

# ARCTIC SEA ICE MAPPING USING KOMPSAT-5 ENHANCED WIDE SWATH SAR IMAGES

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ABSTRACT... Mapping sea ice and open water in the Arctic Ocean is very important for cryospheric researches and ship navigation. Synthetic Aperture Radar (SAR) has been widely used for mapping polar region because it can observe Earth's surface regardless of sun altitudes and weather conditions. Korea Multi-Purpose Satellite-5 (KOMPSAT-5) is South Korea's first satellite equipped with SAR (X-band) that provides high-resolution images in various observation modes. In this study, a total of 84 KOMPSAT-5 SAR images of the Chukchi Sea in the Arctic obtained from August to September 2015 were used to map sea ice and open water. All SAR images were acquired in Enhanced Wide Swath (EW) mode, an imaging mode of KOMPSAT-5 that provides SAR images of 6.25-m spatial resolution over a wide area ( $100 \times 100$  km), and HH-polarization at incidence angle ranging from 17 to 50°. In order to reduce speckle noise, all SAR images were averaged using  $2 \times 2$  pixel window. Random Forest (RF), a rule-based machine learning approach, was applied to classify sea ice and open water. For each SAR image, a total of 12 texture features—mean and standard deviation of intensities, and 10 gray level co-occurrence matrix (GLCM) features— were calculated within  $8 \times 8$  pixel window. The values of each texture feature for each SAR image were normalized and then used as a set of input variables for the binary classification based on RF approach. The overall accuracy and Kappa coefficient of the RF-based sea ice and open water classification were 99.5% and 98.6%, respectively. This means that the KOMPSAT-5 EW SAR images can provide accurate sea ice map over the Arctic Sea with a spatial resolution of 100 m.

**KEY WORDS:** Arctic, sea ice, KOMPSAT-5, SAR