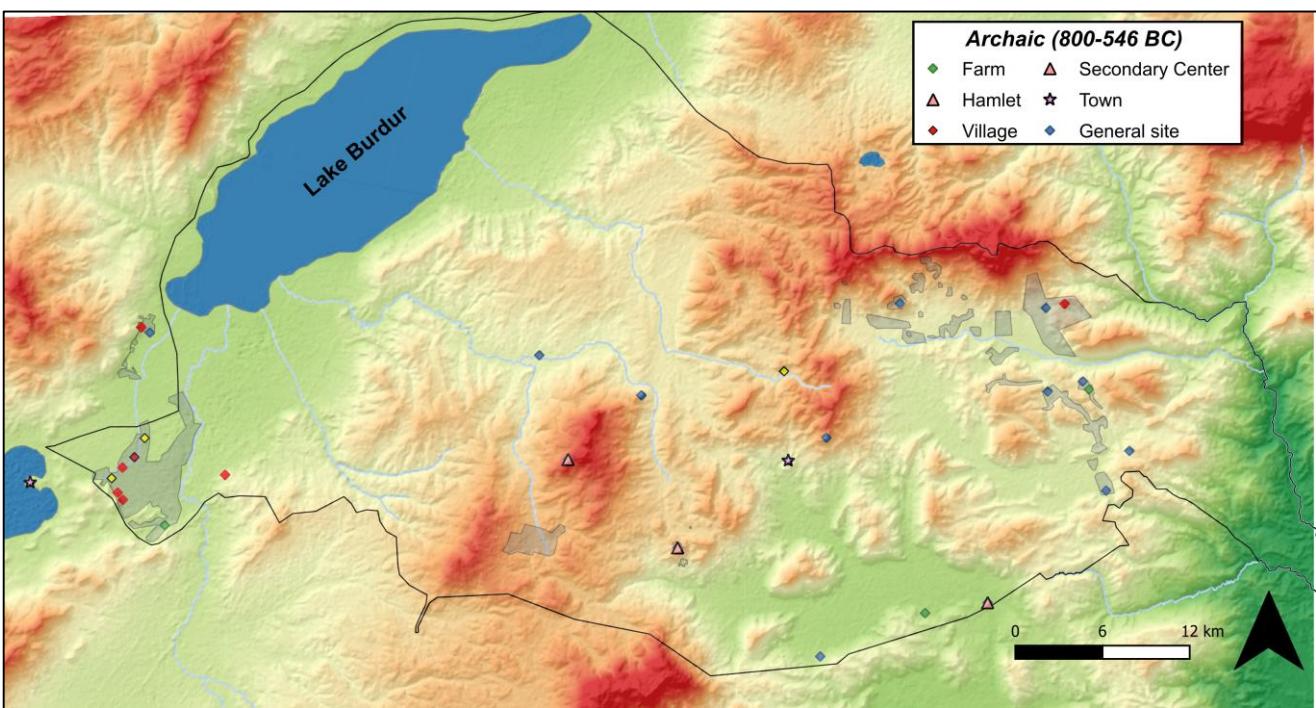
MCA

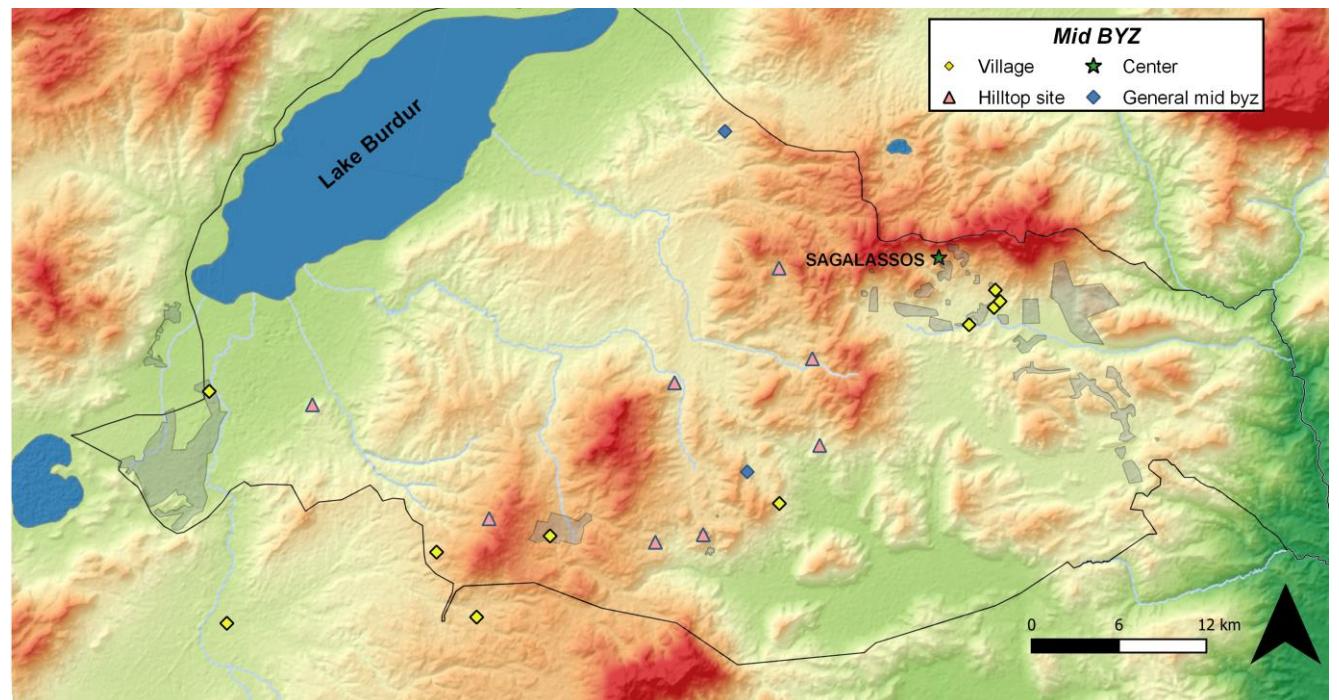
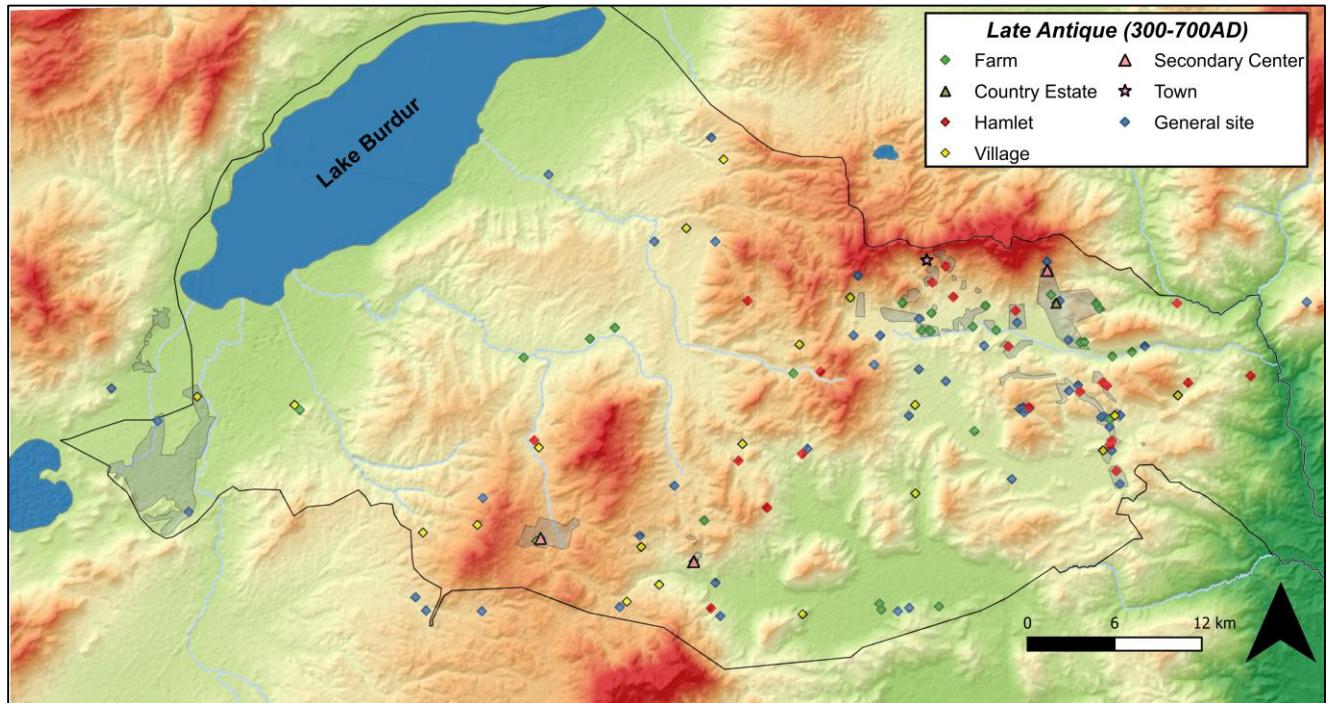
- Small rise in primary anthropogenic indicators and Cerealia from ca 940 CE, more or less simultaneously.
- Main activity appears to be (over)grazing. Indicator levels drop at ca 1150 CE.
- Evolution towards pine forest.

Land use

- Geomorphic model for soil erosion and sediment deposition (Watem/Sedem)
- Changes in vegetation cover, climate & hillslope properties
- Soil erosion driven by anthropogenic factors
- Coupled with crop yield model (AquaCrop)
- Crop yield decrease on hillslopes due to erosion, but no complete collapse!
- Human impact on environment but resilient



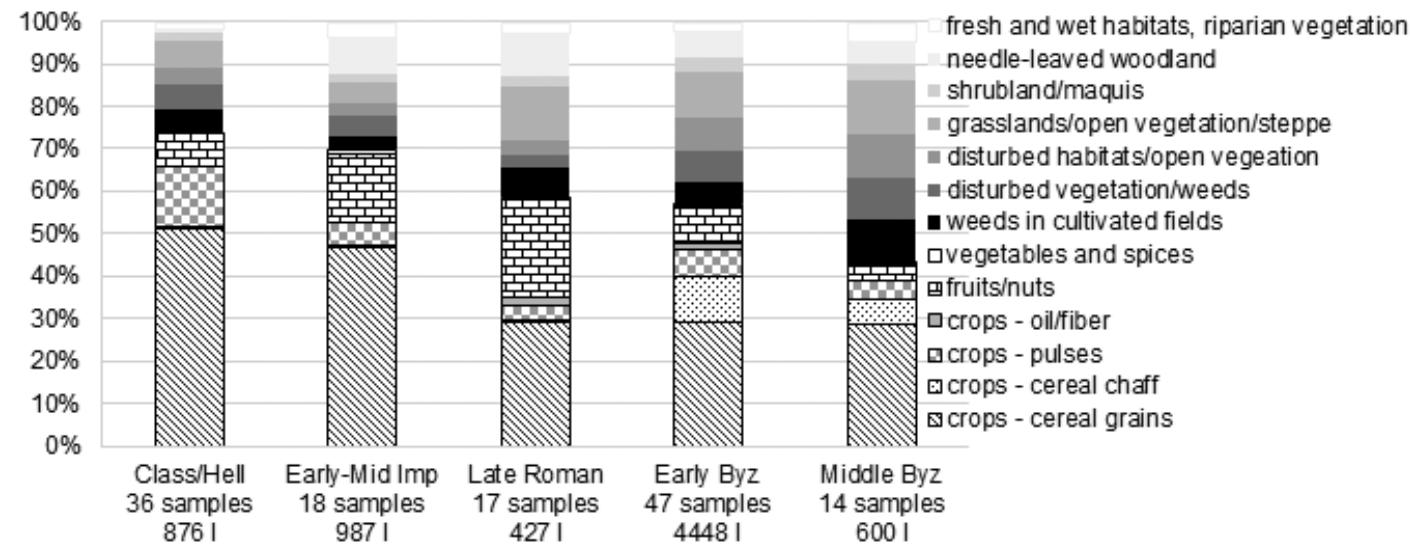
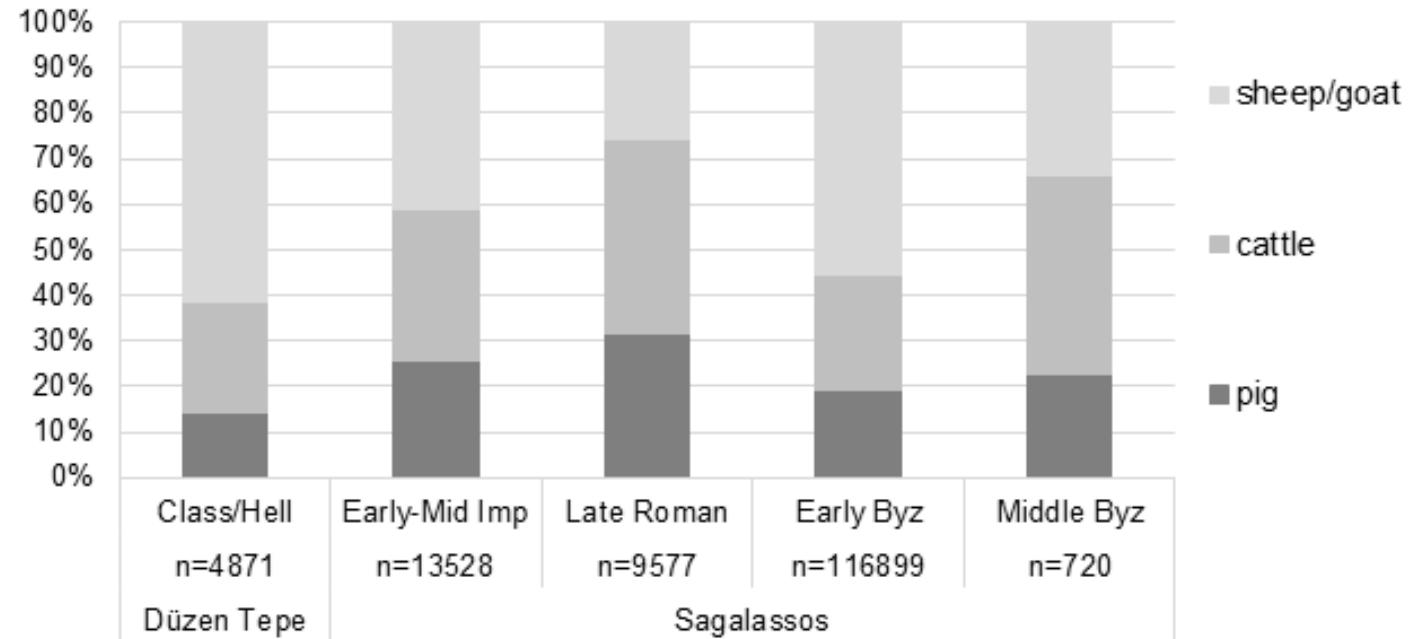




Subsistence

Faunal and botanical remains

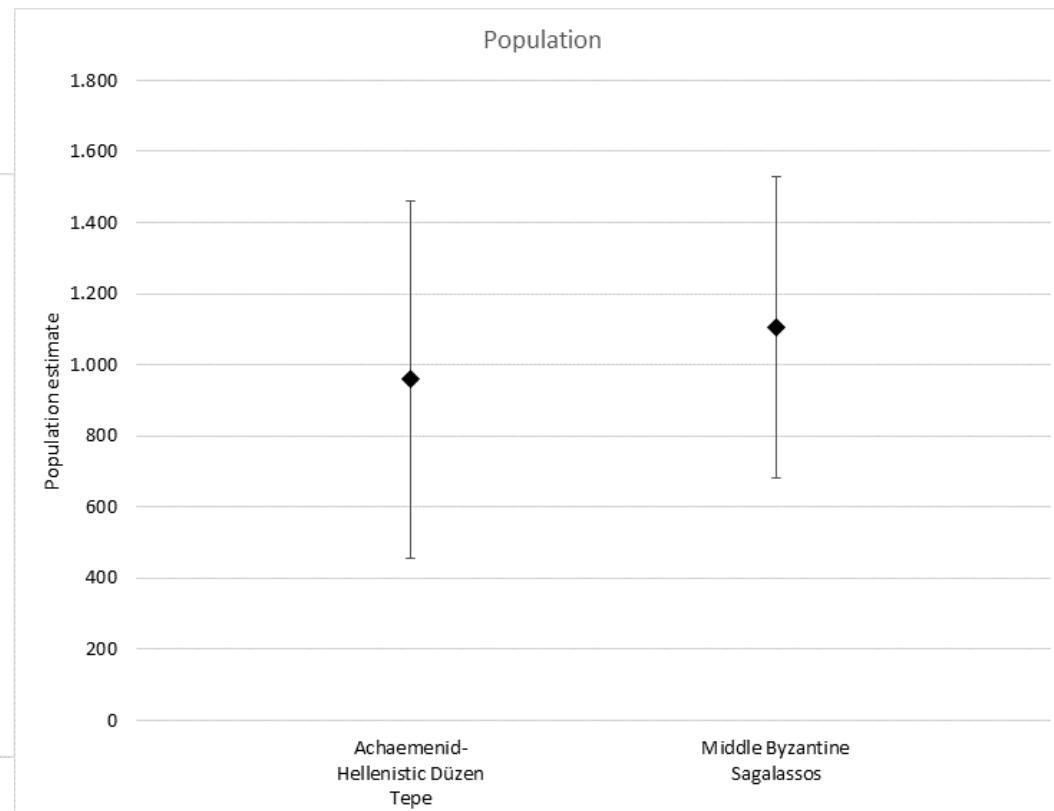
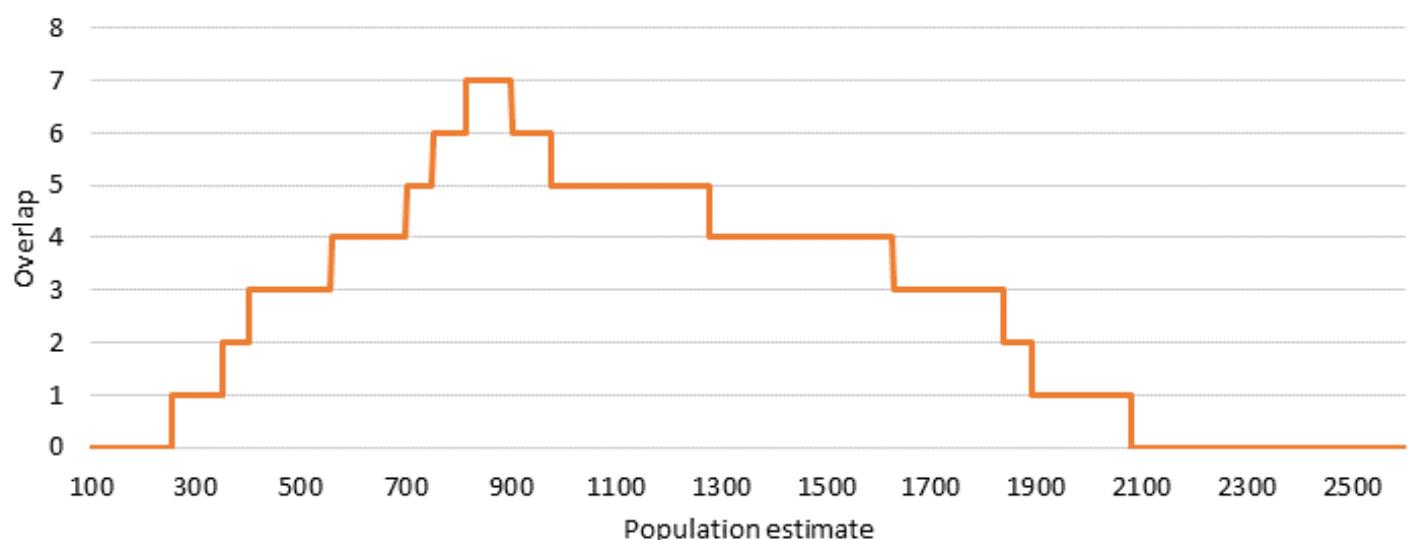
- Diminishing importance of sheep and goat
- Increased cattle and pig
- Decreased importance of cereals



Demography

Population estimates

- Shotgun 2.0 Method

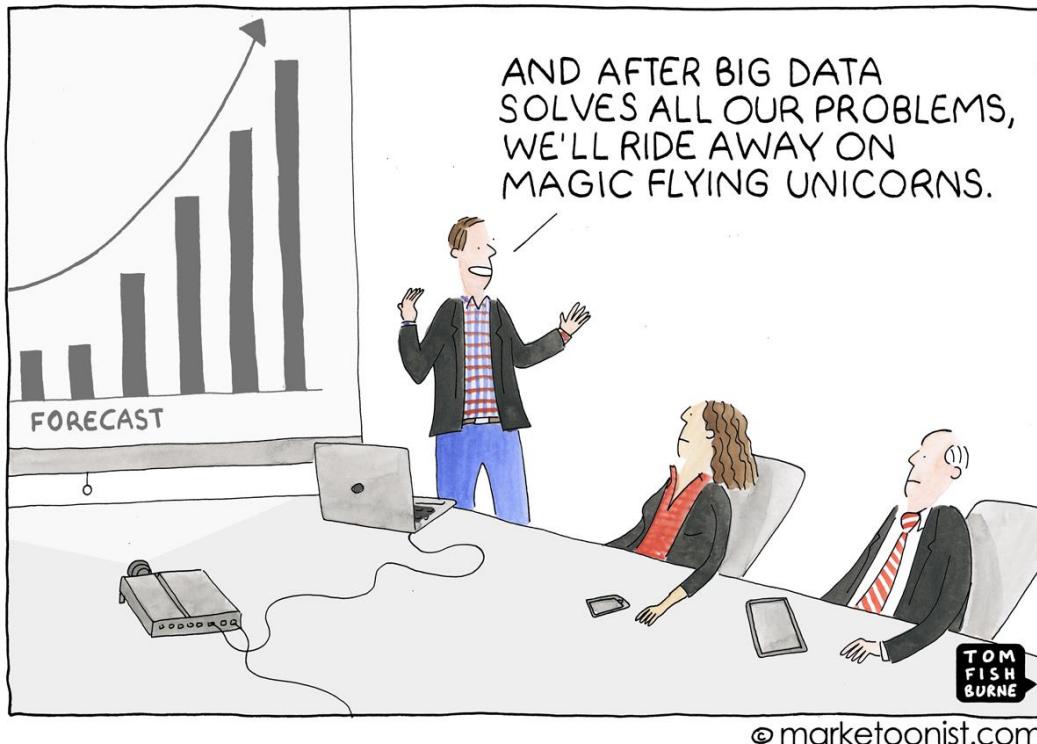


Artisanal production



Discussion 1: Limits of data

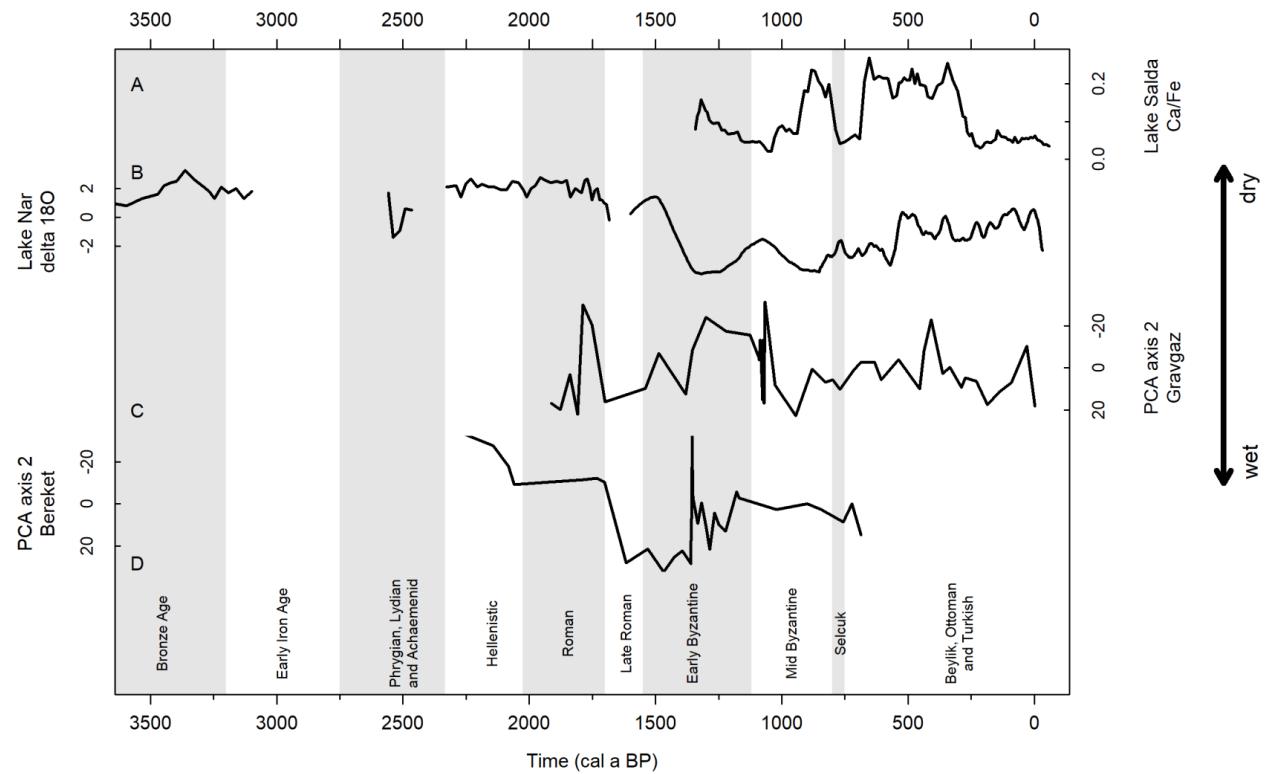
- Gaps in data
- Limited data resolution



Discussion 2: Drivers of change



- BOP (1550 BCE – 650 CE) and MCA (950-1300 CE)
 - Warm and humid
 - Favourable circumstances
 - Human vs. climate induced environmental change
- Functional trade-offs
 - Landscape exploitation
 - Security



Discussion 3: Metabolic regimes

- Endosomatic energy needs
 - Population size
- Exosomatic energy needs
 - Local resource exploitation
 - Architectural energetics
 - Artisanal production
- Human-environment interactions
 - Environmental impact
 - Niche diversification and exploitation
- Flow model of metabolic regime?



Thank you for your attention!

<https://www.arts.kuleuven.be/surplus>

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