Simulation on spectral cross-calibration of NDVI from MODIS, ASTER, and Landsat 5-TM

*Kenta Obata[1], Hiroki Yoshioka[2], Tomoaki Miura[3]

1.National Institute of Industrial Science and Technology (AIST), Geological Survey of Japan, 2.Department of Information Science and Technology, Aichi Prefectural University, 3.Department of Natural Resources and Environmental Management, University of Hawaii at Manoa

Spatio-temporal changes in terrestrial vegetation are of significant importance for understanding environmental issues including global warming. Numerous earth observation satellites have been launched and operated for monitoring the earth surface. For example, the series of the Landsat satellite that provides 30m patial resolution (Landsat 5-Thematic Mapper (TM), Landsat 7-Enhanced Thematic Mapper Plus (ETM+), and Landsat 8-Operational Land Imager (OLI)) have been operated since 1980s. The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) (15m spatial resolution) and Moderate Resolution Imaging Spectroradiometer (MODIS) (250m spatial resolution) onboard Terra have made measurements of the earth surface for more than 16 years. The spectral data obtained by the multiple sensors can provide long term monitoring of terrestrial vegetation over regional/global scale. The sensor specification such as spectral response function, however, shows differences across sensors, resulting in producing systematic errors in the data product (e.g. vegetation indices). It deteriorates the consistency among the data product of vegetation indices from multiple sensors. We developed the cross-calibration algorithm for reducing the errors among Enhanced Vegetation Index (EVI) due to differences between spectral response functions of MODIS and Visible and Near-infrared Imaging Spectrometer (VIIRS) (375m spatial resolution). The algorithm was implemented to actual sensor data of MODIS and VIIRS that were Climate Modeling Grid resolution (0.05 by 0.05 degree) for the cross-calibration and showed potential utilities of the developed algorithm [Obata et al., *Remote Sens.*, 8(1), 2016].
In this study, equations of Normalized Difference Vegetation Index (NDVI) for ASTER and Landsat 5-TM are cross-calibrated with reference to MODIS NDVI based on the developed algorithm. The hyperspectral reflectances derived by Earth Observing-1 Hyperion are used to simulate reflectances of the multispectral sensors. We then evaluate systematic errors among NDVIs between MODIS and ASTER/Landsat 5-TM and show results of the NDVI cross-calibration.

Keywords: NDVI, Cross-calibration, MODIS

