Daytime Sea Fog retrieval over the Yellow Sea based on FY-4A data Using Convolutional Neural Networks

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Sea fog is a dangerous weather phenomenon over Yellow Sea. It hazards maritime activities such as fishery operations and traffic by low visibility. It is necessary to monitor sea fog to reduce the influence on navigation and transportation. Due to rare meteorological stations over ocean, using satellite data to detect sea fog becomes the best choice. Geostationary-orbit satellites (GEOs) are able to acquire the continuous satellite cloud imagery, which provides the sea fog distribution as well as the potential possibility of sea fog short time forecasting. In particular, FY-4A satellite launched in 2016 with 14 channels (3 visible channels and 11 infrared channels) could scan the Yellow Sea as short time as every 15 minutes in the first half hour and every 5 minutes in the second half hour. Since Convolutional Neural Network (CNN) architecture can classify the content of input data by automatically learning hierarchies of features and save lots of time compared with increasingly sophisticated sea fog detection methods, CNN would be highly suitable for image segmentation and then used for monitoring sea fog. Based on FY-4A AGRI multispectral data images and sea fog mask retrieved by threshold algorithm method at daytime over the Yellow Sea in 2018, we use CNN method to train the data and then try to detect sea fog. After the training, the CNN method could fast get the sea fog distribution based on FY-4 data alone. In case validation, sea fog retrieval of CNN method is similar with sea fog mask of previous threshold algorithm method. It indicates that the CNN method would reliably detect daytime sea fog distribution.