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The Roman imperial Trajan Harbour (Tiber delta, Italy) as an archive of coastal evolution during the last 2ky: a micropalaeontological and geochemical approach

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The remains of the Trajan basin nowadays consist of a hexagonal lake, 3 km inland from the coastline. The artificial Trajan harbour, inaugurated in 112 AD, was part of the most important Roman port system of the ancient Mediterranean and was located in correspondence of the ancient coastline, close to the Tiber River mouth.
The basin hosts 5 m thick fine sediments, recording the environmental evolution of this coastal area from the 2nd century AD until today. Although of great historical and archaeological interest, the lake was never studied before in a geoarchaeological perspective. Micropaleontological, XRF-geochemical and stable isotopes analyses were performed on two cores drilled in the centre of the Trajan Lake.
The aim of this study is to identify the main phases of environmental evolution of the area, linked to three main factors: the river regime, the coastline variations and the human impact.
Autoecological data from ostracoda and foraminifera were used to characterise the different salinity inputs in such marginal marine environment. Selected carbonatic shells of ostracoda (Cyprideis torosa and Heterocypris salina) and foraminifera (Haynesina germanica and Ammonia tepida) were used to perform stable isotope analyses. High-Resolution Gamma-Ray Spectroscopy and Magnetic Susceptibility analyses were also performed along the bulk core. Chemical data were statistically analyzed by carrying out principal component analysis. The chronological framework is based on historical data and 4 AMS radiocarbon dates.
The harbour phase characterized the lower part of the core, indicating a saline lagoonal environment with both marine and freshwater inputs, these latter probably linked to floods. The subsequent post-harbour phase indicates isolation from the sea: sediment inputs and low-salinity to freshwater fluctuations seem to be caused by delta progradation, but human interventions played a major role. Infact, correlations between scientific and historical data confirm that human impact influenced the natural processes shaping the Tiber delta area during the last Anthropocene.