

Profiling spectro-radiometer data series for cruise Pelagia PE136

Data Originator and Collaborator

Andrew Lane - Proudman Oceanographic Laboratory, UK.
 Dr. Karen Wild-Allen - Napier University, Edinburgh, UK.

Content of data series

Parameter	Unit	Parameter code	Number of stations	Comments
Profile of downwelling irradiance in 6 spectral channels (E_d)	W m ⁻² nm ⁻¹	412ERXUD to 665ERXUD	35	none
Profile of downwelling PAR	μE m ⁻² s ⁻¹	PARERXUD	35	none
Profile of upwelling radiance in 7 spectral channels (L_u)	W m ⁻² nm ⁻¹ sr ⁻¹	412LRXUU to 683LRXUU	35	none
Depth (computed from pressure)	metre	DEPHPR01	35	none
Sea temperature	deg. C	TEMPPR01	35	none
Surface downwelling irradiance in 6 spectral channels (E_s)	W m ⁻² nm ⁻¹	412ERXSD to 665ERXSD	35	none
Surface downwelling PAR	μE m ⁻² s ⁻¹	PARERXSD	35	none
Sub-surface radiometer tilt	degree	PTCHEI01	35	none
Sub-surface radiometer roll	degree	ROLLEI01	35	none
Surface radiometer tilt	degree	PTCHEI02	35	none
Surface radiometer roll	degree	ROLLEI02	35	none
Additional data:				
Secchi disk depth	m	SECCSDNX	26	none

Instrumentation

- Biospherical Instruments Inc. (BSI) Profiling Reflectance Radiometer PRR-600 lowered by hand from the side of the ship. The instrument is equipped with the following standard sensors: standard upwelling radiance and downwelling irradiance arrays (see specifications below), detector array temperature and water temperature and pressure/depth transducers. The instrument was also fitted with BSI's optional dual-axis inclinometer.

- BSI surface reference Radiometer PRR-610 cosine-corrected for surface irradiance. The surface radiometer was fixed on the roof of the ship's bridge for the duration of the cruise. The instrument is equipped with the following standard sensors: downwelling irradiance array and detector array temperature. A dual-axis inclinometer was also fitted on the instrument. The PRR-610 was radiometrically matched and synchronized with the underwater PRR-600 instrument.

Both instruments were calibrated by the manufacturer. Optical calibrations are performed in accordance with the methods outlined by the National Institute of Standards and Technology (NIST), U.S. National Bureau of Standards Technical Note 594-13 and NBS Special Publication 250-20. For radiance calibrations a Spectralon® (Labsphere) plaque functioning as a near-perfect "Lambertian" diffuser with a NIST-traceable working Standard Of Spectral Irradiance was used. The protocol has no formal NIST reference but was systematically reviewed in the context of the NASA-sponsored SeaWIFS Round Robin Intercomparison Experiment (SIRREX).

The configuration used was the standard seven-channel configuration (corresponding to SeaWIFS wavelength bands) with the following channels for subsurface and surface downwelling irradiance: 412 nm , 443 nm, 490 nm, 510 nm, 555 nm, 665 nm and PAR (Photosynthetically Active Radiation covering 400-700 nm). For upwelling radiance the configuration included a 683 nm channel instead of PAR.

Specifications:

- PRR-600 Cosine collector for irradiance sensor is Teflon® supported by quartz, optimized for cosine response in water. Similarly PRR-610 surface reference collector is optimized for use in air.
- Filter photodetectors in the PRR-600 and PRR-610 are specified to 10 ± 1 nm FWHM (Full Width Half Maximum bandwidth) with centre wavelengths designed to hit the SeaWiFS bands while taking into account details such as the viewing geometry of the system. Both the irradiance and radiance detector geometries have been designed to limit the solid angle to 10 degrees, and the filter design has been specified to compensate for this solid angle in arriving at the center wavelengths and bandwidths in the assembled instruments.
- Irradiance array angular response is $\pm 2\%$ from 0 to 65 degrees and $\pm 10\%$ from 65 to 85 degrees.
- Temperature sensor: platinum resistance transducer, range -5 to 35 deg. C, accuracy ± 0.1 deg. C, resolution ± 0.03 deg.C. Time constant is 1 second for a 66% response to a step change in water temperature.
- Pressure/Depth transducer: normally 200 m full scale. Accuracy is $\pm 1\%$ of full-scale accuracy. The sensor is calibrated in metres assuming water density of 1 g/cm^3 .
- Platform orientation sensors: accuracy $\pm 1^\circ$ over $\pm 45^\circ$.

Further information regarding the instrument can be obtained from BSI's web site (<http://www.biospherical.com>).

Sampling strategy

The PRR-600 was deployed between 10:00 and 14:00 GMT as soon as possible before or after hourly CTD casts. The cast was generally immediately followed or preceded by a Secchi disk deployment. Deployment of optical instruments were made from the side of the ship in direct sunlight and the wire angle was kept as near to vertical as possible. However, weather and tidal conditions sometimes made these procedures difficult to achieve.

These optical measurements were complemented with suspended particulate matter analysis on samples collected from the surface layer using the CTD-rosette sampler, the ship's non-toxic water supply and bucket sampling.

BODC processing

In order to standardise parameter units with that held in BODC's parameter dictionary, the following modifications were applied:

- surface and subsurface PAR measurements were converted from $\mu\text{E cm}^{-2} \text{s}^{-1}$ to $\mu\text{E m}^{-2} \text{s}^{-1}$ by multiplying the original values by 10E3.
- narrow-band surface and sub-surface downwelling irradiances were converted from $\mu\text{W cm}^{-2} \text{nm}^{-1}$ to $\text{W m}^{-2} \text{nm}^{-1}$ by dividing the original values by 100.
- narrow-band sub-surface upwelling radiance were converted from $\mu\text{W cm}^{-2} \text{nm}^{-1} \text{str}^{-1}$ to $\text{W m}^{-2} \text{nm}^{-1} \text{str}^{-1}$ by dividing the original values by 100.

The data were then loaded into a database under the ORACLE Relational Database Management System without further modification.

Comments on data quality

The data have not been screened or processed by the originators.