Tutorial Title: **Remote Sensing Ocean Application**

Continuing Education Units and Professional Development Hours

Instructor(s): **Desmond Power ~ VP Remote Sensing C-CORE , St John's, NL**
Mark Kapfer ~ Senior Project Engineer C-CORE , St John's, NL
Kelley Dodge ~ Technical Lead C-CORE , St John's, NL

Overview:

Remote Sensing Ocean Applications as it pertains to icebergs and sea ice. We are entering an era of increased earth observation information with rapidly improving sensors, all of which are relevant to oceans. This tutorial will provide a high level overview of remote sensing fundamentals, remote sensing techniques and a variety of earth observation sensors. Following this, sea ice charting and iceberg monitoring sections will be delivered to follow the marine theme to the Oceans '14 conference. The final section is a case study on ordering satellite imagery specifically for an oceans application as it pertains to ice mapping and monitoring.

The course will include:

Introduction to Remote Sensing will deliver a high level overview of remote sensing concepts including basic background on illumination and reflectance. This will be followed by various visual examples and techniques of earth observation. This topic will also cover past, current and future sensors and platforms as well as related examples of imagery and applications.

Sea Ice Charting remains a manually intensive process due to the complexity of the many factors involved. This section helps to bridge that appreciation of using satellite imagery to identify complex ice regimes in order to deliver standardized ice charts. This section also provides an introduction to global ice charting standards as well as an overview of a variety of ice types and interpretation techniques. Stages of development and concentration ice charts will be discussed as well as a discussion on egg charts, how to use them and how to understand the material within them. This section contains many visuals to help enhance the user's experience and help solidify the users understanding of the content.

Icebergs Monitoring delivers an extensive look at current trends and techniques for monitoring icebergs and highlights the importance of remote sensing's role. This section will also go into detail about utilizing various types of radar to identify icebergs, but also how to discriminate those with ships and other manmade objects without restriction to darkness, rain or cloud. It will also detail some of the detection performance techniques such as scan and averaging and how to utilize polarizations for detection. This section will also discuss recommended applications for icebergs as well as strategies for tactical monitoring. Finally, there will be a quick analysis on satellite archives for design and strategic planning.

Ordering Remote Sensing Data uses an example data set that needs to be acquired to fulfill an operational requirement. The general purpose of this case study is to highlight ordering processes, expand on situational issues that occur when attempting to acquire ideal datasets and detail possible issues that occur while attempting to schedule a data plan. This section will also

discuss the process of evaluating the types of imagery required to best image an area for a given application. This includes the trade-off of resolution versus coverage, the effects of incident angles on imagery and sensitivities that various modes inherently have. The goal of this session is to track the stages of understanding the application, evaluating the sensors required, picking the mode, planning the order and deconflicting if required.

Biographies:

Desmond Power, M.Eng, P.Eng, VP Remote Sensing has 23 years' experience in the field of engineering, dealing mainly in radar, radio frequency, remote sensing and earth observation projects. He started his career in terrestrial radar, working as a RF designer on an over the horizon radar for the Canadian military. In the early part of his career, he worked on antenna design, simulation and testing, mainly in the high frequency band. He was also heavily involved with signal processing and analysis of radar data. Soon after the launch of RADARSAT in 1995, Desmond moved into projects related to Earth Observation. In his role as VP of Remote Sensing, Desmond leads a team of 35 people involved in projects related to radar and RF systems, computer vision, earth observation and software development.

Mark Kapfer, Senior Project Engineer is a remote sensing and ice analyst with over 13 years of experience in the field. Mark has developed the products used by C-CORE's monitoring services and works closely with the end users to refine product content and Internet accessibility issues. He continues to be the lead on the operations and ice product development for the Floe Edge Monitoring Service since 2004 serving over 600 users in over 30 communities in Arctic Canada. He has worked with Geological Surveys of Canada in providing detailed ice interpretation of coastal regions of North-Western Canada for the Nearshore Ice complex project. Mark produced the products for the Sea Ice Data Fusion project for ice classification using segmented Multi-Polarization SAR, and compiled and evaluated all of the statistical information involving SAR polarization ratios.

Kelley Dodge, B.Eng, P.Eng. is the Technical Lead for Earth Observations in the Remote Sensing group. She is also project manager for several SAR satellite projects and acts as the technical advisor for the Polar View Iceberg Monitoring. She graduated from Memorial University of Newfoundland in 2000 with a B.Eng. Since joining C-CORE Kelley has become intimately involved with image analysis and processing with RADRSAT-1/2 SAR, ENVISAT ASAR and TerraSAR-X imagery. Kelley's work has involved evaluating and demonstrating the iceberg and ship detection and classification capabilities of single and dual polarized SAR imagery. She possesses a firm knowledge of GIS methodologies and techniques and is skilled in current Geomatics hardware and software. In the past several years, she had conducted a large series of tutorials with the oil and gas industry on the use of