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Stanford B. Hooker, Editor

*NASA/Goddard Space Flight Center
Greenbelt, Maryland*

Elaine R. Firestone, Senior Scientific Technical Editor

*Science Applications International Corporation
Beltsville, Maryland*

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Stanford B. Hooker

*NASA/Goddard Space Flight Center
Greenbelt, Maryland*

Scott McLean

Jennifer Sherman

Mark Small

Gordana Lazin

Satlantic, Inc.

Halifax, Canada

Giuseppe Zibordi

*JRC/SAI/Marine Environment Unit
Ispra, Italy*

James W. Brown

*RSMAS/University of Miami
Miami, Florida*

Chapter 1

SIRREX-7 Overview

STANFORD B. HOOKER
*NASA/Goddard Space Flight Center
Greenbelt, Maryland*

SCOTT MCLEAN
*Satlantic, Inc.
Halifax, Canada*

ABSTRACT

The primary objective of SIRREX-7 was a thorough inquiry into the absolute capability of a single calibration facility. A small team of investigators was assembled to address this question at Satlantic, Inc. The experimental group was kept small, because the entire activity had to take place in a single room with a small number of experimental stations. Because this required a substantial commitment in time and resources, there was a strong desire to learn as much as possible about the equipment and methods normally used in the calibration process. Consequently, a wide diversity of each equipment type was assembled: 10 FEL lamps, 7 reflectance plaques, 10 fixed wavelength radiometers, 1 hyperspectral radiometer, the SXR, 1 single-channel mapping (narrow field-of-view) radiometer, plus the original SQM and 4 SQM-IIs. The instrumentation came from three different organizations with differing calibration and measurement objectives, so the assembled equipment had a diverse range of calibration histories, ages, sizes, intended uses, sensitivities, flux levels, etc. Although SIRREX-7 was conducted at only one facility, the diversity in equipment ensures that a significant subset of the results achieved will have a wider applicability to the larger community.

1.1 INTRODUCTION

The determination of the absolute radiometric response of an irradiance or radiance sensor requires a properly staffed and equipped calibration facility. For SeaWiFS calibration and validation activities, the latter must include stable sources and sensors with defined spectral radiometric characteristics traceable to NIST. The calibration facility must also have a variety of specialized radiometric and electronic equipment, including reflectance plaques, spectral filters, integrating spheres, and highly regulated power supplies for the operation of the lamps. Precision electronic measurement capabilities are also required, both for setting and monitoring lamp current and voltage, and for measuring the output of the radiometer.

Although there have been six previous SIRREXs and significant progress was made at each one, in terms of understanding the sources of uncertainties in radiometric calibrations, a thorough inquiry into the absolute capability of a calibration facility regularly used by the ocean color community was not investigated. This was an important task, because, as already mentioned, the goal of a calibration facility used for SeaWiFS validation is to provide reproducible calibrations from 400–850 nm to within $\pm 1\%$.

SIRREX-7 was convened with a small team of investigators to estimate calibration uncertainties at Satlantic, Inc. The experimental group was kept small, because the entire activity had to take place in a single room. Satlantic agreed to be the hosting organization, because:

1. Many SeaWiFS and SIMBIOS investigators rely on Satlantic equipment and calibrations;
2. They have a state-of-the-art facility (all calibrations are done in a clean room with exceptional baffling and optical alignment equipment);
3. They commercialized the original SQM (so several units were available for an absolute intercomparison experiment); and
4. They have the interest and commitment (having participated in all of the previous SIRREXs) to underwrite the significant financial requirements for the hosting organization.

A final uncertainty budget for any instrument requires a thorough understanding of laboratory and field performance. The SeaWiFS Project participated to provide expertise and unique equipment (the original SQM and SXR), a variety of sources and targets (plaques, FEL lamps, etc.),