NOTICE OF THESIS PROPOSAL PRESENTATION

Geodesy and Geomatics Engineering

Doctor of Philosophy

Michael Sheng

Wednesday, January 24, 2018 @ 2:00 pm
Head Hall – Room E-4

Co-Supervisors:	Marcelo Santos, Geodesy and Geomatics Engineering
	Petr Vanicek, Geodesy and Geomatics Engineering
Supervisory Committee:	Robbie Kingdon, Geodesy and Geomatics Engineering
Chair:	TBA

Towards the Formulation of a Physically Rigorous Satellite-Only Gravity Model

ABSTRACT

Satellite-only gravity models have become commonplace in present-day geodesy but they must be evaluated with great care as any errors present in the model will propagate into any end product for which they are used. Currently, satellite-only global gravitational models (GGMs) make use of extensive filtering or regularization techniques, are fitted after-the-fact with respect to EGM2008, are unstable at higher degrees and orders, or are referred to a surface at which the systems of equations are invalid. In order to address the problems associated with the present day models we must look to new techniques for both the formulation of these models, as well as the methodology that is used in order to evaluate various functionals of the geopotential. Firstly, the commission error that is introduced by evaluating these GGMs while neglecting the requirements of harmonicity must be investigated to confirm that it is significant to precise geoid modelling. The next stage of research involves the creation and validation of a global laterally varying topographical density model for the purpose of more rigorously transforming the space above the geoid into one in which the gravitational potential is harmonic (ie: Helmert's space, No-Topography space, etc.). Finally, a new technique for the formulation of a satellite-only GGM is investigated. By making use of the spherical Green's functions, we can simultaneously solve for the boundary value problem as well as the transformation between the well-measured components of the gradiometric tensor observables from the GOCE mission. In order to be able to apply the spherical Green's function solution, the initial assumption of globally spanning data must be satisfied. The GOCE satellite orbits between the band [-83,83] degrees latitude and therefore the polar regions must be filled with data before formulation of the GGM is possible. In order to do this, terrestrial and airborne gravity data over the North and South poles must be transformed into the gradiometric tensor components and then upward continued to the satellite orbit. Once this is complete, the spherical Green's function solution can be carried out in the Helmert space in order to meet the requirements for the formulation of a physically and mathematically rigorous satellite-only GGM valid anywhere at or above the geoid.

Faculty Members and Graduate Students are invited to attend the presentation