Validating and improving long-term aerosol data records from SeaWiFS

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Natural and anthropogenic aerosols influence the radiative balance of the Earth through direct and indirect interactions with incoming solar radiation. However, the quantification of these interactions and their ultimate effect on the Earth's climate still have large uncertainties. This is partly due to the limitations of current satellite data records which include short satellite lifetimes, retrieval algorithm uncertainty, or insufficient calibration accuracy.

We have taken the first steps in overcoming this hurdle with the production and public release of an aerosol data record using the radiances from the Sea-viewing Wide Field-of-View Sensor (SeaWiFS). SeaWiFS was launched in late 1997 and provided exceptionally well-calibrated top-of-atmosphere radiance data until December 2010, more than 13 years. We have partnered this data with an expanded Deep Blue aerosol retrieval algorithm. In accordance with Deep Blue's original focus, the latest algorithm retrieves aerosol properties not only over bright desert surfaces, but also over oceans and vegetated surfaces. With this combination of a long time series and global algorithm, we can finally identify the changing patterns of regional aerosol loading and provide insight into long-term variability and trends of aerosols on regional and global scales.

In this work, we provide an introduction to SeaWiFS, the current algorithms, and our aerosol data records. We have validated the data over land and ocean with ground measurements from the Aerosol Robotic Network (AERONET) and compared them with other satellites such as MODIS and MISR. Looking ahead to the next data release, we will also provide details on the implemented and planned algorithm improvements, and subsequent validation results.