

Global Cross-Comparison of MODIS vs. VIIRS Vegetation Index Datasets

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Vegetation index (VI) time series data derived from moderate resolution sensors such as Earth Observing System Moderate Resolution Imaging Spectroradiometer (MODIS) have widely been used in studies that involve the characterization of seasonal and inter-annual vegetation dynamics. The Visible Infrared Imaging Radiometer Suite (VIIRS) sensor series of the Joint Polar Satellite System program is slated to continue the highly calibrated data stream initiated with MODIS. In this study, we cross-compared global VI datasets derived from MODIS and VIIRS for year 2015 with the goal of understanding their cross-sensor radiometric compatibility. The four VIs of the “top-of-atmosphere (TOA)” and “top-of-canopy (TOC)” normalized difference vegetation indices (NDVIs), TOC enhanced vegetation index (EVI), and TOC two-band EVI (EVI2) were investigated. For all the four VIs, the overall systematic differences and uncertainties (measured as mean differences and root mean square differences, respectively) were small (~ 0.020 VI units) in which VIIRS VIs were higher than the MODIS counterparts. TOA NDVI and TOC NDVI cross-sensor differences were not seasonally nor view zenith angle-dependent. TOC EVI and TOC EVI2 cross-sensor differences were view zenith angle dependent where systematic differences increased with increasing view zenith angles. These results suggest that the normalization of view zenith angles is a required step to use these two datasets interchangeably.

Keywords: Data continuity, VIIRS, MODIS, NDVI, EVI, EVI2