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The SeaWiFS Bio-Optical Archive and Storage System (SeaBASS): Current Architecture and Implementation

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Chapter 1

Introduction

1.1 Motivation and Philosophy

Experiences with past and present satellite ocean color missions, such as the Coastal Zone Color Scanner (CZCS) and Sea-viewing Wide Field-of-view Sensor (SeaWiFS), demonstrate the need for high quality *in situ* measurements for bio-optical algorithm development and satellite data product validation (Gordon et al. 1983, Evans and Gordon 1994, McClain et al. 1998, Hooker and McClain 2000). The National Aeronautics and Space Administration (NASA) SeaWiFS Project, for example, is tasked with producing normalized water-leaving radiances with an absolute accuracy of 5% (Hooker and Esaias 1993), which requires comparative, globally distributed *in situ* radiometric measurements with accuracy finer than 5%. The advent of additional missions, such as the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Medium Resolution Imaging Spectrometer (MERIS), and the approach of future missions, including the Global Imager (GLI) and the second Polarization and Directionality of the Earth's Reflectances (POLDER-2) instrument, further underline the need for accurate, temporally and geographically diverse samples of oceanographic and atmospheric data.

Historically, the amount of data suitable for algorithm development and satellite validation activities has been limited due to a paucity of simultaneous observations and the difficulty associated with obtaining globally distributed sampling (O'Reilly et al. 1998, Bailey et al. 2000). With regards to the latter, spatial biases are often undesirable for satellite missions with continuous global coverage. Due to their required accuracy, these data are additionally limited by biases introduced by varying measurement and data processing techniques (Hooker and Maritorena 2000, Hooker et al. 2001). As such, global, high quality, *in situ* data sets are invaluable and prerequisite to advance the field of ocean color.

To facilitate the assembly of a global bio-optical data set, the SeaWiFS Project developed the SeaWiFS Bio-optical Archive and Storage System (SeaBASS), a local repository for *in situ* radiometric and phytoplankton pigment data used regularly in their scientific analyses (Hooker et al. 1994). The system has since been expanded to contain oceanographic and atmospheric data sets collected by the NASA Sensor Intercomparison and Merger for Interdisciplinary Biological and Oceanic Studies (SIMBIOS) Project (McClain et al. 2002), as part of NASA Research Announcements (NRA) NRA-96-MTPE-04 and NRA-99-OES-99, which has aided considerably in minimizing spatial bias and maximizing data acquisition rates (McClain and Fargion 1999a and 1999b, Fargion and McClain 2001 and 2002). The SeaWiFS and SIMBIOS Project Offices (SPO) currently share responsibility for the maintenance of SeaBASS, including all design modification and construction.

To develop consistency across multiple data contributors and institutions, the SPO has defined and documented a series of *in situ* data requirements and sampling strategies that ensure that any particular set of measurements will be acceptable for bio-optical and atmospheric correction algorithm development and ocean color sensor validation (Mueller and Austin 1995, Fargion et al. 2001, Mueller et al. 2002a and 2002b). In addition, the SPO has sponsored a series of round-robin activities to establish and advance the state of instrument calibration, protocols, and traceability to radiometric standards (Mueller 1993, Meister et al. 2002). Data prepared using these techniques are suitable for both verifying the radiometric precision and stability of satellite-borne ocean color sensors and validating the algorithms used to relate the radiances to other geophysical parameters.