

DEPOSITIONAL PATTERNS (PLIOCENE AND QUATERNARY) IN MOBILE MEDITERRANEAN SETTINGS

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Abstract.— Team investigations of post-Miocene depositional patterns and facies in the western, central and eastern Mediterranean focus on (a) sediment dispersal, including transport processes and the role of deltas and canyons, (b) the effects of Quaternary dynamics on terrigenous and biogenic sedimentation, (c) the relation between post-Miocene structural mobility and deposition, and (d) the possibility of applying modern sedimentation models to problems of ancient sedimentary sequences exposed in circum-Mediterranean mobile belts.

Résumé.— Des études sédimentologiques et structurales des séries plio-quadernaires sont conduites dans divers secteurs de la Méditerranée occidentale et orientale; ces études ont plusieurs objectifs: (a) la reconnaissance des zones d'apports et des mécanismes de transport englobant le rôle des deltas et des canyons sous-marins sur l'acheminement des matériaux vers les grands fonds; (b) l'étude des variations climatiques quaternaires, leur influence sur les renversements de courants et leur empreinte sur les conditions du milieu; (c) l'analyse de l'évolution structurale post-miocène et des relations tectonique-sédimentation; et (d) l'application des modèles de sédimentation récente aux séquences sédimentaires fossiles qui affleurent dans les chaînes péri-méditerranéenne.

A series of on-going and recently completed studies on unconsolidated sedimentary sequences in various Mediterranean settings have as principal purpose the detailing and interpretation of Pliocene and Quaternary depositional patterns and facies. The Mediterranean Basin (MEDIBA) Project, funded by the Smithsonian Research Foundation since 1970 and also the organizations of the respective authors, focuses on diverse sedimentary problems in western, central and eastern Mediterranean environments (see Fig. 1). Moderate to high-resolution subbottom profiling (sparker, air-gun, 3.5 kHz), coring, suspended sediment sampling, and underwater photography are the primary shipboard techniques used; x-radiography, SEM, and carbon-14 dating supplement standard petrologic laboratory techniques. The sedimentation problems of interest and areas of study are listed in Table 1.

A distribution of the largely muddy facies on margins and in basins is related to deltaic input, to water mass movement and suspended sediment transport, and to off-shelf spillover and canyon processes which facilitate sediment transfer to the deeper environments. Investigations of these factors are being undertaken in the Nile Cone, on margins off the Balearic Platform and Catalonia, and in the Hellenic (Ionian Sea) sectors. Outgrowths of these studies include techniques to distinguish mud turbidites, hemipelagites and other fine-grained deposits which prevail in the Mediterranean.

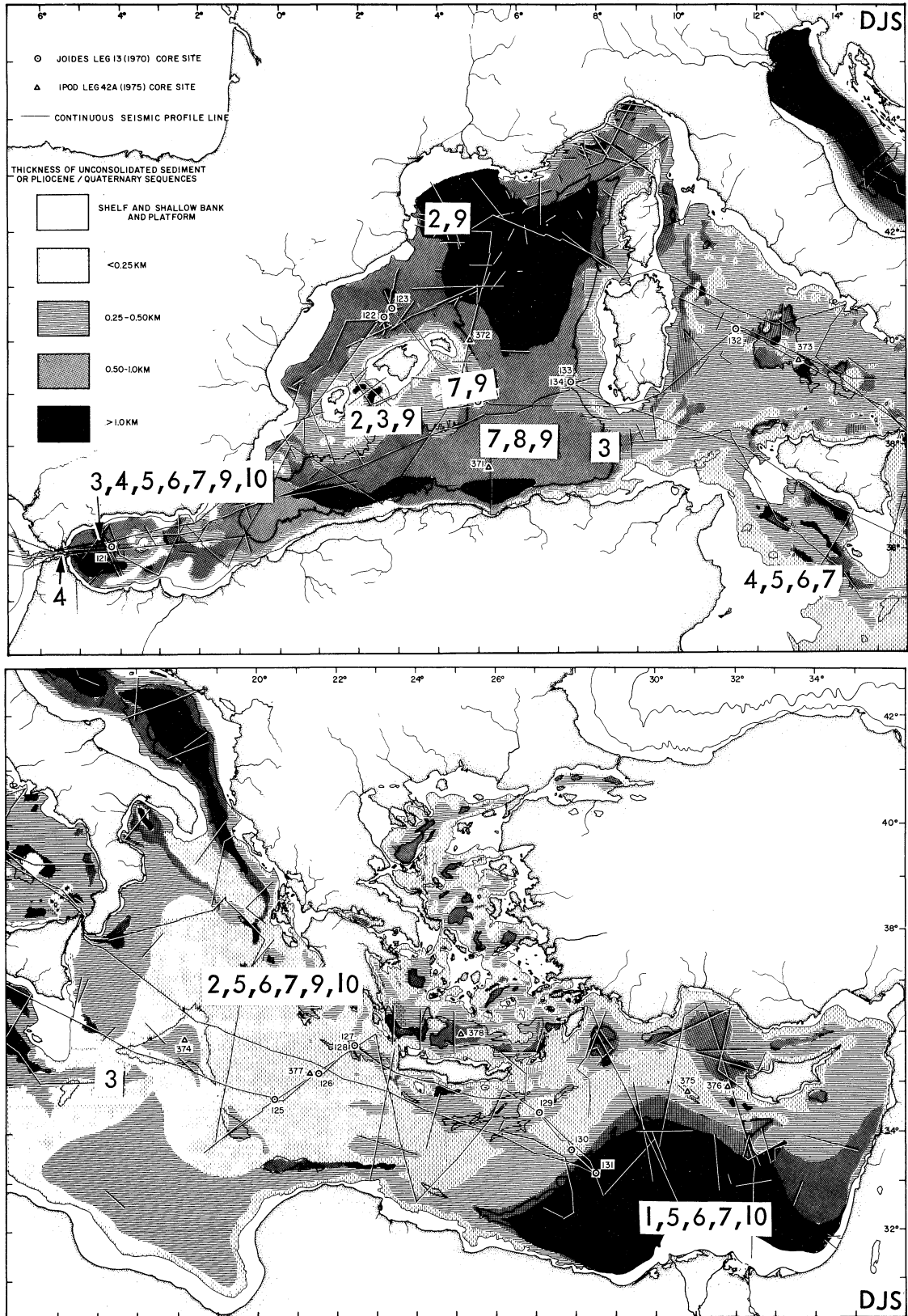


Fig. 1 Charts showing the Pliocene-Quaternary thickness (after Stanley, 1976) and sedimentation studies under the auspices of the MEDIBA Project in the Mediterranean. Large numbers refer to studies listed in Table I.

Table 1. Sedimentation studies in the Mediterranean conducted under the auspices of the Mediterranean Basin (MEDIBA) Project (code numbers are shown in Fig. 1).

- 1=Role of deltaic input on basin sedimentation: Nile Cone.
- 2=Submarine canyon sedimentation: off Catalonia, Balearic Platform, Hellenic Arc.
- 3=Off-shelf sediment spillover: Alboran Sea, Balearic Platform, slopes off the Strait of Sicily.
- 4=Quaternary dynamics affecting possible current reversals: Strait of Gibraltar-Alboran Sea, Strait of Sicily.
- 5=Influence of Quaternary oscillations on cyclic sedimentation and facies changes: Alboran Sea, Strait of Sicily basins, Hellenic Arc, Nile Cone.
- 6=Rate of sedimentation related to Quaternary oscillations: Alboran Sea, Strait of Sicily basins, Nile Cone and Hellenic Arc.
- 7=Interpretation of different mud and fine-grained sequences: Alboran Sea, Balearic Rise and Basin, Strait of Sicily basins, Hellenic Arc, Nile Cone.
- 8=The effect of salt tectonics (halokinesis) on basin plain sedimentation: Balearic Basin.
- 9=The influence of style (extension and/or strike-slip versus compression) and intensity of structural mobility on depositional patterns: Catalonian margin, Balearic Platform and Rise, Balearic Basin, Hellenic Arc.
- 10=Formulation of depositional models to interpret the geological record: Alboran Sea, Hellenic Arc, Nile Cone.

The rhythmic and cyclothemic (Nile Cone) nature of sedimentary sequences reflect Quaternary climatic and eustatic oscillations which modified water mass flow and may have induced short-term current reversals. The formation of sapropel layers, unconformities, and marked changes in rates of sedimentation in cores record these Quaternary changes.

Depositional patterns in most sectors (with the exception of zones influenced by deltas) are more closely related to structural displacement than to sedimentation per se. A complex of margin structure types are identified on the basis of seismic profiles; it is possible to relate sediment thicknesses and facies to distension and/or strike-slip (western Basin, for instance) versus compression (Hellenic Arc).

Sedimentation models can be formulated on the basis of recent and sub-recent depositional patterns in different settings; in some instances these may be used to interpret the origin of ancient marine sequences presently exposed in the circum-Mediterranean belts.

