bearing Kanawha Formation (Middle Pennsylvanian) of southern West Virginia. Projecting marine-zone control points onto nearby geophysical and core logs has greatly aided understanding of the complex stratigraphy of the Kanawha Formation, which was deposited in a rapidly subsiding basin.

Recent work has indicated problems with several type sections, notably those of the Seth Limestone, Hernshaw coal, Peerless coal, Buffalo Creek coal, and the Buffalo Creek Limestone. Also, it appears that previous mapping of the Dingess Limestone in Boone, Raleigh, Logan, and Mingo Counties (from the West Virginia Geological Survey County Reports) actually represents several separate marine units which were mapped as a single unit. Stratigraphic cross sections, constructed from gamma-ray, density, and core logs and incorporating biostratigraphic information from field investigations of marine zones, allow better correlation of units, more reasonable interpretations, and a new evaluation of the coal measures of the Kanawha Formation in southern West Virginia.

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Biostratigraphic Relation of Neogene Benthic Foraminifera from Southern California Outer Continental Borderland to Monterey Formation

In recent years there has been considerable discussion concerning the biostratigraphic correlations between planktonic zonations and the classical Neogene California benthic foraminiferal stages. One of the primary objectives of IPOD Leg 63 was to explore these correlations and to determine the possibility of temporal variation of the benthic stages between the outer continental borderland and land sections.

Site 468 was drilled on the Patton Escarpment, which lies under the present southeastern margin of the California current system. The sediments yielded well-preserved calcareous and siliceous planktonic assemblages that ranged in age from Holocene to middle Miocene. Samples also contain abundant benthic foraminiferal assemblages that consist of species characteristic of both oceanic and continental margin environments.

The benthic foraminiferal assemblages range from the Venturian stage of the Pleistocene to the Luisian-Relizian stages of the middle Miocene. Because of the dependence of benthic species on bottom environmental parameters, the dominant occurrence of lower bathyal to abyssal faunas present problems for direct correlations to local California stages. The majority of key species needed for recognition of the late and middle Miocene benthic stages, as defined in land sections, are indicative of upper to middle bathyal environments and are excluded from the deeper habitats because of environmental restrictions. The occurrence of the lower bathyal pseudo-Saucesian assemblage as a major faunal constituent in the late and middle Miocene samples furthers adds to the complexity of correlations between the planktonic zonations and benthic foraminiferal stages.

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Sedimentology and Structure of Franciscan Assemblage, Yolla Bolly Terrane, Northern California

The Yolla Bolly terrane of the Franciscan assemblage in northern California is a typical subduction complex that has undergone penetrative deformation and metamorphism to the high-pressure/low-temperature blueschist facies. Detailed mapping combined with sedimentologic analysis has enabled us to: (1) reconstruct a probable paleosedimentary environment; (2) analyze the interaction between deformation and metamorphism during and after subduction; and (3) speculate on subsequent deformational history including tectonic accretion to North America.

The Yolla Bolly terrane consists of several thrust-bound lithologic units: a lower unit of disrupted mudstone and thin-bedded sandstone (broken formation) containing scarce volcanic flows and beds of radiolarian chert; a middle unit of predominantly thick-bedded to massive sandstone (metagraywacke) that includes several zones of radiolarian chert; and an upper unit of mudstone and thin-bedded sandstone (broken formation) containing numerous intrusive and extrusive volcanic rocks as well as rare radiolarian chert. Coeval ages (Tithonian to Valanginian) on radiolarians from all three units, together with the sedimentologic data, suggest that the rocks represent a continent-derived submarine fan, deposited in a complex transform graben possibly similar to the present-day Gulf of California or basins in the California continental borderland.

Radiometric ages of approximately 100 m.y. on metagraywacke containing lawsonite and aragonite indicate that these rocks were subducted and metamorphosed to a high-pressure/low-temperature mineral assemblage about 30 m.y. after they were formed. Closely following subduction, the rocks were probably involved in a collision that imbricated and tectonically returned the subduction complex to the surface.

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Infaunal Influences on Sedimentology of Shelf-Slope Boundary

Although the benthic infauna of the inner continental shelf and continental slope have been studied in some detail, the infauna of the shelf-slope break have received scant attention. The shelf-slope break marks the transition from the highly variable and physically controlled environment of the shelf to the more stable biologically controlled environment of the deep slope and basins. A slight change in depth across the shelf-slope break can cause a drastic change in the composition of the infauna. Since sediment grain size at the shelf-slope break can range from silt-clay to sand and is commonly coarser than the sediment shoreward on the adjacent shelf, infaunal composition of a particular assemblage can range from predominantly suspension feeders to predominantly deposit feeders. The density and biomass of these assemblages, which in some areas may be greater than on the adjacent shelf or slope, appear to be related mostly to current patterns and degree of sediment heterogeneity whereas salinity and temperature variations are minimal and play only a minor role. In those areas such as the shelf-slope break off New England, infaunal densities are relatively large and these infauna may be a significant factor in regulating sediment structure through carbonate and feces deposition as well as through bioturbation. In addition, the removal of organic material from the pelagic realm and the reworking of deposited organic material by the organisms make the infauna at the shelf-slope break an important mechanism for enhancing the transport or organic material to the ocean basin.

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