## Deep Sea Drilling for Earliest Pliocene Sediments in the Eastern Mediterranean

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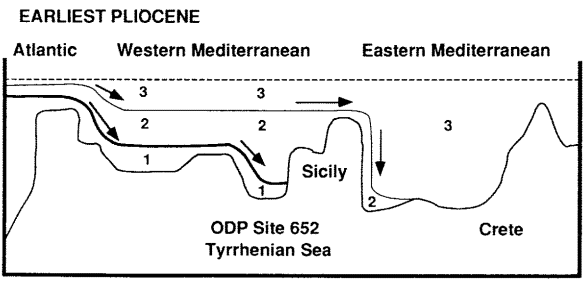
During the Messinian (latest Miocene) Salinity Crisis, the normal water exchange pattern between the Atlantic and Mediterranean was disrupted due to the relative lowering of the sea level in the latter with respect to the former. Marine waters flowed into the desiccating basins with no return flow to the open ocean (CITA and RYAN, 1973). The Zanclean (earliest Pliocene) termination of evaporite conditions in the Mediterranean was apparently facilitated by a major eustatic rise in sea level that allowed increasingly greater amounts of marine water to flow into the Mediterranean and overcome the extreme negative hydrologic balance that had produced the Salinity Crisis (MCKENZIE *et al.*, 1988). This terminal flood is manifested in the sedimentary record by marine pelagic sediments directly overlying the continental evaporitic sediments and marks the stratigraphic boundary between the Miocene and Pliocene.

Deep sea drilling in the Mediterranean during DSDP Legs 13 and 42 demonstrated that the earliest Pliocene sediments overlying the continental deposits were not always time synchronous, i.e. the flooding and infilling of the multiple basins were undoubtedly progressive dynamic processes (RYAN, HSU *et al.*, 1973; HSU, MONTADERT *et al.*, 1978). During ODP Leg 107, deep sea drilling at Site 652 in the Tyrrhenian Sea recovered a sedimentary sequence comprising an apparently complete Miocene/Pliocene boundary section (SHIPBOARD SCIENTIFIC PARTY, 1987). The sediments appeared to have been continuously and subaqueously deposited during the transition from continental to marine conditions. A high-resolution bio-, magneto-, and chemostratigraphic study of this sequence delineated a series of paleoceanographic events within the 300,000 yrs. period following the initiation of the earliest Pliocene terminal flood (MCKENZIE *et al.*, 1990). These events can be correlated to changes in amount and depth of water exchange between the Atlantic and Western Mediterranean with the infilling of the western basin occurring progressively during the first 250,000 yrs. post flood. Moreover, preliminary studies of the relative strontium isotope ratios (87Sr/86Sr) of the lowermost Pliocene sediments from three locations in the Mediterranean (ODP Site 652-Tyrrhenian Sea, Sicily, and Crete) indicate that the marine flooding and infilling of the Tyrrhenian Basin may have occurred earlier with continental conditions in the Sicilian and Cretian Basins being maintained progressively longer with increasing distance from the Atlantic source (MCKENZIE *et al.*, 1989). The figure below illustrates the progressive infilling of the Mediterranean from west to east.

Our understanding of the timing and consequences of these paleoceanographic events recorded in basinal sequences deposited across the Miocene/Pliocene boundary has been limited by the quality of material available for study. Using the advanced drilling technology of the JOIDES Resolution, it would be possible to have excellent recovery of sediments from a number of sites in the deep Mediterranean basins. In particular, selection of an appropriate site (or sites) in the Eastern Mediterranean to compliment Site 652 would provide a record of environmental changes that could be correlated with the paleoceanographic events delineated for the Western Mediterranean. Specific factors to be evaluated could include: (1) the relative timing of the cessation of continental conditions in the Eastern Mediterranean, (2) the influence of paleoclimate on the hydrologic balance between meteoric input and marine inflow across the shallow sills to the west and, hence~ on the evolution of the earliest Pliocene water body and (3) the development of two-way exchange of marine waters between the western and eastern basins and its significance for the Mediterranean paleoceanography and global climate.




Based on preliminary strontium isotope ratios, the earliest Pliocene marine infilling of the Mediterranean from the Atlantic occurred in three stages: Stage 1 - as eustatic sea level rose, the deeper basins of the Western Mediterranean, such as the Tyrrhenian, were gradually infilled by waters cascading down the western sill, Stage 2 - the waters gradually filled the deeper basins and transgressed across shallower morphology, such as the Sicilian Basin, and finally cascaded into the Eastern Mediterranean, and Stage 3 - with continued rising eustatic sea level, a threshold level was passed allowing waters to completely infill the basins of the Eastern Mediterranean. Diagram by A. Isern after CITA and RYAN (1973).

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