Characteristics of Sunda Subduction Zone

The Sunda Arc is continuous from east of Java northwest to Burma and has a wide lower trench slope, an outer-arc ridge, and a fore-arc basin with a thick sediment fill. South of Java, a thin cover of hemipelagic sediment is carried into the trench on the subducting plate, whereas northwest of Sumatra up to 6 km of Bengal Fan sediments enter the trench. This change in sediment thickness produces a corresponding change in trench slope structure. Off Java, trench and hemipelagic sediments are accreted in thrust packets with no discernible internal structure. In the north, the fan sediments are deformed into large coherent folds. The outer-arc ridge, which is 1 to 3 km below sea level off Java, becomes emergent to the northwest as Nias, Mentawai, Nicobar, and Andaman Islands. Subduction is oblique west of Sumatra, and the fore-arc region is cut by strike-slip faults. The fore-arc basin is segmented into smaller basins along its strike by transverse structural highs. Fore-arc basin sediments are derived from the old crystalline terranes of Sumatra and the volcanic terrane of Java. Sedimentary sequences in the fore-arc basin reflect several periods of uplift and deformation of the outer-arc ridge and the magmatic arc.

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Contrasts in Paleogene Tectonic Style, Kodiak Accretionary Complex: Ridge-Trench Interaction and Reduced Convergence Rate

The Paleogene Sitkalidak and Ghost Rocks Formations, along the southeastern side of the Kodiak Islands, respectively comprise the youngest and second youngest deep-sea deposits exposed adjacent to the eastern Aleutian Trench. The Paleocene Ghost Rocks Formation consists of a trench and/or trench slope turbidite sequence with interstratified oceanic basalts and andesites which were deformed and intruded by tonolitic plutons by 60 Ma. The Eocene Sitkalidak Formation comprises a trench slope and trench-filling fan sequence, lacking lavas and plutons, but petrographically correlative to the Aleutian abyssal fan. Regional metamorphism to prehnite-pumpellite and zeolite facies with maximum temperatures of 200 to 240°C and 100 to 125°C, respectively, characterize the Ghost Rocks and Sitkalidak Formations. Offscraped parts of the Ghost Rocks Formation exhibit more intense deformation than the comparable obductively offscraped unit of the Sitkalidak Formation.

The near-trench volcanism and plutonism, and regional metamorphism of the Ghost Rocks Formation is most simply explained by interaction with the Kula-Farallon Ridge, which plate reconstructions place near Kodiak 60 Ma. The Eocene progradation of sediment from the Kodiak area to the Aleutian abyssal fan requires a filled trench and probably reflects a reduction in convergence rate. Both the Paleocene demise of the Kula-Farallon Ridge and any Eocene northward motion of the Alaska Peninsula would have reduced the convergence rate beneath the Kodiak region during progradation of the Aleutian abyssal fan. Obductive offscraping of the Sitkalidak Formation is consistent with slow convergence beneath a prograding fan sequence. Cessation of siliciclastic turbidite accumulation on the Aleutian abyssal fan about 30 Ma suggests an increase in the convergence rate and/or decrease in sediment influx at this time.

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Genetic Lithostratigraphy of Dunkard Group, Southwestern Pennsylvania and Northern West Virginia

The Dunkard Group (Late Pennsylvanian–Early Permian) consists of 400 m of clastic sedimentary rocks with thin limestones and coals that were deposited in deltaic and alluvial-plain environments during the final stages of late Paleozoic sedimentation in the Appalachian basin. Lithofacies indicative of deposition in prograding, tidally influenced, high-constructive deltas dominate the lower Dunkard; these lithofacies are superseded up-section by alluvial-plain lithofacies. The distribution of lithofacies and paleocurrent data indicates that the fluival-deltaic systems prograded northward during deposition of the Dunkard. Sandstones of the Dunkard Group are typically multistory belt sands which were deposited by meandering rivers and highly sinuous delta distributaries.

Petrographic analysis indicates that Dunkard sandstones are immature to submature litharenites derived from a mixed sedimentary, metasedimentary, and volcanic terrane, suggesting a collision orogene provenance related to Alleghenian suturing. Composition of the sandstones is strongly grain-size controlled and depositional environments influenced composition by controlling grain size. Constant composition through the section suggests no major change in source lithology or tectonic regime of the source area during Dunkard deposition.

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Landsat Imagery as Tool for Determining Potential Oil and Gas Resources

Several hydrocarbon-bearing areas in the world have been examined using custom processed Landsat imagery along with geologic interpretations to determine potential hydrocarbon resources. Project areas are located along the Texas Gulf Coast, the western Overthrust Belt, the Athabasca Canadian region, and the South China Sea area.

Digital Landsat data were processed to produce 1:250,000 scale edge-enhanced, false-color, and high pass filter images. All the images were geometrically corrected with topographic controls and nonlinear deconvolution techniques (coverage = 13,000 sq mi or 33,800 sq km). These specially processed images have been used to map surface geology, lineament systems, and geomorphic anomalies in relation to subsurface geologic and geophysical data. Project areas are defined in terms of their tectonic genesis, structural trends, and hydrocarbon potential. Numerous exploration targets and several modes of hydrocarbon entrapment are identified by image interpretation.

The pressing need for more energy resource demands an accelerated large-scale exploration program. Landsat imagery has been utilized as a tool in the four project areas for structural, stratigraphic, and geomorphic analysis to locate geologic anomalies. Image analysis provides a better understanding of the regional stress-strain relations for tectonic correlation. This information can be used to identify a suite of exploration targets to be integrated into industry seismic programs.

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Subtle Porosity and Traps Within Frisco Formation (Devonian, Hunton Group): Geologic-Seismic Waveform Ap-