zones described by D. Bukry, although regional, secondary marker species are needed to define some zonal boundaries. Nannoplankton zonation established at these two deep-sea localities provides a standard of reference for much of the Neogene in the eastern Mediterranean.

Reworked Cretaceous and early Cenozoic nannoplankton are present throughout the stratigraphic interval studied, but not in quantities large enough to mask indigenous species which are used for the determination of zonal boundaries. Sedimentation rates at Sites 375 and 376 were highest in the late Miocene and late Pleistocene. Open-marine, warm-water species of discoasters are present in significant numbers throughout the Miocene and Pliocene. Earliest Pliocene assemblages contain numerous specimens of the deep-water genera *Amaurolithus, Ceratolithus,* and *Triquetrorhabdulus*, evidence of the rapid marine transgression immediately following Messinian evaporite deposition.

Nannoplankton in post-Messinian sediments at the drill sites and the Zanclean stratotype at Capo Rossello, Sicily, indicate that the base of the *Amaurolithus tricorniculatus* Zone (base of *Triquetrorhabdulus rugosus* Subzone) corresponds to the Miocene-Pliocene boundary.

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Miocene-Pliocene Molasse, Zagros Mountains, Iran

The Miocene-Pliocene sedimentary sequence in southwest Iran, a thick clastic wedge, is an excellent example of postorogenic sedimentation in the peripheral basin of a suture zone. The molasse records the rise of the Zagros Mountains, which formed as a result of the collision between the Arabian and Persian plates during the Miocene-Pliocene. The sequence is composed of two formations, the Agha Jari and Bakhtyari. Deposition of these units was preceded by deposition of the Mishan Formation, a shallow-marine limestone and marlstone deposit. The Mishan is conformably overlain by the Agha Jari, which consists of repetitious fining-upward fluvial cycles. The cycles comprise lithic sandstones (calclithites) and gypsum-veined marly mudstones. The unit is approximately 2,000 m thick in the study area, but reaches thicknesses greater than 3,000 m in other areas. The Agha Jari is conformably overlain by the Bakhtyari, which consists of interbedded conglomerate, sandstone, and mudstone. The conglomerate beds are characterized by closely packed, well-rounded clasts of Cretaceous to Eocene limestone and chert which were derived from the Zagros Mountains on the northeast. The Bakhtyari clastic units probably represent deposition on an alluvial fan, whereas the finer grained Agha Jari clastic strata represent distal-fan or alluvial-plain deposition.

Previous workers have recorded the presence of an unconformity between the Agha Jari and Bakhtyari Formations, but no unconformity was found in the study area. The contact is gradational, with both formations composing a continuous, coarsening-upward sequence.

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Miocene-Pliocene Syndepositional Tar Deposit in Iran

A fossil-bearing, tar-impregnated sandstone representing the deposit of a Miocene-Pliocene oil seep occurs near the top of the Agha Jari Formation in southwestern Iran. The sandstone is interbedded with typical Agha Jari clastics: red sandstone, siltstone, and marly mudstone. Sedimentologic and stratigraphic characteristics of the unit indicate that the tar was deposited contemporaneously with the sediment. The tar is concentrated in the 3-m-thick sandstone which is exposed laterally for 400 m, and ranges from cross-bedded medium-grained sandstone to interbedded sandstone and poorly sorted gravel. Tar is interspersed between grains and as detrital clasts. Mineralogically, the sandstone consists of calcium carbonate and tar-cemented litharenites. Small vertebrate fossils and some freshwater gastropods are concentrated in the gravel lenses. Other characteristics, such as reworked levee deposits, lenticular gravel beds, and fining-upward sequences, indicate a fluvial origin for the unit. The source of the tar was probably an oil seep which emptied into a small stream or river. Recent oil seeps in Iran serve as analogs and illustrate how such a deposit may have formed.

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Distribution, Morphology, Mechanisms, and Ages of Sediment Slides on Eastern Continental Margin—Cape Cod to Florida

Recent mapping off eastern North America has revealed four areally extensive slide zones between the Blake-Bahama Outer Ridge and Long Island. These slide zones are recognized on the basis of 3.5-kHz records and by the structures present in piston and box cores. The distribution of piston cores containing slump and debris-flow structures indicates that mass movements have taken place in this region on a wide scale and that slumping and sliding of sediments from the slope and upper rise onto the middle and lower rise are ubiquitous in the region during recent geologic time.

The slides appear to originate on the continental slope and upper rise and appear to have occurred in multiphase events. In the area south of Baltimore Canyon a series of apparently disconnected 20 to 30° scarps are present within the stratified hemipelagic sediments of the upper rise and slope. Large volumes of sediment which now cover an area of at least 2,000 sq km moved down through the valleys onto the middle rise (~3,100 m). The sudden loading of material appears to have triggered a series of smaller slides in deeper water (3,100 to 3,600 m), and this sediment then moved down onto the lower rise to depths as great as 4,200 m, forming a narrow mudflow tongue 10 km wide and 100 km long which appears to be disconnected from the shallower flows.

Three very large slide zones, each in excess of 10,000 sq km, occur on the slope and rise: (1) north of the