DSCOVR/EPIC mission: Retrieval of aerosol and ocean products using machine learning methods

Knut Stamnes (1), Yongzhen Fan (1), Nan Chen (1), Wei Li (1), Charles Gatebe (2), and Jakob Stamnes (3)

(1) Stevens Institute of Technology, Physics and Engineering Physics, Hoboken, United States (kstamnes@stevens.edu), (2) NASA Goddard Space Flight Center, Greenbelt, MD, United States (charles.k.gatebe@nasa.gov), (3) University of Bergen, Bergen, Norway (Jakob.Stamnes@uib.no)

For almost 40 years, satellite ocean color sensors, such as CZCS (1978–1986), SeaWiFS (1997–2010), MERIS (2002–2012), MODIS (1999–present), and VIIRS (2012–present), have provided a global view of many useful aerosol and water parameter products, especially in open ocean areas. These sensors, mostly onboard polar orbiting satellites, take measurements at 700 - 900 km above the Earth's surface, and therefore can provide moderate to high spatial resolution. However, since the temporal resolution of these sensors is limited, they are not able to capture short-time variations of the atmosphere-surface system. Geostationary sensors, such as GOCI (2000–present), take measurements from a geosynchronous orbit and are therefore capable of making hourly measurements to study the diurnal variation of atmosphere-surface properties. However, the spatial coverage of these geostationary sensors is limited. The Earth Polychromatic Imaging Camera (EPIC) onboard the Deep Space Climate Observatory (DSCOVR) located at the L1 point between the Earth and the Sun, makes continual spectral measurements of the entire sunlit Earth surface about every 108 minutes while the Earth rotates. These unique measurements provide both global coverage and high temporal resolution suitable for short-term variability studies, because the same area of interest will appear in a series of images with good viewing geometry. Hence, any area of interest can be studied. To explore the scientific potential of such unique datasets to serve the remote sensing community, we will use them to retrieve spectral aerosol optical depths and remote sensing reflectances from ocean and inland water areas. Traditional ocean color atmospheric correction algorithms do not work for EPIC due to the limited number of spectral bands available. Our retrieval algorithms, however, which are based on coupled atmosphere/ocean radiative transfer model simulations and machine learning techniques, have been modified to be applicable to the EPIC spectral bands. We present aerosol and ocean products retrieved using these algorithms and cross-validated with MODIS products.