WEST ANTARCTIC LANDFAST SEA ICE MAPPING USING ALOS PALSAR DATA AND OBJECT CORRELATION IMAGE ANALYSIS

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ABSTRACT... Landfast sea ice (fast ice) is the sea ice attached to the coast or icebergs. Fast ice plays an important role in sea ecosystems in the Antarctic. The multi-year fast ice fasten to ice tongues or ice shelves can be mechanically coupled with each other. As an interface between the atmosphere and ocean system, fast ice can change the amount of incoming solar energy, being an important factor for climate change. Therefore, the research on fast ice such as its extent or variations is necessary. In this research, a method of detecting fast ice was proposed over the West Antarctic fast ice areas with no fast ice reference data. Object correlation images (OCIs) approach, a kind of change detection method, was used to suggest an automated and accurate method to detect fast ice. ALOS PALSAR SAR images recently distributed by the Alaska Satellite Facility (ASF) were used, and machine learning techniques were applied to classify two classes of fast ice and non-fast ice with the image correlation method. As in the analysis of box plots, OCIs, some of GLCMs, and mean variables were used as important variables. The evaluation of the three machine learning models was performed with the test dataset through confusion matrix. Among the three models, RF model showed the highest overall accuracy of 93.43% and Kappa coefficient of 72.73%, whereas DT model showed lower accuracies than the other models. SVM model detected fast ice regions more than RF model, but over-detected fast ice with high PA of 81.82% and low UA of 69.23% with low accuracy of fast ice class. The fast ice classification maps generated by the three machine learning models shows that all the models well detected fast ice regions compared to the fast ice reference areas identified by pairs of the backscattering images.

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KEY WORDS: West Antarctica, Landfast sea ice, ALOS PALSAR, Object Correlation Images