NEWS FROM ODP

The Joides Resolution came back to the Mediterranean once again and made new discoveries on Neogene stratigraphy. Reports by shipboard micropaleontologists Silvia Spezzaferri (leg 160) and Silvia Iaccarino (Leg 161).

Leg 160 (Eastern Mediterranean): preliminary results

Silvia Spezzaferri & Leg 160 Scientific Party

Leg 160 was the first in a two-leg program to investigate the tectonic and paleoceanographic history of the Mediterranean Sea. One focus of this leg was on accretionary and collisional processes associated with the convergent boundary between the African and European Plates. The other focus was the origin and paleoceanographic significance of sapropels, organic-rich layers that are intercalated in the Plio-Pleistocene sediments of the Mediterranean Basin. During the Leg were drilled 11 sites (963 to 972) and 43 holes (Fig. 1). The most important sites for the study of Neogene successions are 963 to 969 and are described below.

Site 963 in the Strait of Sicily (at a water depth 470 m) represents the gateway between the western and eastern part of the Mediterranean Basin. The recovered sediments consists of 200 m of nannofossil ooze spanning the time interval from the early Pleistocene to the Holocene at an extraordinary resolution. The sapropels recovered at this site will allow the correlation of those identified in land sections.

Site 964 located at the foot of the Calabrian Ridge was drilled to recover a Pliocene to Pleistocene sedimentary record of sapropels formation in the Ionian Basin. The sedimentary sequence of 121 m consists of nannofossil ooze and nannofossil clay with more than 50 Pliocene sapropels. Some of this sapropels contain an organic carbon contents reaching up to 25% a value that prior to Leg 160 was known only from Mesozoic black shales.

Five sites were drilled along a north-south transect on the Eratosthens Sea Mount (ESM) (Fig. 2). The sedimentary sequence recovered at Site 965 (located on the northern slope of the seamount) consists of early Pliocene to Holocene nannofossil ooze overlying a 200 m-thick sequence of carbonate platform sediment with calcareous algae including rhodoliths and oncoliths, corals, oolits, small benthic foraminifers, gastropods and palecypods.

The same sequence was recovered at Site 966 located on the northern margin of the Seamount plateau. The presence of large benthic foraminifers (Lepidocycline and Miogypsine) at about 270 m allowed an age attribution of this sediments to the early Miocene. The carbonate platform sediment overly a pelagic chalky limestones rich in middle Eocene planktonic foraminifer and calcareous nannofossils which can be correlated to the outcropping coeval formations in Cyprus.

About 600 m of sediments were cored at Site 967, which is located on a small ridge near the foot of the northern slope of the ESM.. The sedimentary sequence at this recall that of the previous Site 966 in the first 150 m. However, the Eocene pelagic succession overly upper Createceous sediments and thus further carbonate platform sediment whose age is not known.

Site 968 is located on the crest of a small ridge that projects southward from the base of the Cyprus slope at a depth of 2000 m. The sedimentary sequence at this site consists of a Pliocene to Pleistocene nannofossil ooze and nannofossil clay with several turbidites layers. At about 167 mbsf the succession sharply pass to silty clay, silt and sand containing a few specimens of ostracods possibly related to brackish environment and the benthic foraminifer Ammonia beccarii.

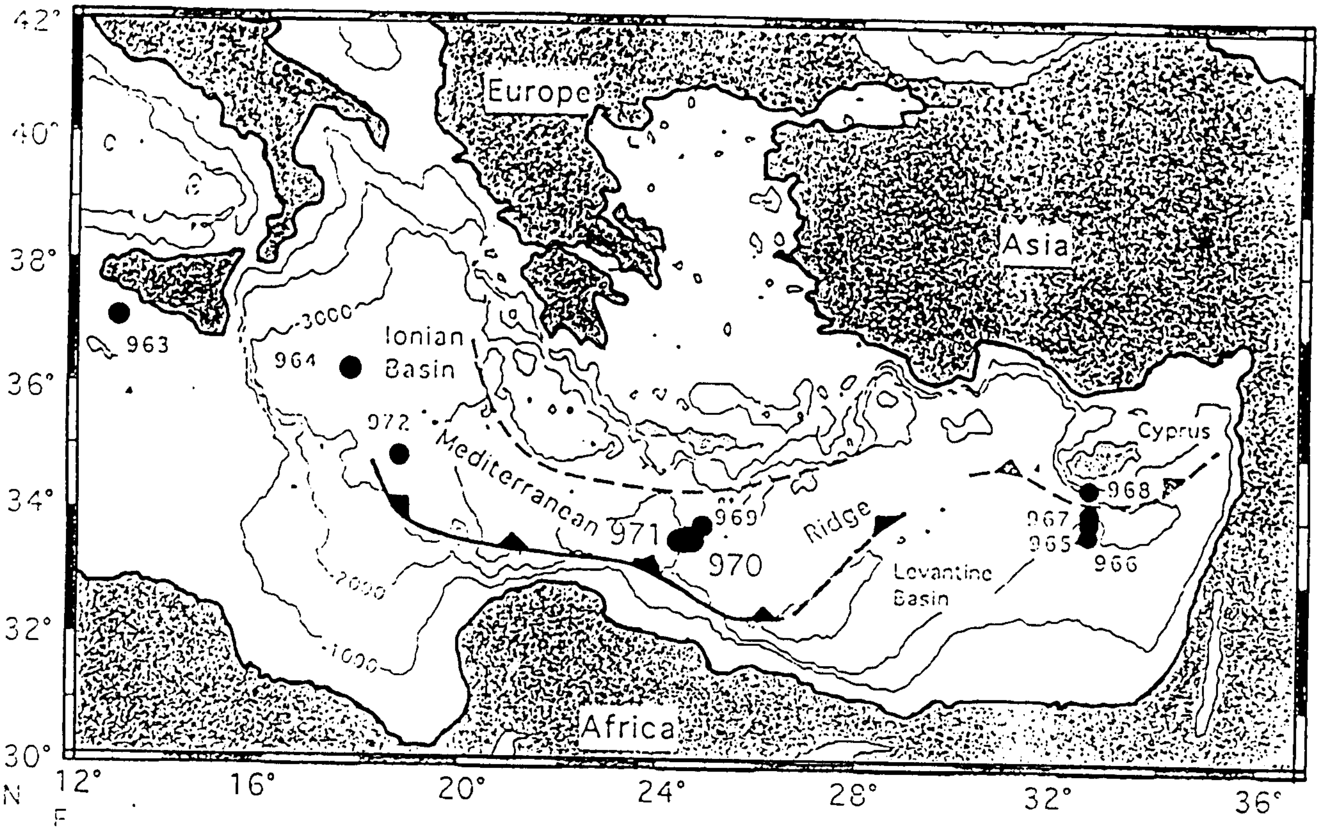


Fig. 1. Location map of the Eastern Mediterranean with the sites (963-973) drilled during the ODP leg 160

A short hiatus was observed at the Pliocene-Pleistocene transition in all the sites drilled on the ESM, it probably corresponds to a phase of tectonic uplift of Cyprus. A sequence of about 80 sapropels was also recovered on the ESM.

Finally Site 969, is probably the most suitable site drilled during Leg 160 for the study of the Miocene-Pliocene transition. The sharp transition to carbonate-rich sediments to calcareous silty clay containing brackish ostracods and A. beccarii was observed at about 115 mcd (m composite depth). In addition, the 121 m of lower Pliocene to Holocene sediments at this site contains over 80 sapropels

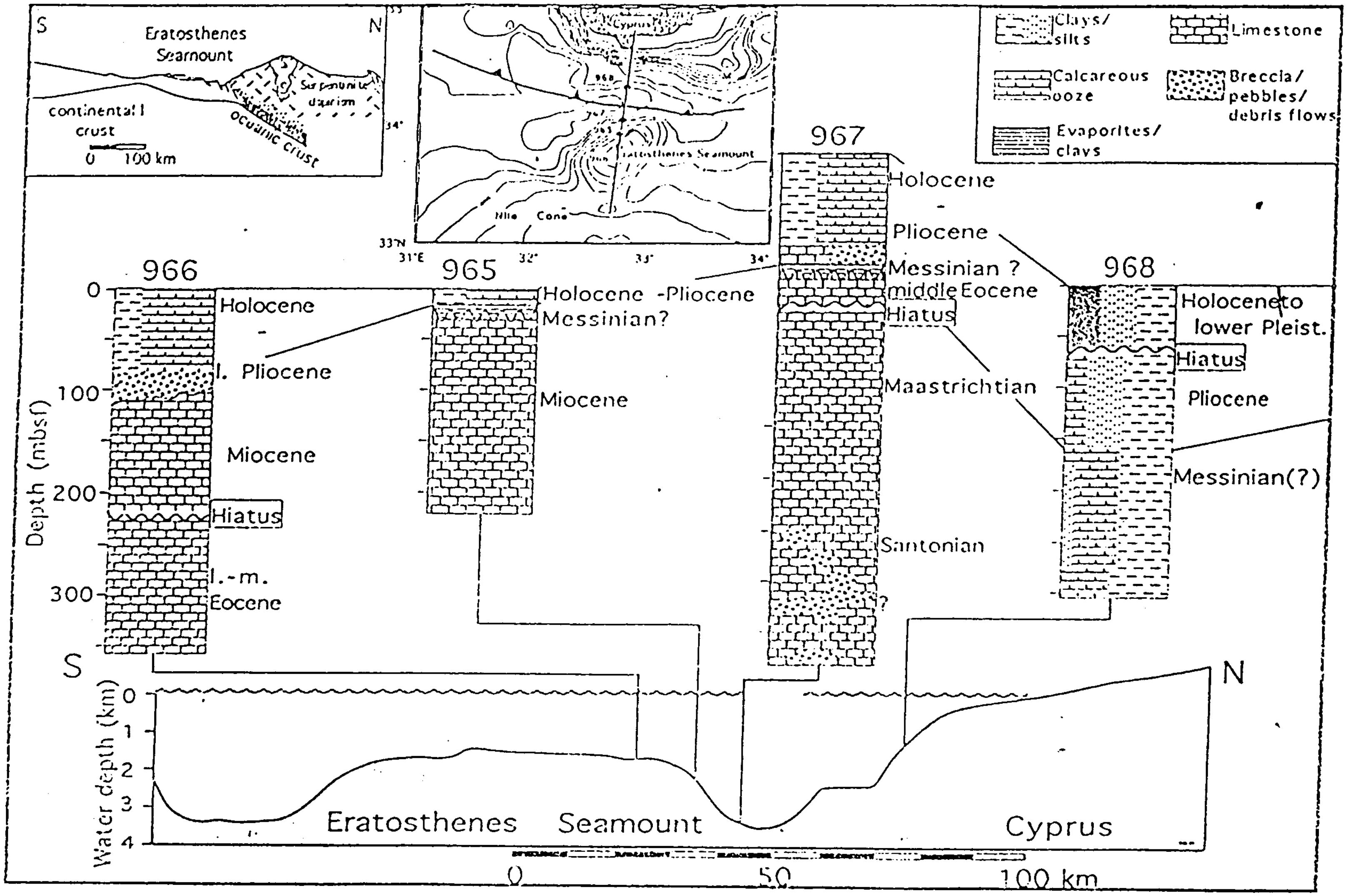


Fig. 2. Erathostenes Seamount transect. Location of Sites 965 through 968 with lithostratigraphic profiles, age and location

LEG 161 preliminary report
by
Silvia Iaccarino and Scientific staff

Leg 161 was the second of two ODP legs to address both tectonic and paleoceanographic objectives in the Mediterranean Sea. The paleoceanographic program was concentrated on reconstructing Atlantic-Mediterranean water exchange and the paleoceanography of the western Mediterranean during the Late Neogene. Tectonic studies were focused on the origin and tectonic evolution of the Alboran Sea as well-defined example of an extensional basin developed in collisional setting.

The main focus of the paleoceanographic program during Leg 161 was to document the timing of sapropel formation and the circulation patterns in the western Mediterranean. Secondary objective was to determine environmental changes during the onset of the salinity crisis and the reestablishment of open-marine conditions during earliest Pliocene.

To achieve these goals, six sites across the western Mediterranean (fig.1) from the Tyrrhenian Sea to the Alboran Sea, immediately east of the Strait of Gibraltar were drilled . Site 974 in the Tyrrhenian Sea, and Site 975 in the southern Balearic Basin were dedicated entirely to paleoceanographic studies. Sites 976, 977, 978 and 979 in the Alboran Sea were focused mainly on tectonic goals but also paleoceanographic objectives were involved.

APC and XCB drilling at multiple offset holes ensured continuous recovery of Pliocene-Pleistocene sequences at these sites. 6.500 meters of cores were recovered during Leg 161. The sequences are complete in the Tyrrhenian Sea and in the Balearic basin in that all the calcareous plankton biozones are present while in the Alboran Sea, major unconformities were observed within Pliocene and Miocene intervals. Good paleomagnetic signals were obtained at Sites 974 and 975 for the Pleistocene interval and at Site 978 for the early Pliocene interval. Sedimentation rates varied between 3 and 4 cm/k.y. in the Tyrrhenian and Balearic seas and 15-30 cm/k.y. in the Alboran Sea (fig.2).

At Site 974 and 975, 38 sapropels very similar to those found in the eastern Mediterranean, were recovered through the Pleistocene and uppermost Pliocene. Total organic content of these layers varies between 0.8% and 2.5%; maximum concentrations of >6% are reached in the Tyrrhenian Sea. At the Alboran sites more than 40 organich-rich layers were found, but they are more dispersed, and some are more than 3m thick, reflecting higher sedimentation rates.

The Miocene-Pliocene boundary was crossed at Site 974 and 975 and "lago-mare" sediments were recovered immediately below the boundary. Moreover at Site 975, below the "lago-mare" sediments, an evaporite sequence was retrieved that consists of finely laminated gypsum, limestone and marls. In the Alboran Sea more or less significant hiatuses occur at the Miocene-Pliocene boundary. At Site 978 where the sequence is the most complete, the latest Miocene sediments are of uncertain environmental interpretation.

Sites 976, 977, 978 and 979 were focused on the tectonic goals. Site 976 penetrated through the Pleistocene and late middle Miocene sedimentary cover and recovered more than 250m of metamorphic basement, yielding information on the origin and evolution of the Alboran Sea. Sites 977 and 978 yielded informations on the late Miocene to Holocene subsidence history and rifting evolution of the basin while Site 979 penetrated a zone of syn- and post-sedimentary folds on the flank of the Alboran Ridge yielding information on the nature and on the age of the later stages of compressional tectonicreorganization of the Alboran Basin

A lithostratigraphic and chronostratigraphic summary of Leg 161 drill sites is shown in fig.3

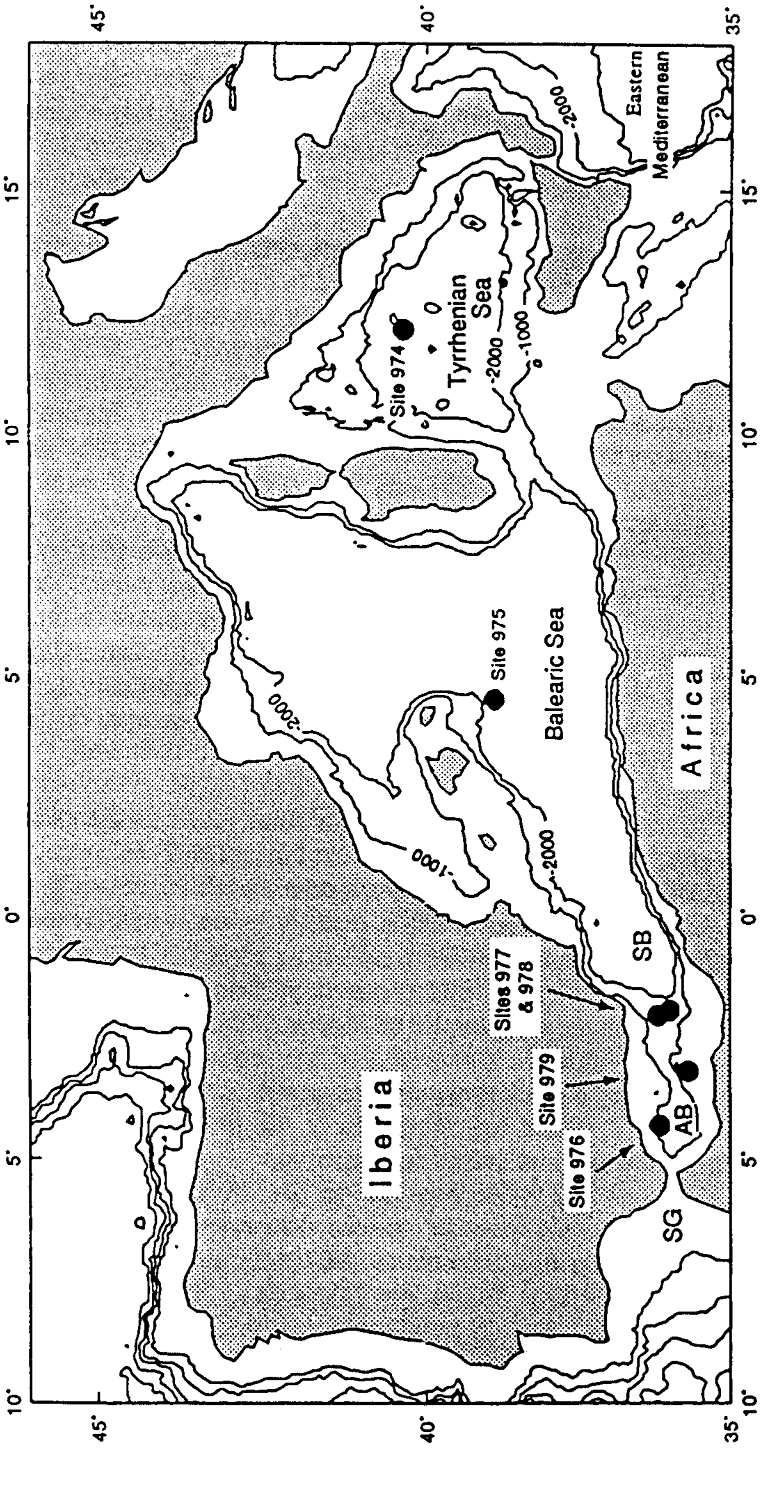

Iberia
Africa
Balearic Sea
Tyrrhenian Sea
Eastern Mediterranean
Site 974
Site 975
Sites 977 & 978
Site 979
Site 976
SB
AB
SG
-1000
-2000
45˚
40˚
35˚
10˚
5˚
0˚
5˚
10˚
15˚

fig.1

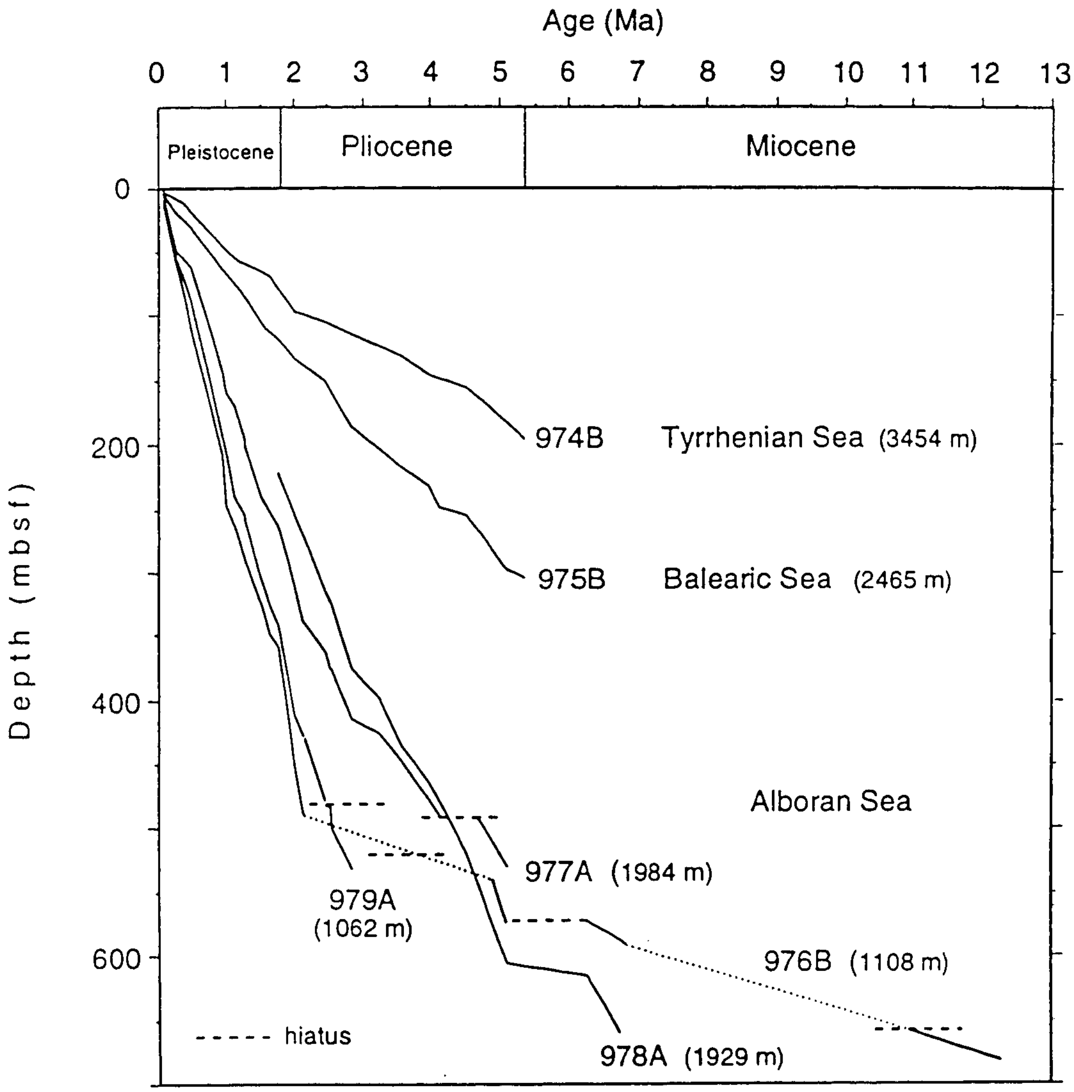
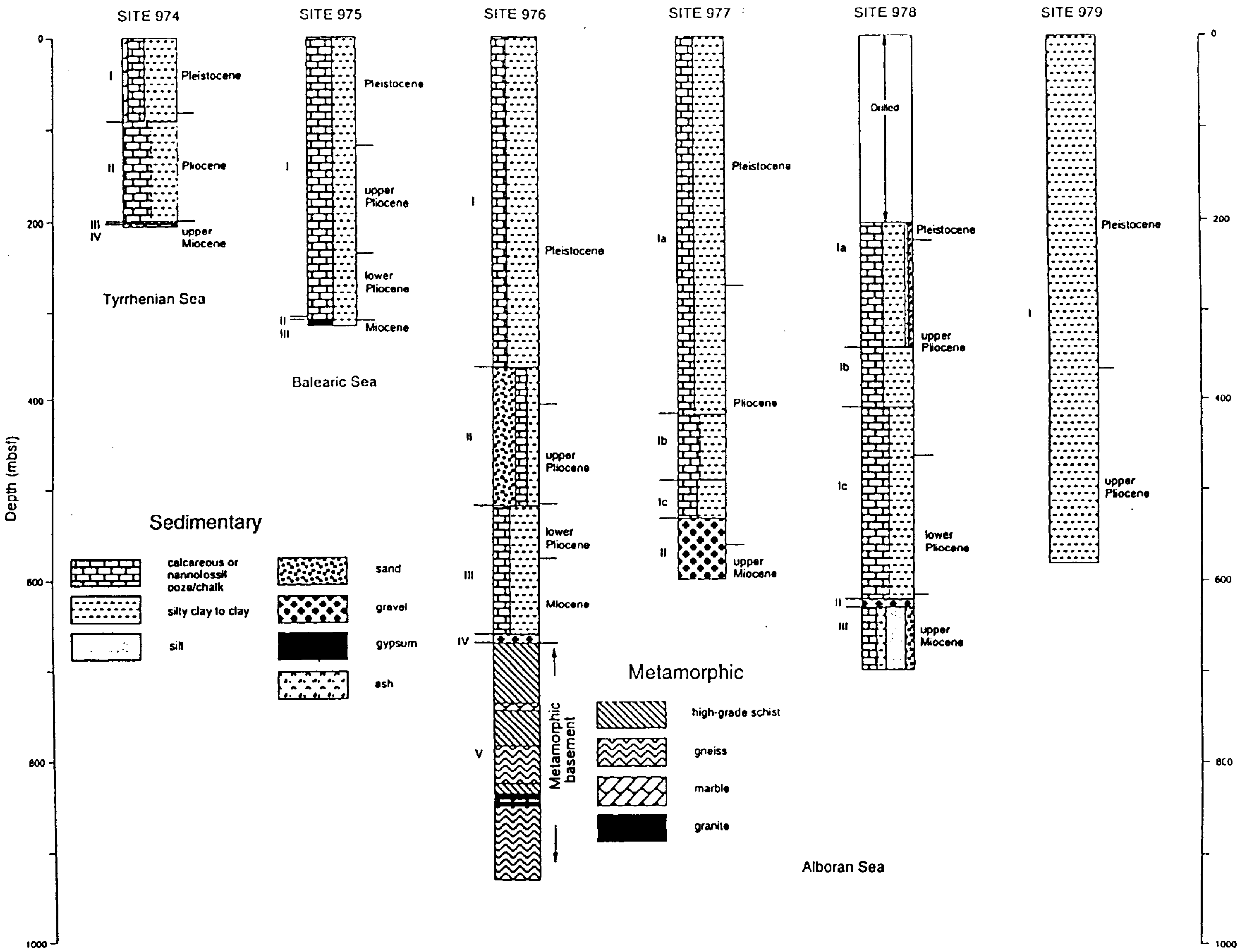

Age (Ma)
0 1 2 3 4 5 6 7 8 9 10 11 12 13
Pleistocene
Pliocene
Miocene
0
200
400
600
Depth (mbsf)
974B
Tyrrhenian Sea (3454 m)
975B
Balearic Sea (2465 m)
Alboran Sea
977A (1984 m)
979A
(1062 m)
976B (1108 m)
978A (1929 m)
hiatus

fig. 2



SITE 974
SITE 975
SITE 976
SITE 977
SITE 978
SITE 979
Depth (mbsf)
0
200
400
600
800
1000
Pleistocene
Pliocene
upper Miocene
upper Pliocene
lower Pliocene
Miocene
I
II
III
IV
V
Ia
Ib
Ic
Drilled
Tyrrhenian Sea
Balearic Sea
Alboran Sea
Metamorphic basement
Sedimentary
calcareous or nannofossil ooze/chalk
silty clay to clay
silt
sand
gravel
gypsum
ash
Metamorphic
high-grade schist
gneiss
marble
granite

fig. 3