Synergistic use of X- and C-band SAR data for tactical ship route planning in the Arctic Waters

* Markus JOCHUM1, Oliver LANG1, Roland CHRISTMANN1, Parivash LUMSDON1, Camilla MOHRDIECK2

1. Airbus Defence and Space, 88039 Friedrichshafen, Germany, markus.jochum@airbus.com
2. Airbus Defence and Space, 89077, Ulm, Germany, Camilla.mohrdieck@airbus.com

* Corresponding Author

ABSTRACT

As a result of climate change the sea ice conditions in the arctic become increasingly attractive in the summer months for commercial shipping. However, shipping routes in the Arctic north remain affected through ice and icebergs. Dynamic ice conditions require continuous monitoring and where appropriate an adjustment of the route. Airbus Defence and Space and the Canadian partner C-CORE are therefore investigating and building methods by combining C- and X-band data to support tactical ship routing. Usually wide area SAR modes, e.g. from RADARSAT-2 ScanSAR are used to gather information for strategic ice information. In addition there is a demand for tactical planning to specify which information has to be up-to-date and geographically limited to an area of interest. High resolution X-band SAR data could contribute with detailed information about sea ice structures that cannot be detected by the wide swath modes.

The collection of TerraSAR-X and RADARSAT-2 imagery have been coordinated with a Canadian shipping company which commutes with large vessels between Montreal and Deception Bay even throughout the winter season. The project activities are threefold:

1- Operational performance: Test if acquisition, step wise adoption and delivery of high resolution TerraSAR-X imagery could be provided in acceptable time after acquisition to the ship in order to support the tactical navigation.

2- Discrimination of Icebergs and ships in ice: The imagery has been analyzed with regard to distinguish icebergs in ice from ships in ice. Automatic detection methods and manual detection methods have been evaluated. Another activity exploits the potential of the bi-static imagery from the TanDEM-X mission. Ice hazards like ridges and bergs embedded within sea-ice are serious threads to shipping activities.

3 –Tracking: The Multi-Source Tracking activities aim to integrate all available heterogeneous information about ships and icebergs (e.g. X- and C-band SAR-data, satellite-AIS data, ice radar data) into a comprehensive and consistent situation picture that contains one “Multi-Source-Integrated (MSI)” track per detected object of interest together with the object’s measured and derived attributes. Particular focus is put on the integration of ship attributes such as length, width, orientation, status of movement (if available) in order to complement their tracks and to resolve potential conflicts in the association of SAR-plots to ship tracks, which is complicated by the presence of icebergs and clutter.