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SIMBIOS Program in Support of Ocean Color Missions: 1997-2003

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ABSTRACT

The NASA Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) Program had a worldwide, ongoing ocean color data collection program, as well as an operational data processing and analysis capability. SIMBIOS data collection takes place via the SIMBIOS Science Team. In addition, SIMBIOS had a calibration and product validation component (Project Office). The primary purpose of these calibration and product validation activities were to (1) reduce measurement error by identifying and characterizing true error sources, such as real changes in the satellite sensor or problems in the atmospheric correction algorithm, in order to differentiate these errors from natural variability in the marine light field; and (2) evaluate the various bio-optical and atmospheric correction algorithms being used by different ocean color missions. For each sensor, the SIMBIOS Project reviews the sensor design and processing algorithms being used by the particular ocean color project, compares the algorithms with alternate methods when possible, and provides the results to the appropriate project office.

Keywords: SeaWiFS, MODIS, MOS, OCTS, OSMI, POLDER, data merger, SIMBIOS, calibration, validation.

1. INTRODUCTION

The SIMBIOS Program was conceived in 1994 as a result of a NASA management review of the agency's strategy for monitoring the bio-optical properties of the global ocean through space-based ocean color remote sensing. At that time, the NASA ocean color flight manifest included two data buy missions, the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) and Earth Observing System (EOS) Color, and three sensors, two Moderate Resolution Imaging Spectroradiometers (MODIS) and the Multi-angle Imaging Spectro-Radiometer (MISR), scheduled for flight on the EOS-Terra and EOS-Aqua satellites. The review led to a decision that the international assemblage of ocean color satellite systems provided ample redundancy to assure continuous global coverage, with no need for the EOS Color mission. At the same time, it was noted that non-trivial technical difficulties attended the challenge (and opportunity) of combining ocean color data from this array of independent satellite systems to form consistent and accurate global bio-optical time series products. Thus, it was announced at the October 1994 EOS Interdisciplinary Working Group meeting that some of the resources budgeted for EOS Color should be redirected into an intercalibration and validation program¹.

6. CONCLUDING REMARKS

The calibration and validation programs for individual missions (both domestic and international) had a wide range of approaches and methodologies, making international cooperation imperative to ensure high quality climate data. The SIMBIOS Project and Program is a success story on how to tackle these issues while engaging the ocean color community. The achievements were certainly due to the operational configuration (Figure 1) and to the engagement of project staff with the science team. Over the past several years, a set of key resources were developed: 1) a comprehensive *in situ* bio-optical database; 2) a program to evaluate different atmospheric correction algorithms; 3) a program to link the calibrations of individual ocean color satellite instruments; 4) a program (including cross-calibrations and measurement protocols) to develop a consistent *in situ* calibration and validation data set for the satellite measurements; 5) a model for funded collection of *in situ* data, including rapid turnover; 6) alternate algorithms to convert radiometric measurements to derived geophysical products; and 7) alternate methods to combine ocean color measurements from different sources into a single data set. Our hope is that the organizational structure, lessons learned, and knowledge achieved by SIMBIOS will benefit future ocean color programs.

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