NOUS UNITS OF DETRITAL SEDIMENT, UPPER DEVONIAN, NEW YORK

Previously studied sedimentary environments and time-stratigraphic relations in the Sonyea Group (Upper Devonian) and adjacent units of New York provide an excellent framework for examining the effects of transport distance and environment of deposition on sediment composition and texture within an essentially isochronous unit of detrital sediment.

Samples for this study consist of 250 thin sections from 54 exposures and 12 environments of deposition, ranging from nonmarine to marine-slope and basin. Preliminary petrographic analyses reveal the following basinward trends: (1) fine-grained, foliated metamorphic rock fragments, a common constituent of the nonmarine sediments, are almost totally absent from sediments of the marine shelf, slope, and basin; (2) mean size of quartz grains ranges from fine sand in nonmarine environments to coarse silt in basin turbidites, whereas the maximum size ranges from granule to fine sand; (3) percentages of matrix range from 20% in nonmarine to over 80% in prodelta sediments; (4) rock fragments, including polycrystalline quartz, vary from 50% in nonmarine sediments to 4% in basin trubidites; and (5) monocrystalline quartz ranges from 23% in nonmarine sediments to over 40% in delta-front sediments.

In addition to these general trends, different sedimentary environments with similar mean sizes of quartz grains are distinguished on the basis of differences in petrology and size distributions of quartz grains. For example, fluvial floodplain, estuary, delta-channel, and delta-front environments, all having a very fine mean size of quartz grains, show significant differences in percentages of quartz, rock fragments, and matrix, or in the nature of the size distributions of quartz grains.

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JURASSIC PROXIMAL AND DISTAL CARBONATE TURBIDITES OF CENTRAL HIGH ATLAS MOUNTAINS, MOROCCO

The Lower Jurassic sediments of the High Atlas Mountains of Morocco were deposited in a northeast-southwest-oriented trough approximately 100 km wide and 800 km long. The trough margins are characterized by carbonate and marl shelf deposits, whereas the central, axial part is characterized by offshore, deeper water carbonates and marls. The depositional history of some of the deeper water sediments can be determined from a thick, carbonate, turbidite sequence flanking the southern High Atlas shelf. Within this section (800 m thick), it is possible to trace a sequence from proximal turbidites near the base through progressively more distal turbidites in the upper part of the section. Distinctive turbidite units are observed and, when lithology and unit geometry are traced up through the section, distinct changes can be recognized. There is a reduction in bed thickness and grain size, a change in intraclast types, and an increase in bedding regularity; well-developed laminae are more common and beds become well graded.

This turbidite sequence represents deposition from successive turbidity currents. The vertical changes from proximal to distal turbidites record either a deepening of the trough, a change in location of the sediment-source area, or a combination of both these factors.

EVERETT, A. G.

EPA REGULATIONS AFFECTING OIL INDUSTRY

No abstract available.

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LATE PALEOZOIC CLASTIC WEDGES IN APPALACHIAN PROVINCE

Late Paleozoic clastic wedges, arrayed from north to south along the western edge of the Appalachian tectonic welt, differ in age as well as spatial relations. The northern, Catskill, wedge is the oldest and apparently was derived from the north, whereas the succeeding Warrior-Arkoma wedge was apparently derived from a southern or Ouachita source. The youngest, Pocahontas and Dunkard, wedges are located between the older two and were derived from only a relatively small area in the central Appalachian Blue Ridge and Piedmont. Although the style of sedimentation differs among these large sedimentary prisms, all were governed by similar tectonic controls of differential subsidence and growth faulting. Significantly, the trend of tectonic complexes from which the sediments were derived is nearly at right angles to most of the present structures and suggests predrift tectonic connection.

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EROSIONAL ORIGIN OF INNER SHELF SEDIMENTS—EVIDENCE FROM NORTH FLORIDA

Study of 194 vibratory cores (4–20 ft long) from the Atlantic inner shelf off central and northern Florida indicates that most of the Holocene shelf sediments were derived from erosion and reworking of shelf substrata, and that direct fluvial contribution attending the last rise in sea level was negligible. Erodable, unconsolidated, and semi-lithified Tertiary and Pleistocene deposits are present in localized exposures or lie at shallow depths beneath the inner shelf surface in many places. All these older sediments contain ample quantities of fine to coarse quartz sand. Selective removal of the finer constituents of these older deposits, such as small Foraminifera, silt-size dolomite rhombs, and terrigenous muds, by erosion and reworking during Holocene transgression, can readily account for the veneer of fine to medium orthoquartzitic sand that mantles the inner shelf.

Progressive upward depletion of these characteristic fine constituents within the Holocene sand body is evidence of continuity with the underlying source strata. In addition, species of large, durable Foraminifera and phosphorite grains, both typically abundant in the Tertiary substrata, are present throughout the Holocene sand body. Although ultimately derived through the large Piedmont-drainage rivers in Georgia, the present shelf assemblage is indicative of mixed local sources. An erosional origin further explains the observed characteristics of the surface sediment: low feldspar, high phosphorite, and unstable heavy mineral assemblage, and pronounced rounding of quartz grains. In contrast, direct fluvial mechanisms of deposition do not account for such characteristics.

The last major rise in sea level was evidently a period of extensive erosion for the Atlantic shelf, in addition to being a transgression with discontinuous deposition as Curray has suggested.

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EVOLUTION OF SANTA BARBARA BASIN-WESTERN TRANSVERSE RANGES, CALIFORNIA

The modern Santa Barbara basin displays the east-west structural grain of the Transverse Ranges. Plate-tectonic theory suggests this grain evolved late in Tertiary time. However, Paleogene and early Neogene paleostructural and paleogeographic reconstructions suggest an Early-Middle Tertiary inception of the western Transverse Range province. Episodic diastrophism indicates that this evolution was also irregular.

Generally northwest-trending Paleocene shorelines in the eastern Santa Monica Mountains have been mapped by Campbell and Yerkes. This earliest Tertiary record is largely missing in the western Transverse Ranges, However, by middle to late Eocene time, a more westerly alignment is evidenced by the southward "flowing" proximal submarine fans of the Matilija

and Sacate Formations. That this westerly shift continued is documented by Oligocene (Sespe) isopach trends and paleocurrent-slope indicators. In late Paleogene-early Neogene time, Vaqueros sands, unconformably overlying the nonmarine Sespe, were winnowed over time-persistent, east-west structural highs.

The culmination of the development of the western Transverse Ranges is marked by middle Miocene rifting, foundering, and volcanism. Deep-basin sedimentation essentially began with this event. The synclinal distribution of late Miocene turbidite sands is evidence for the continued growth of the early formed structural highs.

Late Neogene sediments within the Santa Clara graben offer a classical example of structurally controlled sedimentation. Pleistocene and Holocene submarine-fan deposits reflect the impingement of the westward-plunging Montalvo anticlinorium. Contrasting northern and southern shelf deposits of similar age also are controlled by early formed structural trends. Many of these structures are the oil and gas fields of the modern Santa Barbara basin.

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DELTAIC SEDIMENTATION, SALT MOBILIZATION, AND GROWTH FAULTING IN GULF COAST BASIN

Regional facies mapping and analysis of thick, terrigenous wedges, and mapping of principal structural features (salt intrusion and growth faulting) indicate a direct relation between sedimentation and tectonics in the western Gulf basin. Proximal parts of clastic wedges infilling the basin consist of paralic, mainly deltaic, depositional systems; distal parts are made up largely of deep-water, continental-slope deposits. Two kinds of delta systems are characteristic: (1) high-constructive deltas marked by rapid, large-volume deposition; and (2) high-destructive deltas with large sand content and slower rates of accumulation.

Distribution of 4 major high-constructive delta systems and associated continental-slope systems is coincident with 4 major salt-diapir fields (including about 90% of the domal salt structures of the basin). Mobilization of deep seated, bedded salt occurred by lateral migration to interdeltaic areas and by distal migration, establishing diapir fields fronting major delta systems and coincident with slope systems. Salt mobilization related to strike-depositional (barrier bar and strandplain) systems was generally as broad salt ridges rather than domes.

In high-constructive deltas, growth faulting is facies coincident, forming at the boundary of delta-front sands and thick prodelta muds. As with salt mobilization, the principal tectonic grain of growth faulting developed in connection with the 4 major episodes of high-constructive wedges in the offlap filling of the basin, rejuvenating growth faulting and salt mobilization initiated by the high constructive deltas. Accordingly, direct facies correlation in distribution of growth faulting and salt mobilization occurred.

FORRESTER, J. D.

HOW MINING INDUSTRY CONSIDERS THE ENVIRONMENT

No abstract available.

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PRACTICAL APPLICATION OF REMOTE SENSING TO PETROLEUM AND MINERAL EXPLORATION

The symposium papers concern many aspects of the application of remote sensing to natural resource exploration. Remote sensing is best discussed in the context of the electromagnetic spectrum. Any device which senses a part of the spectrum from a remote position may be classified as a remote sensor. Visible light is the most familiar part of the spectrum, and our eyes and a camera with its film are remote sensors. In the shorter wavelengths, ultraviolet light has been useful in limestone-dolomite studies. X-ray diffraction patterns long have been used in mineral identification. In exploration for radioactive minerals, sensing parts of the gamma-ray spectrum with airborne or ground scintillometers is a common technique. On the longer wavelength side of the spectrum, near and far infrared are adjacent to visible light. Near or photographic infrared, when taken with a low sun angle, has been very useful in mapping faults and other features which are topographically expressed. Far, or thermal, infrared is also useful in mapping faults. Because water has a tendency to be more abundant in fault zones, they commonly are expressed as slight temperature lows due to the cooling effect of evaporation.

Side-looking-radar imagery also is very useful in fault delineation and for general mapping purposes, particularly in areas where cloudiness is a problem in conventional aerial photography. Side-scan sonar is a technique used to obtain underwater imagery, and should prove useful in bathymetric studies of shelf areas.

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PETROLOGY AND SEDIMENTATION OF EARLY PALEOZOIC ISLAND-ARC DEPOSITS, NEWFOUNDLAND

The Cambro-Ordovician New Bay Formation (2,000 m) of the Newfoundland Appalachians is a southward-thickening prism of conglomeratic, volcanogenic turbidites interbedded with sandstone and black argillite. Abundant sedimentary structures include tool and scour marks, cross-lamination, normal and multiple graded bedding, slump folds, and channels. The top of the formation is mostly agglomerate interbedded with red-and-green laminated silty argillite. Trails and burrows are the only fossils.

The sandstones are lithic-feldspathic arenites and basaltic wackes composed of fresh, angular unstable mineral grains and little quartz. The conglomerates have volcanic and sedimentary clasts enclosed in an ashy matrix altered to chlorite. Volcanic clasts are basalt, andesite, and dacite porphyry. Sedimentary clasts include green cherty siltite, fine-grained feldspathic arenite, abundant rip-up clasts of argillite, and rare jasper.

Analysis of Bouma sequences, amalgamated contacts, and trace fossils indicates abrupt regression late in New Bay deposition. Sole marks, slump folds, and channel axes indicate marginal sediment supply from turbidity currents and slumping down an east-facing submarine slope.

On the northwest the formation thins and apparently passes into marine and subaerial pyroclastic strata of the Wild Bight Group. On the east it is in sedimentary and tectonic contact with the Dunnage mélange which has been interpreted as an ocean trench deposit. The petrology and sedimentology of the New Bay Formation compares closely with certain Miocene volcanic arc deposits described from Malekula Island, New Hebrides. Therefore the New Bay is interpreted as a volcanogenic "apron" deposited in the arc-trench gap of a Cambro-Ordovician island arc.

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STARVED ROCK MEMBER OF ST. PETER SANDSTONE—OFFSHORE SHOAL

The Starved Rock Member of the St. Peter Sandstone has been described as a clean, medium-grained sandstone that was deposited in a broad band across northern Illinois. This deposit displays a sequence of sedimentary structures that indicates deposition in shallow water. From the base upward the structures include (1) massive beds; (2) small-scale trough cross-strata; (3) high-angle tabular cross strata; (4) large-scale trough