VIIRS OCEAN PRODUCTS FROM NPOESS / NPP

Justin Ip, Hiroshi Agravante, Bruce Hauss, Sid Jackson, Merit Shoucri, Nancy Andreas

Northrop Grumman Aerospace Systems, Redondo Beach, California 90278

Curtis Mobley

Sequoia Scientific, Inc., Bellevue, Washington, 98005

Abstract

The Visible/Infrared Imaging Radiometer Suite (VIIRS) is one of the instruments that make up the suite of sensors to be flown on the National Polar-orbiting Operational Environmental Satellite System (NPOESS). First launch of the VIIRS is on the NASA NPP (NPOESS Preparatory Project) mission next year. VIIRS radiometric data will be used to produce over 20 Environmental Data Records (EDRs). VIIRS ocean products will include EDRs for Sea Surface Temperature (SST), Ocean Color/Chlorophyll (OCC) at VIIRS moderate resolution (750 m at nadir), and Net Heat Flux (NHF) at approximately 12 km aggregated cells. The SST EDR is a key EDR. The OCC EDR is produced in two steps – first the Atmospheric Correction Over Ocean then the Ocean Color/Chlorophyll algorithms. Ocean Albedo will be produced as an Intermediate Product (IP) at VIIRS moderate resolution by the NHF algorithm, to be combined with the Land and Ice Albedo IPs to produce the Albedo EDR. This presentation will emphasize on the pre-launch testing and performance assessment of the SST and OCC algorithms.

The VIIRS SST EDR will be derived from the moderate resolution thermal emissive channels covering the short-wave and long-wave infrared spectral regions (3.7 to 12.05 µm). Both skin and bulk SST will be retrieved. The VIIRS sea surface temperature retrieval algorithm will be described and performance results using both simulated and MODIS proxy data will be presented. The skin SST is used as an input to the ocean color algorithm.

The Carder Semi-analytical ocean color algorithm was employed as the initial ocean color algorithm for use with MODIS on EOS-Terra and Aqua. This algorithm has, with only minor modifications, been selected by NGST as the ocean color algorithm for the VIIRS sensor on NPP/NPOESS. This paper will report on the testing and pre-launch performance assessment of the current VIIRS Ocean Color/Chlorophyll (OCC) algorithm, based on application to both global *in situ* and synthetic datasets. Performance results are presented for the retrieval of chlorophyll-a as well as the retrieval of the key absorption and scattering inherent optical properties (IOP). These performance results represent an optimal retrieval of chlorophyll-a and absorption and scattering IOPs, since it is based on *in situ* or synthetic remote-sensing reflectance spectra without the added error due to imperfect atmospheric correction or sensor noise and bias.

To assess the standalone performance of the VIIRS OCC algorithm we have used a combination of global synthetic and *in situ* IOP-AOP datasets. The two synthetic datasets used for assessing OCC performance are based on in-water radiative transfer simulations using different versions of the widely accepted Hydrolight ocean radiative transfer model (RTM). They were independently developed by NGST and by the International Ocean-Color Coordinating Group (IOCCG). The *in situ* datasets include the NASA bio-Optical Marine Algorithm Dataset (NOMAD), Version 1.3, and the IOCCG *In Situ* Dataset, which is an extraction from NASA's SeaWiFS Bio-optical Archive and Storage System (used for the cross-comparison of IOP algorithms reported in IOCCG Report No. 5). These datasets contain biogeochemical values (e.g., chlorophyll and chlorophyll-a concentrations), absorption and scattering IOP values, and AOP values such as the spectral water-leaving radiance, surface irradiance, and remote-sensing reflectance. This information plus auxiliary values of latitude, longitude, and sea-surface temperature are all that is required to assess the standalone performance of the VIIRS OCC algorithm.

From standalone testing of the VIIRS OCC algorithm with both global synthetic and *in situ* datasets, we conclude that the algorithm is working correctly and that it achieves performance measures that are comparable to other state-of-science ocean color algorithms. The precision error achievable with the OCC algorithm is consistent with that obtained from sensors like SeaWiFS and MODIS.