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# Grain size controls on the morphology and stratigraphy of river-dominated deltas

Alex Burpee (1), Daniel Parsons (2), Rudy Slingerland (1), Doug Edmonds (3), Jim Best (4), James Cederberg (1), Andrew McGuffin (1), Rebecca Caldwell (3), and Austin Nijhuis (3)

(2) University of Hull, Geography, Environment and Earth Science, Hull, United Kingdom (d.parsons@hull.ac.uk), (1) Department of Geosciences, Pennsylvania State University, University Park, Pennsylvania 16802, USA., (3) Indiana University Department of Geological Sciences and Center for Geospatial Data Analysis, 1001 East 10th St. Office GY425, Bloomington, IN, 47405, USA., (4) Departments of Geology, Geography and Geographic Information Science, Mechanical Science and Engineering and Ven Te Chow Hydrosystems Laboratory, 133 Computer Applications Bldg, 605 E. Springfield Ave., Champaign, IL 61820

The proportions of sand and mud that make up a river-dominated delta strongly determine its topset morphology, which in turn controls its internal facies and clinoform geometry. These relationships allow prediction of the stratigraphy of a delta using the character of its topset and reconstruction of deltaic planform from measures of clinoform geometry. This paper presents results from the Delft3D modeling system which was used to simulate nine self-formed deltas that possess different sediment loads and critical shear stresses that are required for re-entrainment of mud. The simulated deltas were set to prograde into a shallow basin without waves, tides, Coriolis forcing, and buoyancy.

Model results indicate that sand-dominated deltas are more fan-shaped whilst mud-dominated deltas are more birdsfoot in planform, because the sand-dominated deltas have more active distributaries, a smaller variance of topset elevations, and thereby experience a more equitable distribution of sediment to their perimeters. This results in a larger proportion of channel facies in sand-dominated deltas, and more uniformly-distributed clinoform dip directions, steeper dips, and greater clinoform concavity. These conclusions are consistent with data collected from the Goose River Delta, a coarse-grained fan delta prograding into Goose Bay, Labrador, Canada and also allow us to undertake a re-interpretation of the Kf-1 parasequence set of the Cretaceous Last Chance Delta, a unit of the Ferron Sandstone near Emery, Utah, USA. We argue that the Last Chance delta likely possessed numerous distributaries with at least five orders of bifurcation.