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Differential Transport of Sand Grains: Ripples and Dunes, A Suspension Criterion

Differential transport of sand grains by unidirectional water flow over a cohesionless bed material having superimposed ripples or dunes results in hydraulic sorting. Hydraulic sorting occurs on many scales in natural fluvial systems, e.g., flood plain vs. channel deposits, bed vs. load in transit, various parts of cross-bed sets or individual laminae, etc. The mechanisms of hydraulic sorting include differential entrainment at the source, differential deposition and differential transport rates which are sensitive to prevailing bed configurations. By comparing transport rates of individual grain sizes calculated from size analysis of bed material and load under ripple and dune conditions, it is shown that the sampled load may be differentiated into two subpopulations of grains moved by different transport mechanisms, namely, those particles confined to transport within bed forms, and intermittent suspension load. Due to practical limitations in the flume, this study is limited to the two coarsest subpopulations observed in typical samples of river sediment. Theory and results of flume experiments suggest the following approximate hydraulic criterion for separating the two mechanisms of sediment transport: the point where the relative difference in transport rates between size fractions increases abruptly. This criterion is confirmed by flume experiments for flow conditions spanning the stability fields for ripples and dunes.

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Washover of Deltaic Barriers on Louisiana Coast

Washover processes are an important factor in the transgressive development of barrier coastlines. Sea level elevation necessary for overwash is composed of a storm surge component, a wave setup component, a wave runup component, and an astronomical tide component. The nature and severity of overwash are a function of overwash elevation, its frequency of occurrence, and regional barrier geometry.

Washover deposits on Louisiana barriers commonly account for over 50% of total sediment storage. Louisiana barriers have evolved by deltaic distributary abandonment; continuing sequential evolution of Mississippi delta complexes has generated a corresponding sequence of transgressive barriers. The resulting spectrum of barrier geometries has provided an ideal field site for the examination of washover form variability and its controlling processes.

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Permeability and Microfabric of Clayey Sediments

Most clayey marine sediments being deposited in today's oceans will eventually make excellent seals for hydrocarbons. Extensive consolidation testing of marine sediments indicates that most fine-grained marine deposits of the oceans are underconsolidated indicating the presence of excess pore water pressures. This condition is attributed to the low permeability of the sediments and indicates the potential of these sediments as seals for hydrocarbons.

Analyses of the consolidation, permeability, and microstructure characteristics of clayey marine sediments from most of the world's oceans show that the permeability decreases under an imposed load 7 to 8 order of magnitude faster than porosity. This decrease in permeability is controlled by the amounts and type of clay present as well as its microstructure. Clay microstructure refers to two important properties of a sediment—the fabric and physicochemistry. The fabric, a geotechnical property of the sediment is defined as the orientation and arrangement of the solid particles and the particle to particle relation. The relation between depth of burial, porosity, permeability, and fabric of marine clays will be discussed in relation to seals for hydrocarbons.

The consolidation tests have shown that the compressibility and permeability of the three clay types, kaolinite, illite, and bentonite, can be represented by power law functions of the porosity (n). They are $\sigma = An^B$ (psi) for the vertical stress supported by the mineral grains and $K = Cn^D$ (md) for the absolute permeability measured in the vertical direction with seawater. For these different clay types the following table lists the constants A, B, C, and D.

	A	B	C	D
Kaolinite	8.10	−5.43	0.296	5.71
Illite	3.07	−5.10	0.836	7.34
Bentonite	5.45	−6.09	0.0098	8.64

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Brizalina lowmani, a Meroplanktonic Foraminiferan Useful as Indicator of Shelfal Circulation and Eutrophication (with Comments on Biostratigraphy and Evolution)

Brizalina lowmani was found to be the most abundant living foraminiferan of the south Texas outer continental shelf, both in the sediment and in the water column. *B. lowmani,* considered a nearshore benthonic foraminifer, evidently possesses a meroplanktonic stage which allows it to take advantage of the pelagic and benthonic environments. Our study indicates that standing crops of *B. lowmani* in the water column can be used to determine provenance and direction of shallow and deep shelf currents.

Standing crops of *B. lowmani* in the sediment can be used as indicators of bottom shelf current and direction, depth and area of winter water column mixing, and degree of eutrophism of bottom and overlying waters.

The meroplanktonic nature of *B. lowmani* allows a wide dispersal of the form, suggesting why similar forms can be utilized as biostratigraphically useful index fossils. The form, *B. lowmani,* may be reminiscent of the early evolution of planktonic foraminiferans.

CASEY, RICHARD, Rice Univ., Houston, TX, et al

Radiolarian Species Composition, Density, and Diversity as Indicators of Water Structure and Circulation on South Texas Shelf

Radiolarian species composition, density, and diversity can be used to define the structure of the water column and circulation patterns of waters overlying the south Texas shelf. Radiolarian species that occur in the western North Atlantic, Caribbean, and Gulf of Mexico are also found in the south Texas shelf waters. The radiolarian assemblage from the western North Atlantic has the greatest density and diversity. Radiolarian densities and diversities are lower in the Caribbean and Gulf of Mexico, and are lowest in the waters over the shelf. Radiolarian densities and diversities on the shelf reflect incursions of open ocean waters at varying depths. Certain