Development of trophic state index monitoring method in the lakes using Landsat-8 data

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An economical and a simple method is desired as a presentation tool of water quality information in lakes for public people from administration in recent years. Water quality monitoring using satellite data is expected as such tool. But the example for which satellite data is used continually is very little as a water quality monitoring tool in lakes of our country. There were problems of the spatial resolution, the repeat cycle and the sensitivity to the water as this reason. The nutritional state of the lakes in our country is generally estimated by environmental index of the total nitrogen (TN) and total phosphorus (TP) etc., but the water quality parameter which can be estimated from a satellite is limited to chlorophyll a (Chl.a) and suspending substance (SS) etc. On the one hand, there is a method called the modified trophic state index (M-TSI) from Chl.a, TN, and TP in the lakes (Aizaki et al., 1981).

So the method by which automatic calculation and mapping of TSI using Landsat-8/OLI data with sensitive (12bit) and the high spatial resolution (30m) launched in February, 2013 was developed by this research. Lake Shinji and Lake Nakaumi (Shimane and Tottori prefectures in Japan) as test sites, were chosen. The 15 scenes from April, 2013 to July, 2014 were used for satellite data. At first, LCI (Linear Combination Index) method (Frouin et al., 2007) known as a simple atmospheric correction algorithm for ocean color sensor was used for Chl.a estimation from OLI data easily. The OLI band 2 , band 3. and band 5 were selected as the bands of LCI method. The -1 and 0.3 were set as the Angstrom index which indicates wavelength-dependence of aerosol. On the other hand, M-TSI was calculated from a relationship between Chl.a, TN, and TP in our country made separately. After the simple Rayleigh scattering correction was conducted, a target area was extracted from header information on Landsat-8 data using the programming function of the Matlab software (MathWorks Inc.). Finally, the automatic mapping system that TSI is estimated via Chl-a from LCI was developed. The characteristic of TSI distribution indicates the very high value in the western part of Lake Shinji in particular.

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