Response of benthic foraminifera to flooding episodes and gravity flows in a steep Mediterranean deltaic setting: Climatic and sediment transport implications

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Introduction

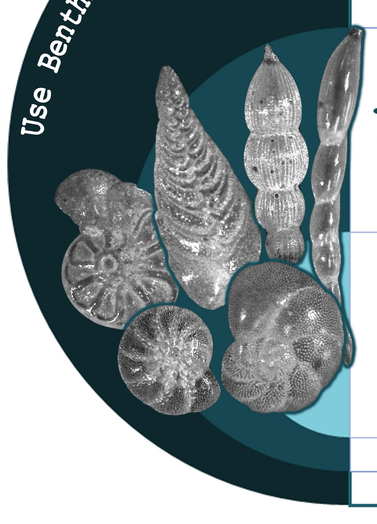
Deltaic systems are located in the transition between terrestrial and aquatic environments, where complex interactions between climatic, sedimentary and tectonic processes occur (e.g. Syvitski and Saito, 2007). Those systems are sensitive to sea-level changes (e.g. Nicholls and Hoozemans, 1996), constituting targets for predicting its future evolution in response to sea-level rise (Jabaloy-Sánchez et al., 2014).

In the Mediterranean Sea, the Guadalfeo River is an outstanding example of a deltaic system influenced by an abrupt physiography and fed by one of the most high-energy drainage systems along the Spanish Mediterranean coast (Jabaloy-Sánchez et al., 2014).

In order to study these vulnerable environments, multivariate analyses based on benthic communities are commonly used. Among these, benthic foraminifera are one of the best micro-organisms to study, since they react in a rapid and sensitive way to environmental changes in water bodies and their shells have a good preservation in sediments (Scott et al., 2001). As a result, they are excellent tools for palaeoenvironmental reconstructions (Debenay et al., 2000), including the ecological assessment of transitional and coastal ecosystems (e.g. estuaries, coastal lagoons, deltas) (Schönfeld et al., 2012).

Objectives

Use Benthic Foraminifera to

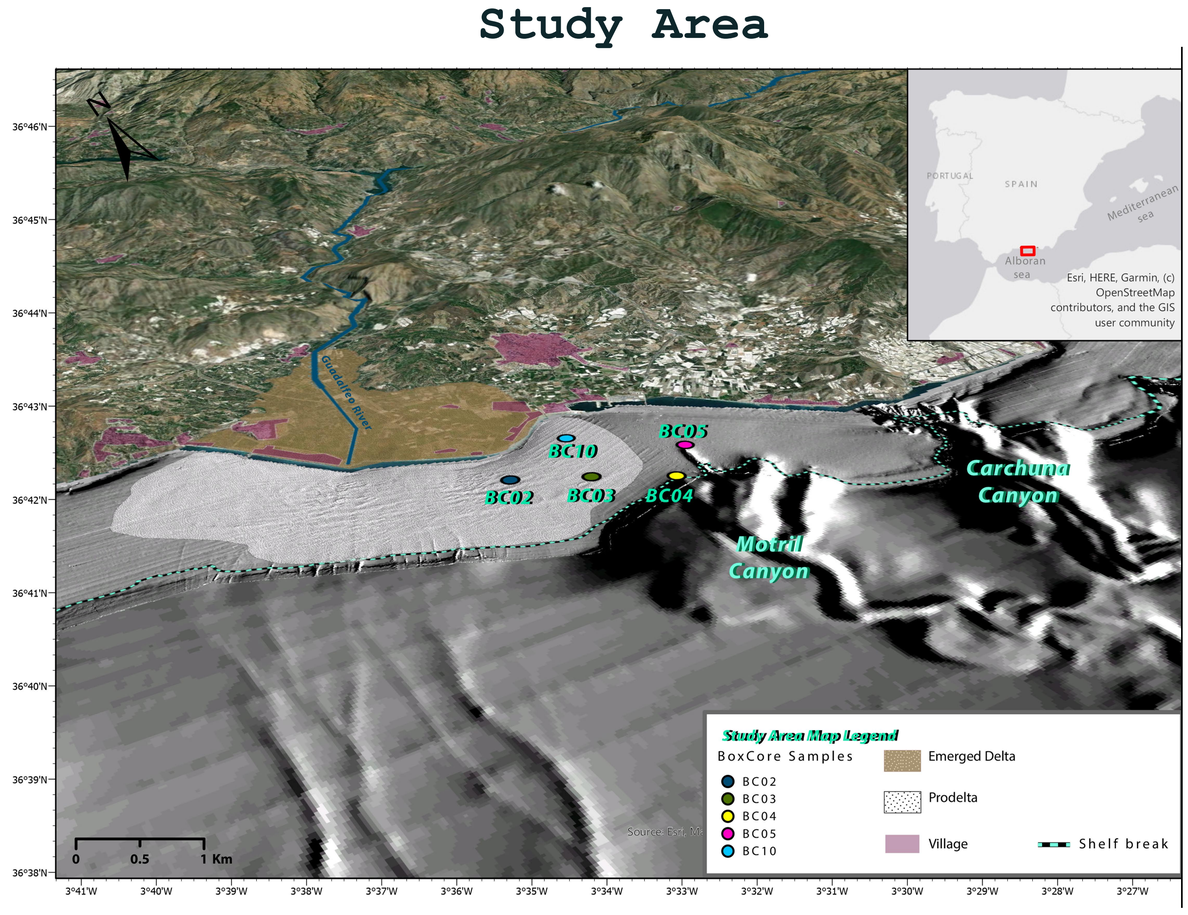


Identify
- Deltaic evolutive patterns involving fluvial flooding episodes and generation of gravity flows
- Superimposed influence of human impacts

Understand
- Prodeltas' development history (Late Holocene - Present paleoenvironmental reconstruction)

Provide
- Innovative insights into the adaptive patterns of benthic foraminifera in response to conditions of high environmental stress

Study Area



Methodology

Sample and data collection using a Remote Operated Vehicle (ROV) onboard the RV Sarmiento de Gamboa

Sample washing and treatment at CIMA's Laboratory

Foraminifera picking and classification using a stereo microscope (total of ~160 samples, living and dead foraminifera)

Calculate:

Population densities

Diversity indices

Multivariate statistical analyses

Identify the spatial variability of living and dead benthic assemblages

Identify transport pathways within the Guadalfeo prodelta and the nearby Motril Canyon head

Age control and sedimentary facies analysis

Sediment and seismic facies analysis

Data correlation and integration of results

Dissemination to the scientific community and thesis writing

References:

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