

A Proposal for Refinement of the MODIS Calcite Algorithm and Cal/Val Activities Towards Assembly of Earth System Data Records

Abstract

I propose to provide calibration/validation data for refining the MODIS particulate inorganic carbon (“PIC” or CaCO_3) algorithm and to produce earth system data records of suspended PIC concentration. My lab has performed Atlantic Meridional Transect cruises between the U.K. and South Africa, providing cal/val data for the MODIS two- and three-band PIC algorithms; this has provided optical and hydrographic data, plus analytical measurements for several cruises totaling 135d at sea. Moreover, the original PIC algorithm has been revised in order to produce a “merged” two- and three-band algorithm, which optimizes the strengths of each individual algorithm. Using our field data, we have partitioned the variance in backscattering attributable to PIC, particulate organic carbon and biogenic silica in this mid-ocean environment. The objectives of our new proposal would be to further refine the PIC algorithm to reduce RMS error and provide new data to independently test its accuracy. The British have invited our participation for future AMT cruises which gives us unprecedented access to the mid-Atlantic, critical to optical modeling of PIC in the global ocean. We will take advantage of other cruise efforts in the Gulf of Maine for further cal/val and algorithm refinement. I also propose data analysis of the global PIC patterns. The results of this work will significantly advance global-scale validation of the PIC product (MOD 25) and provide Earth System Data Records of PIC. Refinement of the PIC algorithm directly address all of NASA’s goals in the “Carbon Cycle and Ecosystems Focus Area for marine environments”: 1) document and understand how the global carbon cycle and marine ecosystems are changing, 2) quantify global productivity, biomass, and carbon fluxes and 3) provide useful projections in marine ecosystems of future changes in global carbon cycling for ecological forecasting and improvement of climate change predictions.