Monitoring Open Water Fraction in the Beaufort Sea Using High Resolution SAR and Ice Mass-Balance Buoys Via Support Vector Machines

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Previous studies have classified open water using relatively coarse satellite imagery, making comparison to single-point in-situ measurements difficult. A crucial area in the Arctic demanding small-scale data fusion between remote satellites and Ice Mass Balance (IMB) buoy measurements is the Marginal Ice Zone (MIZ). The MIZ can be characterized as an area where open-ocean processes significantly alter the pack ice, the collection of ice floes is relatively small, and the local sea ice is heavily decayed by melting. In this study we build a support vector machine learning model using information from one single high-resolution TerraSAR-X image at HH polarization with a resolution of 5.25 m. The trained model is then used to quantify open water and ice concentrations on a regional scale within the MIZ for 18 images from early September through mid-October, 2013. We compare our method results to a classical technique for obtaining open water fraction using an unsupervised image threshold scheme known as Ostu’s Method, where classification is solely done through intra-class variance. Open water fraction estimates obtained from our support vector machine model are then analyzed in tandem with measurements from an ice mass-balance buoy deployed by the Cold Regions Research and Engineering Laboratory (CRREL).