Generation of the GCOM-C land surface phenology product: Algorithm development and performance evaluation

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The satellite Global Change Observation Mission –Climate (GCOM-C) carrying the optical sensor, Second Generation Global Imager (SGLI) with 250 m spatial resolution, was launched on December 23, 2017. One of the major goals of the GCOM-C mission is to monitor global climate changes. Vegetation phenology not only describes the life cycle events of periodic plants in the growing season but also is an indicator of the sensitivity of the ecosystem to climate change. The long-term study of phenological records on the surface of vegetation is very important for exploring regional and global scale biological responses to environmental changes. Land surface phenology from satellite monitoring has been shown to capture the spatial patterns of vegetation dynamics at global scales. In this study, we will present a newly proposed algorithm to produce the Global Land Surface Phenology (GLSP) product based on the GCOM-C/SGLI data. The GCOM-C GLSP algorithm uses GCOM-C Atmospheric Corrected Reflectance (RSRF) data as the input to calculate the normalized difference greenness index (NDGI). The temporal NDGI trajectory is reconstructed using the iterative Savitzky-Golay filter and modeled using a hybrid piecewise logistic function to retrieve the state of seasonal vegetation development, detect phenological transition dates and characterize the confidence of phenology detections on an annual basis. The GCOM-C GLSP algorithm has been verified by the field phenology observations of specific species at multiple observation sites (i.e., Penological Eye Network, PhenoCam Network), and compared with the VIIRS and MODIS GLSP products to evaluate the resulting phenological metrics. The evaluations results demonstrated satisfactory agreements between the satellite-estimated and field-observed phenological metrics, indicating that the GCOM-C/SGLI data can be used to generate a new generation of the GLSP product at 250 m resolution.

Keywords: Land surface phenology product, Piecewise logistic, Evaluation

