



***Geodesy and Geomatics Engineering Presents
a Special Seminar***

Dr. Attila Komjathy

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
University of New Brunswick, Fredericton, NB, Canada

Thursday, February 13, 2014 @ 12:30 p.m.

Head Hall, Room E-4

**Detection of Natural-Hazards-Generated Ionosphere
Perturbations and Related New Applications**

ABSTRACT

Natural hazards, including earthquakes, volcanic eruptions, and tsunamis, have been significant threats to humans throughout recorded history. The Global Positioning System satellites have become primary sensors to measure signatures associated with such natural hazards. These signatures typically include GPS-derived seismic deformation measurements, co-seismic vertical displacements, and real-time GPS-derived ocean buoy positioning estimates. Another way to use GPS observables is to compute the ionospheric total electron content (TEC) to measure and monitor post-seismic ionospheric disturbances caused by earthquakes, tsunamis, and volcanic eruptions.

Research at the University of New Brunswick (UNB) laid the foundations to model the three-dimensional ionosphere at NASA's Jet Propulsion Laboratory by ingesting ground- and space-based GPS measurements into the state-of-the-art Global Assimilative Ionosphere Modeling (GAIM) software. As an outcome of the research, new and innovative GPS applications have been invented including the use of ionospheric measurements to detect tiny fluctuations in the GPS signals between the spacecraft and GPS receivers caused by natural hazards occurring on or near the Earth's surface. This continuing research is expected to provide early warning for earthquakes, tsunamis, volcanic eruptions, and asteroid impacts, for example, using GPS and other global navigation satellite systems.

The talk will demonstrate new and upcoming applications including recent natural and accidental hazards that generated TEC perturbations to perform state-of-the-art imaging and modeling of earthquakes, tsunamis, and asteroid impacts. By studying the propagation properties of ionospheric perturbations generated by natural hazards along with applying sophisticated first-principles physics-based modeling, we are on track to develop new technologies, which can potentially save human lives and minimize property damage.