Theme 11. Biochemical and biological processes in sedimentary rocks

Special Session 11.2. Trace fossils in sedimentological analysis: expanding their applicability in space and deep time

Oral presentation

Trace fossils from Miocene to Pleistocene tidal straits in southern Italy: implications for the ichnofacies model

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Ichnologic analysis in tidal environments has focused on tide-dominated estuaries and deltas, as well as on tidal flat-subtidal sandbody complexes. Conversely, tidal straits representing marine passageways between emerged lands that link two adjacent larger basins have received less attention from an ichnologic perspective. The Lower Pleistocene Messina and Siderno straits, and the Tortonian Monte Pellegrino Strait (Amantea Basin) in southern Italy, have been explored to evaluate their ichnologic content within the framework of tidal straits. These comprise three well-defined zones: (1) strait center, (2) intermediate zone (i.e., 'dune-bedded zone' of Longhitano), and (3) strait end. The intermediate zone, the most important in terms of sediment volume, is characterized by 3D and 2D dunes fields ('constriction-related delta' of Dalrymple). The intermediate zone is typified by rapid tidal currents, alternation of strong erosion and rapid deposition, organic particles kept in suspension by vigorous currents, sandy substrates, and well oxygenated bottom and interstitial waters. Influence exerted by waves seems to have been negligible in the observed facies. The ichnofacies model predicts that this zone would be characterized by the archetypal *Skolithos* Ichnofacies. However, elements of this ichnofacies seem to be restricted to scarce vertical burrow segments of *Ophiomorpha*. In contrast, large-scale, cross-bedded, coarse- to fine-grained sandstone in places contain abundant horizontal trace fossils assigned to the ichnogenera *Bichordites* and *Scolicia*, attributed to irregular echinoids, being locally associated with *Macaronichnus*. Colonization of these highly mobile substrates occurred at times of reduced current speed and pauses in sedimentation. An amensal relationship between the echinoderms and the producer of the vertical burrows may be invoked. This tidal depositional regime prevented construction of permanent burrows such as those that typified the *Skolithos* Ichnofacies. The studied association represents a departure from the ichnofacies paradigm, similar to the *Macaronichnus* association of the foreshore in wave-dominated shorelines. These new observations in tidal strait deposits suggest that the ichnology of tidal environments is more complex than previously envisaged.