Surface Parameters Inversion from Sea Ice Using Spaceborne Polarimetric SAR Data

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The discrimination between open water and sea ice, and/or between sub-classes of sea ice are challenges for SAR remote sensing regarding sea ice monitoring applications. Compared to single channel SAR data, fully polarimetric data contain more physical information about the occurring scattering processes which can be used to increase the estimation and discrimination accuracy.

Unsupervised polarimetric classification or segmentation approaches allow the discrimination between sea ice and open water, as well as between several classes of sea ice. However, the main problem lies in the physical interpretation of the obtained classes. In this work, we propose the combination of unsupervised classification with surface roughness and moisture content information extracted by applying a quantitative inversion technique for establishing the physical relevance of the obtained classes. In a first step, a recently developed two-component polarimetric surface scattering model (Ex-Bragg) for the quantitative estimation of surface roughness and dielectric constant based on the eigenvalues and eigenvectors parameters of the polarimetric coherency matrix is applied [1]. Then, the estimated parameters are compared with sea ice classes obtained by applying an unsupervised classification based on the complex Wishart distribution of the polarimetric coherency matrix elements [2,3,4]. For our investigations we use fully polarimetric C- and L-band data acquired during the second shuttle-borne SIR-C mission over the coast of Newfoundland in April 1994.

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