Arctic Sea Ice Characterization Using Fully Polarimetric Air-Borne and Space-Borne Synthetic Aperture Radar

Suman Singha

Remote Sensing Technology Institute (IMF), German Aerospace Center (DLR), Henrich Focke Str. 4, 28199, Bremen, Germany. Suman.Singha@dlr.de

ABSTRACT

Arctic Sea ice monitoring has attracted increasing attention over the last few decades. Besides the scientific interest in sea ice, the operational aspect of ice charting is becoming more important due to growing navigational possibilities in an increasingly ice free Arctic. For this purpose, satellite borne SAR imagery has become an invaluable tool. In past, mostly single polarimetric datasets were investigated with supervised or unsupervised classification schemes for sea ice investigation. Despite proven sea ice classification achievements on single polarimetric data, a fully automatic, general purpose classifier for single-pol data has not been established due to large variation of sea ice manifestations and incidence angle impact. Recently, through the advent of polarimetric SAR sensors, polarimetric features have moved into the focus of ice classification research. The higher information content of four polarimetric channels promises greater insight into sea ice scattering mechanism and overcome some of the shortcomings of single polarimetric classifiers. Two spatially and temporally coincident, fully polarimetric acquisitions from the TerraSAR-X/TanDEM-X, RADARSAT-2 and ALSO-2 satellites and Multi Frequency Fully polarimetric acquisitions from DLR-FSAR were investigated. Proposed supervised classification algorithm consists of two steps: The first step comprises a feature extraction, the results of which are ingested into a neural network classifier in the second step. Based on the common coherency and covariance matrix, we extract a number of features and analyse the relevance and redundancy by means of mutual information for the purpose of sea ice classification.