NOTICE OF THESIS PROPOSAL PRESENTATION

Geodesy and Geomatics Engineering

Doctor of Philosophy

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Wednesday, May 27, 2015 @ 10:00 am
Head Hall – Room E-11

Supervisor:	John Hughes Clarke, Geodesy and Geomatics Eng.
Supervisory Committee:	Susan Haigh, Geodesy and Geomatics Eng.
	Katy Haralampides, Civil Engineering
	Ian Church, University of Southern Mississippi
Chair:	To Be Announced

Coupling of Repetitive Multibeam Surveys and Hydrodynamic Modeling to Understand Bedform Migration and Delta Evolution in Squamish River

ABSTRACT

The growth of any delta is controlled by the available sediment flux from the feeder fluvial system. The way in which the fluvial sediment load is distributed can result in both in gradual and catastrophic changes on the seabed. The manner in which that sediment moves through the tidally-influenced estuarine channels on the delta top controls the mechanism of growth and collapse of a delta lip which ultimately contribute to seabed mass wasting. A multi-year project has been conducted in Squamish, British Columbia in the year 2011, 2012 and 2013 to understand this mechanism. This project utilized repeat multibeam to observe the dynamic changes in the seabed morphology over time in the delta top and its adjacent prodelta. This research is as a subset of this multi-year project which focuses on the delta front from which the mass wasting into the deeper fjord is fed.

The sediment process in the delta top channel and the mouth bar, including subtidal and intertidal areas manifests in changes in both long-wavelength channel morphology as well as the superimposed short-wavelength bedform fields. While the long wavelength shape changes over a time scale of about a week, it is clear that the individual bedforms cannot be correlated from one tide to the next, indicating much faster evolution. As part of this thesis, the gradual evolution of both is investigated using repetitive surveys that can capture the instantaneous expression of both the long wavelength channel shape as well as the superimposed bedforms distribution (as preserved at high water).

In order to quantitatively analysis the gradual evolution in bedform morphology, this research implements a spectral analysis method to describe bedforms population characteristics from repetitive multibeam datasets. This will reveal the evolution of bedform characteristics from subcritical condition to critical and potentially supercritical bedform in the Squamish River. These same surveys, if adequately referenced, can also describe the evolution of long wavelength channel morphology on the delta edge.

The seabed morphological character is an expression of the superimposed flow fields. Since it is not possible to measure the current during the low water, this research also proposes the development and implementation of a hydrodynamic model to estimate the spatial and temporal flow field over the channel and the mouth bar. Herein a 3D hydrodynamic model was built to predict the flow within the river, the delta top and adjacent fjord over the complete tidal cycle and to quantify the bed shear stress associated with tidal modulation and river discharge.

Combining the understanding in the bedforms population characteristics, the long wavelength evolution from repetitive multibeam surveys and the spatial and temporal flow on the delta top from a 3D hydrodynamic model will lead to an improved understanding of the sedimentary processes active on Squamish delta. This, in turn will contribute to the evolution of the delta edge and mass wasting mechanism on the delta slope.

Faculty Members and Graduate Students are invited to attend the presentation