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Paleoenvironmental reconstructions of sedimentary successions by means of benthic foraminiferal and ostracod assemblages

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The aim of the research is the reconstruction of the paleoenvironmental evolution of Neogene and Quaternary successions of southern Italy by means of the systematic study of benthic foraminiferal (Foraminifera, Rhizaria) and ostracod (Ostracoda, Crustacea) fossil assemblages, their quantitative analysis, the definition of the ecological distribution of the species and the comparison of the results furnished by the two taxonomic groups. Both the taxa are usually considered as part of the meiobenthos and are provided of a calcareous shell, and consequently are frequently found in the sedimentary record of the fine grained deposits pertaining to terrigenous successions. Benthic foraminifers and ostracods display different characteristic as paleoecological indicators, thus the comparison of their variations, connected with the environmental changes occurred during the deposition, is necessary to obtain a detailed analysis.

Points of special interest are:

1 – Salinity variations. In successions representing transgressive-regressive phases in coastal environments, they are frequently reflected in variations of salinity. These can be evaluated by mean of benthic foraminiferal and ostracod analysis if transitions in the range from normal marine to polyhaline waters are recorded, and exclusively by ostracod assemblages when deposition in mesohaline, oligohaline and limnetic paleowaters occurs.

2 – Paleobathymetry. Reliable paleodepth estimates may be inferred with both benthic foraminiferal and ostracod analysis. The first group offers the advantage of high density assemblages and large number of available data. On the other hand, ostracods have a more delicate shell (highly sensitive to transport) and show different instars (representing development stages), and, consequently, they permit, in mixed assemblages, the discrimination between allochthonous and autochthonous specimens.

Points 1 and 2 complement each other, providing data aimed at reconstructing the dynamics of sedimentary basins as well as of coastal areas subjected to intense volcanic activities with rapid variations of the sea level.

3 – Paleoxygenation and climatic phases. The integration of informations derived by benthic foraminiferal and ostracod assemblage analysis allows the recognition of hypoxic and anoxic episodes. Ostracods are very rare in environments where dissolved oxygen values are lower than 3 ml/l, whereas benthic foraminiferal assemblages display different composition in suboxic, dysoxic and anoxic bottom waters. Various genera and species with high tolerance to low oxygen waters are characteristic or dominant in layers (sapropels) deposited during sedimentary episodes which can be correlated on basinal and inter-basinal scale, connected with chronologically defined climatic phases.

Another field of interest is the paleogeographical evolution of the connection

between various Mediterranean areas and with other basins (Atlantic, Paratethys, Indo-Pacific). It requires an accurate taxonomic definition at specific level and the comparison with recent literature which highlighted the co-occurrence of pandemic and endemic taxa, with the aim of contributing to the knowledge of the complex colonization-speciation patterns in the Late Neogene and Quaternary Mediterranean waters.

Specifically, the project includes the study of deposits belonging to Neogene wedge-top basins unconformable over the Apennines pre-orogenic nappes. Meiofaunal analysis, combined with a sedimentary facies analysis, is aimed at reconstructing the paleoecology and paleogeography of the above mentioned basins that, being developed between tectonic phases, represent effective tectono-stratigraphic markers. The depositional environments up to now recognized, particularly in Pliocene basins, include alluvial fan (continental), fluvial, marine shelf and slope, and coastal-transitional successions including lagoonal, dune, shoreface and backshore/foreshore sediments,

Proposal for a PhD position

The activities planned in the present PhD project include: sampling of fine grained deposits pertaining to terrigenous successions of the southern Italy, with particular interest in outcrops located in the Apennine of the Campania region; sample processing for paleontological analysis of benthic foraminiferal and ostracod assemblages; picking of the calcareous meiofaunal fossil remains; systematic and quantitative analyses, with an appropriate training; comparison of the results with the previous data relative to the paleoecological features of the studied assemblages, addressed to the integration of the investigation in the regional depositional and paleogeographic context.