Climate Change and social transformations in the past (12ka BP): from field data acquisition towards socio-ecological modeling
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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)
- Climate change and impact on cultural and political dynamics?
  - Neolithic (9.2, 8.2 and 6.5 ka BP)
  - Bronze Age (4.2 ka cal BP)
  - Final Bronze Age and Historical periods (3.2-2.8 and 1.3 et 0.7 ka cal BP)

Methods: 4 transects – multiproxy analyses

- Long marine sequences....
- Analyses of long pollen and fire signature series for high resolution climate changes analyses (e.g. modern analogs: Peyron et al., 2005; Vannière et al., 2012)
- High resolution analyses of lake and fluvial sequences (e.g. 8.2 Impression in Berger et al., 2016)
- Socio-political changes: cultural areas, settlement, political changes (e.g. Carozza et al., 2015; Lespérance et al., 2016a, b)

Paleomex 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. 2.2-2.0 ka BC recorded in the lake, fluvial and soil records
  - A temporal Imparture structure with 2 wet periods in Southern France
  - Changes in the human settlement system around 2.2-2.0 ka BC
  - In lowlands, the number of settlements decreased significantly along the river systems during a period of very high hydrosedimentary discharges, dryness, and fire activity
  - Environmental changes (glacial retreat) permitted the exploitation of copper and resulted in high altitudes (above 2,500 m) for an exploitation of alpine copper as in Saint-Vincent (Mont-Fleury) and archaeological findings. New revealed a growth in human pressure in mountain areas, specifically in the Pyrenees (340 BC-1 BC)
  - Change of settlement from lowland 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 long-term reconstructions on such a regional scale, with a holistic view, with archaeological and socio-ecological data to confirm or disprove hypotheses in the functioning of the Neolithic societies.

References:

Geological and archaeological studies of Holocene Climate in the Mediterranean and North Africa (12-0 Ka BP) - with a special focus on the investigation of the Late Neolithic period in Crete, eastern Mediterranean Sea

We propose a spatially explicit multi-agent and temporally defined (scale-2 seasonal) multi-agent modelling

The GAMA platform (www.gamaplatform.org) built in Objective-oriented software for multi-scale and long-term modelling process

Map of the micro-regions documenting the Late Neolithic to Early Bronze Age transition around 4.2 ka BP (± 2.2-2.0 ka BC (Berger-Carozza et al., 2016)).

Sea surface temperatures and land derived input time series were generated from the Gulf of Lions inner shelf sediments. WARM Mediterranean sediments show higher uncentred-weighted odd carbon-numbered n-alkanes. The SST record depicts at least two major Early Holocene (11-9 ka BP) followed by a cooling of ~3°C between 7000 and 1000 BP and rapid warming from ~1800 AD onward. Several superimposed multi-decadal events of ~1°C amplitude were identified. Concentrations show a broad increase from the Early Holocene towards (the present with a pronounced minimum around 2100-2000 BP and large fluctuations during the Late Holocene. Sediments of this inner shelf seems to be originated from the Upper Rhone River watershed, primarily delivered during positive North Atlantic Oscillation (NAO).

Improving our understanding of the Late Neolithic to Early Bronze Age transition around 4.2 ka BP (± 2.2-2.0 ka BC (Berger-Carozza et al., 2016)).

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