**INVESTIGATING TRANSIENT ELECTROMAGNETIC RESPONSE IN THE UNDERWATER ENVIRONMENT**

*Lin-Ping Song, UBC; Stephen Billings; Leonard Pasion, Black Tusk Geophysics; Laurens Beran, Black Tusk Geophysics; Douglas Oldenburg*

Underwater (UW) munitions have been a concern for human recreational and industrial activities. To remediate munitions contaminated UW sites, one promising technique path is to follow electromagnetic induction (EMI) sensing that has shown the tremendous success in detecting and identifying terrestrial unexploded ordnance (UXO). Yet, the presence of seawater could make an UW EMI survey difficult. In the conductive medium (~ 4 S/m), EMI signals and acquisition are subject to amplitude/phase distortions and operational restrictions. It is necessary to quantify and analyze these impairing effects in order to design an effective UW EMI sensing. This work aims to characterize EMI responses in the underwater setting through numerical and experimental study and better understand the impact of underwater environments on EMI marine systems deployed to detect and classify buried munitions. To account for the effects of conductive medium and interfaces on EMI sensing, we simulate an underwater environment as a three-layered medium and model metallic targets buried in the sediment. We investigated factors that influence the background and scattered responses, including sea depth, the size and offset of a loop, standoff distance, host conductivity, field dispersion, excitation waveforms, and insulation of transmitter. The major findings show that the physical propagation in the conductive seawater could affect the scattered field from a buried metallic object, but typically only at very early times and at large receiver to object offsets. The current channeling response decay fast and is negligible. Within an interested time range, the terrestrial and marine responses of a metallic target are virtually identical. In principle, we can apply the terrestrial EMI modeling and inversion methods to marine detection and characterization after properly removing background response from measurements.