

Wakame (*Undaria pinnatifida*) areas mapping using satellite remote sensing

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Wakame (*Undaria pinnatifida*) is regarded as an invasive alien species globally. This invasion causes some fishery damages and destruction of local ecosystems in many countries. Satellite remote sensing can be a candidate method to efficiently identify the wakame areas. However, there are common difficulties in the seaweed area monitoring as well as wakame as follows; since the light in near infrared wavelength range is absorbed in seawater, only the visible light can be used. To identify the wakame areas, the distribution has been estimated from the ocean temperature and the current. But the identification method is only the indirect estimation.

Some researchers have reported the identification of seaweed areas using remote sensing indices and using calculations of seaweed area models based on optical information for the sea depth and the bidirectional reflectance distribution function. The spectral reflectance used as a reference, however, is measured at outside seawater. Those spectra for seaweeds living in the seawater are not directly measured.

In this study, we have directly measured the water depth dependence of wakame spectral living in seawater and have investigated the influence of the water depth on the spectrum. Based on the measured spectra, we aim to establish a method of satellite remote sensing that is sensitive to wakame areas identifying the difference with other species of seaweed beds. In this presentation, we will present mainly on the latter topic.

To judge whether we can identify the wakame areas by satellite remote sensing, for Funakoshi Bay in Japan, satellite images taken by Sentinel 2 were analyzed. Pixel intensities at the wakame areas were significantly smaller than others in the band 1, 2, 6, and 7. Considering the fact that the features of wakame spectra measured at inside seawater remain clear at the water depth of over 90 cm, we can expect to identify the wakame areas. Furthermore, analyzing the difference between the term of wakame appeared (April) and the term of disappeared (July), we can map only the wakame areas because the other seaweeds are perennial plant, although wakame is annual plant.

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