SORTIE-2 Final Radiometric Data Report
Document Number: WET-DN-00519
Revision A: [2008-07-31]

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1.2 Symbols and Abbreviations

Symbol	Description	Units
AOP	Apparent Optical Property	
$E(\lambda)$	Instrument measured irradiance	$\mu W\ cm^{-2}\ nm^{-1}$
$E_d(\lambda)$	Downwelling spectral irradiance below the sea-surface	$\mu W\ cm^{-2}\ nm^{-1}$
$E_s(\lambda)$	Downwelling spectral irradiance above the sea-surface	$\mu W\ cm^{-2}\ nm^{-1}$
$E_{s\ diff}(\lambda)$	Downwelling spectral irradiance above the sea-surface	$\mu W\ cm^{-2}\ nm^{-1}$
$E_v(\lambda)$	Upwelling spectral irradiance measured near the sea surface	$\mu W\ cm^{-2}\ nm^{-1}$
$E_{lamp}(\lambda)$	Spectral irradiance of standard lamp at a specified distance	$\mu W\ cm^{-2}\ nm^{-1}$
$F1(\lambda)$	Reduction in Field of View due to differences in refractive index	dimensionless
$F2(\lambda)$	Immersion reflectance changes at window - water interface	dimensionless
$Imm(\lambda)$	Total spectral immersion effects	dimensionless
IOP	Inherent Optical Property	
$L(\lambda)$	Instrument measured radiance	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L_u(\lambda)$	Upwelling spectral radiance below the sea-surface	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L_s(\lambda)$	Upwelling spectral radiance measured near the sea surface	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L_w(\lambda)$	Upwelling spectral radiance just above the sea-surface	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L_{wn}(\lambda)$	Normalized water leaving radiance	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L^{ex}_{wn}(\lambda)$	Exact Normalized water leaving radiance	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
$L_T(\lambda))$	Target Radiance	$\mu W\ cm^{-2}\ nm^{-1}\ sr^{-1}$
MOBY	Marine Optical BuoY	
$\eta_g(\lambda)$	Relative spectral index of refraction of optical window	dimensionless
$\eta_W(\lambda)$	Relative spectral index of refraction of water	dimensionless
NASA	National Aeronautics and Space Administration	
NIST	National Institute of Standards and Technology	
$\rho(\lambda)$	Spectral reflectance of standard target	dimensionless
$Q(\lambda)$	Q factor	sr
R_{rs}	Remote Sensing Reflectance	sr^{-1}
SORTIE	Spectral Ocean Radiance Transfer Investigation and Experiment	

2 Introduction

2.1 Scope

This document summarizes scientific investigations carried out by WETSAT Inc. under contract to the Center for Hydro-Optics and Remote Sensing (CHORS) at San Diego State University (SDSU) for the Spectral Ocean Radiance Transfer Investigation and Experiment (SORTIE) [RD20] in January of 2008, referred to as SORTIE-2.

2.2 Background and Rationale

Ocean color measurements from space, whether they are from polar orbiting or geostationary platforms, require similar calibration and validation efforts. An extensive pre-launch sensor characterization is critical for all ocean color missions and should include response versus scan angle, polarization sensitivity, stray light contamination and ray-trace modeling and validation among others. Because of changes and uncertainties in the sensor and its optical alignment after launch any pre-launch calibration provides only a starting point for the follow-on post-launch vicarious calibration and characterization (VC^2). After launch, there are other *in situ* match up measurements that are required to validate and diagnose systematic artifacts in both atmospheric aerosol models and ocean BRDF models.

The Marine Optical BuoY (MOBY) has been the quintessential vicarious calibration platform for over a decade with its radiometric data being used by a variety of national and international researchers and federal agencies to improve ocean color data retrievals. The MOBY site off Lanai Island, Hawaii, was selected based on convenience for routine servicing and reduced atmospheric and in-water radiometric variability. Maintenance of the MOBY site has been labor intensive and relatively expensive, providing only a single, highly calibrated point for vicarious calibration.

It is now important to consider additional VC^2 facilities and sites that augment a single-site MOBY-like facility, to cover the ranges of variability in oceanic and atmospheric conditions required for comprehensive calibration, characterizations and validations of the satellite measurement/model system. These facilities may be based on different deployment platform concepts and strategies than those used at MOBY, possibly including towers or vessel-based sortie surveys to measure *in situ* time-series of water-leaving radiances. A VC^2 facility must address and demonstrate the following criteria:

1. Alternative instrumentation and measurement methods must be experimentally validated by directly comparing derived exact, normalized water-leaving radiance, $L^{ex}_{wn}(\lambda)$, with results of concurrent measurements using MOBY instruments and methods at a common site. The comparison site might be the MOBY site, or another site with suitable bio-optical and atmospheric conditions.

2. A second level of site-to-site comparability must be demonstrated through direct comparisons of mean $L^{ex}_{wn}(\lambda)$ bias and random uncertainties (ie. Type-A Standard Uncertainty, National Institute of Standards and Technology (NIST)) with concurrent satellite sensor VC^2 experiments at MOBY and the proposed site. Comparative experiments must take into account systematic differences in spectral out-of-band responses to account for contrasts in water-leaving radiance spectra and atmospheric conditions at the two site locations.

3. Protocols are needed for screening measurements used to compute uncertainties and must carefully specify the criteria used to remove each type of data from the analysis. In an experimental analysis of an ensemble of differences between satellite and *in situ* determinations of water-leaving radiance pairs, the satellite and *in situ* data must be filtered separately and in the blind, and a pair removed if either does not pass its independent criteria.

The SORTIE project proposes a series of experiments to demonstrate that by combining hyperspectral apparent optical property (AOP) and hyperspectral inherent optical property (IOP) measurements in oligotrophic and coastal areas, with state-of-the-art radiative transfer modeling; substantial improvements can be made in the uncertainty associated with VC^2 of ocean color sensors.

To meet these objectives, the Satlantic HyperPro II hyperspectral radiometer has been selected as a portable radiometer of similar low radiometric uncertainty as that demonstrated for MOBY. Stray light characterizations of the HyperPro II have been performed at the NIST Spectral Irradiance and Responsivity Calibrations using Uniform Sources (SIRCUS) [RD11, 12] facility in 2005, 2006, and 2008. In addition, rigorous characterization and calibration protocols have been used for the SORTIE radiometers. This included immersion factor measurement [RD19], spectral calibration [RD15], thermal responsivity characterization [RD16], spatial characterization [RD17,18], and stray light characterization, in addition to calibration using a NIST scale standard lamp. These instruments are used to generate $L_w(\lambda)$ and $L_{wn}(\lambda)$ data products for the SORTIE Team.

2.3 SORTIE2 Mission Overview

The objective of SORTIE-2 was to take the experimental plan from the clear waters of Hawaii to the coastal waters of the US using a small coastal vessel. This deliberately moves the project into areas with spatial variability and coastal aerosols. Match up with satellite data will provide a Lw comparisons directly, without the direct presence of MOBY. Unfortunately neither MOBY nor SeaWiFS were operational during SORTIE-2.

SORTIE-2 operations were conducted in January 2008 off the coast of San Diego, CA. The timing was intended to take advantage of the ONR RaDyO program in which most of the SORTIE investigators were involved.

The operational plan for SORTIE2 is detailed in [RD39]. The standard operating procedures for the HyperPro II systems for SORTIE is documented in [RD13].

3 SORTIE Radiometric Profiler (HyperPro II) System

The HyperPro II is a hyperspectral profiling radiometer system, which can be converted to operate in both profiler and surface buoy mode. The HyperPro II data is accompanied by in-air surface irradiance (Es) reference measurements obtained from a HyperOCR hyperspectral irradiance sensor. The HyperPro II system typically has 138 surface irradiance channels, 138 downwelling irradiance channels and 138 upwelling radiance channels ranging from 350 to 800nm. For SORTIE, the HyperPro II system reports the full 255 channels from 300-1100nm for stray light corrections, but only channels from 350-900nm (which are calibrated to a NIST scale) can be processed to radiometric units. The HyperPro II also uses optical shutters for dark readings during deployment. Variable and adaptive integration times are used for all spectrometers and the values for these integration times are included in the telemetry.

Optical Specifications:	**HyperOCR**	
Spectral range	HyperPro: 350-800nm	
Entrance slit	70 x 2500μm	
Detector type	256 channel Silicon photodiode array	
Pixel size	25 x 2500μm	
Spectral sampling	3.3nm/pixel	
Spectral resolution	10nm (3 pixel slit image)	
Spectral accuracy	0.3nm	
Stray light	$< 1x10^{-3}$	
Field of view	Irradiance	Cosine corrected single collector
	Radiance	8.5° half angle baffled Gershun tube
Electrical specifications:	**HyperOCR**	
Acquisition module	16 bit ADC	
Digital resolution	16 bits	
Frame rate	0.5 Hz	
Data rate	57.6 kbps	
Data format	Binary	
Data interface	RS-422 / RS-232	
Power	18-72 VDC at 3 Watts	
Telemetry options	Real time	
Physical specifications:	**HyperOCR**	
Size	6 cm diameter x 32cm long (sensor length)	
Weight	1.07 kg	
Operating temp. range	-10°C to +50°C	
Absolute maximum spectrometer storage temperature range	-40°C to +60°C	

Table 1. HyperPro II HyperOCR Radiometers Specifications

In descriptions of SORTIE data the instruments used are referred to by system they are part of or by their type and serial number as shown in Table 2 below:

AOP Instrument	Measurement	System
HPL191	Upwelling radiance (on HyperPro)	HyperPro MPR012 (system "A")
HPE235	Upwelling or downwelling irradiance (on HyperPro)	HyperPro MPR012 (system "A")
HSE266	Incident irradiance (surface reference)	Reference HSE266 (system "A")
HPL180	Upwelling radiance (on HyperPro)	HyperPro MPR071 (system "B")
HPE191	Upwelling or downwelling irradiance (on HyperPro)	HyperPro MPR071 (system "B")
HSE192	Incident irradiance (surface reference)	Reference HSE192 (system "B")

Table 2 - AOP Instrument Identifier Descriptions

3.1 HyperPro II – profiler mode

In profiler mode, the HyperPro II free-falls through the water column, providing a profile of spectral upwelling radiance ($L_u(\lambda)$) using a HyperOCR (sensor code HPL) and downwelling irradiance (Ed(λ)) using a HyperOCR (sensor code HPE). Coincident above water measurements of the surface downwelling irradiance ($E_s(\lambda)$) are also made by a HyperOCR (sensor code HSE) mounted to the ship. These measurements provide data for the computation of key quantities needed to characterize the underwater light field, such as profiles of reflectance, attenuation coefficients, spectral water-leaving radiance, and remote sensing reflectance.

3.2 Profiler Mode Configuration for SORTIE

Two HyperPro systems were used for SORTIE1, MPR012 (Dalhousie University) and MPR071 (CHORS/SDSU). For SORTIE1 MPR012 was always be configured for profiling mode. MPR071 was configured for both profiling and surface buoy mode (see section 5.3). For both

systems the $E_d(\lambda)/L_u(\lambda)$ offset is 31.6cm (E_d to top of clamp 11.5cm, L_u to top of clamp 20.0cm). It is important to set these distances correctly for data processing, particularly in coastal waters.

Figure 1 - HyperPro II system configured for profiling

For HyperPro II profiler mode when configured as described in the standard operating procedures [RD13], the sensor distances are as follows:

E_d to surface 0.000m
L_u to surface 0.316m
E_d to pressure 0.786m
L_u to pressure 0.467m

For data processing in ProSoft the sensor distances must be set in the processing configuration (described in Appendix A). For profiler mode, the distances to surface need be set as in the tables below.

On Deck Pressure Tare

	E_d	L_u
Distance to Surface	0	0.316
Distance to Pressure	0.786	0.467 (use zero in ProSoft)

Table 3. Pressure Tare Values for HyperPro in Profiler Mode

3.3 HyperPro II – surface buoy mode

The HyperPro II can also be operated in buoy mode to obtain upwelling radiance and irradiances near the surface at subwave period sampling rates, away from vessel perturbations in the optical light field. The HyperPro II irradiance sensor is inverted and placed at the same depth as the L_u radiance sensor to measure upwelling irradiance, $E_v(\lambda)$, near the surface. Coincident above water measurements of the surface downwelling irradiance ($E_s(\lambda)$) are also made by a HyperOCR (sensor code HSE) mounted to the ship. These measurements provide data for the computation of key quantities needed to characterize the near surface light field, such as reflectance, attenuation coefficients (modeled), spectral water-leaving radiance,remote sensing reflectance and Q factor.

3.4 Surface Buoy Mode Configuration for SORTIE

While on station and other operations are underway (ie ROV MOS, CTD, etc) surface $L_u(\lambda)$ and $E_v(\lambda)$ measurements may be taken using the HyperPro II in surface buoy mode (see Fig 2). To switch the profiler into this configuration, the $E_d(\lambda)$ sensor is inverted to measure $E_v(\lambda)$. The sensor is placed so that the E_v / L_u offset is 0.0cm ($E_v(\lambda)$ to bottom of clamp 14.5cm). It is important to set these distances correctly for data processing, particularly in coastal waters.

Figure 2 - HyperPro II system configured for surface buoy mode

For HyperPro II surface buoy mode when configured as described in the standard operating procedures [RD13], the sensor distances are as follows:

E_v to surface 0.200m
L_u to surface 0.200m
E_v to pressure 0.467m
L_u to pressure 0.467m

For data processing in ProSoft the sensor distances must be set in the processing configuration (described in the Appendices). For surface mode, only the distance to surface need be set as in the tables below.

On Deck Pressure Tare

	E_d	L_u
Distance to Surface	0.200	0.200
Distance to Pressure	0.467	0.467 (use zero in ProSoft)

Table 4. Pressure Tare Values for HyperPro in Surface Mode

3.5 Global/Diffuse Measurements

Global/diffuse measurements were taken to enable estimation of self shading corrections and for cosine corrections. To collect this data, two E_s sensors are used, one measures the total irradiance as usual, while the other Es sensor has the direct beam of the sun blocked (similar to as shown in Fig 3) using an occultor.

Figure 3 - Collecting diffuse irradiance data

4 Radiometric Calibration and Characterization

4.1 Characterization

The SORTIE instruments have been characterized according to the detailed community consensus of measurements and protocols embodied in the NASA Ocean Optics Protocols [RD26,27,28,29,30], augmented with advances made by Satlantic in conjunction with NASA and NIST.

Spectral Range

The spectral range for SORTIE is determined using the NIST scale on the primary calibration lamp used, F409, which is 350-900nm. A reduced wavelength range of 350-700nm has been used for data processing for SORTIE to retrieve high quality Lwn data.

Spectral Resolution

The spectral resolution for each radiometer was measured per [RD22] and detailed results are available in [RD15, 32]. The nominal spectral resolution is 9nm.

Spectral Accuracy

The spectral accuracy is determined to within ± 0.1nm by calibrating the radiometers with spectral line lamps as detailed in [RD22]. Calibrated radiometer wavelengths (documented in [RD15, 32]) are incorporated into SORTIE calibration files.

Field of View

Field of view of the radiance sensor is determined by placing the instrument in a stepper motor controlled rotation table, and performing a rotation about the entrance optics center of rotation in a collimated light beam as detailed in [RD24]. SORTIE radiance sensors have a Full Width Half Maximum (FWHM) field of view of approximately 9.6 degrees in air (approximately 7 degrees in water) [RD17, 34].

Cosine Response

The cosine response of the radiance sensor is determined by placing the instrument in a stepper motor controlled rotation table, and performing a rotation about the entrance optics center of rotation in a collimated light beam as detailed in [RD24]. The acceptable range of response is within 3% from 0 to 60 degrees, and 10% from 60 to 85 degrees of the perfect cosine response to angle of incidence. Measurement results are summarized in [RD18, 35].

Thermal Response

The thermal response of the dark current is compensated for by using a shutter that measures the dark current every 6 frames. The thermal responsivity effects are compensated by correction factors determined by characterizing the changes in response with temperature while the radiometer views a stable source as detailed in [RD23]. Thermal responsivity coefficients are incorporated into the calibration files for SORTIE as per experimental results summarized in [RD16, 33].

Immersion Effects (Radiance)

Due to the difference in indices of refraction between air (where the instrument is characterized and calibrated) and water (where it is operated), a correction factor must be applied to obtain the effective in water radiances. This correction factor is referred to as the immersion factor. There are two effects contributing. First, the reduction in solid angle viewed by the sensors effectively reduces the amount of flux into the sensor. This correction is given by F1:

$$F1(\lambda) = (\eta_W(\lambda))^2$$

where η_W is the index of refraction of water.

To correct for the calibration values in air, the in-water values are multiplied by the effective loss of viewing area in water (F1).

The second effect is due to the change in index of refraction at the glass/air (glass/water) interface. This correction is given by F2:

$$F2(\lambda) = (\eta_w(\lambda) + \eta_g(\lambda))^2 / ((\eta_w(\lambda) \cdot (1 + \eta_g(\lambda))^2)$$

where η_g is the index of refraction of the window.

Since the indices of refraction of water and glass are better matched, there are less reflection losses at the window. The immersion factor thus increases the in-water values to correct for this effect.

The total immersion effect is then:

$$Imm(\lambda) = F1(\lambda) \cdot F2(\lambda)$$

Thus the correction for actual in-water radiance values is:

$$L_{wl}(\lambda) = L(\lambda) \cdot \mathrm{Imm}(\lambda)$$

Immersion Effects (Irradiance)

Irradiance immersion factors for in water irradiance sensors for SORTIE are measured using procedures documented in [RD21, 25]. Results are summarized in [RD19, 36] and are incorporated into SORTIE radiometer calibration files.

4.2 Calibration

Each instrument is calibrated according to procedures detailed in [RD10]. Documented uncertainties for the Satlantic calibration lab are 2.7% for radiance and 2.3% for irradiance [RD10]. A NIST standard lamp, F409, is used for all radiometer calibrations for SORTIE.

Absolute Radiometric Calibration, Radiance

Absolute radiometric radiance calibration is performed with a calibrated 1000W FEL lamp on a 5m optical bar using the 'plaque method'. The lamp is powered by an Optronics 83A current source. The flux from the lamp is normally incident on a 50cm diffuse reflectance target standard at a distance of *D* cm. The instrument views the target at an angle of 45.0° such that the field of view of all the sensors is completely covered by the target. The calibration radiances are determined using:

$$L(\lambda) = (E_{lamp}(\lambda, 50\text{cm}) / \pi) * (50.0 \text{ cm} / D \text{ cm})^2 * \rho(\lambda)$$

where:

$L(\lambda)$ is the calibration radiance

$E_{lamp}(\lambda, 50\text{cm})$ is the lamp standard spectral irradiance at 50cm

$(50.0 \text{ cm} / D \text{ cm})^2$ is the $1/r^2$ distance

$\rho(\lambda)$ is the target 0/45 standard reflectance

Reflection Target: (Labsphere, calibration traceable to NIST)

Standard Lamp: (for SORTIE, NIST standard lamp)

Absolute Radiometric Calibration, Irradiance

Absolute radiometric irradiance calibration is done using a calibrated 1000W FEL on a 5m optical bar using direct radiation from the lamp. The lamp is powered by an Optronics 83A current source. The flux from the lamp is normally incident on the irradiance sensor cosine

collector at a distance of 50cm. The calibration irradiances are determined using the following equation :

$$E(\lambda) = E_{lamp}(\lambda, 50cm)$$

where:

E(λ) is the calibration irradiance

E(λ, 50 cm) is the lamp calibration at 50 cm

Standard Lamp: (for SORTIE, NIST standard lamp)

All SORTIE radiometers were calibrated at Satlantic facilities using procedures documented in the SIRREX-7 Technical Memorandum [RD10]. Calibrations were be done with a NIST calibrated FEL lamp F409N [RD10] and 50cm plaque standard T26466H with a 0/45 reflectance calibration. The radiometers report the full 255 channels from 300-1150nm for stray light corrections, but the NIST scale calibrations are valid only from 350-900nm. F409 also has an Optronics scale, F409B, valid from 300-1200nm which was used for initial data processing. A comparison for the Optronics F409B and NIST F409N scales is shown for the overlapping range of 350-900nm in Figure 3. The NIST calibration reported here was dated 1996-07-21 and is based on the NIST ITS-90 Scale.

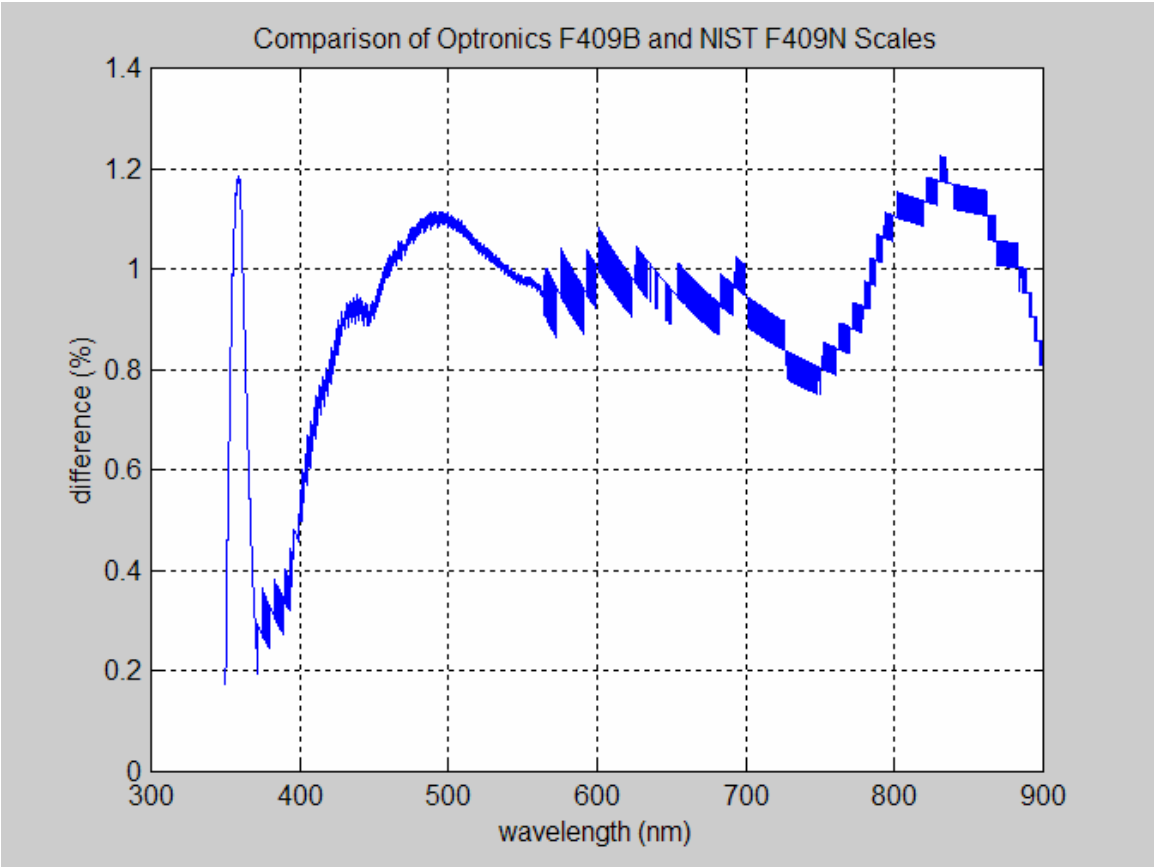


Figure 4 - F409 NIST vs Optronics Irradiance Scale Comparison

F409 was recalibrated by NIST in 2008-04-18. This scale is not used for SORTIE-2 data, but the recalibration shows a less than 1% offset (see Figure 5). This also represents a scale shift between the NIST 2000 Spectral Irradiance Scale and the NIST 1990 Spectral Irradiance Scale.

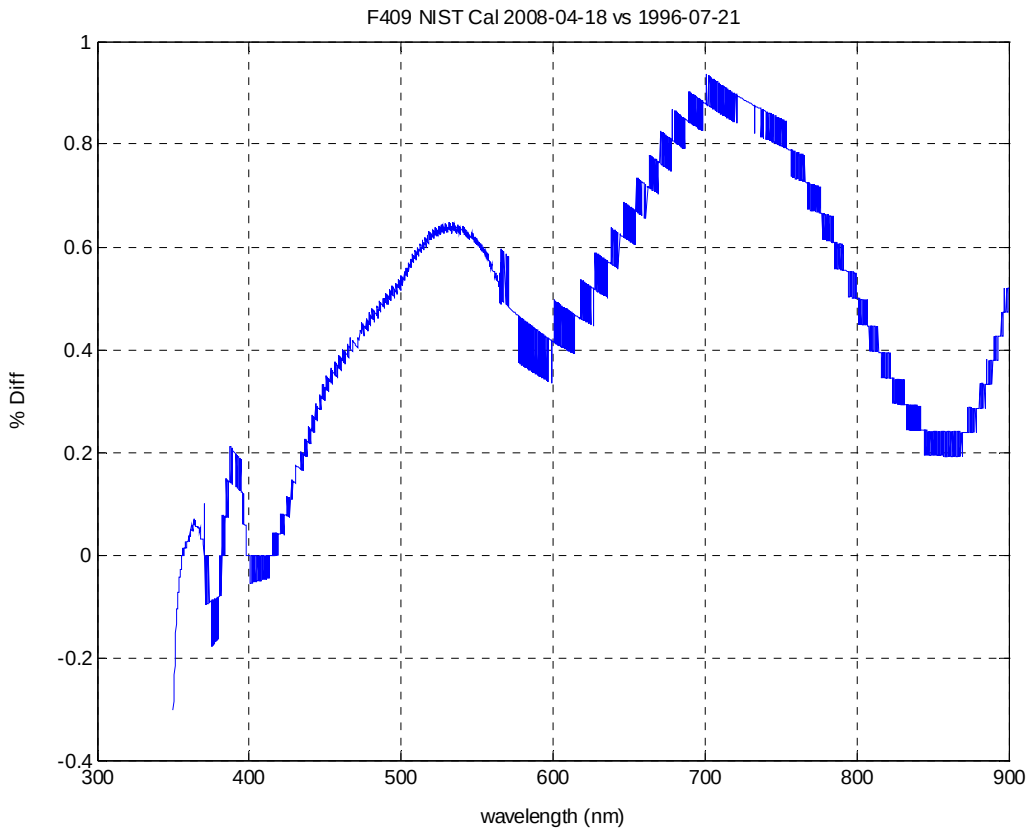


Figure 5 - Recalibration of NIST Lamp F409 in 2008

Final data processing uses a combination of the two files to allow the full radiometer output of 300-1150nm for stray light correction (at the digital counts level). Final results are only produced for the NIST scale region of 350-900nm.

For SORTIE-2 the post mission calibrations are “I” for HPL180, HPE191, and HSE192, “H” for HPL191, “I” for HPE235, “F” (HSE266) series .CAL files. These have been reprocessed to add the calibrated wavelengths [RD15, 32], thermal responsivity corrections [RD16, 33], and measured immersion factors for these specific instruments [RD19, 36]. These updated .CAL files are designated “IX” for HPL180, HPE191, and HSE192, “HX” for HPL191, “IX” for HPE235, and ‘FX” for HSE266.

The cal files are also stray light corrected using NIST SIRCUS [RD11, RD12] correction matrices provided by NIST in 2005 for HPL180, HPE191 and HSE192 and in 2008 for HPL191, HPE235, and HSE266. These updated post cruise .CAL files, designated “IS” for HPL180, HPE191, and HSE192, “HS” for HPL191, “IS” for HPE235, and “FS” for HSE266, have been used to process all SORTIE-2 data from 2008.

Calibration File	Cal Type	Date
HPL180IS.CAL / PLD180IS.CAL	Radiance $L_u(\lambda)$	2008-02-11
HPL191HS.CAL / PLD191HS.CAL	Radiance $L_u(\lambda)$	2008-02-11
HPE191IS.CAL / PED191IS.CAL	Irradiance $E_d(\lambda)$	2008-02-11
HPE191IS_Eu.CAL / PED191IS_Eu.CAL	Irradiance $E_v(\lambda)$	2008-02-11
HPE235IS.CAL / PED235IS.CAL	Irradiance $E_d(\lambda)$	2008-02-11
HPE235IS_Eu.CAL / PED235IS_Eu.CAL	Irradiance $E_v(\lambda)$	2008-02-11
HSE192IS.CAL / HED192IS.CAL	Irradiance $E_s(\lambda)$	2008-02-11
HSE266FS.CAL / HED266FS.CAL	Irradiance $E_s(\lambda)$	2008-02-11

Table 5 - AOP Instrument Calibration Files for SORTIE-2

Note PLD, PED and HED files are calibrated shutter dark files and contain the same calibration data with a different frame header for data processing purposes only. Also the _Eu calibration data is the same information as the $E_d(\lambda)$ calibration files with a different identifier for each channel (ie $E_v(\lambda)$) for data processing purposes only.

4.3 SORTIE-2 Pre and Post Cruise Calibration Analysis

Post experiment calibrations were performed after the experiment on 11 Feb 2008.

Post calibration of HPL180 show the system was within 2.4% of the previous calibration over the entire wavelength interval from 350-900nm. This is within the documented uncertainty of radiance calibrations of 2.7% [RD10] using calibration methods documented during SIRREX-7 [RD10] (see Figure 6).

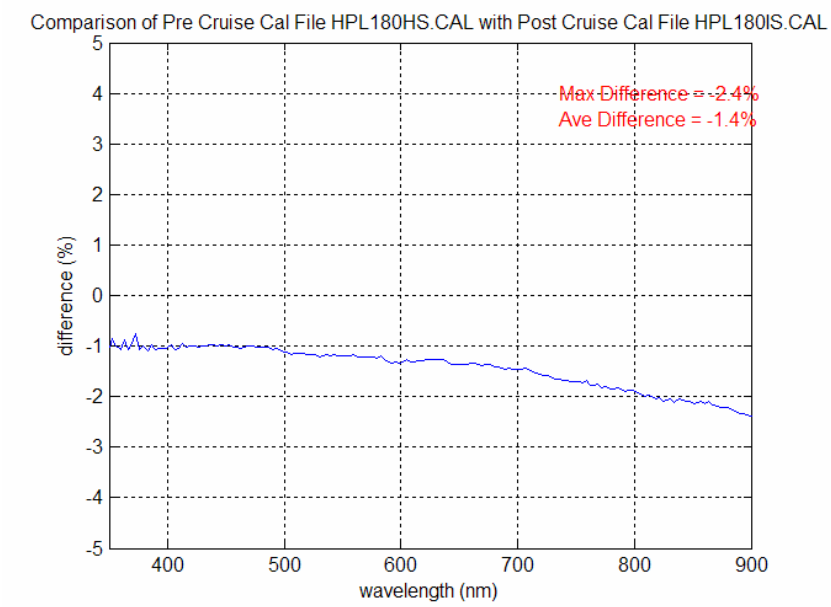


Figure 6 - Pre and Post Cruise Calibration Comparison for HPL180

Post calibration of HPE191 show the system was within 1.0% of the previous calibration from 350-900nm. This is within the documented uncertainty of irradiance calibrations of 2.3% [RD10] using calibration methods documented during SIRREX-7 [RD10].

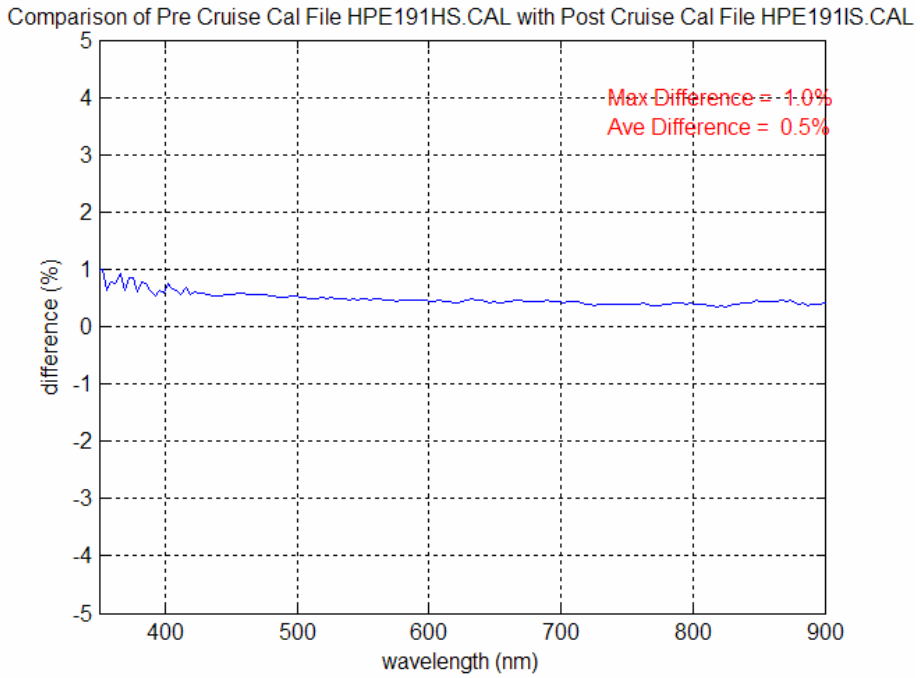


Figure 7 - Pre and Post Cruise Calibration Comparison for HPE191

Pre to post calibration comparison of HSE192 show the system was within 5.6% from 350-900nm. This is within the documented uncertainty of irradiance calibrations of 2.3% [RD10] using calibration methods documented during SIRREX-7 [RD10] (see Figure 8) only for the range 400-900nm. This is highly anomalous and further investigation will be required. Comparisons with calibration from calibration GS (from 2007-05-31) and the SORTIE-2 post calibration IS (from 2008-02-11) shows that the instrument is stable within this period within documented uncertainties (see Figure 9). Calibration HS is the source of the anomaly and SORTIE-2 post-calibration file HSE192IS will be used for data analysis.

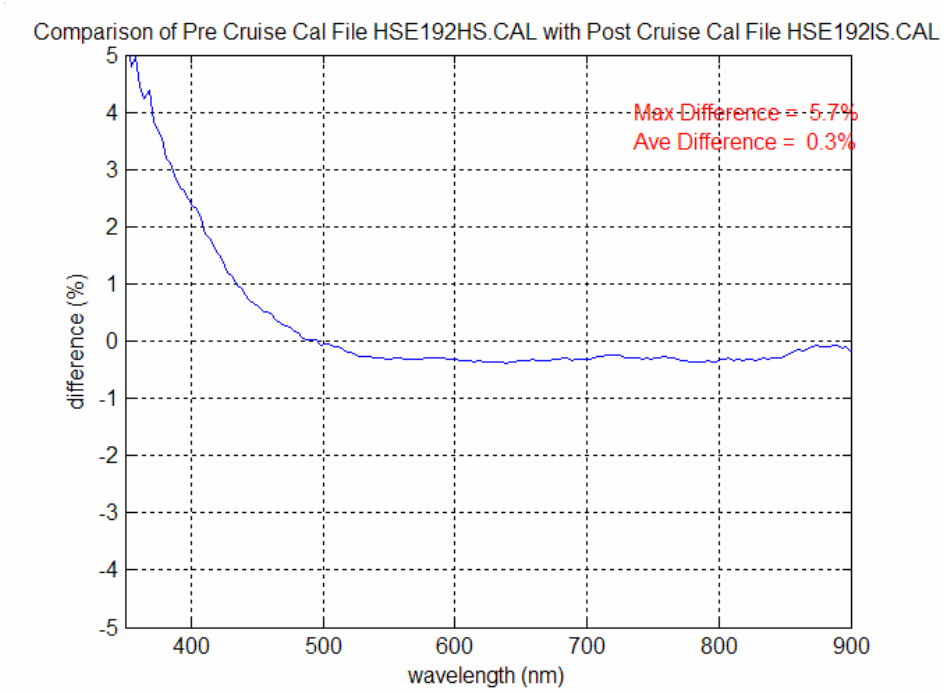


Figure 8 - Pre and Post Cruise Calibration Comparison for HSE192

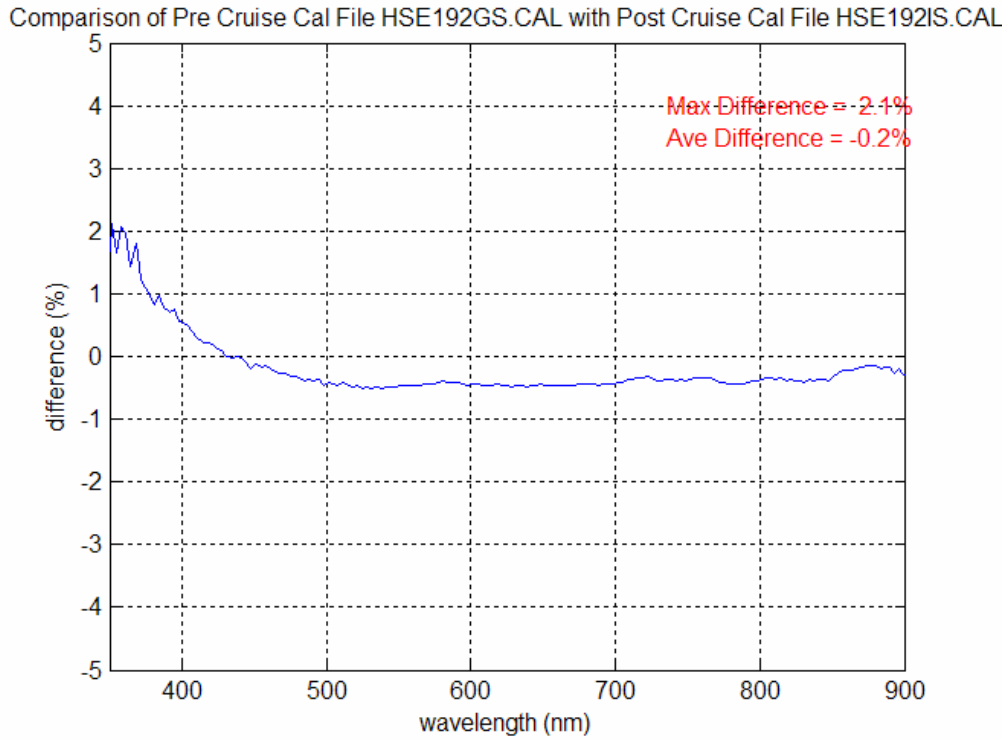


Figure 9 - GS Calibration and Post Cruise Calibration Comparison for HSE192

Post calibration of HPL191 show the system was within 1.0% of the previous calibration over the entire wavelength interval from 350-900nm. This is within the documented uncertainty of radiance calibrations of 2.7% [RD10] using calibration methods documented during SIRREX-7 [RD10] (see Figure 9).

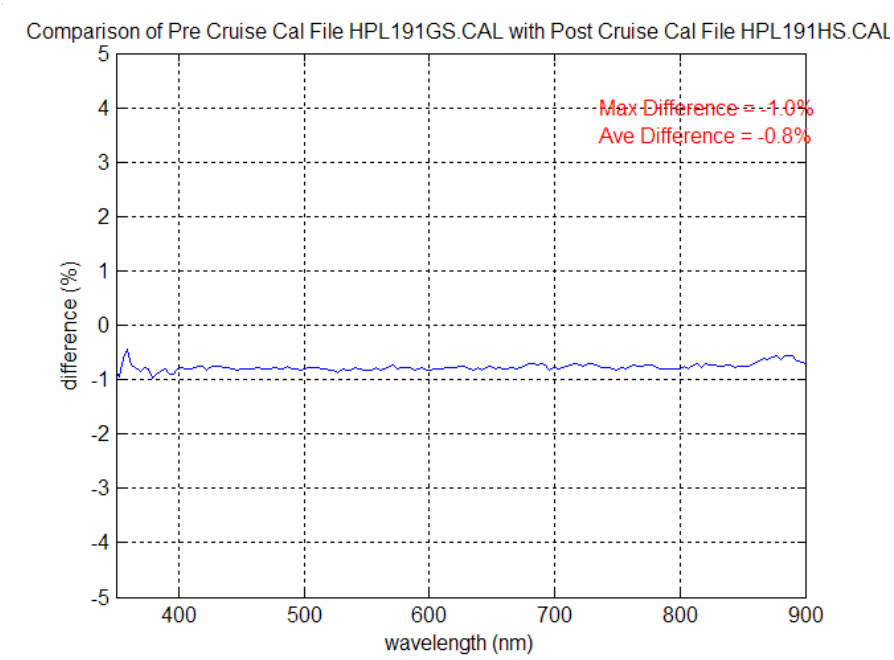


Figure 10 - Pre and Post Cruise Calibration Comparison for HPL191

Post calibration of HPE235 show the system was within 2.6% of the previous calibration from 350-900nm. This exceeds the documented uncertainty of irradiance calibrations of 2.3% [RD10] using calibration methods documented during SIRREX-7 [RD10]; however, the difference was well within established calibration uncertainties over the range 400-700 nm (see Figure 10). $E_d(\lambda)$ is not used in the computation of $L_w(\lambda)$ or $L_{wn}(\lambda)$.

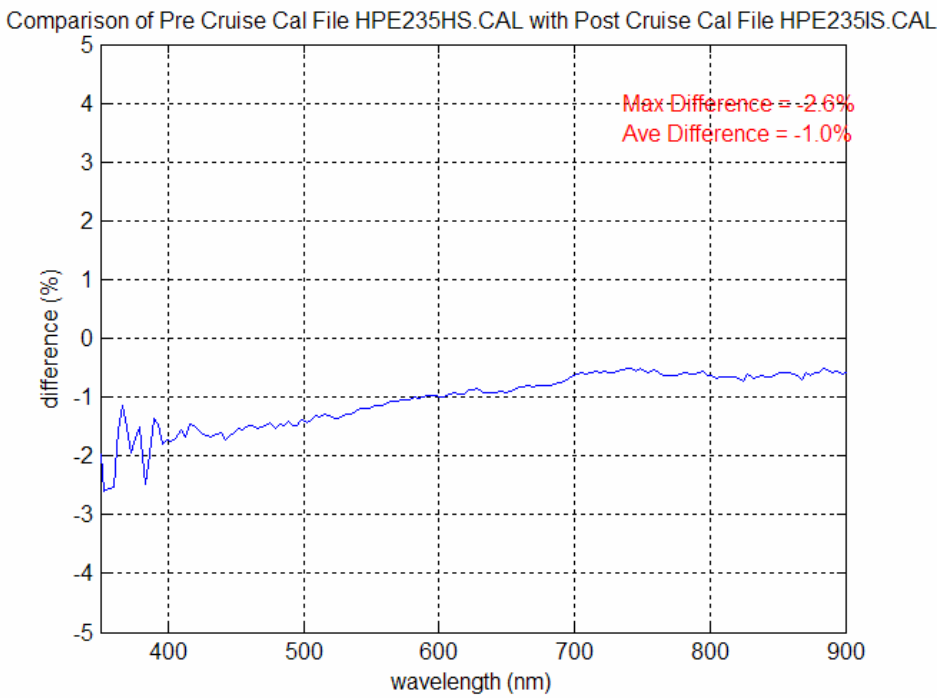


Figure 11 - Pre and Post Cruise Calibration Comparison for HPE235

Post calibration of HSE266 show the system was within 0.6% from 350-900nm. This is within the documented uncertainty of irradiance calibrations of 2.3% [RD10] for channels using calibration methods documented during SIRREX-7 [RD10] (see Figure 11).

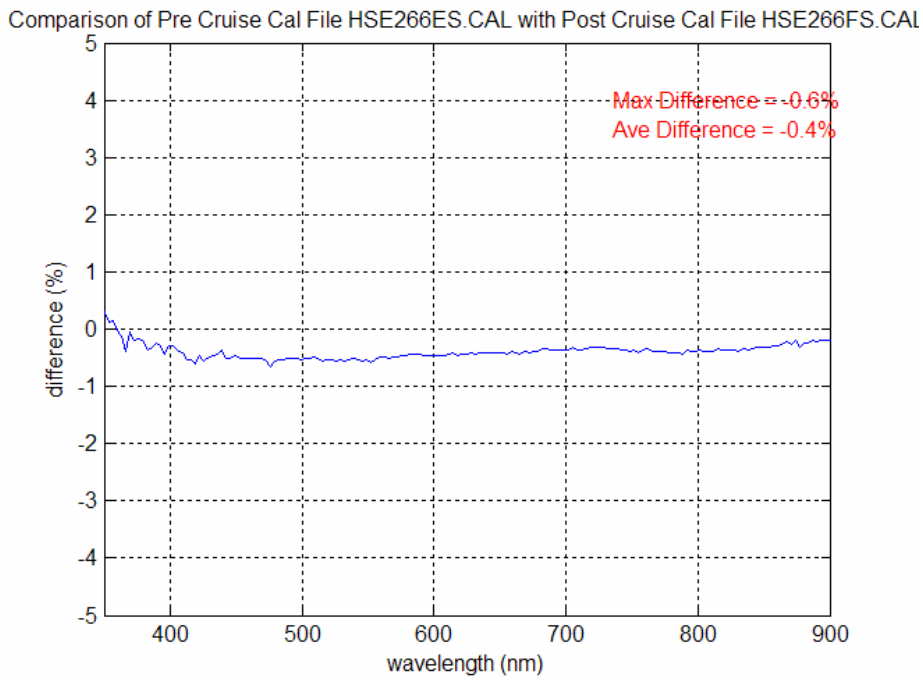


Figure 12 - Pre and Post Cruise Calibration Comparison for HSE266

4.4 MPR071 Calibration File Summary for SORTIE-2

MPR071D.CAL – MicroPro hub ancillary sensors

Post cruise calibrated pressure sensor, accuracy 3cm (0-20m), 5cm (0-200m)

HPL180IS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

PLD180IS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HPL180_SIRCUS_Correction.DAT (saved as a .mat file and renamed LU180_StrayLight.mat for ProSoft)

Stray light correction matrix

HPE191IS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

Immersion factor characterized

PED191IS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

Immersion factor characterized

HPE191_SIRCUS_Correction.DAT (saved as a .mat file and renamed ED191_StrayLight.mat and EU191_StrayLight.mat for ProSoft)

Stray light correction matrix

SATBB2F139.TDF – Calibration file for ECO-BB2FL

4.5 MPR012 Calibration File Summary for SORTIE-2

MPR012G.CAL – MicroPro hub ancillary sensors

Post cruise calibrated pressure sensor, accuracy 3cm (0-20m), 5cm (0-200m)

HPL191HS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

PLD191HS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HPL191_SIRCUS_Correction.DAT (saved as a .mat file and renamed LU191_StrayLight.mat for ProSoft)

Stray light correction matrix

HPE235IS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

Immersion factor characterized

PED235IS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

Immersion factor characterized

HPE235_SIRCUS_Correction.DAT (saved as a .mat file and renamed ED235_StrayLight.mat and EU235_StrayLight.mat for ProSoft)

Stray light correction matrix

BB2F-077.TDF – Calibration file for ECO-BB2FL

SATFLCD150.TDF – Calibration file for ECO-FLCD

4.6 HSE192 Calibration File Summary for SORTIE-2

HSE192IS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HED191IS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HSE192_SIRCUS_Correction.DAT (saved as a .mat file and renamed ES192_StrayLight.mat for ProSoft)

Stray light correction matrix

4.7 HSE266 Calibration File Summary for SORTIE-2

HSE266FS.CAL – Post cruise calibration light frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HED266FS.CAL – Post cruise calibration dark frames F409N scale

Wavelength calibration

Thermal responsivity correction

Stray light corrected

HSE266_SIRCUS_Correction.DAT (saved as a .mat file and renamed ES266_StrayLight.mat for ProSoft)

Stray light correction matrix

5 Data Collection

Data collection procedures for SORTIE are documented in [RD13].

5.1 RAW Data File Naming Protocol

EEEEE_YYYY-MM-DD_TSx.RAW

EEEE = Experiment Name

SORTIE2

YYYY = Year

MM = Month

DD = Day

T = Type of Measurement

P = deep (100m profile) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

S = multicast surface replicates (five 10m profiles) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

T = surface buoy mode ($E_s(\lambda)$,$E_v(\lambda)$,$L_u(\lambda)$)

G = Global Irradiance ($E_s(\lambda)$)

D = Diffuse Irradiance (($E_{s\ diff}(\lambda)$)

S = System ID

A = MPR012 and/or HSE266

B = MPR071 and/or HSE192

x = SatView Sequence Letters (A..Z)

6 In Situ Data Processing

6.1 In Situ Data Processing Procedures

All field data is processed with ProSoft 7.8.2-RC19 which has special processing features for SORTIE. These include stray light correction, thermal responsivity correction, multicast processing, and Thuillier SOLSPEC9 extra terrestrial solar irradiance. Additional processing for multicast include Ked and Klu range checking (if less than Kw from RD37), automated selection of extrapolation depth per wavelength to a user selected number of optical depths, data filtering at a given number of standard errors (SEs), smoothing of Es spectrum time series and normalization of profile data with Es data to correct for the change in solar angle during the cast. New plots are available to show all data points (Ed and Lu) for a multicast profile sequence, overlaying the regression line, along with the points selected and rejected for the regression. The plot also shows the value of one optical depth, and for Ed plots the Ed/Es ratio.

Details on ProSoft may be found in the ProSoft User's Manual [RD20].

6.2 Data Reduction/Analysis

The data collection is followed by a defined series of analysis steps, which reduce the collected data to geo-referenced, calibrated, and averaged data products for further statistical analysis. The steps include calibration, time- or depth-binning, and derivation of products, and encompass transitions from Level 1 (raw data) to Level 4 (derived products). Native output formats for ProSoft data is Hierarchical Data Format (.HDF). These files are converted to ASCII tab delimited files suitable for Excel using ProSoft ASCII conversion utilities. HDF files are also saved for all processed levels for viewing with ProSoft HDF Viewer tools see [RD20].

Collected and processed data archiving and organization is based on the level of processing. Data processing was divided into four levels: Level 1, 2, 3 and 4.

- Level 1 - binary data with the extension .RAW obtained as a result of data acquisition. **(submitted)**
- Level 1a - binary data is extracted from RAW data under the control of the instrument (calibration) files. Extracted information is grouped along with its calibration information and placed into Level la hdf files. File nametag is _L1a.
- Level 1b – Level 1a data is calibrated. No data editing is applied. File nametag is _L1b.
- Level 2 – includes Level 1b data, which is further modified per request basis. File nametag is _L2 **(submitted HDF only)**:
    - Shutter dark correction is applied; reference and dark data deglitching is applied.
    - Profiler's data is tilt edited
- Level 2s - level 2 data is interpolated onto a common co-ordinates vector, which is either depth (profiler mode) or time (buoy mode). File nametag is _L2s **(submitted HDF, SeaBASS, ASCII)**.

- Level 3 - ASCII data obtained by depth-binning HyperPro data taken in profiler mode and time-binning data collected in buoy mode. Wavelength interpolation to equal interval can also be done in Level3. This is not done for SORTIE, but all radiometers are wavelength interpolated to match up with the Lu wavelength. File nametag is L3 **(submitted HDF, SeaBASS, ASCII)**
- Level 4 files produced from L3 data **(submitted HDF, ASCII)**:
  - K_d and K_u for all wavelengths
  - Surface optical data, E_d and L_u propagated to surface level
  - Water leaving radiances, L_w, L_{wn}
  - Surface remote sensing reflectances
  - Q factor if surface E_u and L_u are available

6.2.1 Level 1 to Level 2 conversion

The first step in the analysis of the hyperspectral data is the conversion from Level 1 to Level 2 data. The calibration file is used, along with the shutter dark corrections, to derive upwelling radiances ($L_u(\lambda)$), and downwelling irradiances ($E_s(\lambda)$,$E_d(\lambda)$), in calibrated physical units (μW cm^{-2} nm^{-1} sr^{-1} and μW cm^{-2} nm^{-1} respectively). The steps involved are:

1. Convert raw binary optical (light and shutter dark) and ancillary data into an integer representation in counts.

2. Convert data counts into engineering units in accordance with the calibration equations (see Satlantic Instrument File Standard V6.0 [RD31]). The calibration equation for optical hyperspectral (OPTIC3) data is:

$$L_{DarktDat} = L_{CountsDarkDat} \cdot a \cdot ic \frac{it_1}{it_2}$$

$$L_{LightDat} = L_{CountsLightDat} \cdot a \cdot ic \frac{it_1}{it_2} \qquad (2)$$

   where a is a slope, ic is an immersion coefficient, it_1 is the first integration time and it_2 is the second integration time. a, ic and it_2 are taken from a calibration file, and it_1 is obtained from the same log file as optical data.

3. Deglitch dark data using a first difference filter (optional – not done for SORTIE).

4. Interpolate shutter darks as a function of measurement time to match the number of dark and light data measurements.

5. Correct light data using shutter darks:

$$L = L_{LightDat} - L_{DarkDat} \qquad (3)$$

In Multicast mode each profile in the multicast sequence is separated and output as individual HDF files so they can be reprocessed in single cast mode for comparison purposes. These files use the file naming convention SORTIE2_2008-MM-DD-Sxx_Pn_L2.hdf (where Pn specifies the profile number, typically 1..5).

6.2.2 Level 1b – Level 2s Conversion

All optical data sensors are checked for wavelength sequence. The columns of optical data are organized from left to right as a function of the increasing wavelength.

Optical data can be also deglitched if respective settings in processing parameters are set. As a rule the deglitching is not required (no deglitching is done for SORTIE).

Optional deglitching module is applied to data to remove obvious glitches in dark data (no deglitching is done for SORTIE). First, a first difference operator is applied to the time series of N frames of optical data at each channel:

$$dL_\lambda(i) = L_\lambda(i+1) - dL_\lambda(i), i = 1,..., N-1$$

Second, the standard deviation is calculated for each channel:

$$stdL(\lambda) = \sqrt{\frac{1}{N-2}\sum_{i=1}^{N-1}\left(dL_\lambda(i) - \langle dL_\lambda \rangle\right)^2}$$

Third, any data which values are higher than 10 $stdL(\lambda)$ is blanked by a blanking constant NaN.

Profiler data has a number of corrections and checks before the level 2 data files are created. These include pressure tare (offset) correction, wavelength sequence check and a tilt quality control edit.

Synchronization of optical data frames with pressure at Hyperspectral Profiler

Optical data frames are synchronized with pressure using timetags that are appended to each frame by SatView. Once the pressure frames are synchronized with the optical frames, TIMER time values are used to take into account the differences in integration times of the different optical data frames (i.e. Lu integration time may exceed the integration time of Ed). As a result interpolated pressure vector is appended to each sensor which contains any of the optical light frames. Note that if integration times, i.e. for Lu and Ed, are different, the appended pressure vector values also will be slightly different.

Pressure TARE Correction

Pressure sensors often have a small offset value that will change with atmospheric pressure. The offset is removed by a pressure tare. This value is stored in the header records by SatView when the data is collected. The pressure tare is defined as the pressure value that is measured when a profiler's Ed sensor is located just at the surface. This value has to be later subtracted from the measured pressure values of a profile. If the profiler measurements were logged with

SatView, the pressure tare value is automatically inserted into the file header. If no information is obtained, pressure tare value is set to 0.

Tilt Edit

Profiler measurements can be edited interactively or automatically removing any tilt contaminated records. In manual mode, a plot is shown with profiler tilts (if available) and profiler velocity as a function of depth. With the interactive graphical editor the user defines an upper z_{min} and lower depth z_{max} (we assume that z co-ordinate is directed downwards i.e. depth is z_{min} surface and z_{max} at the bottom of a profile). Data above z_{min} or below z_{max} will be removed. A tilt $Tilt(z)$ threshold $Tilt_{limit}$ (default is 5 degrees) usually is used for estimation of z_{min} and z_{max}. In a case of missing tilt sensor, the freefall velocity of the profiler can be used (zero or negative velocity is assumed to be high tilt). Automated editor module determines z_{min} and z_{max} in 10% of the upper and lower part of profiler measurements. The upper depth and the lower depth are defined as the first depth level (z) where the following conditions are met:

$$Tilt(z) < Tilt_{\lim it}$$
$$\min(z) \le z < 0.1\max(z) \quad \text{for top layer of the profile}$$
$$(\max(z) - 0.1\max(z)) < z \le \max(z) \quad \text{for bottom layer of the profile}$$

If a reference instrument is present, then the matching records in the reference data are also removed.

In Multicast mode each profile in the multicast sequence is separated and output as individual HDF files so they can be reprocessed in single cast mode for comparison purposes. These files use the file naming convention SORTIE2_2008-MM-DD-Sxx_Pn_L2s.hdf (where Pn specifies the profile number, typically 1..5).

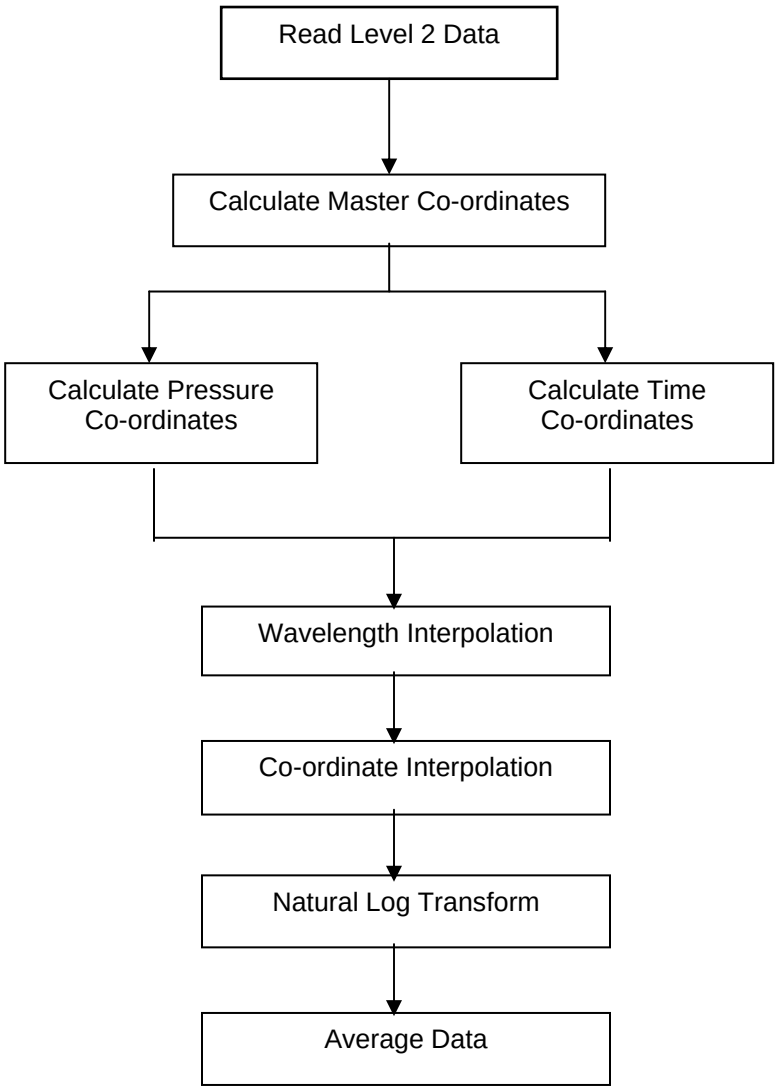
Also in Multicast mode the new ASCII files are generated automatically. These files are named SORTIE2_2008-MM-DD-Sxx_Pn_ss_L2s.dat (where Pn specifies the profile number, typically 1..5 and ss specifies the sensor – Ed, Es, Lu).

In Single Cast mode a new ASCII file is generated automatically. These files are named SORTIE2_2008-MM-DD-xxx_ss_L2s.dat (where ss specifies the sensor – Ed, Es, Lu, Ev, Ls).

SeaBASS files are automatically produced in Multicast. These files are named SORTIE2_2008-MM-DD-Sxx_Pn_SB_ss_L2s.dat (where Pn specifies the profile number, typically 1..5 and ss specifies the sensor – Ed, Es, Lu).

In Single Cast mode SeaBASS files are generated automatically. These files are named SORTIE2_2008-MM-DD-xxx_SB_ss_L2s.dat (where ss specifies the sensor – Ed, Es, Lu, Eu). Note that to be SeaBASS compliant Ev (surface irradiance in ProSoft terminology) is renamed Eu and Ls (surface radiance in ProSoft terminology) is renamed Ls.

6.2.3 Level 2s to Level 3a conversion (Single Cast Mode Only)



1. Data from the Level 2 hdf file is read and organized depending on the type of instrument (i.e. Satnet Hyperspectral Profiler/Reference).
2. At level 3a processing, the averaging of data is done within intervals based on a system of co-ordinates. For systems with a profiler the co-ordinates are based on pressure (averaging in depth). For systems with a reference only or SAS the co-ordinates are based on time (averaging in time).
3. There exists in most instruments a difference in distance between sensors. For example for HyperPro II the distance between the Ed sensor at the top and the Lu sensor at the bottom is usually set to 0.315 m. This presents a problem when defining a pressure co-

ordinate system that is common to all sensors that make up the instrument. When processing optical data, the data closest to the surface is usually of greater importance than data at the deepest of the profile. Therefore it makes sense to choose the sensor nearest the surface which in all profiler cases is the Ed sensor. The pressure values for the Ed sensor, hereafter referred to as master pressure, are then used to derive the pressure co-ordinates. It should be noted that if no Ed sensor is present then the Lu sensor pressure must be used instead. The master pressure is then filtered to eliminate frames where pressure is not increasing.

$$depth(n+1) - depth(n) \leq 0$$

The pressure co-ordinates are created by rounding up the first master pressure value to the nearest 0.1 m then increasing the pressure by intervals equal to the depth resolution until reaching the highest (deepest) master pressure value which is rounded down to the nearest 0.1 m.

4. The systems reference instrument has an Es sensor which ProSoft uses to calculate the time co-ordinate system. The master time for the very first frame is taken as the first Timetag2 value if available else Time Stamp, the time at which logging data begins, is used. The timer values give the elapsed time for each frame since the time of the first frame which is used to calculate the absolute time for each frame.
5. Profiler and reference data can be interpolated onto a constant wavelength interval by setting the level 3 parameter Wavelength Interpolation to the desired interval. Equal interval wavelength interpolation can only be used for Hyperspectral instruments. This is not done for SORTIE and a new module interpolates other radiometers to match up with the Lu wavelengths.
6. The data to be averaged is interpolated onto the master co-ordinates ensuring that all the data is mapped to a common co-ordinate system prior to averaging. The co-ordinates are based on either pressure or time. The interpolation method used for both Profiler and Reference instruments is ‘linear’. This interpolated data is then written to a level 2s hdf file for viewing by the user.
7. Optical sensor data (Es, Ed, Lu) are natural log transformed to “straighten” the data prior to averaging.
8. The data is then averaged based on the level 3 parameters Bin Interval and Bin Width for pressure co-ordinates and Time Interval and Time Width for time co-ordinates. The Bin Interval or Time Interval determines the points at which to average with the Bin Width or Time Width determining the number of data points to use for averaging.

6.2.4 Level 3 to Level 4 conversion (Single Cast Mode)

The Level 3 data serve as the basis for the production of a number of derived information products. For the HyperPro, four are relevant: Surface Products, Water Leaving Radiance, Remote Sensing Reflectance, Diffuse attenuation coefficient and Photosynthetically Available Radiation (PAR). These represent a series of mathematical manipulations of the data in the Level 3 files.

The “Surface Products” represent the propagation of both radiance and irradiance to a common depth horizon, which is specified as just below the sea surface (0-). For upwelling radiance taken at some depth below the sea-surface (0.15m in the buoy mode), the radiance just below the surface is estimated by first computing the spectral attenuation coefficient for spectral radiance based on statistical computations using a ratio of blue to green wavebands as input. This attenuation coefficient governs the propagation of radiance to the surface based on an exponential model, and this model is used to determine the upwelling radiance just below the sea-surface. For irradiance, the above-water measurement is used and propagated through the sea-surface using an estimated fresnel reflectance.

In profiler mode, the subsurface values are derived from the near-surface data recorded at the start of a cast. For buoy mode subsurface values, all the data for a log are averaged into a single radiance and a single irradiance spectrum. Each set of these spectra is then combined to produce the Level 4 data.

Remote sensing reflectances are produced by propagating the radiance at a level just below the sea-surface through the surface by use of Fresnel reflectances, giving water-leaving radiances (Lw(λ)). These are then divided by the above-water irradiances on a band by band basis to produce remote sensing reflectances.

Under typical conditions for which incident lighting is provided by sun and sky, the various radiance's and irradiances all decrease exponentially with depth, at least far enough below the surface (and far enough above the bottom in shallow water) to be free of boundary effects. This effect can be generally expressed as the diffuse attenuation coefficient calculated for Ed as follows:

$$E_d(z,\lambda) = E_d(0^-,\lambda)e^{-\int_0^z k_d(z',\lambda)dz'}$$

$E_d(z,\lambda)$ - downwelling irradiance as a function of depth and wavelength.

$E_d(0^-,\lambda)$ - surface value of downwelling irradiance as a function of wavelength.

$e^{-\int_0^z k_d(z',\lambda)dz'}$ - effect of the diffuse attenuation coefficient as a function of depth and wavelength.

The traditional method of k analysis (Smith and Baker 1984 and 1986) is to estimate k(z) as the local slope of measured ln(Ed(z)) in an interval of a few meters centered on depth z_m.

6.2.5 Level 2 to Level 4 conversion (Multicast Mode)

In Multicast Mode, Level 4 products are generated directly from tilt edited profiles for the purposes of obtaining accurate water leaving radiances **(no other Level 4 products are generated).** Instead of binning data and generating averaged profiles, multicast uses all of the data points that meet tilt criteria, greatly increasing the number of data points. Other processing enhancements for Multicast mode include:

1) normalization of Ed and Lu to Es data to compensate for the change in incident irradiance during the cast.

2) check for Klu and Ked values less than Kw (from Morel 2001 [RD37]), this can trigger for the recalculation of regressions for a fixed number of optical depths, optimizing for each wavelength

3) data filtering is also available, this eliminates extreme outliers, particularly useful for Ed in clear waters near the surface.

4) statistics on the regressions are also calculated including the standard error of K and the surface intercept Lu(0-) or Ed(0-).

5) the user may select up to two wavelengths to view processing results for data QA

In multicast mode only selected "Surface Products" are computed. This includes the following:

Level 4 Product	Description
Lu(0-)	profiler radiance extrapolated to just below the sea surface
Lw	Lu(0+) or water leaving radiance
Lw+SE	water leaving radiance plus one standard error
Lw-SE	water leaving radiance minus one standard error
Lwn	Normalized water leaving radiance (using F0/Es)
Es	averaged irradiance
Ed(0-)	profiler irradiance extrapolated to just below the sea surface
Ed(0+)	profiler irradiance projected through the sea surface as a quality check compared to Es
F0	mean extraterrestrial solar irradiance – for SORTIE1 this is Thuillier SOLSPEC9 data [RD7]
KLu	diffuse attenuation coefficient for Lu
SE KLu	standard error for KLu regression
KEd	diffuse attenuation coefficient for Ed
SE KEd	standard error for KLu regression

Table 6 - Level 4 Multicast Data Products

When multicast data processing is selected on a multicast file a special editor separates the file into cast segments based on tilt criteria (for SORTIE <5 degrees) which typically removes the upcast data. In multicast processing, both upcast and downcast data will be used unless the tilt exceeds the selected threshold. Even for hyperspectral sensors over 100 samples per meter can be obtained from a multicast sequence of five profiles.

Once the file is segmented, the data goes through Level 2 and 2s processing which are output to separate HDF files for further analysis if it is desired to review each cast individually.

To obtain a better estimate of the mean surface solar irradiance all of the Es data is smoothed using a linear regression. This assumes that the time period of the multicast is short (ie <10 minutes) and is thus approximately linear. The regression removes ship motion from the data and allows for an accurate normalization of the Lu and Ed data to account for the change in solar flux levels due to the change in solar angle. As a quality check the Es near 490 is plotted showing the data (blue) and regression (red) as can be seen in the example below.

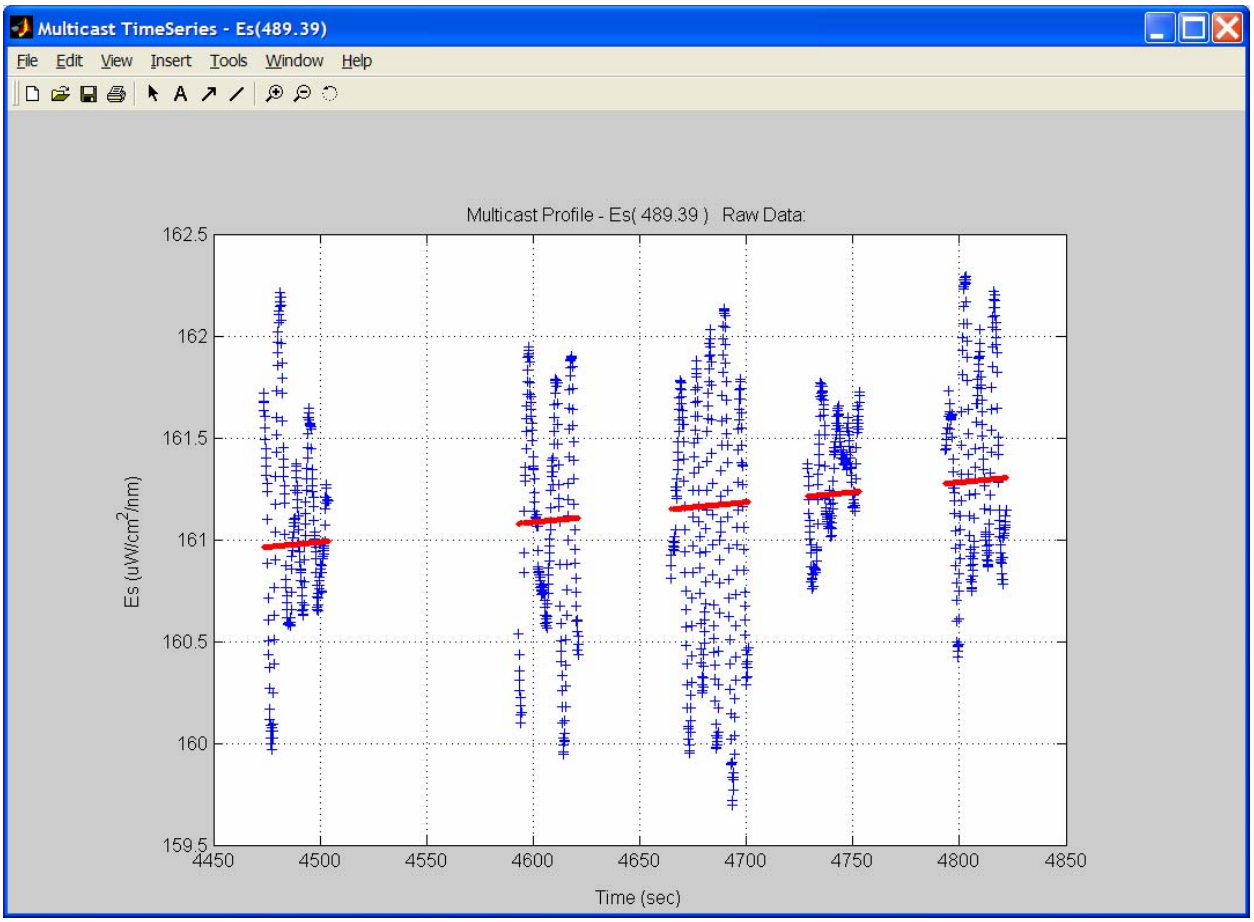


Figure 13 - Example of Multicast Es data

Once the Es data regression is complete the Ed and Lu data is normalized to the Es regression line for the same time as the Ed and Lu data samples were taken. Once processing is complete this data can be “unnormalized” and referenced to any given time (within 10-20 minutes). For all SORTIE2 data the reference time is the beginning of the cast.

To compute the profile regressions for K and the surface intercept (Lu(0-) and Ed(0-)), an iterative approach is used to optimize the regression for each wavelength. Previous processing runs of this data showed that using a fixed regression depth of 5.2m (ie the depth of the Mid MOBY arm used for comparisons in SORTIE-1) was a poor choice in the blue due to insufficient depth for extrapolation (ie generated negative values or K < Kw) due to the clarity of the water and also in the red due to it being too many optical depths (also generating negative or complex K's). The new version of the processor was designed to minimize the chance of generating bad results.

For Multicast processing of the profile data, it is first normalized as described above. The data is then checked for zero or negative values (these may occur if the data is very close to darks). These are replaced with 1E-07 to avoid regression errors. An initial attempt at regression is completed. This data is then filtered at ±10 Standard Errors from the regression line to remove outliers and the regression is repeated. After filtering the regression K values are checked to see if they are lower than Kw (pure water from Morel 2001 [RD37]) on a pixel by pixel basis. If they are K is set to Kw – 0.001 and optical depth is determined from this. The regression is then recalculated using 1.5 optical depths or the bottom of the cast, whichever is smaller. The data is then refiltered and a final regression is done with these points removed. The final results are saved and a warning is generated if the result is still less than Kw (for Kd this would mean the profile was not deep enough to properly regress the data, which is the case from some of the Multicast data sets from SORTIE-1 in the blue – casts deeper than 10m will be used for future Case-I experiments). As a quality check and to help the user visualize the effect of the processing settings plots can be generated at two wavelengths showing the extreme cases (for SORTIE 490 and 700nm were selected). The following figures show examples of the results.

The plots show all the data points (note that these are normalized values, so for Lu they are Lu/Es and for Ed they are Ed/Es). They are colored blue for "good" and red for "rejected" by the data filter. The total number of points and the number of points rejected are reported on the plot. The green line shows the final regression line, the two red lines show the limits of the outlier rejection filter. For Ed the ratio of Ed to Es is also shown as a quality check. Ideally this should be 1.000, which in practice is very hard to achieve. The data is shown to the depth set by the user or to the automated extrapolation depth computed, whichever is shallower. One optical depth and the K value are also shown on the plots. Note that on the Ed490 plot, Ked is 0.0154/m, which is well below Kw reported by Morel 2001 (0.0166/m). However the results show an Es/Ed ratio of 1.020 which is almost perfect.

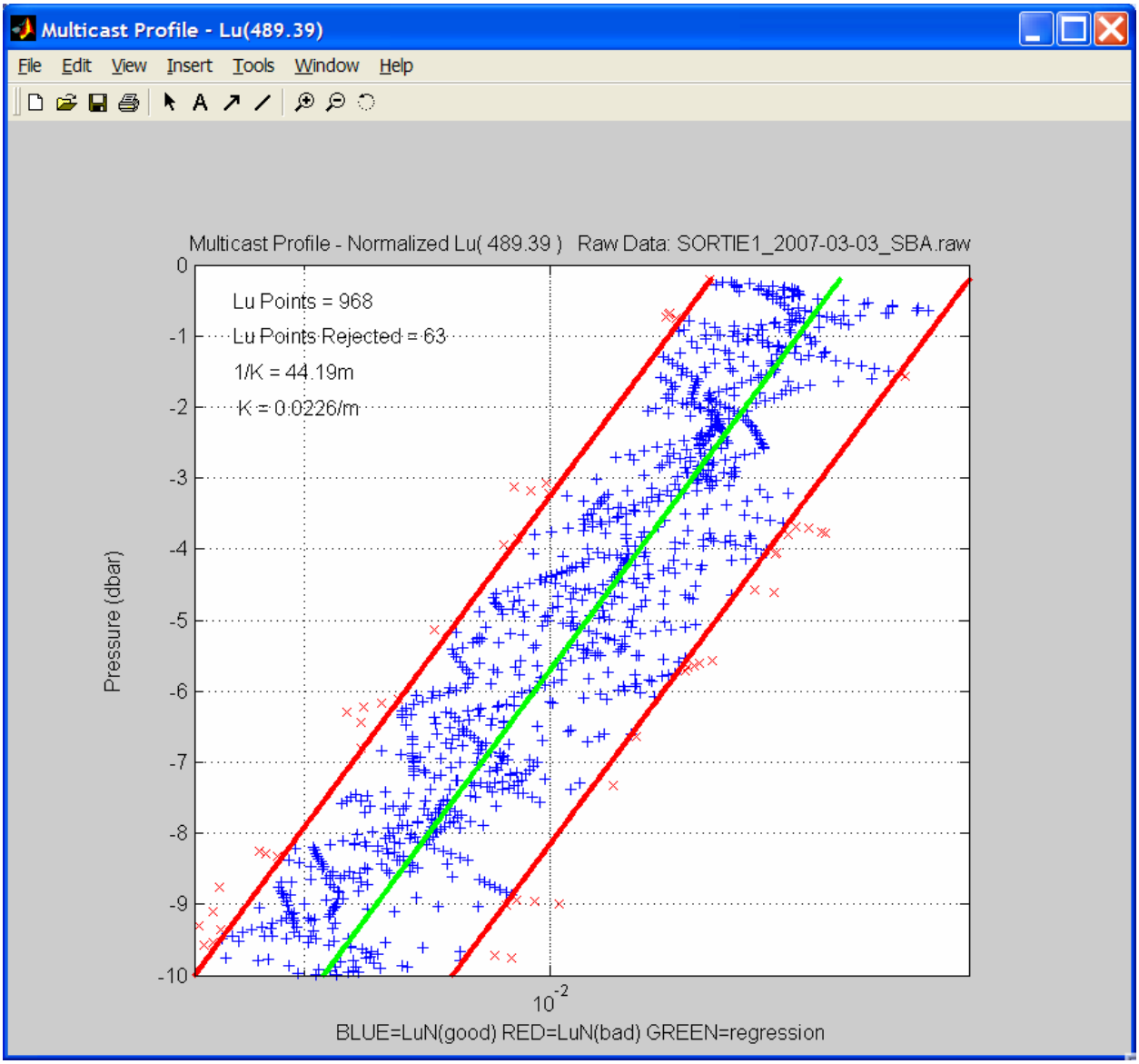


Figure 14 - Example of Multicast Lu490 data

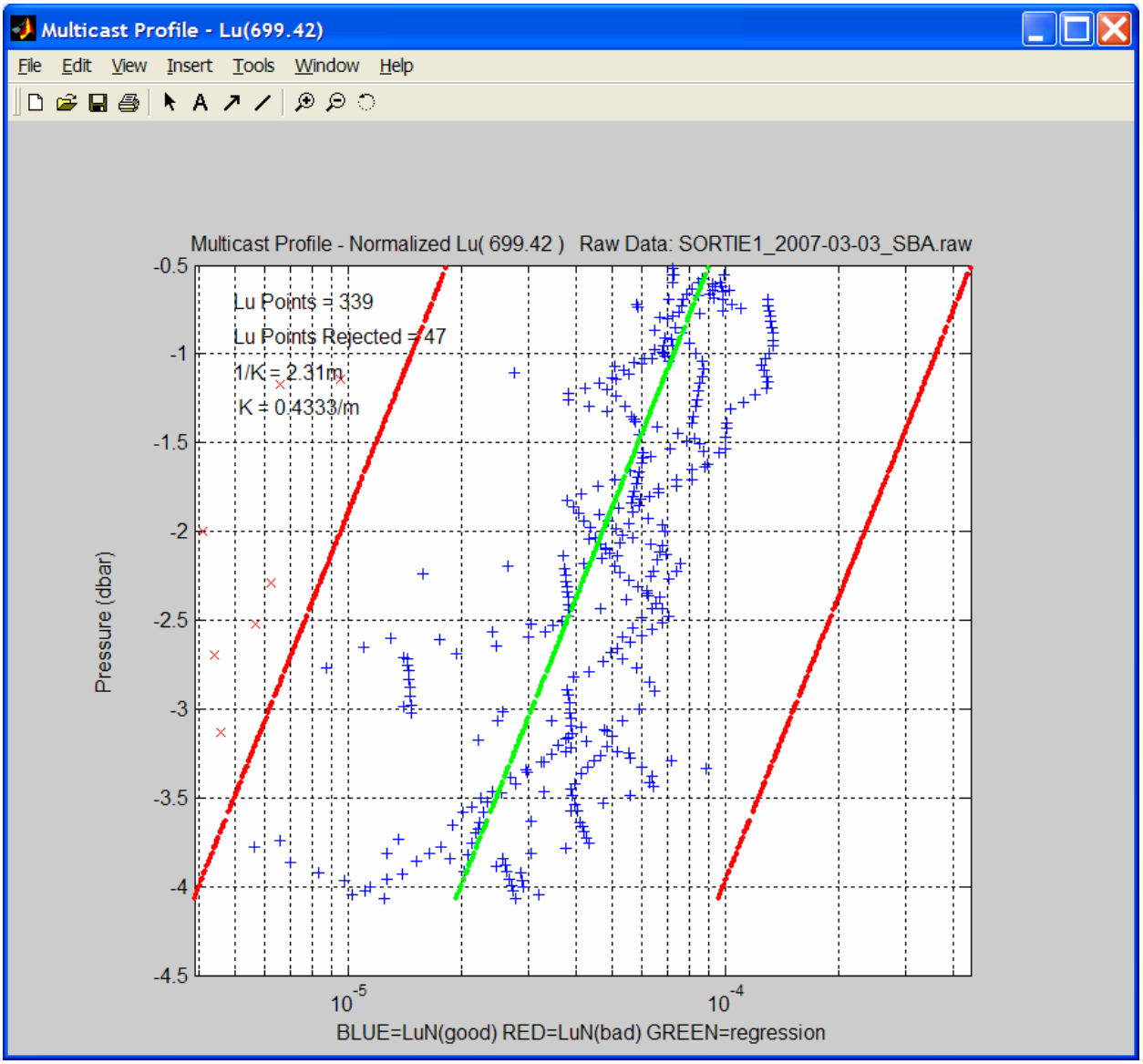


Figure 15 - Example of Multicast Lu700 data

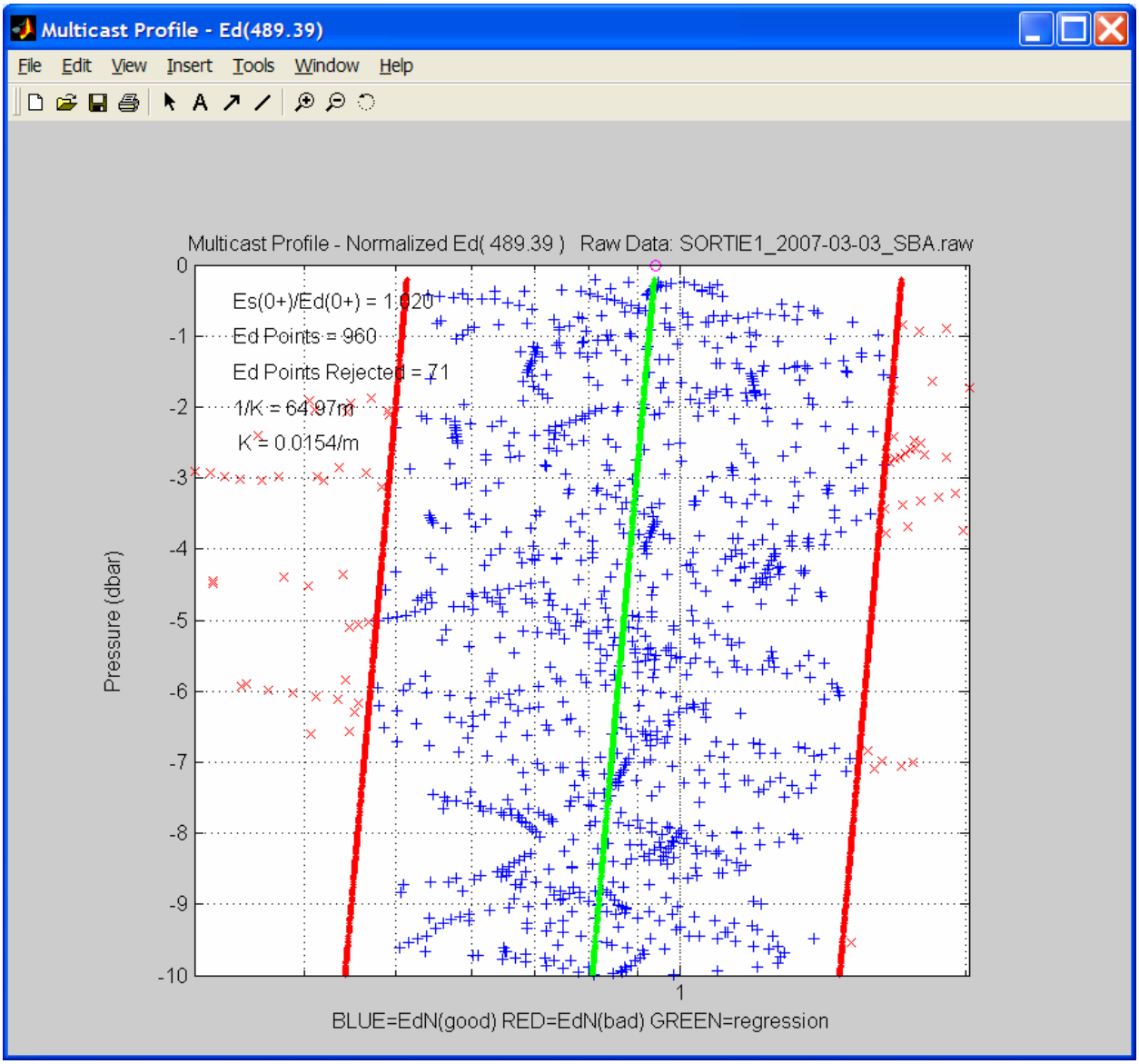


Figure 16 - Example of Multicast Ed490 data.

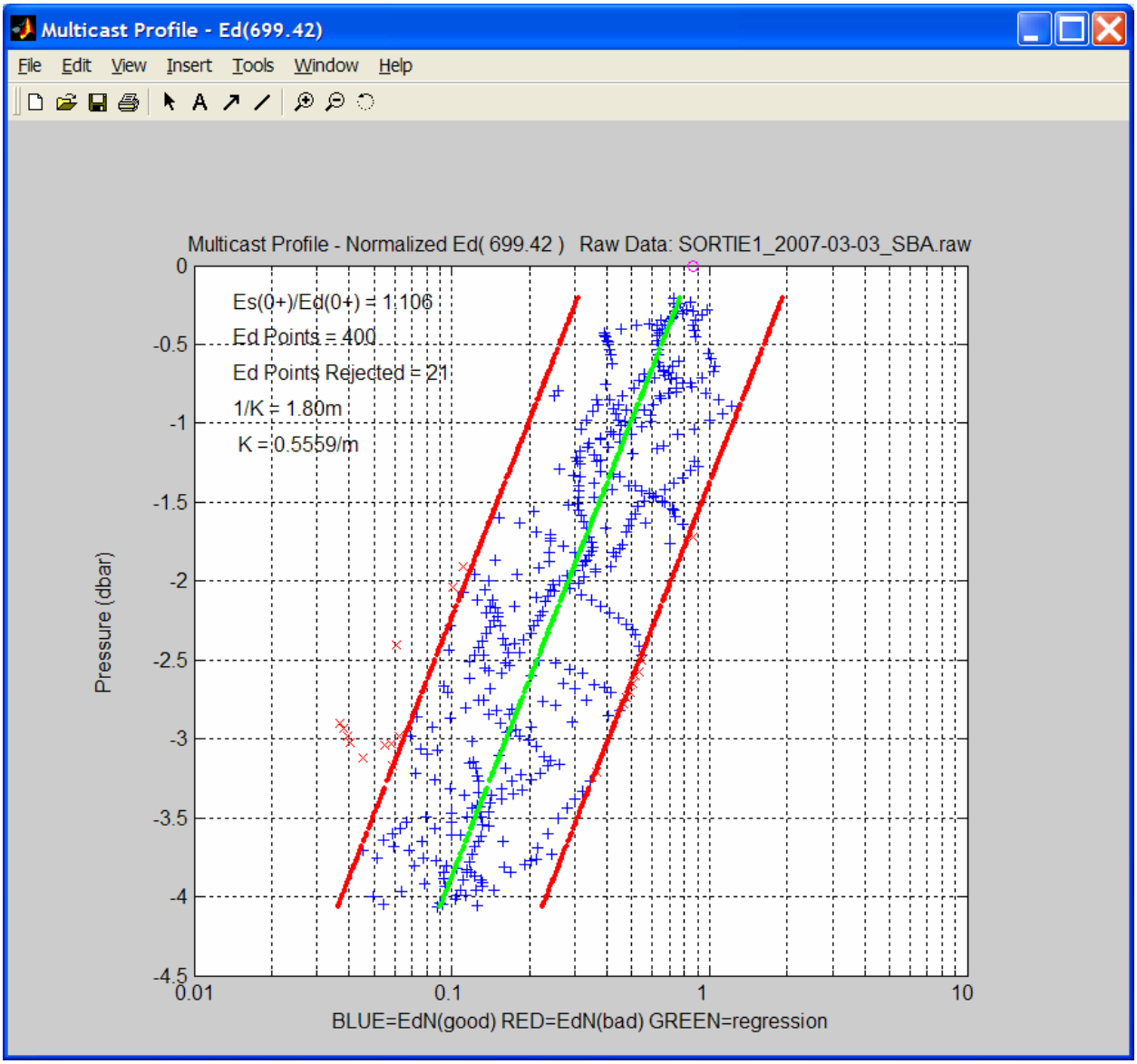


Figure 17 - Example of Multicast Ed700 data

6.2.6 ASCII Output Files for SORTIE

The following is a summary of routine tab delimited ASCII processing levels produced for SORTIE:

File Type	File Codes	ProSoft Instrument Context File	ProSoft Processing Parameters File	Processing Levels for SORTIE in ASCII
Reference only	GAx, DAx, GBx, DBx	SORTIE2_MPR012 SORTIE2_MPR071	SORTIE2_SINGLE	2s, 3a, 4
Conventional Single Cast Profile	PAx, PBx	SORTIE2_ MPR012 SORTIE2_ MPR071	SORTIE2_SINGLE	2s, 3a, 4
Multicast Profile	SAx, SBx	SORTIE2_ MPR012 SORTIE2_ MPR071	SORTIE2_MULTI_BEGIN (default),	2s (individual profiles), MC 4
Surface Buoy Mode	TBx	SORTIE2_ MPR012_Surface SORTIE2_MPR012_Surface	SORTIE2_SINGLE	2s, 3a, 4

Table 7 - ASCII Data Products Produced for SORTIE

Multicast data processing is experimental, although preliminary results show this data to have the highest quality $L_{wn}(\lambda)$ values. ASCII output for multicast (MC) processing is non-standard and produces Level 2s files with each profile extracted to its own file. These files are named SORTIE2_2008-MM-DD-SBx_Pn_ss_L2s.dat (where Pn specifies the profile number, typically 1..5 and ss specifies the sensor – Ed, Es, Ev, Ls, Lu). Multicast Level 4 file names have the format SORTIE2_2008-MM-DD_SBx_MC_L4.dat. Multicast processing does not have a Level 3 output since all profiles are regressed together.

6.3 ASCII File In Situ Data Formats

Tab delimited ASCII file output data files are available for further analysis. Each processing level contains a series of header records that are initially generated in SatView which is then appended with additional metadata records as the data is processed to higher levels. The description of each header record is listed in Table 8.

File Header	Units	Description
PROSOFT	None	ProSoft software version used in analysis
PROSOFT_INSTRUMENT_CONFIG	None	Name of instrument context file used for processing
PROSOFT_PARAMETERS_FILE_NAME	None	Name of ProSoft data processing parameters
CAL_FILE_NAMES	None	List of calibration file names used for data processing
WAVELENGTH_UNITS	As specified	Units of wavelengths – usually nm
LU_UNITS	As specified	Units of Lu/Ls – usually uW/cm^2/nm/sr
ED_UNITS	As specified	Units of Ed/Eu – usually uW/cm^2/nm
ES_UNITS	As specified	Units of Es – usually uW/cm^2/nm
RAW_FILE_NAME	None	Name of Level 1 binary file
CRUISE-ID	None	Identifies the cruise on which the current series of log files is taken.
INVESTIGATOR	None	Identifies PI for project
AFFILIATION	None	Affiliation for project PI
CONTACT	None	Email address for project lead PI
EXPERIMENT	None	Experiment identifier
WIND_SPEED	m/s	Wind speed for station
CLOUD_PERCENT	None	0-100 percent cloud cover
WAVE_HEIGHT	M	Average wave height
DOCUMENT	None	Cruise report file name
OPERATOR	None	Identifies the operator of the data acquisition software for the current log file.
LATITUDE	Decimal Degrees Or Degrees and Decimal Minutes	Identifies the latitude coordinates of the instrument for the current log file.
LONGITUDE	Decimal Degrees Or Degrees and Decimal Minutes	Identifies the longitude coordinates of the instrument for the current log file.

File Header	Units	Description
ZONE	None	Identifies the data acquisition time zone of the current log (ie UTC-4).
COMMENT	None	Comment field for ancillary sky and sea observations
STATION-ID	None	Identifies the station for the current series of log files.
CAST	None	Identifies the current log file in a series of related log files.
TIME-STAMP	None	Identifies the time on the data acquisition computer as of the beginning of the current log file.
MODE	None	Identifies the data acquisition software mode.
PRESSURE-TARE	Meters (m)	Pressure tare taken at the surface for current log file.
TIMETAG	None	Obsolete.
DATETAG	None	Switch to include date/time tagging.
TIMETAG2	None	Switch to include timetag2 tagging.
PROFILER	None	Identifies the status of the profiler instrument.
REFERENCE	None	Identifies the status of the reference instrument.
PRO-DARK	None	Profiler dark correction method.
REF-DARK	None	Reference dark correction method.
PRO-ID	None	This field is the identifier for the profiler.
PROCESSING_LEVEL	None	Identifies the processing level of the current file.
FILE_CREATION_TIME	None	Date of file creation.
DEGLITCH_PRODAT	None	Switch to include deglitching of profiler data.
DEGLITCH_REFDAT	None	Switch to include deglitching of reference data.
STRAY_LIGHT_CORRECT	None	Indicates if stray light corrections were applied to the data
THERMAL_RESPONSIVITY_CORRECT	None	Indicates if thermal responsivity corrections were applied to the data
PRESS_TARE_CORRECTION	Meters (m)	Pressure tare value applied to current log file.
DEPTH_RESOLUTION	Meters (m)	Depth resolution used for Level 2s data interpolation.
BIN_INTERVAL	Meters (m)	Level 3a variable that determines which depth interval to average.
BIN_WIDTH	Meters (m)	Level 3a variable that determines depth range

File Header	Units	Description
		within which to average.
TIME_INTERVAL	Seconds	Level 3a variable that determines which time interval to average.
TIME_WIDTH	Seconds	Level 3a variable that determines the time range within which to average.
WAVEL_INTERP	(nm)	Level 4 variable that determines wavelength interpolation interval.
INTEGRATION_POINTS	None	Level 4 variable that determines number of data points to use for regression analysis.
LU_REGRESSION_POINTS	None	Maximum number of points that can be used in a regression
ES/ED(0+)_RATIO_490	None	Ratio of Es to Ed(0)+ at 490nm. A quality check for Ed regression, ideally 1.000
ES/ED(0+)_RATIO_700	None	Ratio of Es to Ed(0)+ at 700nm. A quality check for Ed regression, ideally 1.000
EXTRAPOLATION_NORMALIZATION_TIME	HH:MM:SS	Time that data normalization is referenced to. Typically start of the cast. For MOBY matchups it is set to MOBY data collection time.
K_RANGE_CHECK_LU	None	If ON it will set any Klu and data products using Klu to zero if Klu < Kw. Not recommended
K_RANGE_CHECK_ED	None	If ON it will set any Ked and data products using Ked to zero if Ked < Kw.
MULTICAST_DATA_FILTER	SE per 100 points	Sets the number of Standard Errors (SE) above and below the regression line to reject points, typically 10
EXTRAP_DEPTH_AUTO_LU	None	Number of optical depths to calculate regression over, typically 2.5
REFLECTION_ALBEDO	None	Reflection albedo value used in level 4 processing.
REFLECTANCE_INDEX	None	Reflectance index value used in level 4 processing.
REFRACTIVE_INDEX	None	Refractive index value used in level 4 processing.
WATER_MEDIUM	None	Indicates if data processed for seawater or fresh water

Table 8 - Header Record Metadata Desciptions for ASCII FIles

Label	Units	Description
TIMETAG2	HHMMSSsss	Time data appended to frame.
DATETAG	YYYYDDD	Date data appended to frame.
PRES	Meters (m)	Used to define a pressure sensor measurement. Pressure measurements are usually used with submersible instruments to gauge their depth.
ALTIM	Meters (m)	Used to define an altimeter sensor measurement. Altimeter measurement is normally used to gauge the distance from a submersible instrument to the ocean floor.
FRAMECOUNTER	None	The value of a frame counter is simply a numerical counter that can help ensure all frames received are sequential.
CHECKSUM	None	The value of the check sum is the last byte of the sum of all bytes, up to but not including the check sum sensor, in a frame of telemetry subtracted from 0.
INTTIME	Seconds	Defines the adaptive or adjusted integration time for all subsequent optical sensors for which the sensor was defined.
DARK	None	Some optical sensors are shielded from light exposure to establish a dark noise floor for a related optical sensor grouping.
DARK_SAMP	None	Indicates the number of dark sensors used to calculate a dark average.
DARK_AVE	None	Defines the actual average dark value.
T	Degrees Celsius (°C)	Used to define a temperature sensor measurement. Temperature sensors can be placed anywhere on an instrument.
TILT	Degrees	Used to define a tilt or attitude measurement for an instrument. A tilt measurement is normally used to determine the alignment of an instrument with the vertical.
PITCH	Degrees	Used to define a tilt sensor along the horizontal axis. A pitch sensor can be used to determine an instruments orientation relative to the horizon.
ROLL	Degrees	Used to define a tilt sensor about the horizontal axis. A roll sensor can be used to determine an instruments orientation relative to the horizon.

Label	Units	Description
COMP	Degrees	Used to define a flux gate compass sensor measurement. These sensors measure magnetic flux to establish direction.
COND	(mmho/cm)	Used to define a seawater conductivity sensor measurement. A conductivity measurement is necessary for calculation of salinity.
FLUOR	(ug/l)	Used to define a fluorometer sensor measurement.
TRANS	(/m)	Used to define a transmissometer sensor measurement. A transmissometer measurement indicates the attenuation of a light beam in a given media.
PAR	($\mu E/m^2$)	Used to define a sensor for measuring photosynthetically active radiation. PAR measurements indicate the total light energy available for photosynthesis per unit area.
TIMER	Seconds	Used to define a timer sensor for indicating the number of seconds that have elapsed since the instrument was powered up.

Table 9 - Level 2 and Level 3 ASCII Ancillary Data Descriptors

Table Label	Units	Description
K_Lu , K_Ed, K_Eu	(/m)	K values
Ls(0-), Lu(0-), Ed(0-), Eu(0-), Es(0-), Ev(0-)	(μw/cm^2/nm) or (μw/cm^2/nm/sr)	Surface optical data
Lw, Lwn	(μw/cm^2/nm/sr)	These may be computed from Es and Ed as indicated in the data descriptors. Ed is intended as a check only and only Es or Ls derived Lwn should be considered for cal/val
RSR-Lu(0+)/Ed(0+), RSR-Lu(0+)/Es, RSR-Ls(0+)/Es	(/sr)	Surface remote sensing reflectance.
Q(0-)	(sr)	Q factor
F0	(μw/cm^2/nm)	Extraterrestrial irradiance used in Lwn computation
Profiler Par	(quanta/cm^{2}s)	Photosynthetically available radiation
Water Properties Table	Depth (m) Temp (°C) Conductivity (mmho/cm) Salinity (psu) Density (Kg/m^3)	Water Properties

Table 10 - Level 4 ASCII Data Descriptors

6.3.1 ASCII File Naming Protocol

EEEEE_YYYY-MM-DD_TSx_(MC_)(Pi_)(ss_)(SRF_)Ln.DAT

( ) indicates field may not be present in all cases

EEEE = Experiment Name

SORTIE2

YYYY = Year

MM = Month

DD = Day

T = Type of Measurement

P = deep (100m profile) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

S = multicast surface replicates (five 10m profiles) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

T = surface buoy mode ($E_s(\lambda)$,$E_v(\lambda)$,$L_u(\lambda)$)

G = Global Irradiance ($E_s(\lambda)$)

D = Diffuse Irradiance (($E_{s\ diff}(\lambda)$)

S = System ID

A = MPR012 and/or HSE266

B = MPR071 and/or HSE192

x = SatView Sequence Letters (A..Z)

(MC_) = Multicast identifier for Level 4 files

(Pi_) = Profile identifier for separated multicast files (typically P1 to P5)

ss = Optical sensor type (Es, Ed, Eu, Lu)

SRF = special Single Cast Mode level 4 file containing only surface products

Ln = Processing Level (2, 2s, 3a, 4)

6.4 SeaBASS File In Situ Data Formats

ProSoft 7.8.2-RC19 also produces SeaBASS compliant ASCII files automatically. SeaBASS files are output at Level 2s (time/pressure interpolated to a common base and unbinned) and 3a (binned Level 2s) files. Level 4 files are produced for SeaBASS only in Multicast. These are not submitted to the SeaBASS database.

6.4.1 SeaBASS File Naming Protocol

EEEEE_YYYY-MM-DD_TSx_(MC_)(Pi_)SB_ss_Ln.DAT

( ) indicates field may not be present in all cases

EEEE = Experiment Name

SORTIE2

YYYY = Year

MM = Month

DD = Day

T = Type of Measurement

P = deep (100m profile) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

S = multicast surface replicates (five 10m profiles) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

T = surface buoy mode ($E_s(\lambda)$,$E_v(\lambda)$,$L_u(\lambda)$)

G = Global Irradiance ($E_s(\lambda)$)

D = Diffuse Irradiance (($E_{s\ diff}(\lambda)$)

S = System ID

A = MPR012 and/or HSE266

B = MPR071 and/or HSE192

x = SatView Sequence Letters (A..Z)

(MC_) = Multicast identifier for Level 4 files

(Pi_) = Profile identifier for separated multicast files (typically P1 to P5)

SB = SeaBASS compliant file

ss = Optical sensor type (Es, Ed, Eu, Lu)

Ln = Processing Level (2s, 3a, 4)

6.4.2 SeaBASS Compliant Header Records

All SeaBASS files begin with SeaBASS compliant header records

```
/begin_header
/investigators=Chuck_Trees
/affiliations=CHORS/SDSU
/contact=chuck@chors.sdsu.edu
/experiment=SORTIE
/cruise=SORTIE2
/station=SORTIE2_2008-01-11_G
/data_file_name=SORTIE2_2008-01-11_GAA.raw
/calibration_files=HED266BS.CAL,HSE266BS.CAL
/data_type=cast
/data_status=preliminary
/start_date=20070303
/end_date=20070303
/start_time=22:02:17[GMT]
/end_time=22:07:21[GMT]
/north_latitude=20.8313[DEG]
```

/south_latitude=20.8313[DEG]
/east_longitude=-157.2067[DEG]
/west_longitude=-157.2067[DEG]
/cloud_percent=20
/secchi_depth=NA
/water_depth=NA
/wave_height=1.0
/wind_speed=4.0
/documents=SORTIE2_2008_Data_Report_WET-DN-00519.pdf

Additional information that is not SeaBASS compliant is added as comments

!
!PROSOFT : ProSoft 7.8.2-RC19
!PROSOFT_INSTRUMENT_CONFIG : MPR012_SORTIE2_DECKTARE
!PROSOFT_PARAMETERS_FILE_NAME : SORTIE2_SINGLE.mat
!OPERATOR : Scott
!ZONE : UTC
!COMMENT : Missing
!CAST : AA
!MODE : NONE
!PRESSURE-TARE : 0.000000
!TIMETAG : OFF
!DATETAG : ON
!TIMETAG2 : ON
!PROFILER : WET
!REFERENCE : OFF
!PRO-DARK : OFF
!REF-DARK : OFF
!PRO-ID : MPR0012
!PROCESSING_LEVEL : 4
!FILE_CREATION_TIME : 13-May-2008 23:38:17
!DEGLITCH_PRODAT : OFF
!DEGLITCH_REFDAT : OFF
!STRAY_LIGHT_CORRECT : ON
!THERMAL_RESPONSIVITY_CORRECT : ON
!DEPTH_RESOLUTION : 0.1 m
!

Level 2s and Level 3a data files are separated into individual sensor files (ie Es, Lu, Ed, Eu) to maintain a SeaBASS compliant data structure.

6.5 Data QA/QC

Data QA/QC is performed at various stages to assure high quality $L_{wn}(\lambda)$ retrievals. The HyperPro II instruments themselves are designed for optimal AOP data collection allowing the radiometers to profile near vertical, slowly through the water column, far from ship perturbations in the light field. Data collection procedures, data collection notes, data processing parameter, and processed data review, all contribute to improved data quality.

Data are collected with minimal clouds (none blocking the solar disk), typically between 1000-1400h local time and at least 50m from the vessel which is typically oriented with the sun on the instrument side and drifting away from the instrument. This is not always achievable and conditions which do not match these conditions are noted in the cruise log.

Data processing parameters are set to remove data records that may be contaminated by excessive tilts, or problems during the profile. Parameters are set to process only downcasts with tilts less than 5 degrees and velocities greater than 0.1m/sec.

Once the data are processed they are reviewed for quality. For multicast data, all radiance casts must vary about the mean of the profile. Profiles that are offset indicate contamination of the data set by clouds or ship based effects (usually ship shadow). Surface reference records are reviewed for dips that usually indicate cloud effects. K profiles are checked to make sure that the profile is consistent with a profile consistent with the optical properties of the water.

Data is flagged as follows:

Data Quality Flag	Selection Criteria
INVALID	Poor profile noted in cruise log, usually an aborted cast. These casts are not usually processed
POOR	Indicates data significantly affected by ship shadow, clouds or other affects
GOOD	Indicates data noted in log as having a potential problem (ie excessive tilts), but resulting data upon review appears to be of high quality
EXCELLENT	Perfect casts with no data flags or quality concerns

Table 11 - Data Quality Flags and Criteria

7 Radiometric Data – In Situ

The daily Cruise Log Files contain a list of all measurements logged by all groups (including satellite overpasses) during the day including location, time and data file names. These logs are included in Appendix B.

Day	Cruise Log	Notes
2008-01-10	SORTIE2_Log_2008-01-10.pdf	Blue Station – off Pt Loma Winds 0, clouds 3/10, waves <1m Casts aborted due to clouds Green Station – off Mission Bay Winds 1m/s, clouds 0/10, waves 0.5m 4 deep profiles, 20 multicast profiles,
2008-01-11	SORTIE2_Log_2008-01-11.pdf	G3A Station – off La Jolla Only 2nm from fog bank Winds 1m/s, clouds 1/10, waves 0.5m 4 deep profiles, 25 multicast profiles, 6 surface mode casts during AQUA overpass (1340PST)
2008-01-12	SORTIE2_Log_2008-01-12.pdf	Green4 Station – off La Jolla High alt clouds – conditions poor Winds 1m/s, clouds 5/10, waves 0.5m 4 deep profiles – cloud contaminated
2008-01-13	SORTIE2_Log_2008-01-13.pdf	Green1 Station – off Pt Loma Conditions excellent Winds 2-5m/s, clouds 0/10, waves 0.5m 8 deep profiles, 60 multicast profiles, 12 surface mode casts bracketing AQUA overpass (1328PST)

Table 12 - Daily Cruise Log Summaries

The daily Processing Logs contain a list o all AOP files processed, processing parameters used, output file types, data quality flags, and processing notes. These logs are included in Appendix C.

Day	Cruise Log	Notes
2008-01-10	SORTIE2_AOP_Processing_Log_2008-01-10.pdf	Blue Station – off Pt Loma Winds 0, clouds 3/10, waves <1m Casts aborted due to clouds Green Station – off Mission Bay Winds 1m/s, clouds 0/10, waves <1m 4 deep profiles, 20 multicast profiles,
2008-01-11	SORTIE2_AOP_Processing_Log_2008-01-11.pdf	G3A Station – off La Jolla Only 2nm from fog bank Winds 1m/s, clouds 1/10, waves <1m 4 deep profiles, 25 multicast profiles, 6 surface mode casts during AQUA overpass (1340PST)
2008-01-12	SORTIE2_AOP_Processing_Log_2008-01-12.pdf	Green4 Station – off La Jolla High alt clouds – conditions poor Winds 1m/s, clouds 5/10, waves <1m 4 deep profiles – cloud contaminated
2008-01-13	SORTIE2_AOP_Processing_Log_2008-01-13.pdf	Green1 Station – off Pt Loma Conditions excellent Winds 2-5m/s, clouds 0/10, waves 1m 8 deep profiles, 60 multicast profiles, 12 surface mode casts bracketing AQUA overpass (1328PST)

Table 13 – Daily Data Processing Log Summaries

SORTIE AOP data files are referred to by their coded file names. The file naming convention describes the experiment name, date of collection and type of data logged as follows:

EEEEE_YYYY-MM-DD_TSx.RAW

EEEE = Experiment Name

SORTIE2

YYYY = Year

MM = Month

DD = Day

T = Type of Measurement

P = deep (100m profile) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

S = multicast surface replicates (five 10m profiles) ($E_s(\lambda)$,$E_d(\lambda)$,$L_u(\lambda)$)

T = surface buoy mode ($E_s(\lambda)$,$E_v(\lambda)$,$L_u(\lambda)$)

G = Global Irradiance ($E_s(\lambda)$)

D = Diffuse Irradiance (($E_{s\ diff}(\lambda)$)

S = System ID

A = MPR012 and/or HSE266

B = MPR071 and/or HSE192

x = SatView Sequence Letters (A..Z)

7.1 MODIS AQUA Data Matchups for SORTIE-2

Operational planning information and cruise summary details may be found in [RD39].

During SORTIE-2 SeaWiFS was not in imaging mode, thus matchups are only available for MODIS AQUA.

7.1.1 SORTIE-2 2008-01-10 (PST)

Although conditions were clear early on 2008-01-10 at Blue Station off Point Loma, fog drifted over the station just prior to the MODIS overpass at 1258PST. The station was aborted and moved to a location closer to shore (Green1) where it was clear. AOP data collection began at 1334PST. Only deep casts (50m) and multicasts to 10m are available. No satellite matchups are available for 2008-01-10.

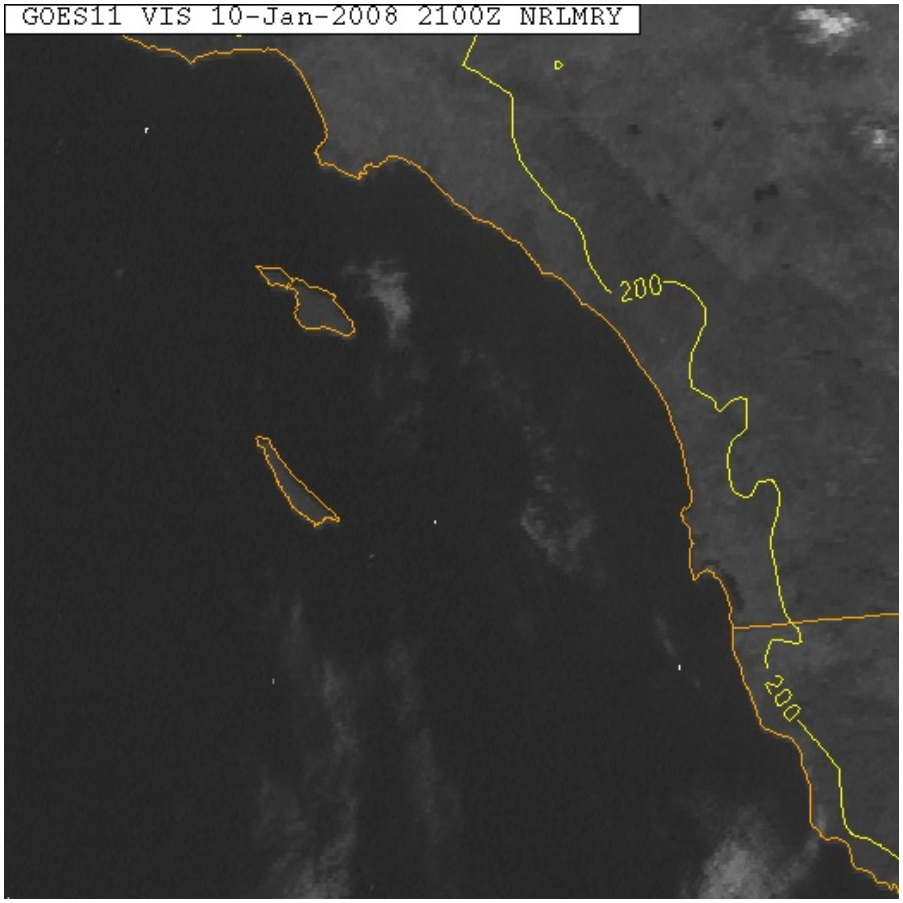


Figure 18 - GOES VIS image 2008-01-10T1300PST

See SORTIE2_2008-01-10.pdf log file for station details and SORTIE2_Processing_Log_2008-01-10.pdf for data quality (see also in Appendices B and C).

Figure 19 - Sky conditions for 2008-01-10T1350PST

7.1.2 SORTIE-2 2008-01-11 (PST)

Fog persisted on 2008-01-11 and the planned station was moved to avoid the fog. The site of Station G3A was selected just 2nm north of the fog bank edge off La Jolla. AOP data collect commenced at 1341PST, just after the peak elevation (only 33.9 degrees) of a MODIS AQUA pass. Deep, multicast and surface AOP data are available.

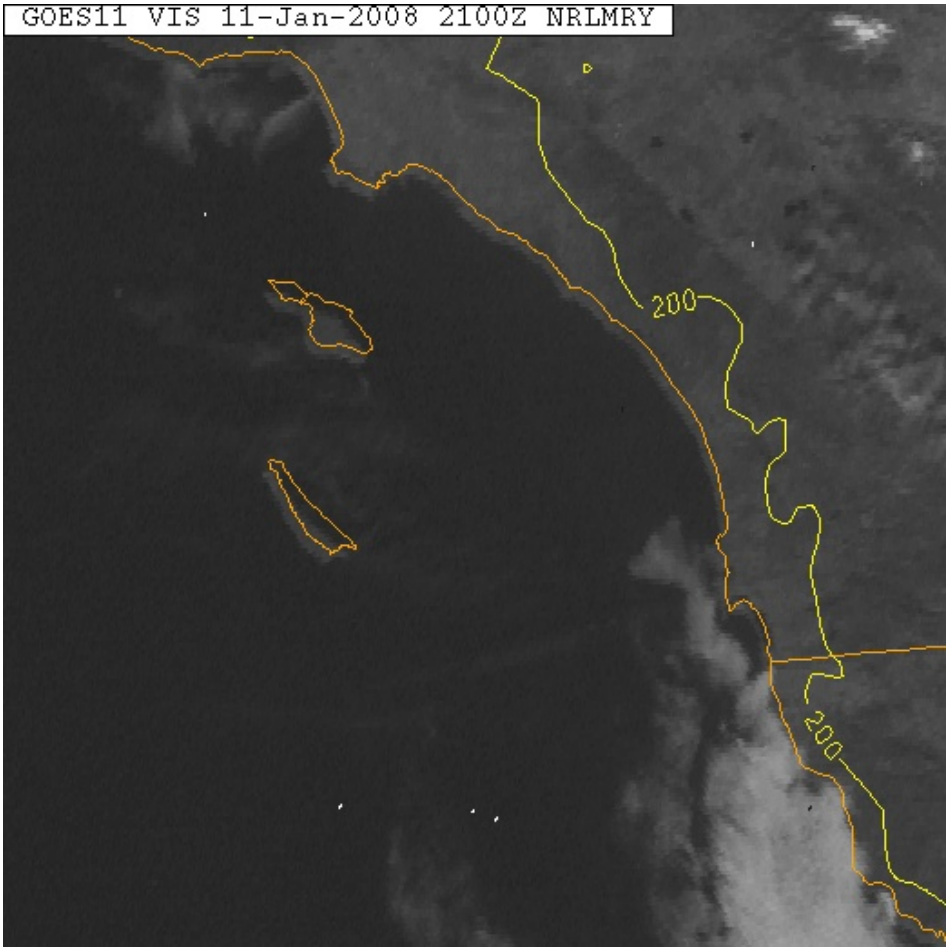


Figure 20 - GOES VIS image 2008-01-11T1300PST

See SORTIE2_2008-01-11.pdf log file for station details and SORTIE2_Processing_Log_2008-01-11.pdf for data quality (see also in Appendices B and C).

Figure 21 - Sky conditions for 2008-01-11T1345PST

7.1.3 SORTIE-2 2008-01-12 (PST)

Heavy fog persisted on 2008-01-12 and the planned station was moved to avoid the fog. The site of Station Green4 was selected just off La Jolla. Unfortunately once clear of the fog there was a layer of high cirrus. AOP data collect commenced at 1215PST and brackets a MODIS AQUA pass with a peak elevation of 58 degrees at 1245PST. Due to the clouds it is likely the imagery will be of poor quality. Only deep cast AOP data are available.

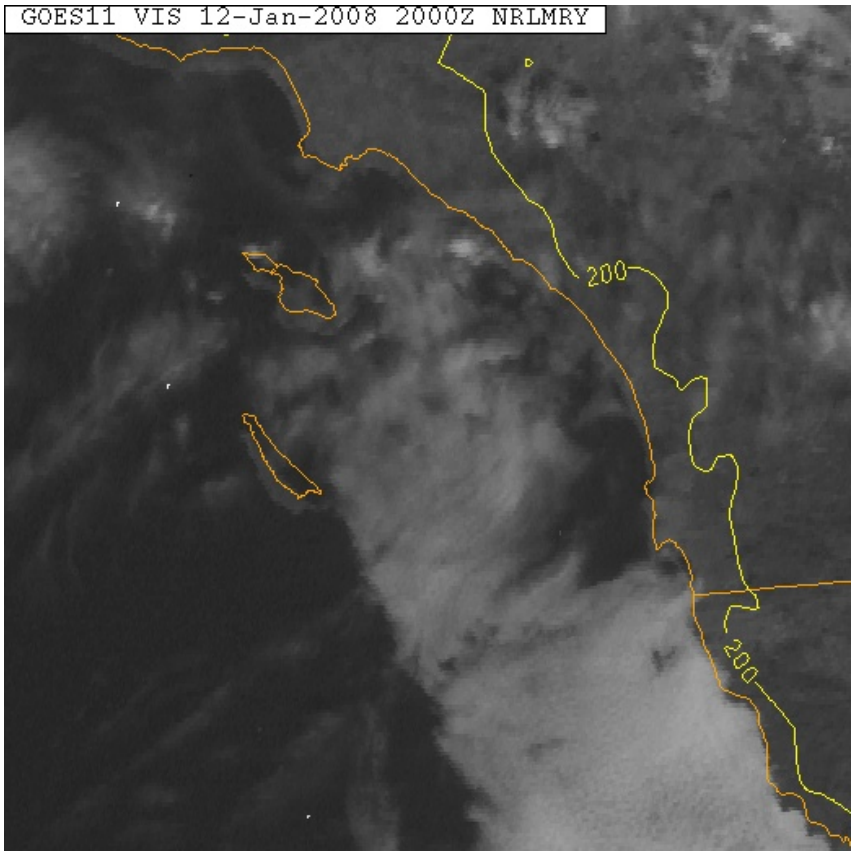


Figure 22 - GOES VIS image 2008-01-12T1200PST

See SORTIE2_2008-01-12.pdf log file for station details and SORTIE2_Processing_Log_2008-01-12.pdf for data quality (see also in Appendices B and C).

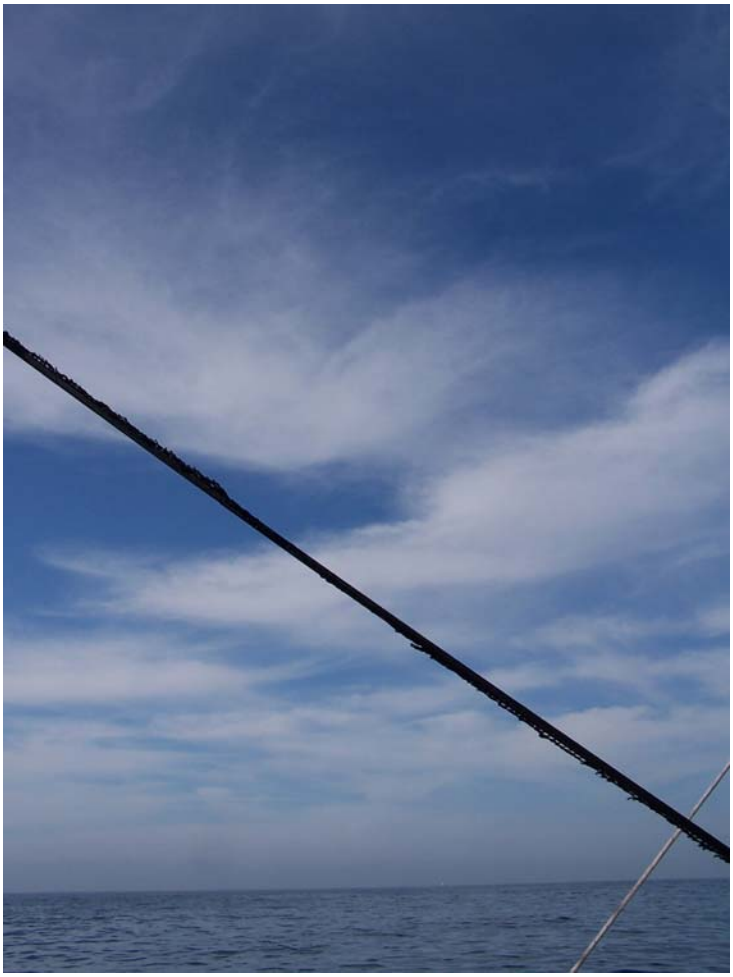


Figure 23 - Sky conditions for 2008-01-12T1215PST

7.1.4 SORTIE-2 2008-01-13 (PST)

Conditions were excellent on 2008-01-13. 80 AOP casts bracket a MODIS AQUA pass with a peak elevation of 48 degrees at 1328PST. Data includes repeated deep, multicast and surface data.

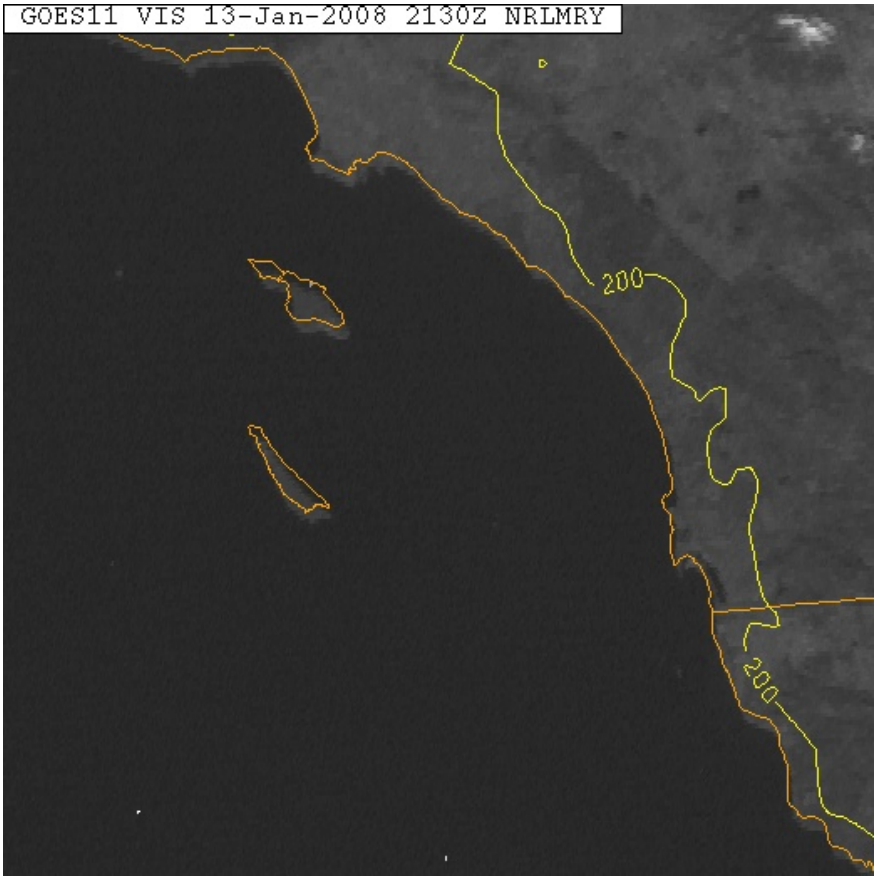


Figure 24 - GOES VIS image 2008-01-13T1330PST

See SORTIE2_2008-01-13.pdf log file for station details
SORTIE2_Processing_Log_2008-01-13.pdf for data quality (see also in Appendices B and C).

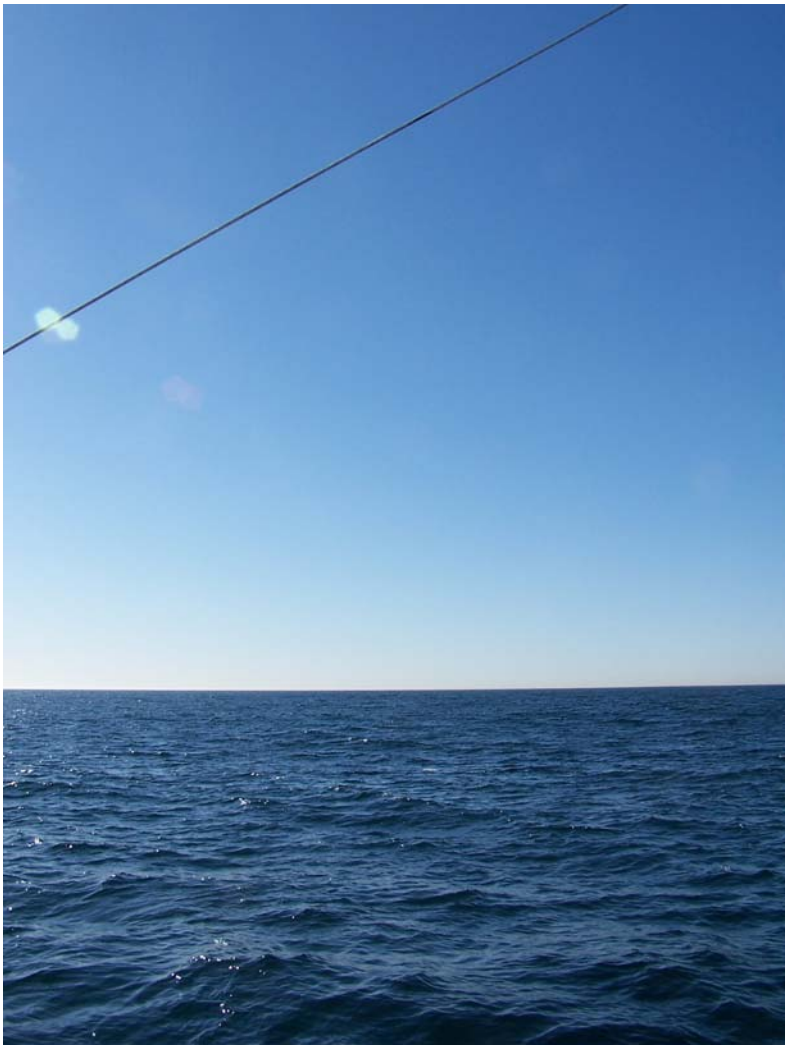


Figure 25 - Sky conditions for 2008-01-13T1415PST

7.2 HyperPro II Lw Comparisons

A summary of final L_w values computed using ProSoft 7.8.2-RC19 are shown in figures 26-37 for each day of SORTIE-2. Solid lines indicate L_w values for which the data passes QA/QC criteria, and the dotted lines indicate ones which failed. Note that Lw spectra do not compare well due to the change in Es during the day as the solar elevation changes (Lwn in the next section show much better matchups as it is normalized to Es). For detailed notes on the analysis of each data set, see the respective AOP Processing Analysis Log (see Table 9, and Appendix C).

For 2008-01-10 note that profiles PAA and PBA were taken at a different station than the rest and are not used in the % deviation calculations.

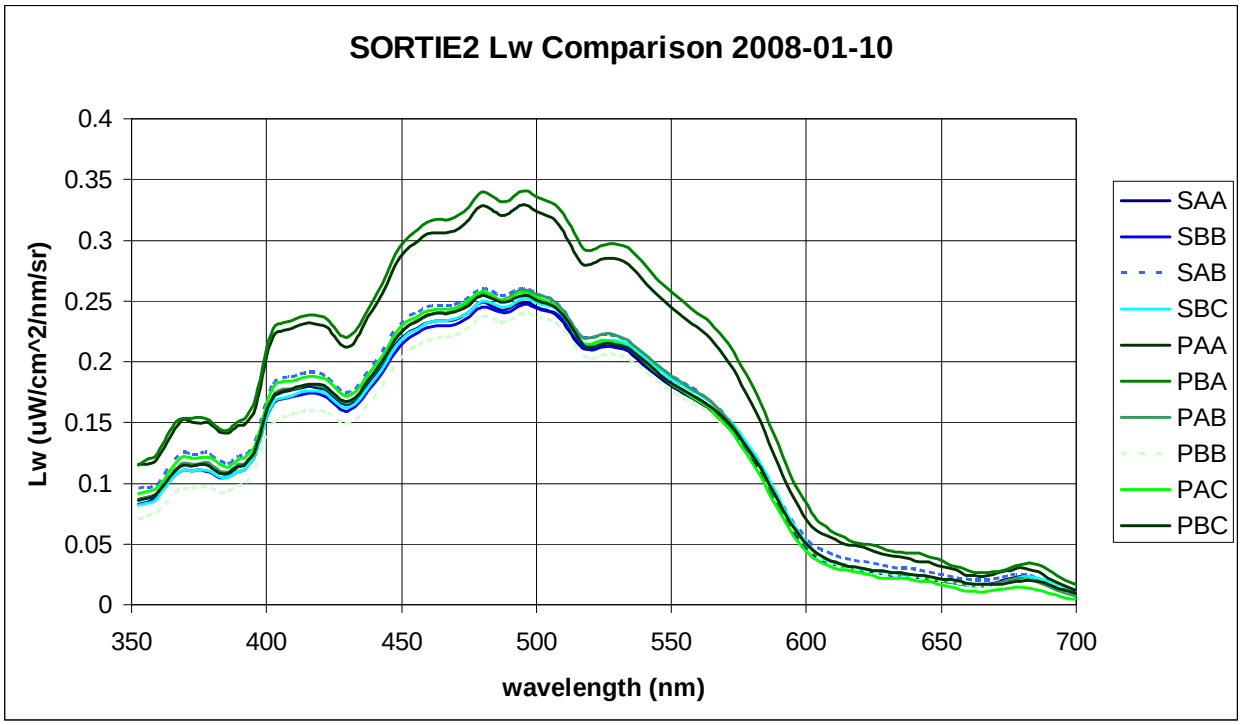


Figure 26 - Lw comparisons for SORTIE2_2008-01-10

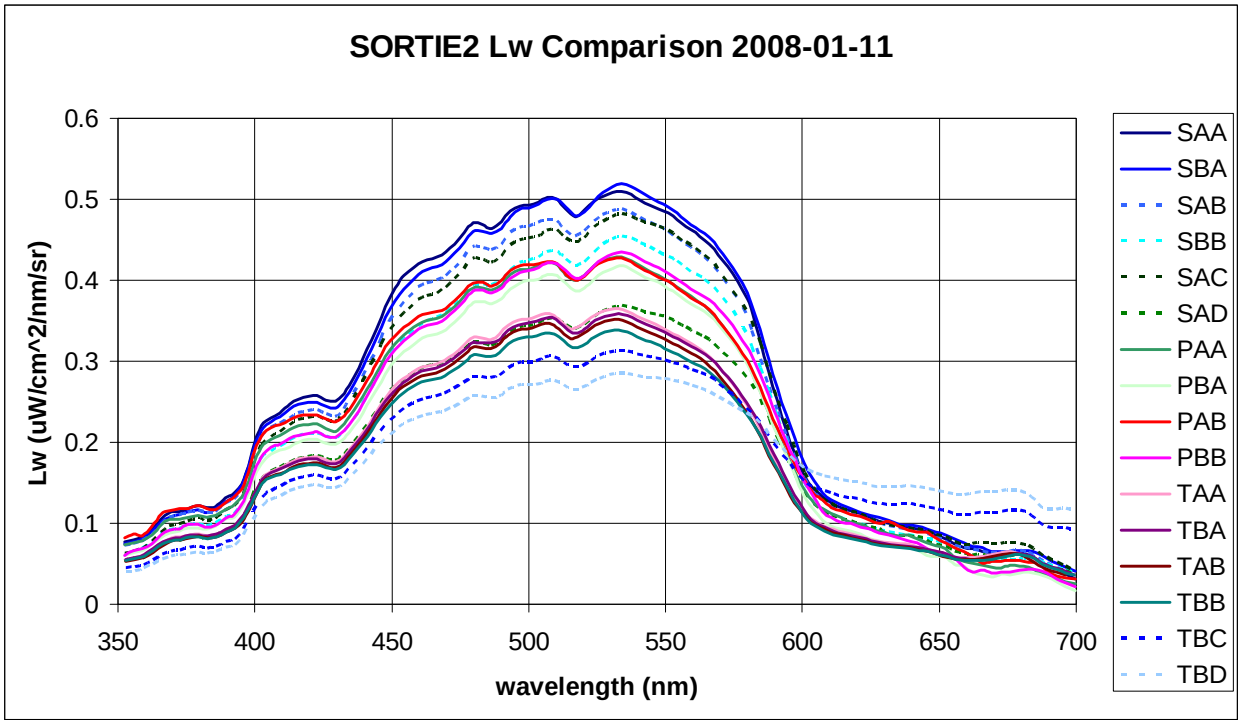


Figure 27 - Lw comparisons for SORTIE2_2008-01-11

Note that due to cloud conditions, no profile passed QA criteria for 2008-01-12.

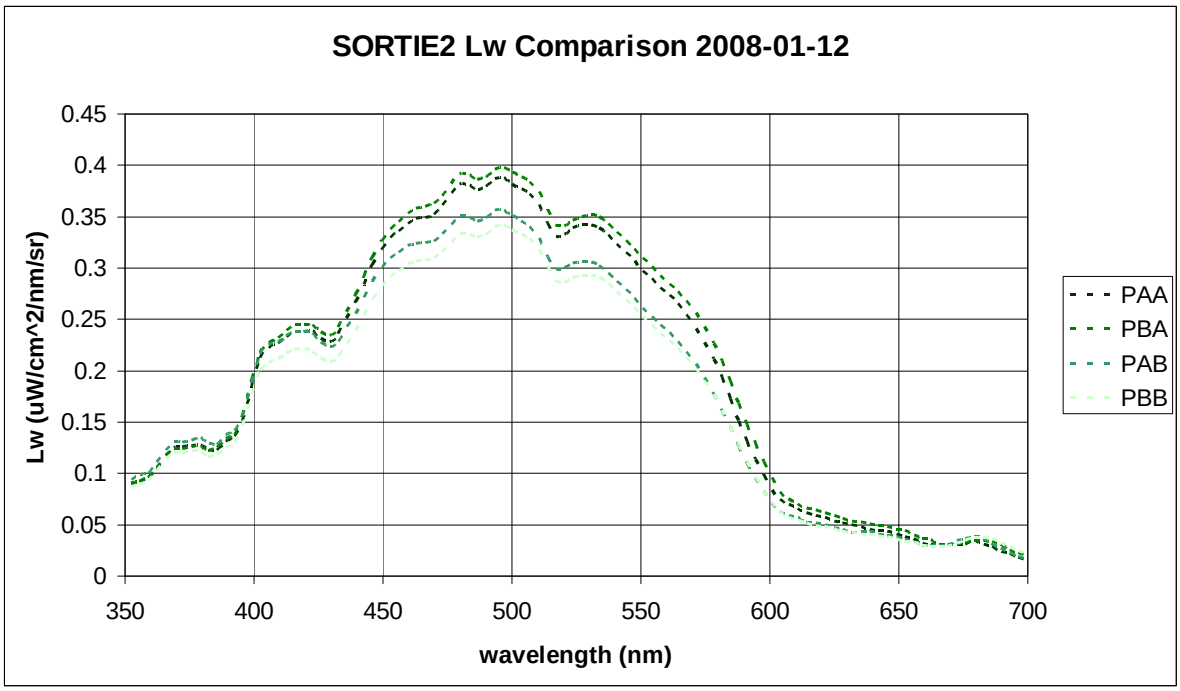


Figure 28 - Lw comparisons for SORTIE2_2007-01-12

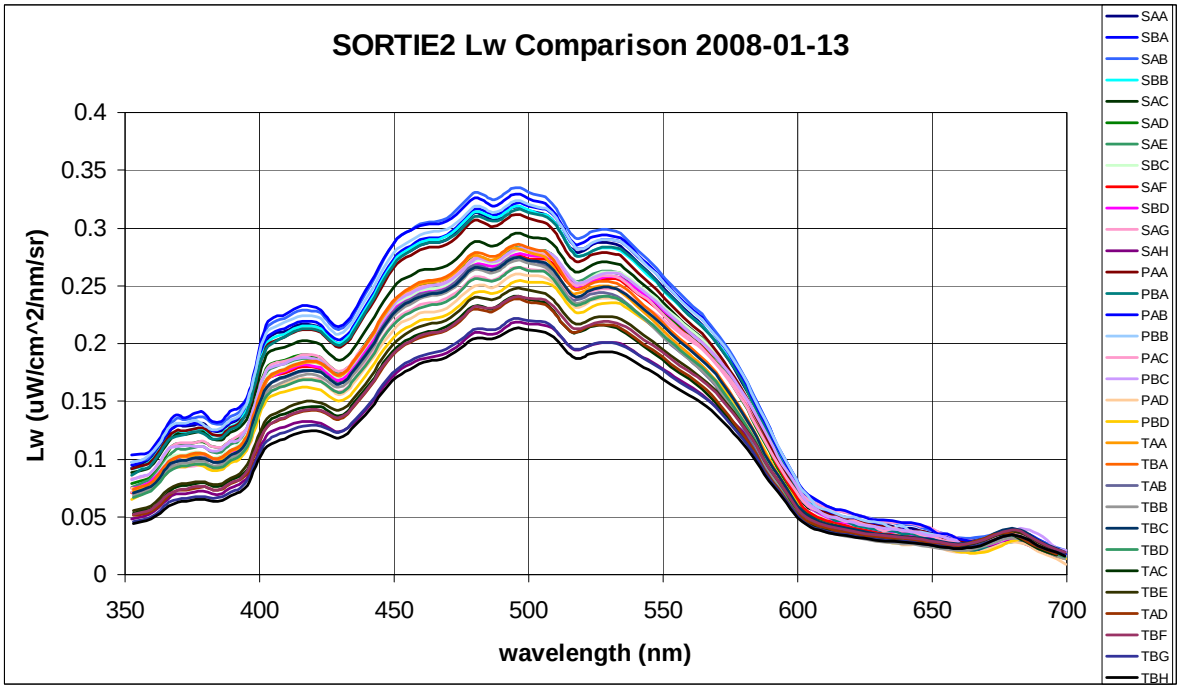


Figure 29 - Lw comparisons for SORTIE2_2008-01-13

7.3 HyperPro II Lwn Comparisons

A summary of final L_{wn} values computed using ProSoft 7.8.2-RC16 are shown in figures 23-30 for each day of SORTIE-2. Solid lines indicate L_{wn} values for which the data passes QA/QC criteria, and the dotted lines indicate ones which failed. For each day the Percent Standard Deviation = Standard Deviation / Mean *100 is also plotted to show the spread of Lwn values for all three deployment/processing techniques (multicast, single cast and surface mode) for all samples and for just those with a good or excellent quality flag. For detailed notes on the analysis of each data set, see the respective AOP Processing Analysis Log (see Table 9 and Appendix C).

For 2008-01-10 note that profiles PAA and PBA were taken at a different station than the rest and are not used in the % deviation calculations.

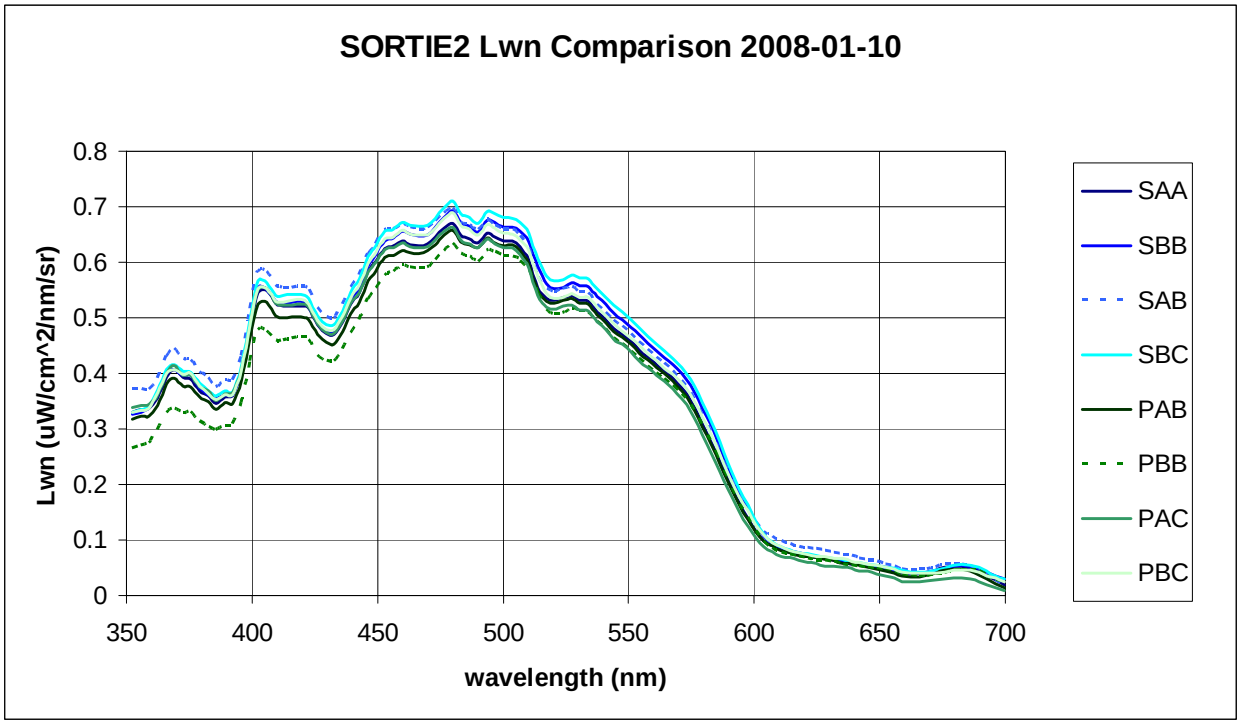


Figure 30 - Lwn comparisons for SORTIE2_ 2008-01-10

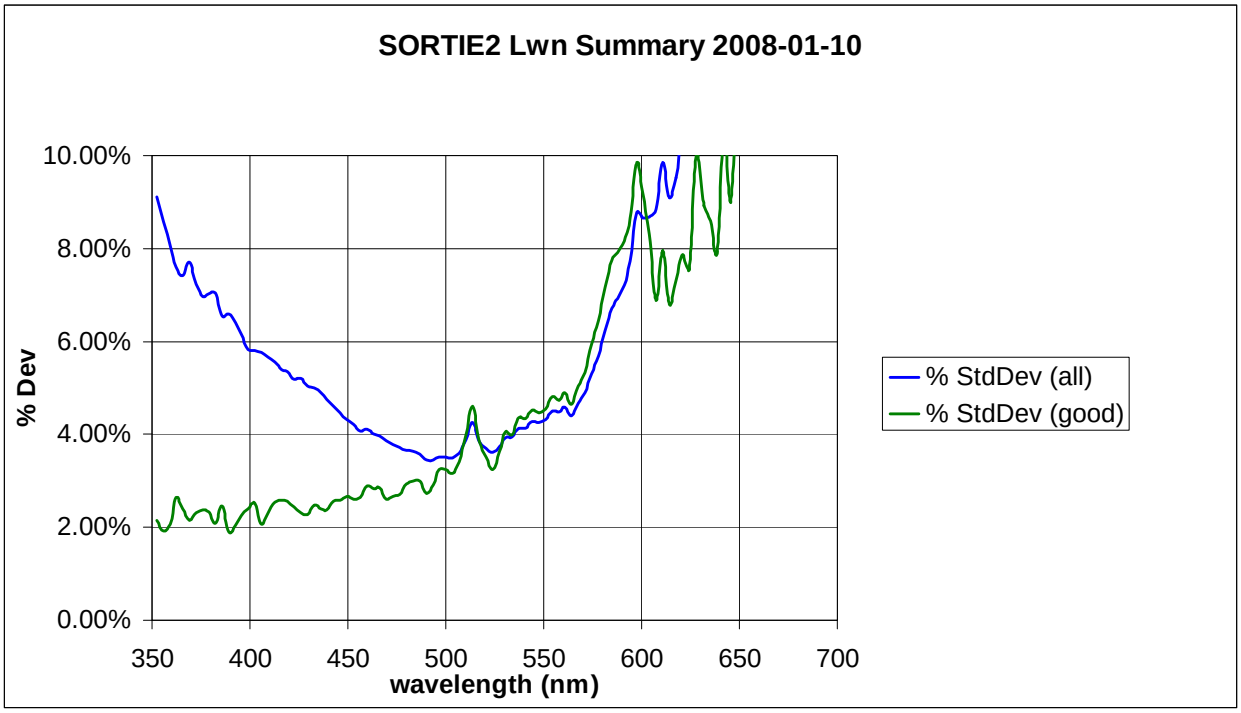


Figure 31 - Lwn comparisons for SORTIE2_2008-01-10 as % Deviation

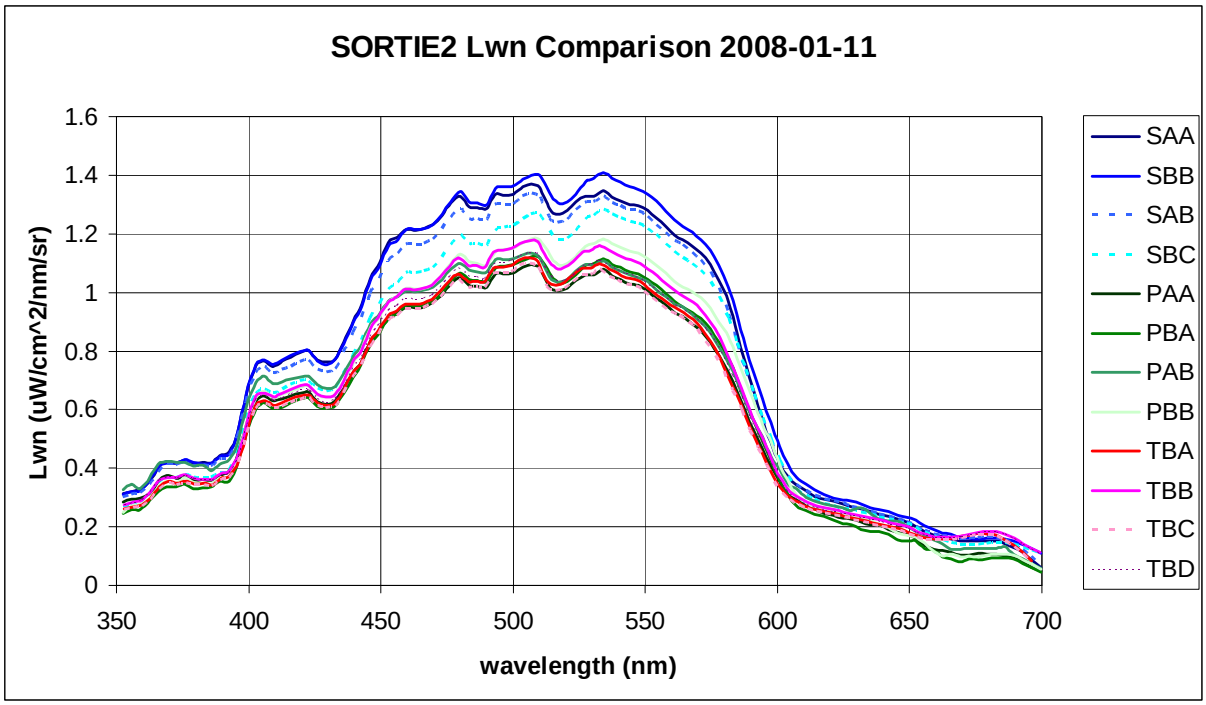


Figure 32 - Lwn comparisons for SORTIE2_2008-01-11

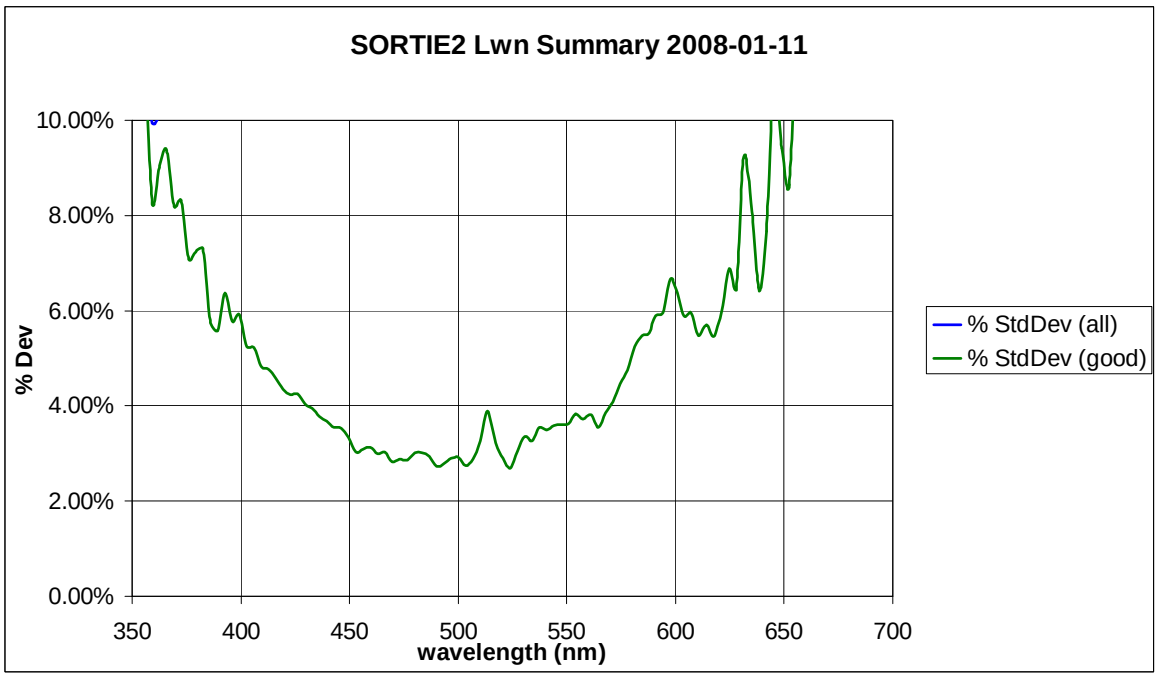


Figure 33 - Lwn comparisons for SORTIE2_2008-01-11 as % Deviation

Note that due to cloud conditions, no profile passed QA criteria for 2008-01-12.

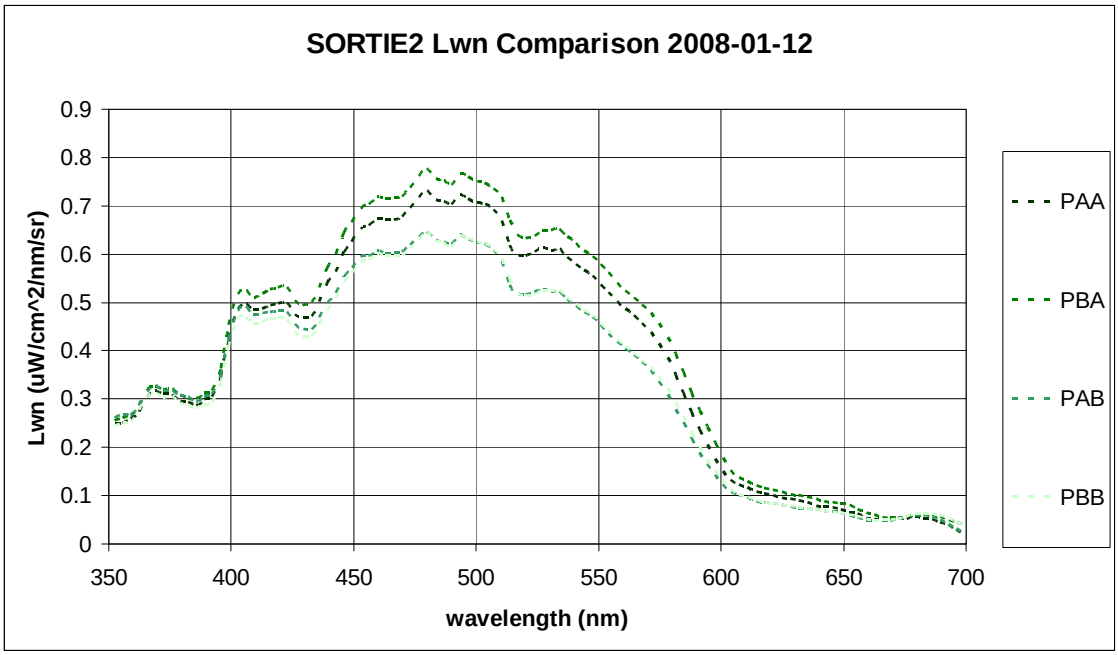


Figure 34 - Lwn comparisons for SORTIE2_2008-01-12

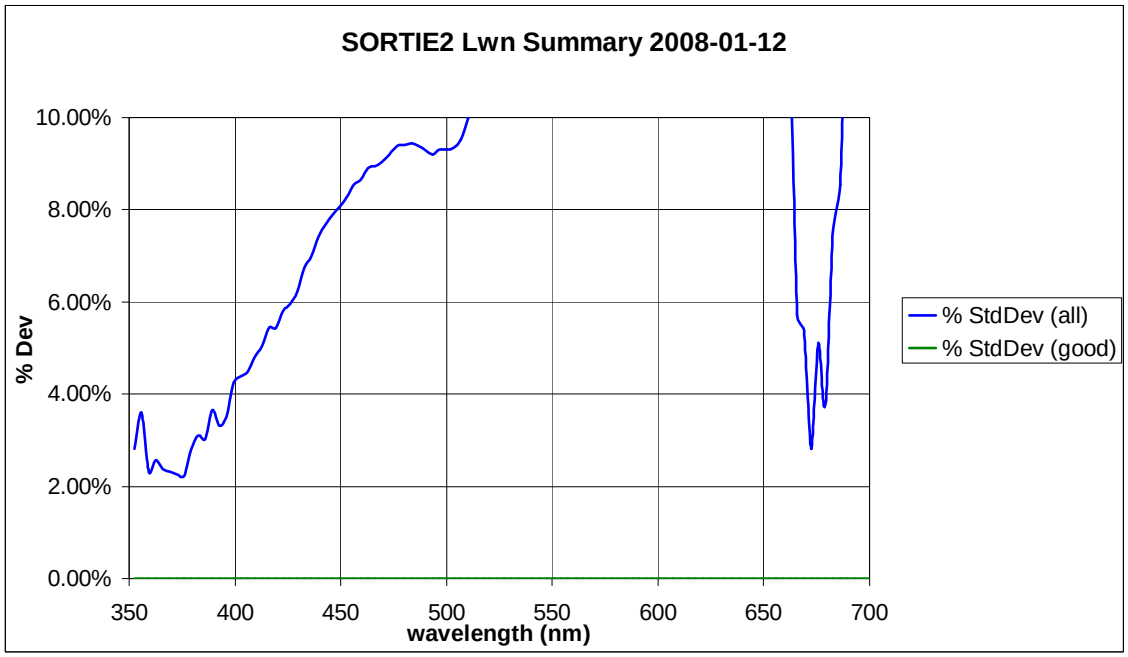


Figure 35 - Lwn comparisons for SORTIE2_2008-01-12 as % Deviation

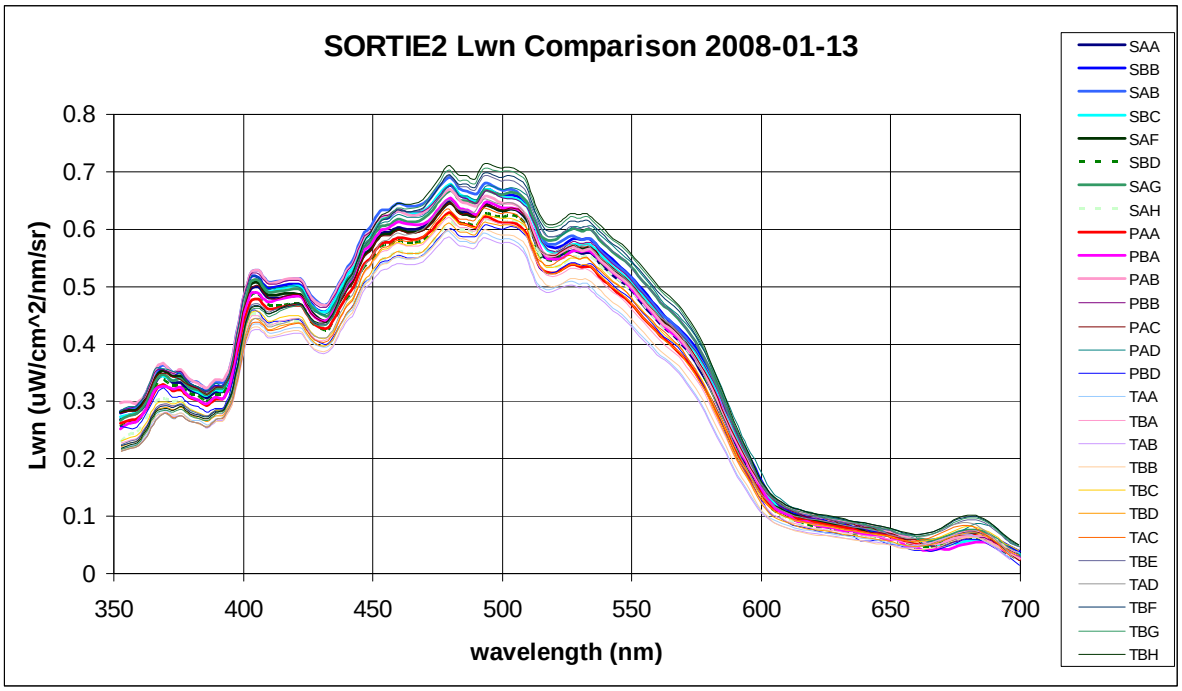


Figure 36 - Lwn comparisons for SORTIE2_2008-01-13

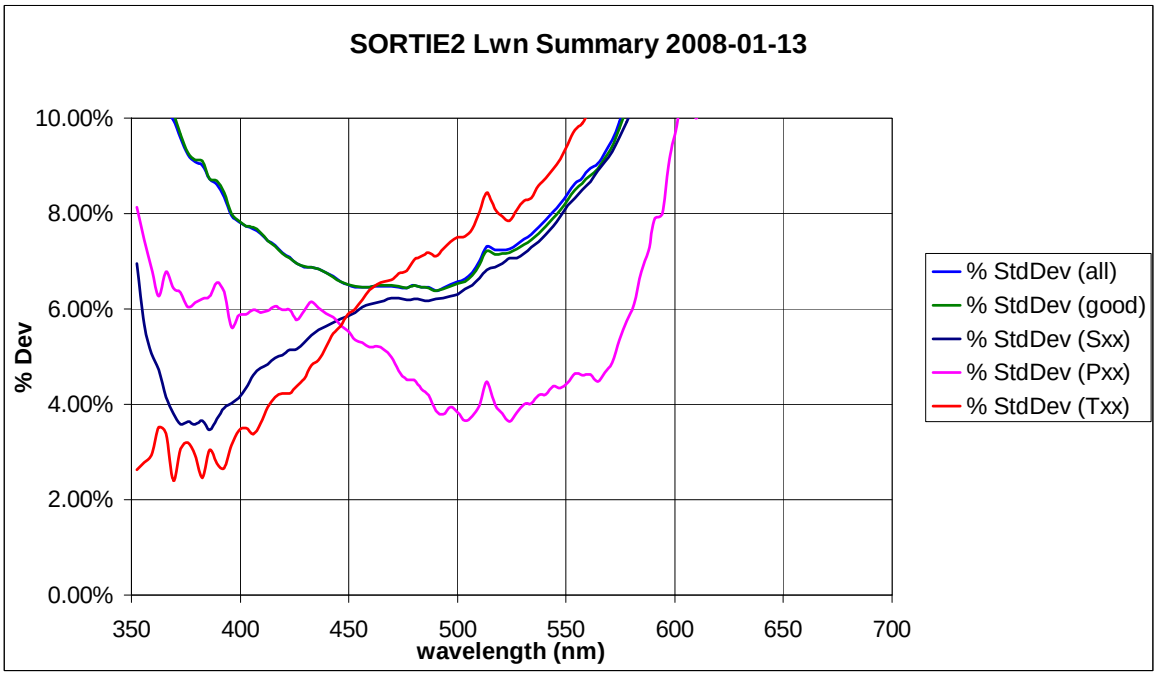


Figure 37 - Lwn comparisons for SORTIE2_2008-01-13 as % Deviation

Since there are 80 casts on 2008-01-13 over a two hour time period the different cast types are separated to look at possible biases. For matchup purposes the Multicast profiles (Sxx files) and Single cast profiles (Pxx files) only are recommended for use as the Surface mode data (Txx files) is still experimental.

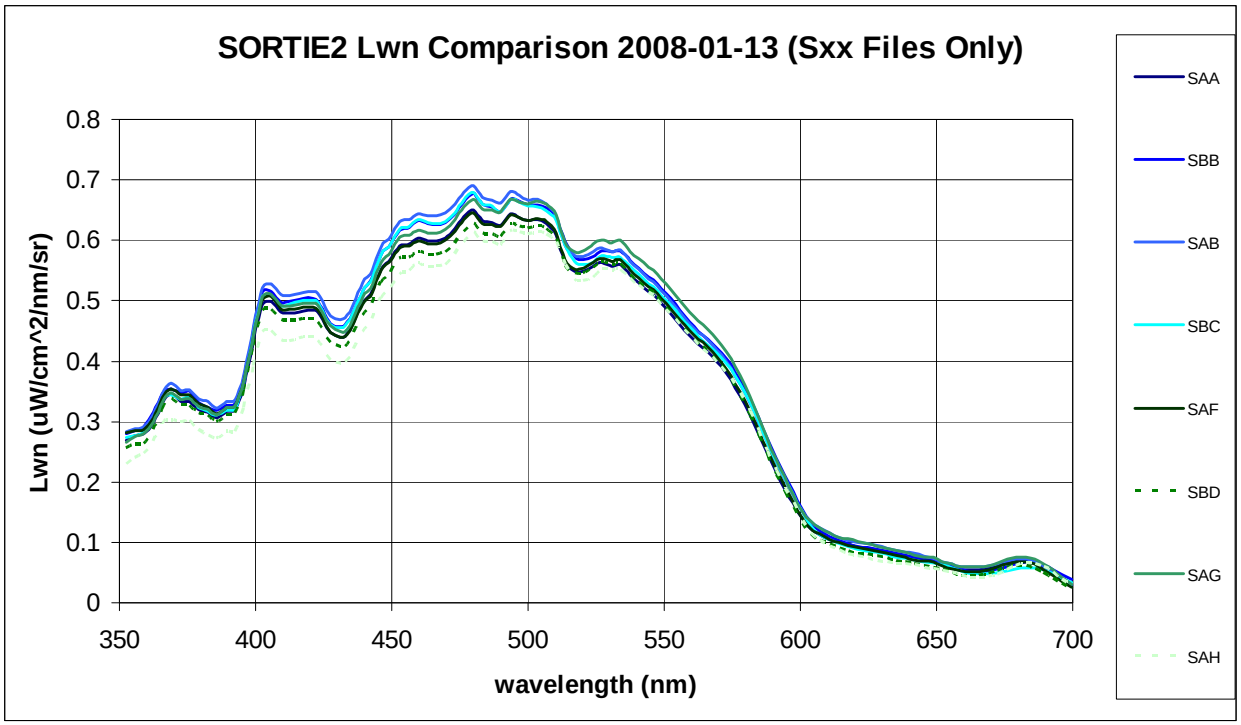


Figure 38 - SORTIE2_2008-01-13 Lwn comparison Multicast (Sxx files) only

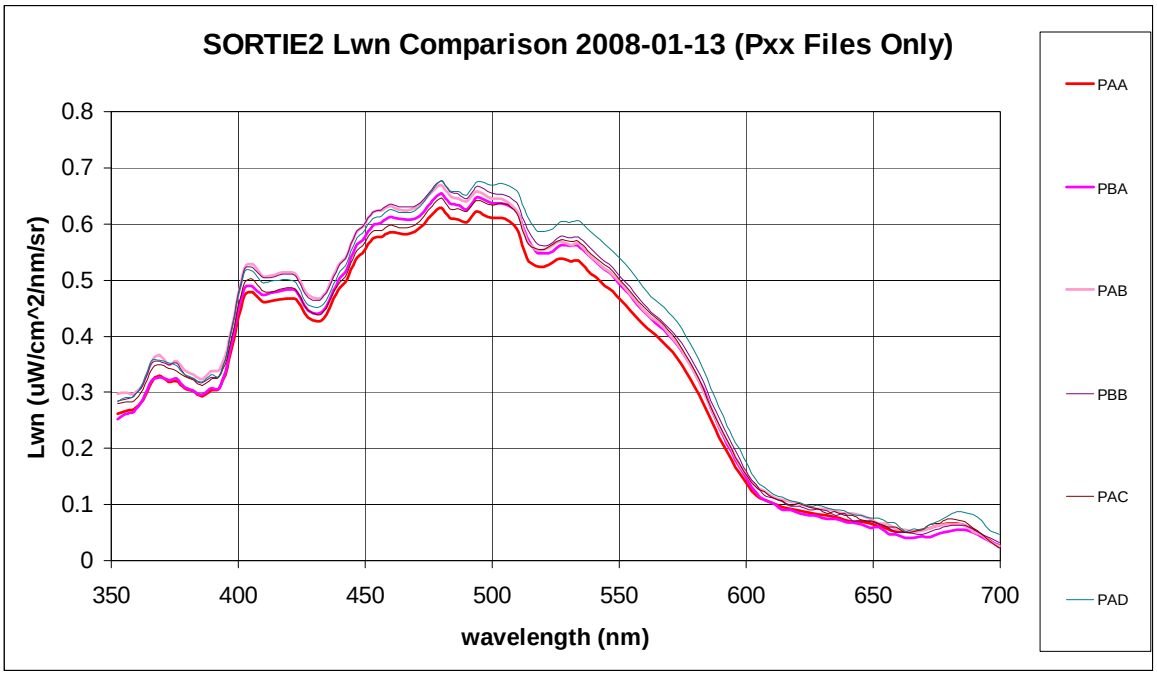


Figure 39 - SORTIE2_2008-01-13 Lwn comparison Single Cast (Pxx files) only

Figure 40 - SORTIE2_2008-01-13 Lwn comparison Surface Mode (Txx files) only

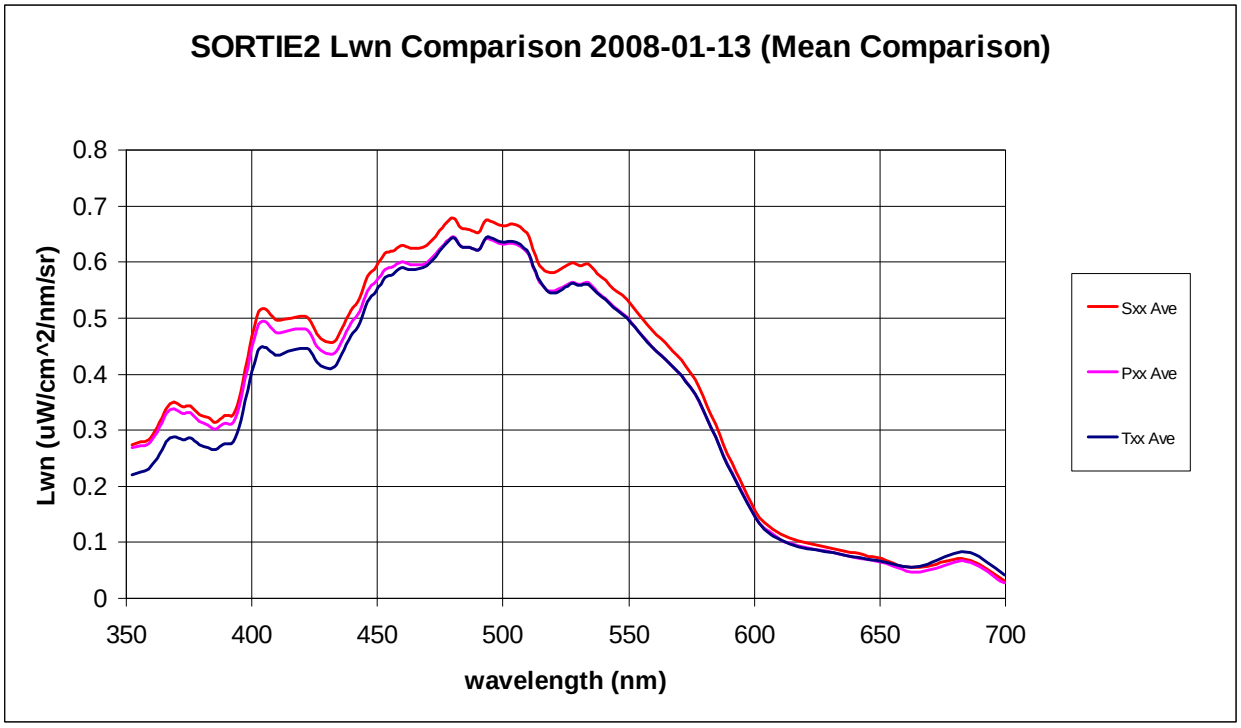


Figure 41 - SORTIE2_2008-01-13 Lwn comparison of means

8 Conclusions and Recommendations

SORTIE2 was a huge success and resulted in 80 casts within 1 hour of a MODIS AQUA pass with fully characterized field radiometers. A number of recommendations for future work are listed below.

Calibration

- Purchase new NIST lamp and recalibrate F409 (in progress after SORTIE-2).
- Work with NIST/MOBY team to complete lab intercomparison analysis (ongoing)

Change measurement protocols

- Only use on deck tare to reduce uncertainty of pressure offset (done for SORTIE-2)
- Make sure vessel crew understand the vessel orientation requirements during radiometer deployment (done for SORTIE-2)
- More multicast profiles, fewer deep, single cast (done for SORTIE-2)
- Simultaneous multicast and surface buoy measurements (done for SORTIE-2)
- Add automated GPS coordinates to log files (done for SORTIE-3)

Data processing

- Develop more objective QC/QA criteria for rejecting profiles. Difficult with single cast profiles, thus the need for more multicast mode. (data processor has been improved)
- Develop higher level L_{wn} statistical analysis for comparing and flagging anomalous data (data processor has been improved)
- Develop self shading corrections for both profiler and surface buoy mode using IOP measurements (ongoing)
- Investigation of biases between Single Cast, Multicast and Surface Mode data (ongoing)

9 APPENDIX A – ProSoft Processing Configuration Files

ProSoft requires to configurations to process data, which include the current instrument and the current parameters (these are available as described on the project DVD and on the project ftp site). These are selected from a list in the main ProSoft GUI.

The current instrument is a configuration file (.cfs) for the physical configuration of the instrument systems logged in the Level 0 file and it is stored in a folder in the ProSoft 7.8.2 directory under \Instruments and in a subfolder with the same name as the .cfs file. These files may be created using the "new" function in the ProSoft GUI and using the settings described in this Appendix. This process requires the calibration files described in the Appendix as well. These files can also be obtained by contacting Scott McLean at scott.mclean@wetsat.com. If the files are obtained directly, they only need to be imported using the "import" function in the ProSOft GUI.

The current parameter set is a configuration file (.mat) for the processing parameters used at various levels of ProSoft. It is stored in a folder in the ProSoft 7.8.2 directory under \Processing parameters. These files may be created using the "new" function in the ProSoft GUI and using the settings described in this Appendix. These files can also be obtained by contacting Scott McLean at scott.mclean@wetsat.com. If the files are obtained directly, they only need to be imported using the "import" function in the ProSoft GUI.

9.1 Instrument Context – SORTIE2_MPR012

Processing Parameters for all "PAx", "SAx", and "GAx" series data files

On deck pressure tare

Water Medium	Seawater
Pressure Tare	On Deck
HPE235IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.786
PED235IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water

	Measurement Mode: FreeFall
	Frame Type: ShutterDark
	Distance to Surface: 0.0
	Distance to Pressure: 0.786
HPL191HS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterLight
	Distance to Surface: 0.316
	Distance to Pressure: 0.0
PLD191HS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterDark
	Distance to Surface: 0.316
	Distance to Pressure: 0.0
MPR012G.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: Anc
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HSE266FS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HED266FS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.0

	Distance to Pressure: 0.0
SATBB2F077.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: FreeFall
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
SATFLCD150.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: FreeFall
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0

9.2 Instrument Context –SORTIE2_MPR012_Surface

Processing Parameters for all "TAx" series data files

On deck pressure tare

Water Medium	Seawater
Pressure Tare	On Deck
HPE235IS_Eu.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.200
	Distance to Pressure: 0.467
PED235IS_Eu.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.200
	Distance to Pressure: 0.467
HPL191HS.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.200
	Distance to Pressure: 0.467
PLD191HS.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.200

	Distance to Pressure: 0.467
MPR012G.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: Anc
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HSE266FS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HED266FS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
BB2F-077.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: Surface
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
SATFLCD150.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: Surface
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0

9.3 Instrument Context – SORTIE2_MPR071

Processing Parameters for all "PBx", "SBx", "GBx" series data files.

On deck pressure tare

Water Medium	Seawater
Pressure Tare	On Deck
HPE191IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.786
PED191IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterDark
	Distance to Surface: 0.0
	Distance to Pressure: 0.786
HPL180IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterLight
	Distance to Surface: 0.316
	Distance to Pressure: 0.0
PLD180IS.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: ShutterDark
	Distance to Surface: 0.316

	Distance to Pressure: 0.0
MPR071D.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: FreeFall
	Frame Type: Anc
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HSE192IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HED192IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
SATBB2F139.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: FreeFall
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0

9.4 Instrument Context – SORTIE2_MPR071_Surface

Processing Parameters for all "TBx" series data files.

On deck pressure tare

Water Medium	Seawater
Pressure Tare	On Deck
HPE191IS_Eu.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.200
	Distance to Pressure: 0.467
PED191IS_Eu.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.200
	Distance to Pressure: 0.467
HPL180IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.200
	Distance to Pressure: 0.0
PLD180IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.200

	Distance to Pressure: 0.0
MPR071D.CAL	Instrument Type: Profiler
	Immersion Coefficient: Water
	Measurement Mode: Surface
	Frame Type: Anc
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HSE192IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterLight
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
HED192IS.CAL	Instrument Type: Reference
	Immersion Coefficient: Air
	Measurement Mode: Surface
	Frame Type: ShutterDark
	Distance to Surface: 0.0
	Distance to Pressure: 0.0
SATBB2F139.TDF	Instrument Type: ECO Series IOP
	Immersion Coefficient: Not Required
	Measurement Mode: FreeFall
	Frame Type: Not Required
	Distance to Surface: 0.0
	Distance to Pressure: 0.0

9.5 Processing Context (Single Cast Mode) – Parameters SORTIE_SINGLE.mat

Processing Parameters for all "P", "T", "G" series data files

STRAY LIGHT = ON
THERMAL CORRECTION = ON
SURFACE EDIT = ON
PROFILE EDIT = ON
MULTICAST PROFILE = OFF
MINIMUM WAVELENGTH = 350
MAXIMUM WAVELENGTH = 700

AUTO DARK CORRECTION = SHUTTER
DARK BINS = 20
SHUTTER DARK DEGLITCH = OFF

DEGLITCH PROFILER DATA = OFF
PROFILER NOISE = 5
UPPER DEPTH LEVEL = 0
LOWER DEPTH LEVEL = 10000
DEGLITCH REFERENCE = OFF
REFERENCE NOISE = 20

HIGH TILT = 5

AUTO EDIT = ON
LOW VELOCITY = 0
HIGH TILT = 5

MINIMUM PRESSURE = 0
MAXIMUM PRESSURE = 10

NORMALIZATION = OFF

DATA FILTERING = ON

FILTER THRESHOLD = 10

K RANGE ED CHECK = ON

K RANGE LU CHECK = ON

DEPTH EXTRAPOLATION = ON

OPTICAL DEPTH LIMIT = 10

DISPLAY GRAPHS = ON

LOWER WAVELENGTH = 490

UPPER WAVELENGTH = 700

DEPTH RESOLUTION = 0.10

BIN INTERVAL = 1.0

BIN WIDTH = 0.5

TIME INTERVAL = 2

TIME WIDTH = 1

WAVELENGTH INTERP = OFF

INTEGRATION POINTS = 5

REFLECTION ALBEDO = 0.043

REFLECTANCE INDEX = 0.021

REFRACTIVE INDEX = 1.345

ET Solar = Thuillier

SELF SHADING = OFF

9.6 Processing Context (Multicast Cast Mode) – Parameters SORTIE2_MULTI.mat

Processing Parameters for all "S" series data files for normalization referenced to beginning of cast

STRAY LIGHT = ON

THERMAL CORRECTION = ON

SURFACE EDIT = ON

PROFILE EDIT = ON

MULTICAST PROFILE = ON

MINIMUM WAVELENGTH = 350

MAXIMUM WAVELENGTH = 700

AUTO DARK CORRECTION = SHUTTER

DARK BINS = 20

SHUTTER DARK DEGLITCH = OFF

DEGLITCH PROFILER DATA = OFF

PROFILER NOISE = 5

UPPER DEPTH LEVEL = 0

LOWER DEPTH LEVEL = 10000

DEGLITCH REFERENCE = OFF

REFERENCE NOISE = 20

HIGH TILT = 5

AUTO EDIT = ON

LOW VELOCITY = 0

HIGH TILT = 5

MINIMUM PRESSURE = 0

MAXIMUM PRESSURE = 10

NORMALIZATION = OFF

DATA FILTERING = ON

FILTER THRESHOLD = 10

K RANGE ED CHECK = OFF

K RANGE LU CHECK = OFF

DEPTH EXTRAPOLATION = ON

OPTICAL DEPTH LIMIT = 1.5

DISPLAY GRAPHS = ON

LOWER WAVELENGTH = 490

UPPER WAVELENGTH = 700

DEPTH RESOLUTION = 0.10

BIN INTERVAL = 1.0

BIN WIDTH = 0.5

TIME INTERVAL = 2

TIME WIDTH = 1

WAVELENGTH INTERP = OFF

INTEGRATION POINTS = 5

REFLECTION ALBEDO = 0.043

REFLECTANCE INDEX = 0.021

REFRACTIVE INDEX = 1.345

ET Solar = Thuillier

SELF SHADING = OFF

10 APPENDIX B – SORTIE-2 Cruise Logs

SORTIE-2 Cruise Logs:

SORTIE2_Log_2008-01-10

SORTIE2_Log_2008-01-11

SORTIE2_Log_2008-01-12

SORTIE2_Log_2008-01-13

SORTIE-2 Cruise Log **2008-01-10 (PST)** **Thursday**

Local = PST UTC-8

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from http://www.nrlmry.navy.mil/sat_products.html

HyperPro File Names

	Code	
SORTIE2_2008-01-xx_GAA	GGR	HSE266 only
SORTIE2_2008-01-xx_GBA	GGR	HSE192 only
SORTIE2_2008-01-xx_PAA	HYP	MPR012, HSE266 100m profile
SORTIE2_2008-01-xx_PBA	HYP	MPR071, HSE235 100m profile
SORTIE2_2008-01-xx_SAA	HYP	MPR012, HSE266 5 casts 10m profile
SORTIE2_2008-01-xx_SBA	HYP	MPR071, HSE235 5 casts 10m profile
SORTIE2_2008-01-xx_TAA	HYT	MPR012, HSE266 surface mode
SORTIE2_2008-01-xx_TBA	HYT	MPR071, HSE235 surface mode

Shelter Is Dock	32 43.266	117 13.185
San Diego Entrance	32 38.110	117 13.774
Blue Station	32 42.000	117 35.000
STN_001B	32 43.000	117 36.500
STN_002B	32 41.000	117 36.500
STN_003B	32 43.000	117 33.500
STN_004B	32 41.000	117 33.500
Mission Bay Entrance	32 45.437	117 15.604
Aqua Pass	12:58PST	76.7EI

Participants:
Ken Voss
Chuck Trees
Scott Freeman

Scott McLean

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments
2008-01-07T1514	32 43.266	117 13.185	2008-01-07T0714	Mission Bay					Depart
2008-01-10T1602	32 38.552	117 14.666	2008-01-10T0802	San Diego Entrance					clear sky, winds calm
2008-01-10T1818	32 38.000	117 35.000	2008-01-10T1018	Blue Station					
2008-01-10T1840			1040	Blue Station	DOLPHIN	deploy	DOL		
2008-01-10T1846	32 41.789	117 34.985	1046	Blue Station	Water	sample	SRF		CT1, 2, 3 (500ml)
2008-01-10T1855	32 42.250	117 35.506	1055	In Transit	DOLPHIN	payed out	DOL		marine layer
2008-01-10T1859	32 42.426	117 35.762	1059	In Transit	DOLPHIN	start log	DOL	SD011008.003	sky clear
2008-01-10T1900			1100		GOES-11 VIS		GOES	20080110.1900.goes11.vis.x.san_diego.x.jpg	
2008-01-10T1902	32 42.603	117 36.011	1102	In Transit	DOLPHIN	start log	DOL	SD011008.004	
2008-01-10T1907	32 42.950	117 36.487	1107	STN01B	DOLPHIN	towing			
2008-01-10T1910			1110	In Transit	HyperRef	stop log	GGR		some shadowing of mast heading south 12:51 log 1854 frames
2008-01-10T1917	32 42.230	117 36.592	1117	In Transit	Water	sample	SRF		CT4, 5, 6 (700ml) wind calm, conditions clear, waves 2-3ft
2008-01-10T1928			1128	STN012B	DOLPHIN	towing	DOL		
2008-01-10T1929			1129	STN012B	HyperRef	start log	GGR	SORTIE2_2008-01-10_GAB SORTIE2_2008-01-10_GBB	
2008-01-10T1930			1130	In Transit	Water	sample	SRF		CT7, 8, 9 (1000ml)
2008-01-10T1935	32 41.440	117 35.778	1135	In Transit	HyperRef	stop log	GGR		6:40 968 frames
2008-01-10T1938			1138	In Transit	HyperPro	tare	HYP		MPR012 10.124m MPR071 10.198m
2008-01-10T1950			1150	Blue Station	DOLPHIN	recovered	DOL		
2008-01-10T1955			1155	Blue Station	NURADS	depoyed	NRD		
2008-01-10T2000			1200		GOES-11 VIS		GOES	20080110.2000.goes11.vis.x.san_diego.x.jpg	
2008-01-10T2015			1215	Blue Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_PAA SORTIE2_2008-01-10_PBA	profile to 30m, abot due to clouds
2008-01-10T2026	32 42.018	117 35.016	1226	Blue Station	NURADS	recovered	NRD		
2008-01-10T2026			1226	Blue Station	Abort station				
2008-01-10T2028			**1258**	**In Transit**	**MODIS AQUA**	**overpass**	**MOA**		**76.7 Max EL**
2008-01-10T2030			1230		GOES-11 VAPOUR		GOES	20080110.2030.goes11.vapour.x.pacsouthwest.x.jpg	
2008-01-10T2100			1300		GOES-11 VIS		GOES	20080110.2100.goes11.vis.x.san_diego.x.jpg	
2008-01-10T2136	32 44.000	117 27.000	1326	Green1 Station	arrive				
2008-01-10T2127			1327	Green1 Station	Water	sample	SRF		CT10, 11, 12 (700ml)
2008-01-10T2130			1330	Green1 Station	NURADS	depoyed	NRD		
2008-01-10T2132			1332	Green1 Station	HyperPro	retare	HYP		MPR012 10.068m
2008-01-10T2132			1332	Green1 Station	MASCOT	begin log	MAS	ARCHIVE,000	
2008-01-10T2134			1334	Green1 Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_PAB SORTIE2_2008-01-10_PBB	profile to 50m
2008-01-10T2138			1338	Green1 Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_PAC SORTIE2_2008-01-10_PBC	profile to 50m
2008-01-10T2141			1341	Green1 Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_SAA	multicast to 10m
2008-01-10T2142			1342	Green1 Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_SBA	multicast to 10m
2008-01-10T2149			1349	Green1 Station	HyperPro	start log	HYP	SORTIE2_2008-01-10_SAB SORTIE2_2008-01-10_SBC	multicast to 10m
2008-01-10T2150			1350	Green1 Station	HyperTSRB	abort	HYT		
2008-01-10T2154			1354	Green1 Station	MASCOT	profile	MAS		
2008-01-10T2200			1400		GOES-11 VIS		GOES	20080110.2200.goes11.vis.x.san_diego.x.jpg	
2008-01-10T2207			1407	Green1 Station	MASCOT	dark profile	MAS		
2008-01-10T2221			1421	Green1 Station	MASCOT	begin log	MAS	ARCHIVE,001	
2008-01-10T2222	32 43.879	117 26.641	1422	Green1 Station	MASCOT	dark profile	MAS		
2008-01-10T2244			1444	Green1 Station	DOLPHIN	start tow	DOL	SD011008.005	7m tow
2008-01-10T2244	32 43.908	117 26.617	1444	Green1 Station	Water	sample	SRF		CT13, 14, 15 (700ml)
2008-01-10T2244			1444	In Transit	DOLPHIN	towing	DOL		go to STN02G1
2008-01-10T2300			1500		GOES-11 VIS		GOES	20080110.2300.goes11.vis.x.san_diego.x.jpg	
2008-01-10T2303			1503	STN02G1	DOLPHIN	towing	DOL		
2008-01-10T2304			1504	STN02G1	Water	sample	SRF		CT16, 17, 18 (700ml)
2008-01-10T2338	32 45.482	117 25.448	1538	STN03G1	Water	sample	SRF		CT19, 20, 21 (700ml)
2008-01-11T0005	32 43.500	117 25.500	1605	STN04G1	DOLPHIN	towing	DOL		
2008-01-11T0017	32 44.400	117 27.133	1617	In Transit	Water	sample	SRF		CT22, 23, 24 (700ml)
2008-01-11T0036	32 45.500	117 28.500	1636	STN01G1	DOLPHIN	towing	DOL	end SD011008.005 start SD011008.006	turn to mission bay
				transit	DOLPHIN	recover	DOL		
2008-01-11T0132	32 45.500	117 21.200	1732	100m isobath	DOLPHIN	begin recover	DOL		
				100m isobath	Water	sample	SRF		CT25, 26, 27 (700ml)
2008-01-11T0146	32 45.446	117 20.225	1746		DOLPHIN	recover	DOL		
2008-01-11T0213	32 45.445	117 15.760	1813	Mission Bay Entrance					
2008-01-11T0235	32 46.619	117 14.965	1835	Mission Bay Dock					

SORTIE-2 Cruise Log **2008-01-11 (PST)** **Friday**

Local = PST UTC-8

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from http://www.nrlmry.navy.mil/sat_products.html

HyperPro File Names

	Code	
SORTIE2_2008-01-xx_GAA	GGR	HSE266 only
SORTIE2_2008-01-xx_GBA	GGR	HSE192 only
SORTIE2_2008-01-xx_PAA	HYP	MPR012, HSE266 100m profile
SORTIE2_2008-01-xx_PBA	HYP	MPR071, HSE235 100m profile
SORTIE2_2008-01-xx_SAA	HYP	MPR012, HSE266 5 casts 10m profile
SORTIE2_2008-01-xx_SBA	HYP	MPR071, HSE235 5 casts 10m profile
SORTIE2_2008-01-xx_TAA	HYT	MPR012, HSE266 surface mode
SORTIE2_2008-01-xx_TBA	HYT	MPR071, HSE235 surface mode

Mission Bay Dock	32 46.619	117 14.965
Mission Bay Entrance	32 45.437	117 15.604
Deploy DOLPHIN	32 47.722	117 21.555
STN04G2	32 52.000	117 27.500
STN01G2	32 52.000	117 30.500
STN02G2	32 50.000	117 30.500
STN03G2	32 52.000	117 27.500
STN04G2	32 52.000	117 27.500
Green1 Station		
Aqua Pass	12:03PST	19.6EL
Aqua Pass	13:40PST	33.9EL

Participants:
Ken Voss
Scott Freeman
Scott McLean
Mike Twardow

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments	
2008-01-11T1605	32 46.619	117 14.965	805	Mission Bay Dock		depart			Depart	
2008-01-11T1630	32 45.445	117 15.760	830	Mission Bay Entrance	In Transit					
2008-01-11T1715	32 47.722	117 21.55	915	In Transit	DOLPHIN	deploy	DOL		at 100m isobath	
2008-01-11T1720	32 47.777	117 21.787	920	In Transit	DOLPHIN	start tow	DOL	SD011108.001		14.76923077
2008-01-11T1725			925	In Transit	Water	sample	SRF		CT28, 29, 30 (?ml)	
2008-01-11T1733	32 48.200	117 22.921	933	In Transit	DOLPHIN	towing	DOL		200m out, towing at 7m	
2008-01-11T1833			1015	In Transit	DOLPHIN	towing	DOL		overcast, turn to Green3	
2008-01-11T1826			1026	In Transit	DOLPHIN	towing	DOL		turn to avoid dive ship	
	32 53.458	117 26.661	1052	In Transit	DOLPHIN	stop to profile	DOL			
2008-01-11T1854			1054	In Transit	DOLPHIN	resume tow	DOL		clearing off	
2008-01-11T1910	32 55.086	117 25.006	1110	In Transit	DOLPHIN	towing	DOL		cross La Jolla Canyon	
2008-01-11T1919	32 56.000	117 25.000	1119	Green3 Station	DOLPHIN	towing	DOL			
2008-01-11T1928	32 57.000	117 26.500	1134	STN01G3	DOLPHIN	towing	DOL		clear	
2008-01-11T1955	32 55.000	117 26.518	1155	STN02G3	DOLPHIN	towing	DOL		foggy	
2008-01-11T2000			1200		GOES-11 VIS		GOES	20080111.2000.goes11.vis.x.san_diego.x.jpg		
2008-01-11T2000			1200		GOES-11 VAPOUR		GOES	20080111.2000.goes11.vapour.x.pac-southwest.x.jpg		
2008-01-11T2003			**1203**	**In Transit**	**MODIS AQUA**	**overpass**	**MOA**		**19.6 max EL**	
2008-01-11T2026	32 57.040	117 23.440	1226	STN03G3	DOLPHIN	towing	DOL		clear	
2008-01-11T2035			1235	In Transit	DOLPHIN	towing	DOL		deck tare MPR071 10.1544m MPR012 10.0158m	
2008-01-11T2040	32 54.984	117 23.428	1240	STN04G3	DOLPHIN	towing	DOL		foggy	
2008-01-11T2100			1300		GOES-11 VIS		GOES	20080111.2100.goes11.vis.x.san_diego.x.jpg		
2008-01-11T2104	32 56.260	117 24.704	1304		DOLPHIN	start recovery	DOL		clear slow to 4kts	
2008-01-11T2114	32 56.792	117 25.030	1314	Green3 Station Alternate	DOLPHIN	stop log	DOL			
2008-01-11T2116			1316	G3A	NURADS	deployed	NRD			
2008-01-11T2120			1320	G3A	DOLPHIN	recovered	DOL			
2008-01-11T2124			1324	G3A	MASCOT	deployed, darks	MAS	ARCHIVE.002		
2008-01-11T2128			1328	G3A	MASCOT	deployed, profile darks 50m	MAS			
2008-01-11T2130			1330		GOES-11 VAPOUR		GOES	20080111.2130.goes11.vapour.x.pac-southwest.x.jpg		
2008-01-11T2137			1337	G3A	MASCOT	deployed, light hold 5m	MAS		select site 2nm N of fog bank	
2008-01-11T2139			1339	G3A	Water	sample	SRF		CT31, 32, 33 (?ml)	
2008-01-11T2140			**1340**	**G3A**	**MODIS AQUA**	**overpass**	**MOA**			
2008-01-11T2141			1341	G3A	HyperPro	start log	HYP	SORTIE2_2008-01-11_PAA SORTIE2_2008-01-11_PBA	profile to 50m	
2008-01-11T2145	32 42.018	117 35.016	1345	G3A	HyperPro	start log	HYP	SORTIE2_2008-01-11_PAA SORTIE2_2008-01-11_PBA	profile to 50m	
2008-01-11T2149			1349	G3A	HyperPro	start log	HYP	SORTIE2_2008-01-11_SAA SORTIE2_2008-01-11_SBA	multicast profile to 5x10m	
2008-01-11T2154	32 44.000	117 27.000	1354	G3A	HyperPro	start log	HYP	SORTIE2_2008-01-11_SAB SORTIE2_2008-01-11_SBB	multicast profile to 5x10m	
2008-01-11T2200			1400		GOES-11 VIS		GOES	20080111.2200.goes11.vis.x.san_diego.x.jpg		
2008-01-11T2213			1413	G3A	HyperTSRB	start log	HYT	SORTIE2_2008-01-11_TAA SORTIE2_2008-01-11_TBA	5:00 surface	
2008-01-11T2218			1418	G3A	HyperTSRB	start log	HYT	SORTIE2_2008-01-11_TAB SORTIE2_2008-01-11_TBB	4:00 surface	
2008-01-11T2235			1435	G3A	HyperTSRB HyperPro	start log	HYP/HYT	SORTIE2_2008-01-11_SAC SORTIE2_2008-01-11_TBC	3:45 surface multicast to 5x10m	
2008-01-11T2239			1439	G3A	HyperTSRB HyperPro	start log	HYP/HYT	SORTIE2_2008-01-11_SAD SORTIE2_2008-01-11_TBD	abort too close to ship	
2008-01-11T2242	32 56.646	117 24.606	1442	G3A	MASCOT	start log	MAS	ARCHIVE.003	profile to 50m	
2008-01-11T2249			1449	G3A	MASCOT	rcovered	MAS			
2008-01-11T2253			1453	G3A	NURADS	recovered	NRD			
2008-01-11T2254	32 56.614	117 24.550	1454	G3A	In Transit				return to Mission Bay	
2008-01-12T0025	32 45.445	117 15.760	1625	Mission Bay Entrance						
2008-01-12T0050	32 46.619	117 14.965	1650	Mission Bay Dock						

SORTIE-2 Cruise Log **2008-01-12 (PST)** **Friday**

Local = PST UTC-8

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from http://www.nrlmry.navy.mil/sat_products.html

HyperPro File Names

	Code	
SORTIE2_2008-01-xx_GAA	GGR	HSE266 only
SORTIE2_2008-01-xx_GBA	GGR	HSE192 only
SORTIE2_2008-01-xx_PAA	HYP	MPR012, HSE266 100m profile
SORTIE2_2008-01-xx_PBA	HYP	MPR071, HSE235 100m profile
SORTIE2_2008-01-xx_SAA	HYP	MPR012, HSE266 5 casts 10m profile
SORTIE2_2008-01-xx_SBA	HYP	MPR071, HSE235 5 casts 10m profile
SORTIE2_2008-01-xx_TAA	HYT	MPR012, HSE266 surface mode
SORTIE2_2008-01-xx_TBA	HYT	MPR071, HSE235 surface mode

Mission Bay Dock	32 46.619	117 14.965	755
Mission Bay Entrance	32 45.437	117 15.604	820
Deploy DOLPHIN	32 47.722	117 21.555	905
STN04G2	32 52.000	117 27.500	1015
STN01G2	32 52.000	117 30.500	
STN02G2	32 50.000	117 30.500	
STN03G2	32 52.000	117 27.500	
STN04G2	32 52.000	117 27.500	
Green1 Station			1215
Aqua Pass	12:45PST	56.3EL	
Aqua Pass	14:23PST	11.2EL	

Participants:
Chuck Trees
Scott Freeman
Scott McLean

Luke

Peru

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments
2008-01-12T1555	32 46.619	117 14.965	755	Mission Bay Dock		depart			Depart
2008-01-12T1620	32 45.445	117 15.760	820	Mission Bay Entrance	In Transit				
2008-01-12T1703	32 47.650	117 21.777	903	In Transit	Water	sample	SRF		CT34, 35, 36 (700ml)
2008-01-12T1705			905	In Transit	DOLPHIN	deploy	DOL		at 100m isobath
			910	In Transit	DOLPHIN	start log	DOL	SD011208.001	
2008-01-12T1715	32 47.616	117 21.989	915	In Transit	DOLPHIN	start tow	DOL		
2008-01-12T1745	32 49.186	117 25.132	945	In Transit	DOLPHIN	towing	DOL		foggy
2008-01-12T1710	32 49.996	117 27.518	1010	STN01G	DOLPHIN	towing	DOL		turn North for sat call
2008-01-12T1828	32 52.206	117 27.878	1028	In Transit	DOLPHIN	towing	DOL		stop for deep DOLPHIN cast
2008-01-12T1832			1032	In Transit	DOLPHIN	towing	DOL		foggy out past San Clemente, turn to G3
2008-01-12T1913	32 56.201	117 25.198	1113	G3	DOLPHIN	towing	DOL		turn to STN03G3 out of fog
2008-01-12T1930			1130	In Transit	DOLPHIN	towing	DOL	SD011208.002	start new log
2008-01-12T1935			1135	In Transit	DOLPHIN	towing	DOL		tare MPR71 10.1796 tare MPR12 10.037
2008-01-12T1938	32 56.656	117 22.886	1138	In Transit	Water	sample	SRF		CT37, 38, 39 (700ml)
2008-01-12T1940			1140	Green4	DOLPHIN	recovered	DOL		cross La Jolla Canyon
2008-01-12T1945			1145	Green4	NURADS	deployed	NRD		
2008-01-12T1947	32 56.495	117 22.678	1147	Green4	MASCOT	deployed	MAS		light
2008-01-12T1950			1150	Green4	MASCOT	start log	MAS	ARCHIVE.004	
2008-01-12T1955			1155	Green4	HyperPro	standing by	HYP		high alt clouds
2008-01-12T2015	32 56.186	117 22.550	1215	Green4	HyperPro	start log	HYP	SORTIE2_2008-01-11_PAA SORTIE2_2008-01-11_PBA	profile to 50m, high alt clouds
2008-01-12T2045			**1245**	Green4	**MODIS AQUA**	**overpass**	**MOA**		**56.3 max EL high alt clouds**
2008-01-12T2053			1253	Green4	HyperPro	start log	HYP	SORTIE2_2008-01-11_PAB SORTIE2_2008-01-11_PBB	profile to 25m, abort due to clouds
2008-01-12T2053			1253	Green4	Water	sample	SRF		CT40, 41, 42 (700ml)
2008-01-12T2108			1308	Green4	DOLPHIN	towing	DOL		foggy
2008-01-12T2108	32 55.841	117 22.243	1308	Green4	MASCOT	recovered	MAS		clear slow to 4kts
2008-01-12T2114			1314	Green4				ARCHIVE.005	
2008-01-12T2115			1315	Green4	MASCOT	profile (dark)	MAS		
2008-01-12T2125	32 55.651	117 22.142	1325	Green4	MASCOT	recoverd	MAS		
2008-01-12T2130			1330	Green4	NURADS	recovered	NRD		
2008-01-12T2130			1330	Green4					Depart
	32 45.445	117 15.760	1450	Mission Bay Entrance					
	32 46.619	117 14.965	1515	Mission Bay Dock					

SORTIE-2 Cruise Log **2008-01-12 (PST)** **Friday**

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from http://www.nrlmry.navy.mil/sat_products.html

Local = PST UTC-8

HyperPro File Names

	Code	
SORTIE2_2008-01-xx_GAA	GGR	HSE266 only
SORTIE2_2008-01-xx_GBA	GGR	HSE192 only
SORTIE2_2008-01-xx_PAA	HYP	MPR012, HSE266 100m profile
SORTIE2_2008-01-xx_PBA	HYP	MPR071, HSE235 100m profile
SORTIE2_2008-01-xx_SAA	HYP	MPR012, HSE266 5 casts 10m profile
SORTIE2_2008-01-xx_SBA	HYP	MPR071, HSE235 5 casts 10m profile
SORTIE2_2008-01-xx_TAA	HYT	MPR012, HSE266 surface mode
SORTIE2_2008-01-xx_TBA	HYT	MPR071, HSE235 surface mode

Green1 - Loma Canyon

Mission Bay Dock	32 46.619	117 14.965	755
Mission Bay Entrance	32 45.437	117 15.604	820
Deploy DOLPHIN	32 44.145	117 20.836	845
STN04G2	32 43.500	117 25.500	945
STN01G2	32 45.500	117 28.500	1015
STN02G2	32 43.500	117 28.500	1030
STN03G2	32 45.500	117 25.500	1100
STN04G2	32 43.500	117 25.500	1130
Green1 Station	32 44.500	117 27.000	1145

Aqua Pass 13:28PST 46.7EL

Participants:
Ron Zaneveld
Scott Freeman
Scott McLean

Marlon Lewis

Ken Voss

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments
2008-01-13T1550	32 46.619	117 14.965	750	Mission Bay Dock		depart			Depart
2008-01-13T1615	32 45.445	117 15.760	815	Mission Bay Entrance	In Transit				clear, no fog, no clouds winds light from East
2008-01-13T1645	32 44.145	117 20.836	845	In Transit	Water	sample	SRF		CT43, 44, 45 (700ml)
2008-01-13T1645			845	In Transit	DOLPHIN	deploy	DOL		at 100m isobath
2008-01-13T1650			850	In Transit	DOLPHIN	start log	DOL	SD011308.001	
2008-01-13T1655			855	In Transit	DOLPHIN	start tow	DOL		
2008-01-13T1730			930	STN04G1	DOLPHIN	towing	DOL		
2008-01-13T1732	32 43.528	117 25.612	932	STN04G1	Water	sample	SRF		CT46, 47, 48 (700ml)
2008-01-13T1733			933	STN04G1	DOLPHIN	profile	DOL		slow for profile to 90m
2008-01-13T1736	32 43.550	117 25.748	936	STN04G1	DOLPHIN	towing	DOL		resume tow
2008-01-13T1805	32 45.470	17 28.490	1005	STN01G1	DOLPHIN	towing	DOL		
2008-01-13T1805			1005	STN01G1	Water	sample	SRF		CT49, 50, 51 (700ml)
2008-01-13T1823	32 43.539	117 28.518	1023	STN02G1	DOLPHIN	towing	DOL		
2008-01-13T1841	32 44.477	117 26.978	1041	Green1	Water	sample	SRF		CT52, 53, 54 (700ml)
2008-01-13T1856	32 45.516	117 25.514	1056	STN03G1	DOLPHIN	towing	DOL		
2008-01-13T1915	32 43.565	117 25.510	1115	STN04G1	Water	sample	SRF		CT55, 56, 57 (700ml) aborted CT55
2008-01-13T1929			1129		HyperPro	standing by	HYP		tare MPR12 10.025 tare MPR71 10.192
2008-01-13T1937			1137	Green1	DOLPHIN	profile	DOL		
2008-01-13T1938	32 44.441	117 27.070	1138	Green1	Water	sample	SRF		CT58, 59, 60 (700ml)
2008-01-13T1951			1151	Green1	DOLPHIN	recovered	DOL		
2008-01-13T1952			1152	Green1	NURADS	deployed	NRD		
2008-01-13T1957			1157	Green1	MASCOT	deployed	MAS		Dark
2008-01-13T2000			1200	Green1	MASCOT	start log	MAS	ARCHIVE.006	Dark
2008-01-13T2013	32 44.268	117 27.093	1213	Green1	MASCOT	recovered	MAS		
2008-01-13T2014			1214	Green1	MASCOT	deployed	MAS	ARCHIVE.007	light at 10m
2008-01-13T2028	32 44.219	117 27.073	1228	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_PAA SORTIE2_2008-01-13_PBA	profile to 50m, clear winds <5kts
2008-01-13T2032			1232	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_PAB SORTIE2_2008-01-13_PBB	profile to 50m, clear winds <5kts
2008-01-13T2035			1235	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_SAA SORTIE2_2008-01-13_SBA	multicast 5x10m
2008-01-13T2043			1243	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_SAB SORTIE2_2008-01-13_SBB	multicast 5x10m
2008-01-13T2058			1258	Green1	HyperTSRB	start log	HYT	SORTIE2_2008-01-13_TAA SORTIE2_2008-01-13_TBA	surface
2008-01-13T2105	32 44.200	117 26.912	1305	Green1	HyperTSRB	start log	HYT	SORTIE2_2008-01-13_TAB SORTIE2_2008-01-13_TBB	surface winds 10kts, clear
2008-01-13T2117			1317	Green1	HyperPro/ HyperTSRB	start log	HYP/HYT	SORTIE2_2008-01-13_SAC SORTIE2_2008-01-13_TBC	multicast 5x10m surface
2008-01-13T2122	32 44.146	117 26.790	1322	Green1	HyperPro/ HyperTSRB	start log	HYP/HYT	SORTIE2_2008-01-13_SAD SORTIE2_2008-01-13_TBD	multicast 5x10m surface
2008-01-13T2128			**1328**	Green1	**MODIS AQUA**	**overpass**	**MOA**		**M46.7 max EL**
2008-01-13T2130			1330	Green1	GOES-11 VIS		GOES	20080113.2130.goes11.vis.x.san_diego.x.jpg	
2008-01-13T2130			1330	Green1	GOES-11 VAPOUR		GOES	20080113.2130.goes11.vapour.x.pac-southwest.x.jpg	
2008-01-13T2133	32 44.105	117 26.735	1333	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_PAC SORTIE2_2008-01-13_PBC	profile to 50m, clear winds 10kts
2008-01-13T2137			1337	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_PAD SORTIE2_2008-01-13_PBD	profile to 50m, clear winds 10kts
2008-01-13T2137	32 44.056	117 26.685	1337	Green1	Water	sample	SRF		CT61, 62, 63 (700ml)
2008-01-13T2143			1343	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_SAE SORTIE2_2008-01-13_SBC	multicast 5x10m
2008-01-13T2153			1353	Green1	HyperPro	start log	HYP	SORTIE2_2008-01-13_SAF SORTIE2_2008-01-13_SBD	multicast 5x10m
2008-01-13T2205	32 43.969	117 26.421	1405	Green1	HyperTSRB	start log	HYT	SORTIE2_2008-01-13_TAC SORTIE2_2008-01-13_TBE	surface
2008-01-13T2215			1415	Green1	NURADS	recover	NRD		
2008-01-13T2215			1415	Green1	HyperTSRB	start log	HYT	SORTIE2_2008-01-13_TAD SORTIE2_2008-01-13_TBF	surface winds 10kts, clear
2008-01-13T2224			1424	Green1	Water	sample	SRF		CT64, 65, 66 (700ml)
2008-01-13T2228			1428	Green1	HyperPro/ HyperTSRB	start log	HYP/HYT	SORTIE2_2008-01-13_SAG SORTIE2_2008-01-13_TBG	multicast 5x10m surface
2008-01-13T2236	32 43.831	117 26.271	1436	Green1	HyperPro/ HyperTSRB	start log	HYP/HYT	SORTIE2_2008-01-13_SAH SORTIE2_2008-01-13_TBH	multicast 5x10m surface
2008-01-13T2242	32 43.781	117 26.116	1442	Green1	MASCOT	recovered	MAS		
2008-01-13T2242			1442	Green1					Depart
2008-01-13T2357			1557	San Diego Entrance					
2008-01-14T0030			1630	San Diego Dock					

11 APPENDIX C – SORTIE-2 Data Processing Logs

SORTIE-2 Data Processing Logs:

SORTIE2_AOP_Processing_Log_2008-01-10

SORTIE2_AOP_Processing_Log_2008-01-11

SORTIE2_AOP_Processing_Log_2008-01-12

SORTIE2_AOP_Processing_Log_2008-01-13

SORTIE-2 Processing Log **2008-01-10 (PST)** **Thursday**

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from www.nrlmry.navy.mil

Local = HST UTC-8

ProSoft Processing: ProSoft V7.8.2-RC19 **Data processed: 2008-07-30**

MPR071 (CHORS) Calibration Files: (precruise)

HSE192IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE191IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL180IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR071D.CAL	pressure sensor post-calibration added

MPR012 (Dalhousie) Calibration Files: (precruise)

HSE266FS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE235IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL191HS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR012G.CAL	pressure sensor post-calibration added

Conditions Summary:
Wind: 1m/sec
Waves: 0.5m
Cloud: 0/10

Processing/Data QA: Scott McLean (WETSAT)

Processing Corrections: stray light, thermal responsivity, shutter darks, output restricted to F409 NIST (1996) scale 350-700nm

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments	ProSoft Instrument Config	ProSoft Processing Paramaters	ProSoft Processing Level	ASCII Files Created	SeaBASS Files Created	Header Records Verified	Data QA Check	Uploaded to ftp site	Submitted to SeaBASS	Data Quality	Processing Comments
2008-01-10T1910	32 42.950	117 36.487	2008-01-10T1110	In transit	Global/Diffuse		GGR	SORTIE2_2008-01-10_GAA.RAW	Global HSE266	SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	last few minutes has antenna shadow
				In transit	Global/Diffuse		GGR	SORTIE2_2008-01-10_GBA.RAW	Global HSE192	SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	last few minutes has antenna shadow
2008-01-10T1929	32 42.230	117 36.592	2008-01-10T1129	In transit	Global/Global		GGR	SORTIE2_2008-01-10_GAB.RAW	Global HSE266	SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				In transit	Global/Global		GGR	SORTIE2_2008-01-10_GBB.RAW	Global HSE192	SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-10T2015			2008-01-10T1215	Blue Stataion	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-10_PAA.RAW	aborted	SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	30m aborr due to clouds
				Blue Stataion	HyperPro		HYP	SORTIE2_2008-01-10_PBA.RAW	aborted	SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	30m aborr due to clouds
2008-01-10T2134			2008-01-10T1334	Green1 Station	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-10_PAB.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1 Station	HyperPro		HYP	SORTIE2_2008-01-10_PBB.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-10T2138			2008-01-10T1338	Green1 Station	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-10_PAC.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1 Station	HyperPro		HYP	SORTIE2_2008-01-10_PBC.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-10T2141			2008-01-10T1341	Green1 Station	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-10_SAA.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5,P6), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6), Level 4 MC	Yes	Yes	Yes		EXCELLENT	6 casts logged
2008-01-10T2142			2008-01-10T1342	Green1 Station	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-10_SBB.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	5 casts logged
2008-01-10T2149			2008-01-10T1349	Green1 Station	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-10_SAB.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5,P6,P7), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6,P7), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6,P7), Level 4 MC	Yes	Yes	Yes		POOR	7 casts logged, shadow near surface
				Green1 Station	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-10_SBC.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		POOR	5 casts logged, shadow near surface

SORTIE-2 Processing Log **2008-01-11 (PST)** **Friday**

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from www.nrlmry.navy.mil

Local = HST UTC-8

ProSoft Processing: ProSoft V7.8.2-RC19 **Data processed: 2008-07-30**

MPR071 (CHORS) Calibration Files: (precruise)

HSE192IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE191IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL180IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR071D.CAL	pressure sensor post-calibration added

MPR012 (Dalhousie) Calibration Files: (precruise)

HSE266FS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE235IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL191HS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR012G.CAL	pressure sensor post-calibration added

Conditions Summary:
Wind: 1m/sec
Waves: 0.5m
Cloud: 1/10

Processing/Data QA: Scott McLean (WETSAT)

Processing Corrections: stray light, thermal responsivity, shutter darks, output restricted to F409 NIST (1996) scale 350-700nm

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments	ProSoft Instrument Config	ProSoft Processing Paramaters	ProSoft Processing Level	ASCII Files Created	SeaBASS Files Created	Header Records Verified	Data QA Check	Uploaded to ftp site	Submitted to SeaBASS	Data Quality	Processing Comments
2008-01-11T2141			2008-01-11T1341	G3A	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-11_PAA.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				G3A	HyperPro		HYP	SORTIE2_2008-01-11_PBA.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-11T2145			2008-01-11T1345	G3A	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-11_PAB.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				G3A	HyperPro		HYP	SORTIE2_2008-01-11_PBB.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-11T2149			2008-01-11T1349	G3A	HyperPro	10m MPR012, MPR071	HYP	SORTIE2_2008-01-11_SAA.RAW		SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				G3A	HyperPro	multicast profile to 10m MPR012,	HYP	SORTIE2_2008-01-11_SBA.RAW		SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-11T2154			2008-01-11T1354	G3A	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-11_SAB.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5,P6), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6), Level 4 MC	Level 2s (P1,P2,P3,P4, P5,P6), Level 4 MC	Yes	Yes	Yes		POOR	6 casts logged, shadow near surface
				G3A	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-11_SBB.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		POOR	5 casts logged, shadow near surface
2008-01-11T2213			2008-01-11T1413	G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TAA.RAW	5 casts to 10m	SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface log 5:00
				G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TBA.RAW	5 casts to 10m	SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface log 5:00
2008-01-11T2218			2008-01-11T1418	G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TAB.RAW	5 casts to 10m	SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface log 4:00
				G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TBB.RAW	5 casts to 10m	SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface log 4:00
2008-01-11T2235			2008-01-11T1435	G3A	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-11_SAC.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		POOR	5 casts logged, shadow near surface
				G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TBC.RAW	5 casts to 10m	SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	surface log 3:45
2008-01-11T2239			2008-01-11T1439	G3A	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-11_SAD.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3), Level 4 MC	Level 2s (P1,P2,P3), Level 4 MC	Level 2s (P1,P2,P3), Level 4 MC	Yes	Yes	Yes		POOR	only 3 casts logged - abort too close to ship
				G3A	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-11_TBD.RAW	5 casts to 10m	SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	surface

SORTIE-2 Processing Log **2008-01-12 (PST)** **Saturday**

CTD	CTD/Rosette
HYP	HyperPro
HYT	HyperTSRB
GDF	HyperRef Global/Diffuse
GGR	HyperRef Global/Global
MAS	MASCOT
MOS	MOS ROV
DOL	DOLPHIN
ECO	ECO-VSF3 with pressure
SRF	Surface water sample
MOB	MOBY
SEA	SeaWiFS overpass
MOT	MODIS Terra overpass
MOA	MODIS Aqua overpass
GOES	GOES11 vis from www.nrlmry.navy.mil

Local = HST UTC-8

ProSoft Processing: ProSoft V7.8.2-RC19 **Data processed: 2008-07-30**

MPR071 (CHORS) Calibration Files: (precruise)

HSE192IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE191IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL180IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR071D.CAL	pressure sensor post-calibration added

MPR012 (Dalhousie) Calibration Files: (precruise)

HSE266FS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE235IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL191HS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR012G.CAL	pressure sensor post-calibration added

Conditions Summary:
Wind: 1m/sec
Waves: 0.5m
Cloud: 5/10

Processing/Data QA: Scott McLean (WETSAT)

Processing Corrections: stray light, thermal responsivity, shutter darks, output restricted to F409 NIST (1996) scale 350-700nm

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments	ProSoft Instrument Config	ProSoft Processing Paramaters	ProSoft Processing Level	ASCII Files Created	SeaBASS Files Created	Header Records Verified	Data QA Check	Uploaded to ftp site	Submitted to SeaBASS	Data Quality	Processing Comments
2008-01-12T2015			2008-01-12T1215	Green4	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-12_PAA.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	clouds
				Green4	HyperPro		HYP	SORTIE2_2008-01-12_PBA.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	clouds
2008-01-12T2053			2008-01-12T1253	Green4	HyperPro	profile to 25m MPR012, MPR071	HYP	SORTIE2_2008-01-12_PAB.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	clouds
				Green4	HyperPro		HYP	SORTIE2_2008-01-12_PBB.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		POOR	clouds

SORTIE-2 Processing Log **2008-01-13 (PST)** **Sunday**

CTD	CTD/Rosette	
HYP	HyperPro	
HYT	HyperTSRB	
GDF	HyperRef Global/Diffuse	
GGR	HyperRef Global/Global	
MAS	MASCOT	
MOS	MOS ROV	
DOL	DOLPHIN	
ECO	ECO-VSF3 with pressure	
SRF	Surface water sample	
MOB	MOBY	
SEA	SeaWiFS overpass	
MOT	MODIS Terra overpass	
MOA	MODIS Aqua overpass	
GOES	GOES11 vis from www.nrlmry.navy.mil	

Local = HST UTC-8

ProSoft Processing: ProSoft V7.8.2-RC19 **Data processed: 2008-07-30**

MPR071 (CHORS) Calibration Files: (precruise)

HSE192IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE191IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL180IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR071D.CAL	pressure sensor post-calibration added

MPR012 (Dalhousie) Calibration Files: (precruise)

HSE266FS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPE235IS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration, measured immersion coefficients
HPL191HS.CAL	NIST scale F409, stray light corrected, thermal responsivity coefficients, wavelength calibration
MPR012G.CAL	pressure sensor post-calibration added

Conditions Summary:
Wind: 2.5m/sec
Waves: 0.5m
Cloud: 1/10

Processing/Data QA: Scott McLean (WETSAT)

Processing Corrections: stray light, thermal responsivity, shutter darks, output restricted to F409 NIST (1996) scale 350-700nm

Time/Date (UTC)	Lat	Lon	Time/Date (local)	STATION	OPERATION	ACTION	CODE	LOG FILE	Comments	ProSoft Instrument Config	ProSoft Processing Paramaters	ProSoft Processing Level	ASCII Files Created	SeaBASS Files Created	Header Records Verified	Data QA Check	Uploaded to ftp site	Submitted to SeaBASS	Data Quality	Processing Comments
2008-01-13T2038	32 44.219	117 27.073	2008-01-13T1228	Green1	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-13_PAA.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro		HYP	SORTIE2_2008-01-13_PBA.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2032			2008-01-13T1232	Green1	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-13_PAB.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro		HYP	SORTIE2_2008-01-13_PBB.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2035			2008-01-13T1235	Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SAA.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5,P6), Level 4 MC	(P1,P2,P3,P4, P5,P6), Level 4 MC	(P1,P2,P3,P4, P5,P6), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SBA.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5,P6), Level 4 MC	(P1,P2,P3,P4, P5,P6), Level 4 MC	(P1,P2,P3,P4, P5,P6), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2043			2008-01-13T1243	Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SAB.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SBB.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2058			2008-01-13T1258	Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TAA.RAW		SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBA.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2105			2008-01-13T1305	Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TAB.RAW		SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBB.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2117			2008-01-13T1317	Green1	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-13_SAC.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBC.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2122			2008-01-13T1322	Green1	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-13_SAD.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBD.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2133	32 44.105	117 26.735	2008-01-13T1333	Green1	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-13_PAC.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro		HYP	SORTIE2_2008-01-13_PBC.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2137			2008-01-13T1337	Green1	HyperPro	profile to 50m MPR012, MPR071	HYP	SORTIE2_2008-01-13_PAD.RAW		SORTIE2_MPR012	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro		HYP	SORTIE2_2008-01-13_PBD.RAW		SORTIE2_MPR071	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2143			2008-01-13T1343	Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SAE.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SBE.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
2008-01-13T2153			2008-01-13T1353	Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SAF.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperPro	multicast profile to 10m MPR012, MPR071	HYP	SORTIE2_2008-01-13_SBD.RAW	5 casts to 10m	SORTIE2_MPR071	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		POOR	5 casts logged, shadow near surface
2008-01-13T2205			2008-01-13T1405	Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TAC.RAW		SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBE.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2215			2008-01-13T1415	Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TAD.RAW		SORTIE2_MPR012_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBF.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2228			2008-01-13T1428	Green1	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-13_SAG.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3,P4,P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Level 2s (P1,P2,P3,P4, P5), Level 4 MC	Yes	Yes	Yes		EXCELLENT	
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBG.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface
2008-01-13T2236			2008-01-13T1436	Green1	HyperPro	multicast profile to 10m MPR012	HYP	SORTIE2_2008-01-13_SAH.RAW	5 casts to 10m	SORTIE2_MPR012	SORTIE2_MULTI	Level 1a, 1b, 2s (P1,P2,P3), Level 4 MC	Level 2s (P1,P2,P3), Level 4 MC	Level 2s (P1,P2,P3), Level 4 MC	Yes	Yes	Yes		POOR	Lwn too low
				Green1	HyperTSRB	surface maeasurement	HYP	SORTIE2_2008-01-13_TBH.RAW		SORTIE2_MPR071_Surface	SORTIE_SINGLE	Level 1a, 1b, 2, 2s, 3a, 4	Level 2s, 3a, 4	Level 2s, 3a	Yes	Yes	Yes		EXCELLENT	surface