

Detection and Mapping of Harmful Algal Bloom using Geostationary Ocean Color Imager(GOCI) and Machine Learning

Suho Bak (1), Dohyun Hwang (1), Unuzaya Enkhjargal (1), Hongjoo Yoon (1)

¹ Pukyong National University, 45 Yongso-ro, Nam-gu, Busan, KOREA

Email: shbak91@pukyong.ac.kr; rupine725@hanmail.net; unuzaya.e@gmail.com;
tezid@inha.ac.kr

Abstract: *Cochlodinium polykrikoides*(*C. polykrikoides*) are representative harmful algae causing red tide in South Korea. The most frequently *C. polykrikoides* red tide occurrence in the central Sea of Korea is the mixed with turbid water area(high concentration of CDOM(Chromophoric Dissolved Organic Matter) and SS(Suspended Solids)) and clear water area. *C. polykrikoides* bloom in clear water can be detected using Chlorophyll-*a* anomaly or Optical property of sea water based method. However, in the case of turbid water, there are many limitations when applying the method used in the previous research.

In this study, we tried to extract *C. polykrikoides* red tide pixels from Level 2 data of GOCI(Geostationary Ocean Color Imager) using machine learning technique. Artificial neural network model used for red tide pixel detection. 1600 pixels were sampled from GOCI image in red tide occurred area, clear water area, turbid water area, respectively. Therefore, there are very few spectral profiles of red tides in the entire dataset. In order to solve this unbalanced data environment, we implemented data augmentation with noise to balance the number of data between classes. 80% of data sets were used as training data sets, and the remaining 20% were used as verification data sets. A red tide index was used for mapping the difference in biomass density between detected red tide pixels. The red tide index used the ratio of bands with high correlations with *C. polykrikoides* red tide biomass.

Keywords: Machine Learning, Satellite Image, Remote Sensing, Harmful Algal Bloom