tage of organic carbon extracted thereby doubling the yield of oil per ton. The process uses hydrogen at temperatures of 500 to 730°C and pressures of 20 to 50 atm. Experimental work in equipment capable of processing up to one ton of shale per hour has confirmed the technical and economic feasibility of above-ground hydroretorting of Devonian oil shales. Investigation of more than 550 samples from some 150 locations in 13 states indicates that IGT's HYTORT™ process can give organic carbon recoveries from 2 to 2.5 times those of conventional retorting, resulting in yields of 25 to 30 gal/ton at many localities, compared with 10 to 15 gal/ton using Fischer Assay.

Resource estimates are based on above-ground hydroretoring and four criteria: overburden less than 200 ft (59 m), stripping ratio less than 2.5 to 1, shale thickness of 10 ft (3 m) or more, and organic carbon at least 10% by weight. Resource estimates include: Kentucky 190 billion bbl, Ohio 140 billion bbl, Tennessee 44 billion bbl, Indiana 40 billion bbl, Michigan 5 billion bbl, and Alabama 4 billion bbl. Seven other states have been sampled but recoverable resources were not identified. The total recoverable resource exceeds 440 billion bbl of synthetic oil if all near-surface shales of more quality were mined for above-ground hydroretorting.

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Oxygen Isotope Record of Ice Volume History: 100 M.Y of Glacio-Eustatic Sea Level Fluctuation

The $\delta^{18}O$ values for shallow-dwelling planktonic foraminifers vary as a function of global ice volume and local temperature. By using only sites which have been shown to have had a stable sea surface temperature during late Pleistocene, we propose to constrain paleotemperature to near-constant modern values. For such sites, variation in $\delta^{18}O$ of shallow-dwelling planktonic foraminifers is thus constrained to reflect variation in global ice volume.

With regard to average values, we suggest the earth has had a significant ice budget since the Cenomanian (approximately 100 m.y. ago). Thus, variation in the average state of the global ice budget is a likely cause for interregional unconformities.

It is possible to evaluate the stability of continental ice caps by sampling short intervals of core in extreme detail. Our preliminary isotopic results show that high-frequency variation of ice volume persists throughout the last 40 m.y. at no less than 25% of the late Pleistocene amplitude. This implies that high-frequency sea level fluctuations of at least 30 m are superimposed upon longer term trends.

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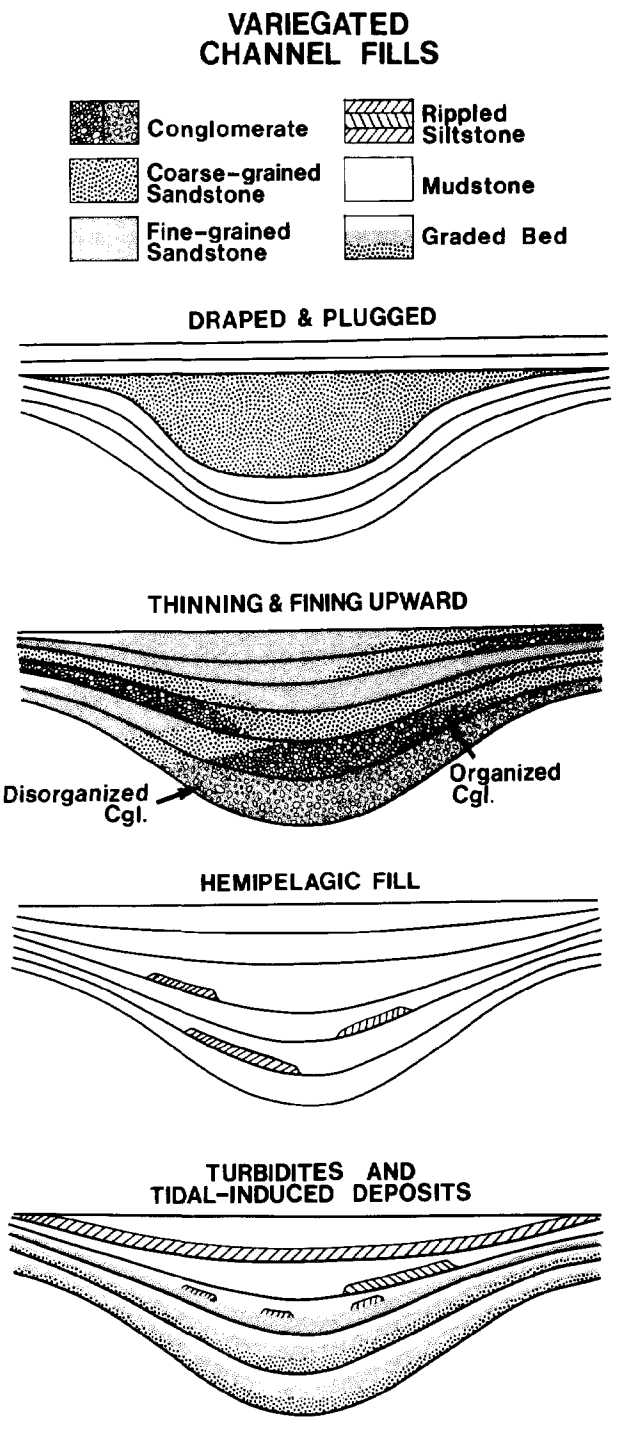
Shelf-Edge Conduit: Channelized Sediment Transport Across Eocene Fore-Arc Basin Margin, Southern California

A complete shallow-to-deep marine transition is exposed in Eocene rocks at San Diego, California. Well-exhibited facies relations, precise biostratigraphic control, and paleobathymetric indicators allow comparison of these continental margin outcrops with similar sequences most commonly observed only by seismic-stratigraphic methods. Even in this active tectonic setting, eustasy appears to be the dominant factor in cutting shelf-edge unconformities, forming and reactivating submarine canyons, and controlling the distribution of facies down the shoreline-to-basin conduit.



Broad, shallow outer-shelf channels funneled coarse-grained littoral sediments to the gullied upper slope and canyon head. These channels were filled with massive to laminated sandstone and shell lag, bioturbated mudstone, and rare slump-folded mudstone. An early Eocene canyon head was cut at the shelf edge during a eustatic lowstand, then eroded landward during subsequent sea level rise. The canyon is floored with a thick, massive sandstone that may be amalgamated or crudely graded, containing clasts of canyon-wall debris up to 6 m long in cross section, as well as conglomeratic to pebbly or gravelly sandstone. It exhibits convolutions, flame structures, and other evidence of rapid