

Warm signature of the Roman period in Mediterranean sea surface temperatures

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Abstract

Sea surface temperature reconstruction (SST) over the last millennia in the Mediterranean area represent an important challenges to document the possible link of past climate variability on the rise and fall of ancient civilizations. In addition, the last report of the Intergovernmental Panel on Climate Change (IPCC 2018) underlines the requirement to assess climate feedbacks during past episodes of moderately warmer (1.5°C-2°C) conditions. Within this framework, we present the reconstruction of the SST anomaly over the last five millennia based on the Mg/Ca ratios measured in the planktonic foraminifer *Globigerinoides ruber* from the sediment core SW104-ND11 extracted in the western part of Sicily Channel (water depth 475 m, central Mediterranean Sea). This new generated SST record is compared with previous published SST records reconstructed from Alboran Sea, Minorca Basin, Aegean Sea and from a north Hemisphere temperature reconstruction. This exercise brings the basses to discuss the regional impact of the most recent episode of apparently warmer conditions than present in the social-economical development of the Mediterranean region.

According to the Mg/Ca *G.ruber* SST record, the Late Holocene maximum temperatures (22.7°C) were reached at ca. 424 CE during the Roman period, after an overall warming trend that started at ca. 3300 BCE and was punctuated by several abrupt short term oscillation. After the Roman period, the Mg/Ca *G.ruber* SST record shows a cooling trend reaching the minimum temperature (18.2°C) at ca. 1673 CE, during the Little Ice Age. During the last three centuries the Mg/Ca *G.ruber* SST record shows warming trend to present day (20.3°C). The comparison of the studied record with other SST records, based in both Mg/Ca and alkenone proxies from several areas of the Mediterranean basin, supports homogeneous warm conditions at regional scale between from 100 BCE to 500 CE, and documents the occurrence of a distinct warming phase of ca. 2°C at the beginning of the Roman Period that led to the so called "Roman Climatic Optimum". This period corresponded to an important demographic increase during the Roman Empire. At ca. 600 CE a cooling phase is recorded, which age corresponds to the Late Antique Little Ice Age (LALIA) event; after this event, the SST Mg/Ca_{*G.ruber*} reconstruction documents the onset, at ca. 1180 CE, of the well-known Medieval Warm Period. The cooling associated to the Little Ice Age event occurred between 1320 CE and ca. 1850 CE with an anomaly of ca. 2°C vs negative values. The studied record of Sicily Channel ends with a turnover from ca. 1850 CE to 2014 CE vs a warming phase of ca. 1°C probably associated to the onset of the Industrial Period/Modern Warm Period. This research was financially supported by NEXTDATA and ERC-TIMED 525 (683237) projects.