Abstracts

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Methodology for Determining Relative Favorability for Development of United States Tar Sand Deposits

As part of the Department of Energy's overall program to stimulate petroleum production from unconventional sources, the Los Alamos Scientific Laboratory is developing a methodology to compare and rank the U.S. tar sand deposits on the basis of favorability for production. Major categories were first defined and included resource characteristics, technologic parameters, extraction process costs, environmental impacts, and institutional constraints. Under each of these major headings are the factors identified as bearing on favorability for production. These factors are assessed by their interrelations and relative importance, and are prioritized by individual and combined impact. This ranking methodology is being verified by analyzing eight reasonably well characterized tar sand deposits, selected on the basis of available information and diversity of both location and character. Ultimately, it will be expanded to include all U.S. tar sand deposits that may have commercial potential.

A major goal of this work is to assist industry and government in the timely and systematic development of U.S. tar sands, potentially a very significant petroleum resource. If it is assumed that only 30 billion bbl of oil are contained in the U.S. tar sand deposits, and that only half that amount is recoverable, the tar sand resource could still reduce our current import needs by 50% for over a decade. Furthermore, world tar sand and heavy oil resources are estimated to be greater than all of the conventional oil produced or discovered to date.

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Structure and Seismic Stratigraphy of Yucatan Basin in Western Caribbean

The structure of acoustic basement and the seismic stratigraphy of the overlying sediments in the Yucatan basin were studied from approximately 4,700 km of UTMSI multichannel seismic reflection profiles (12 fold with air guns and explosive sources) and from available single-channel data. In the central part of the basin the basement lies beneath 1½ to 2 sec of sediments, at a total depth of 7 to 8 sec (2-way time). Several basement ridges, spaced 20 to 40 km apart with ½ sec of relief and trending east-west, were mapped. An east-west basement trend was also observed in the northeastern arm of the basin where the basement is at 6.5 to 7.0 sec with about 1 sec of sediments. Basement highs outcrop at two locations in the western part of the basin and are suitable for future dredging. West of the basin along the continental slope, several linear elongated sediment-filled troughs with parallel northeast-southwest ridges to the east were observed. Since published refraction and gravity data indicate a typical oceanic crust beneath the Yucatan basin, we propose that the east-west basement features originated as closely spaced fracture zones during the opening of the basin by sea-floor spreading during Jurassic and Cretaceous.

The previously described "pelagic" sediments, which appear transparent on single-channel monitors, showed several unconformities and other sedimentary and deformational features in our data. The basin sediments were divided into several major depositional sequences based on unconformities and seismic character. The time-structure and isochronal maps indicate that although deposition was uniform over the basin in the earlier time, major deposition shifted from one area to the other in later periods.

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Sediments and Sedimentary Environments in Guaymas Basin, Gulf of California, Northwest Mexico

The Guaymas Basin is an actively spreading oceanic basin in the Gulf of California, northwest Mexico, in which three major sedimentary environments can be established based on their structural position and types of sedimentary sequences. (1) The active rift-valley setting contains a sequence of fine to very fine, poorly sorted, silty sand, interbedded with mass-flow deposits. The latter includes a mixture of terrigenous sediment derived from the mainland and basinal redeposited(?) (diatom-rich) pelagic sediment. The two populations result from the downslope movement of granular solids dispersed in a clay-water fluid; the upper part is muddy and diatomaceous. (2) The basin floor setting is characterized by high sedimentation rates; consequently the frequency of turbidite deposition (mainly in the lower part of the stratigraphic column) is higher than in the other two settings. The upper part of the stratigraphic column is lithologically more uniform, and consists of disturbed diatomaceous mud with interbeds of turbidites. (3) The slope setting is a province within the oxygen minimum layer and the sediments consist of varved diatomaceous beds interbedded with graded and cross-laminated turbidites.

The transport and depositional mechanisms within Guaymas Basin are difficult to resolve owing to the diversity of sediments supplied from fluvial, beach, and dune sources bordering the basin and further, to the mixing of these sediments by subaqueous gravity transport into the basin. Turbidites deposited during the Holocene-late Pleistocene period are interbedded with varved diatomaceous ooze, and correlate with interglacial highstands of sea level. The terrigenous particles have surface textures produced by glaciofluvial action, and perhaps are derived from the Colorado River province.

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Early Cretaceous Sedimentation in Peruvian Andes

Continuous Early Cretaceous marine sedimentation is recorded in the Lima basin prior to the development of a Late Cretaceous volcanic arc. An abrupt change in source and tec-

*Denotes speaker other than senior author.