Gulf of Mexico Foraminiferal Size Data and Its Incorporation Into A Paleoecologic Zonation Using The Paleoecologic Expert System (PALEX)

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Foraminiferal size data are presented from over 400 bottom samples from the Gulf of Mexico. Of the 74 common species investigated, 25 exhibit an increase in maximum size with increasing water depth. Qualitative terms such as small and large are assigned numerical values, corresponding to bathymetric zones. Quantifying size increases the number of key paleoecologic indicators available for interpretation. This is especially helpful for zonations based on species' upper depth limits.

These key indicators were combined with our existing paleoecologic understanding to formulate consistent paleoecologic rules. These rules form the foundation of the Paleoecologic Expert System (PALEX), a PC based program. PALEX applies these expert rules to well data to rapidly produce a consistent paleoecologic interpretation. Interpretations can be displayed on a sample by sample basis, or averaged using a predetermined filter. Distribution of the key paleoecologic indicators within each sample can be plotted, and confidence levels assigned to the interpretation.

Plotted alongside fossil abundance/diversity curves and integrated with electric log and seismic data, these interpretations can help identify sequence stratigraphic boundaries and system tracts. Examples from Green Canyon, Garden Banks, High Island, and Eugene Island are presented.

Surficial Geology of the Middle and Upper Continental Slope, Northern Gulf of Mexico: The Important Role of Episodic Fluid Venting

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The continental slope of the northern Gulf of Mexico is perhaps the most complex such environment in today's oceans. Large-scale topography of the middle slope to the shelf edge is dominated by knollsand basins created by shallow subsurface salt diapirs and intervening salt withdrawal basins. Superimposed on this regional framework is a diverse array of geologic features and associated sediment types. Recent studies using high resolution acoustic data, 3D-Seismic surface amplitude maps, and direct observation/sampling from manned research submersibles have verified the importance of episodic venting of fluid and gas on surficial slope geology. Deep-cutting faults activated by massive sediment input during periods of cyclic sea level lowering during the Pleistocene provide the avenues of vertical transport to the slope sea floor. Under rapid flux conditions, massive volumes of fluid mud are distributed in sheets and core-like buildups. Below the stability window for gas hydrates (~ 500 m water depth) gas-charged fluids develop hydrate mounds and mound complexes apparently under moderate flux conditions. Chemosynthetic communities and authigenic carbonates are common components of these features. Slow flux conditions favor gas-charged fluids of low sediment content. Hardgrounds and mounds of authigenic carbonates (mostly Mg-calcite, aragonite, and dolomite) and less common exotic minerals like barite. Radiometric dating suggests that major expulsion events follow shelf-edge delta development during periods of lowered sea level during the Pleistocene when sediments are rapidly deposited in the slope province.