

Confirmation of Imbricate Thrusting in California Coast Ranges: Geology of Mysterious Valley Area, Napa County

Most of the structural relief in the northern California Coast Ranges is generated by imbricate thrust faulting, although the region is undergoing major strike-slip deformation. In the Napa County Coast Ranges, the presence of subequal outcrop areas of Franciscan rocks and of Great Valley Sequence sediments and their underlying ultramafic basement, highlights the regional structures.

The area is characterized by plunging folds which show relay patterns, by windows and klippen, and by vertical and lateral repetition of the stratigraphic section. Flat-lying faults are common. Individually these structures are best explained by thrust faulting; as an ensemble they are characteristic of the imbricate overthrust belts of compressional orogenes. Construction of a series of retrodeformable (balanced) cross sections, using a quantitative geometric theory of fault-bend folding, reveals a limited range of possible solutions to the regional deep structure. The structures include thrust faults rotated to high angles, anticlines formed by repeated small-scale imbrication, and regional back thrusts. The cross sections are characterized by thrust faults which rise southwestward across strike and southeastward along strike from the Franciscan into the serpentinite and then into the Great Valley Sequence. Decollement horizons are recognizable in all three lithologies.

The concept of imbricate thrusting provides a single unifying hypothesis with significant predictive ability which explains much of the map pattern and illuminates the three-dimensional structure of the eastern half of the Santa Rosa 1:250,000 map sheet.

PIETRAFESA, LEONARD J., North Carolina State Univ., Raleigh, NC

Shelf-Break Circulation, Fronts, and Physical Oceanography: East and West Coast Perspectives

Physical oceanographic processes present at the continental shelf-slope interfaces of both the east and west coasts of the United States are presented, compared, and contrasted. The Southeast Atlantic Bight shelf-break sector is principally dominated by the Gulf Stream and its associated cyclonic front. At the high-frequency end of the current spectrum, the semi-diurnal tide and inertial currents are dominant. Subinertial frequency motions are dominated by: Gulf Stream frontal meanders, warm core filaments, and cold core eddy ridges; wind forcing; thermohaline forces; and the effects of topography. The Mid-Atlantic Bight and Gulf of Maine outer shelf are shown to contain many of the dynamic elements of the southeastern shelf-slope, but the relative importances of various random surface and offshore low-frequency driving forces change.

West coast shelf-break processes differ principally from their east coast counterparts due to the absence of a Western Boundary Current. Principal circulation elements include various forms of continental shelf waves, wind-driven currents, tides, the California Current System and thermohaline effects.

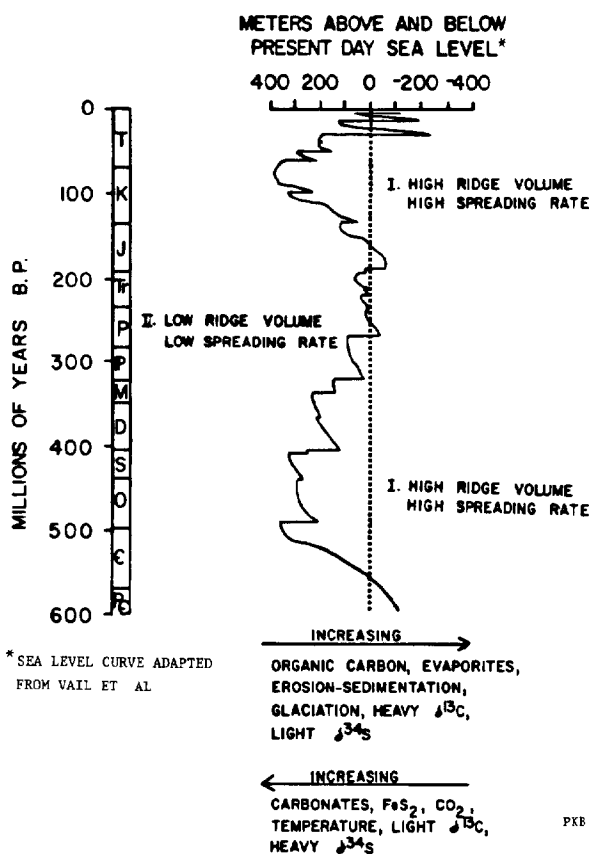
Both subtidal and supertidal frequency events are shown to be capable of initiating sediment motion and of suspending sediments, but lower frequency events are shown to be responsible for the bulk of sediment migration on the outer shelf and slope environs. Gulf Stream frontal phenomena and winter-time atmospheric storms figure prominently in providing physical mechanisms for sediment movement.

The interplay of bottom topography with the physics of the outer continental margin is presented. Bottom features such as shoals, bumps, ridges, and canyons are shown to be regions of sediment erosion, deposition, and draping. Furthermore these features are shown to be causally related to upwelling and downwelling phenomena and to the deflection and scattering of waves and currents.

PIGOTT, JOHN D., Northwestern Univ., Evanston, IL (Present address: Amoco International Oil Co., Houston, TX)

Global Tectonic Control of Secular Variations in Phanerozoic Sedimentary Rock/Ocean/Atmosphere Chemistry

COMPOSITE MODEL OF INFLUENCE OF GLOBAL TECTONICS UPON THE EARTH'S SURFACE ENVIRONMENT



Worldwide changes in sea level due to geotectonic mechanisms during the Phanerozoic have had pronounced effects upon the partitioning of carbon and sulfur among the exogenic reservoirs.

Analyses of mineralogically homogeneous brachiopod shell material (for $\delta^{13}\text{C}_{\text{ox}}$) and associated micrite organics (for $\delta^{13}\text{C}_{\text{red}}$) support the secular variability of whole-rock isotopic data compiled from the literature. Together, the data indicate the ratio of reduced carbon to total carbon in sediments is low at times of global high sea level and high at times of global low sea level. Conversely, the reduced to oxidized sulfur ratio as calculated from $\delta^{34}\text{S}$ values of evaporites follow an opposite trend.

A global tectonic model of carbon and sulfur cycling consistent with these observations is proposed with the following im-