OCGC SEMINAR

Linking surface dynamics to the subsurface record: the effectiveness of overhead imagery in quantifying depositional architecture

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Abstract: Characterization of groundwater aquifers and hydrocarbon reservoirs necessitates an understanding of the distribution and connectivity of subsurface sandbodies. In deltaic environments, distributary channel networks serve as the primary conduits for water and sediment. Once these networks are buried and translated into the subsurface, the coarse-grained channel fills serve as likely conduits for subsurface fluids such as water, oil, or gas. The 3D permeability and connectivity structure of subsurface networks is therefore largely driven by the temporal evolution of channels on the surface.

I will present a method for building synthetic cross sections using overhead images of an experimental delta paired with intermittent topographic data. I'll discuss the challenges associated with prediction of stratigraphy solely from kinematics and geometry of surface networks, including those associated with predicting channel depth from imagery. I'll discuss the relationships between base-level cycles and subsurface architecture of channel sands in our dataset, metrics for characterizing percolation thresholds and connectivity of sand bodies, and an analysis of the sensitivity of these metrics to accurate channel depth prediction from surface imagery.

Dr. Elisabeth Steele was born in Norway, moved to Wyoming when I was young and then lived in Texas as a teenager. I completed by BSc in Geology at the University of Texas at Austin in 2012 and completed my PhD at University of California Santa Barbara in 2017. My PhD was focused on sediment gravity flows and the effects of fluid density on turbidity current dynamics. I spend 1.5 yrs as a postdoc in the St. Anthony Falls Laboratory at the University of Minnesota working with Chris Paola on connectivity of distributary channel sands (focus of today's talk) before joining the faculty at Queen's in May 2019. My research program broadly focuses on depositional sedimentary systems using field and flume studies.