

Remote sensing of floating macroalgae in the coastal areas based on machine learning

*Zhaoxin Li¹, Zhongfeng Qiu², Wei Yang¹

1. Chiba Univ., 2. NUIST

Timely and accurate information about floating macroalgae blooms (MAB), including their distribution, movement, and duration, is crucial in order for local government and residents to grasp the whole picture, and then plan effectively to restrain economic damage. Plenty of threshold-based index methods have been developed to detect surface algae pixels in various ocean color data with different manners; however, these methods cannot be used for every satellite sensor because of the spectral band configuration. Also, these traditional methods generally require other reliable indicators, and even visual inspection, in order to achieve an acceptable mapping of MAB that appears under diverse environmental conditions (cloud, aerosol, and sun glint). To overcome these drawbacks, a machine learning algorithm named Multi-Layer Perceptron (MLP) was used in this paper to establish a novel automatic method to monitor MAB continuously in the Yellow Sea, using Geostationary Ocean Color Imager (GOCI) imagery. The method consists of two MLP models, which consider both spectral and spatial features of Rayleigh-corrected reflectance (Rrc) maps. Accuracy assessment and performance comparison showed that the proposed method has the capability to provide prediction maps of MAB with high accuracy (F1-score approaching 90% or more), and with more robustness than the traditional methods. Most importantly, the model is practically adaptable for other ocean color instruments. This allows customized models to be built and used for monitoring MAB in any regional areas. With the development of machine learning models, long-term mapping of MAB in global ocean is conducive to promoting the associated studies.

Keywords: Floating macroalgae, Image identification, Remote sensing, Machine learning