SEA ICE CLASSIFICATION USING BAYESIAN STATISTICS

J.A. Verspeek
KNMI, Wilhelminalaan 10, 3732 GK De Bilt, The Netherlands

ABSTRACT

Using the scatterometer data from the ERS-2 satellite, a classification algorithm for sea/ice discrimination, based on Bayesian statistics is introduced. Also a comparison with ice maps obtained by other models and measurements is made.

The differences in backscatter properties between water and ice can be used to infer discrimination criteria. Ice has isotropic backscatter properties. Water on the other hand has anisotropic backscatter properties, which fact is used to retrieve wind direction. Traditionally people have used simple parameters representing the geophysical properties of ice, like an anisotropy coefficient. Another approach is to use a geophysical model function (GMF) that describes the measurement backscatter data as a function of one or more physical parameters. This method is used for wind retrieval but can be equally well applied for ice retrieval. It has the advantage that the full information content of the measurements is used.

For wind the backscatter GMF naturally is dominated by two parameters, being the wind speed and wind direction. For ice, plots of measured triplets in sigma0-space show that in good approximation all ice points lie on a straight line. This means that the ice GMF can be described with one parameter, being the abscissa along this line. Based on the distance of a measured sigma0 triplet to the ice line and to the wind cone, a Bayesian algorithm can classify the point as ice or as sea.

The ice model proves a useful tool for sea/ice discrimination and could help in the quality control for the wind retrieval procedure. Also it can be used to distinguish between different types of ice, of which the most prominent are firstyear ice and multiyear ice. The calculated ice map is a product in itself based on the scatterometer measurements. It can be used to monitor the development of the ice edge of the Arctic and Antarctic region on a time scale of days.