Geophysical Research Abstracts
Vol. 17, EGU2015-12487-1, 2015
EGU General Assembly 2015

Ice/water Classification of Sentinel-1 Images

Anton Korosov (1), Natalia Zakhvatkina (2), and Stefan Muckenhuber (1)

(1) Nansen Environmental and Remote Sensing Center, Bergen, Norway, (2) Nansen International Environmental and Remote Sensing Center, St.Petersburg, Russia

Sea Ice monitoring and classification relies heavily on synthetic aperture radar (SAR) imagery. These sensors record data either only at horizontal polarization (RADARSAT-1) or vertically polarized (ERS-1 and ERS-2) or at dual polarization (Radarsat-2, Sentinel-1). Many algorithms have been developed to discriminate sea ice types and open water using single polarization images. Ice type classification, however, is still ambiguous in some cases. Sea ice classification in single polarization SAR images has been attempted using various methods since the beginning of the ERS programme. The robust classification using only SAR images that can provide useful results under varying sea ice types and open water tend to be not generally applicable in operational regime. The new generation SAR satellites have capability to deliver images in several polarizations. This gives improved possibility to develop sea ice classification algorithms.
In this study we use data from Sentinel-1 at dual-polarization, i.e. HH (horizontally transmitted and horizontally received) and HV (horizontally transmitted, vertically received). This mode assembles wide SAR image from several narrower SAR beams, resulting to an image of 500 x 500 km with 50 m resolution.
A non-linear scheme for classification of Sentinel-1 data has been developed. The processing allows to identify three classes: ice, calm water and rough water at 1 km spatial resolution. The raw sigma0 data in HH and HV polarization are first corrected for thermal and random noise by extracting the background thermal noise level and smoothing the image with several filters. At the next step texture characteristics are computed in a moving window using a Gray Level Co-occurence Matrix (GLCM). A neural network is applied at the last step for processing array of the most informative texture characteristics and ice/water classification.
The main results are:
* the most informative texture characteristics to be used for sea ice classification were revealed;
* the best set of parameters including the window size, number of levels of quantization of sigma0 values and co-occurence distance was found;
* a support vector machine (SVM) was trained on results of visual classification of 30 Sentinel-1 images.
Despite the general high accuracy of the neural network (95% of true positive classification) problems with classification of young newly formed ice and rough water arise due to the similar average backscatter and texture. Other methods of smoothing and computation of texture characteristics (e.g. computation of GLCM from a variable size window) is assessed.
The developed scheme will be utilized in NRT processing of Sentinel-1 data at NERSC within the MyOcean2 project.