RMS-SEPM Happy Hour Talk, April 28th, 2015

Influence of Lateral Boundary Conditions on Fluvial Channel-belt Clustering and Connectivity

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ABSTRACT: Stacking patterns describe how channelized deposits are spatially located relative to one another. Three methods are used to describe stacking patterns in fluvial systems: (1) clustering, (2) compensation, and (3) connectivity. Clustering is defined as a close grouping of a set of channels. Compensational stacking is defined as the tendency of a sediment transport system to fill in topographic lows resulting in a semi-organized stacking pattern. Connectivity is defined as the degree of sand-on-sand contacts between stratigraphically adjacent channel belts.

This study uses outcrop measurements to document how clustering, compensational stacking, and connectivity of fluvial channel belts relate to lateral confinement. To address this goal we quantitatively compare outcrop architectural styles of the valley-confined Dakota Sandstone to the unconfined-dispersive fluvial system in the lower Wasatch Formation, both exposed in Utah. At each locality we documented the following: (1) cluster size, (2) cluster shape in 3 dimensions, (3) paleocurrents, (4) channel-belt types and styles (e.g. single or multistory and accretion style), and (5) connectivity between channel belts. Results are the following. First, both confined and unconfined systems have documented clustering using K-functions; however, the sizes of clusters are smaller in the confined system. Second, clusters in the confined system are more longitudinally persistent than those in the unconfined system . Third, the unconfined system has a low compensation index (0.5), compared to the unconfined system, which is >0.8. Fourth, channels in the confined system have higher connectivity values than those in the unconfined system.

Results of this study provide a conceptual framework from which to relate degree of confinement of a depositional system to its internal stacking patterns and have implications for reservoir modeling.

Speaker Biography: Jesse Pisel is a PhD candidate in geology at the Colorado School of Mines in Golden CO. Jesse completed his undergraduate degree at Western State College of Colorado in 2012 before coming to Mines. His dissertation focuses on characterizing fluvial systems from outcrop to subsurface using statistical methods. Currently, Jesse is interested in the stratigraphic expression of earth surface processes over long time scales, as well as statistical and numerical modeling.

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