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Climate Change and social transformations in the past (12ka BP): from field data acquisition towards socio-ecological modeling

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Objectives and challenges

- Climatic trends in Mediterranean areas during the Holocene (from 12 ka BP)
- Definition of the spatial and temporal variability of the Rapid Climate Changes (RCCs)

Methods: 4 transects – multiproxies analyses

- Long marine sequences....
- Analyses of high resolution climate changes analyses (e.g. modern analogs – Peyron et al, 2015 – Saqqal et al, 2016)
- High resolution analyses of lake and fluvial sequences (e.g. 18O isotope in Berger et al. – CDPF 2016)
- Socio-political changes: cultural areas, settlement, political changes (e.g. Carozza et al., 2015 – Lespez et al., 2016a, b)

Paleomos in the Lion’s Gulf

Improve climate and environmental change: seesaw across the Mediterranean basin

Conceptual model of Climate/Environment/Society interactions

4.2 ka BP climatic event and settlement pattern changes from the Late Neolithic to the Early Bronze Age in western Mediterranean:
- Effects of RCC lasting 3,4 centuries around the 4.2 ka BP event, c. 2.2 ka BC recorded in the lake, fluvial and soil systems
- A temporal imprint structure with 2 wet periods in Southern France
- Change in the human settlement system around 2.2-2.0 ka BC
- In lowland areas, the number of settlements decreased significantly along the river systems during a period of very high hydromedimentary discharges, dryness, and fire activity
- Environmental changes (glacial retreat) permitted the exploitation of copper and allowed the development of high altitudes of about 2,500 m allowed for an exploitation of alpine copper, as in Saint-Vincent (Cévennes) France and archaeological findings have revealed a growth in human pressure in mountain areas, specifically in the Pyrenees (Cévennes France)
- Change of settlement from lowland area to mountainous areas may have resulted in a societal reorganization at a regional level, but not in a global societal collapse

Modelling Climate/Environment/Society interactions

Dynamic and spatially explicit modelling is the only way for combining elements from different scales such as climate, rate available food, with archaeologically and socio-ecological models (one-way) feedbacks in the functioning of the Neolithic societies.

Hypotheses

• Paleo-environmentalists provide climate and landscape reconstructions such as century-scale temperature changes, while to understand the consequences on rural populations, one should translate these data into the biophysical rules of farming systems
• Archaeologists provide site-specific habitat and activity descriptions for specific time periods while, to extend such reconstructions to a regional scale, the site occupied by the same culture, a generic and adaptable behavior rationality should be hypothesized, preserving social sampling rules and production practices.

References:


Saqalli, M., Tillman, B. 2015.)

We propose a spatially explicit model (GAMA) and a temporally defined (scale-3) narrative multi-agent modelisation.

The GAMA platform game-platform.org built-in Wolfram|Alpha and the software reference: for spatial and time long-term modelling process.