microcasi_metadata_optics

Project Name	Start Date	End Date	Lat range	Lon range
microCASI	2017-09-11	2017-09-14	48.60252 50.22460	-69.0780 -66.3971

Role	Name	Affiliation	Email
PI	Simon Bélanger	UQAR	Simon_Belanger@uqar.ca
Database contact	Véronique Thériault	UQAR	Veronique_Theriault2@uqar.ca

Citation:
Université du Québec à Rimouski. Aquatel Laboratory. (2023). MicroCasi project 2017: mapping of coastal ecosystems, optical data. [Version 1.0] Data published on St. Lawrence Global Observatory-SLGO. [https://slgo.ca]. Access date: [YYYY-MM-DD].

Project Description:
In September 2017, with the collaboration of Fish and Oceans Canada (DFO) and the Canadian Hydrographic Service (CHS), fieldwork was carried along the northern shore of the estuary of the gulf of St-Lawrence in support of airborne hyperspectral imagery acquisition. The main objective of these acquisitions was to map the nearshore coastal ecosystems (e.g. eelgrass meadows, macroalgae, saltmarsh) and derived bathymetry of the nearshore zone. The microCASI sensor was flown on September 11 2017 by the IIC company in the Forestville area and on September 14 2017 in the BSI area. Surface water was sampled at 6 stations in both area for basic bio-optical and biogeochemical parameters, i.e. TSS, fluorometric chlorophyll-a concentration, CDOM and particulate absorption coefficients. Above and in-water radiometry were also measured at 42 different stations. This particular dataset refers to the optical parameters sampled within the water column such as above-water radiometry and reflectance.

Funders:
Fisheries and Ocean Canada (DFO)

Datasets Table of Content

data_dictionary_optics_microcasi.csv

Description:
The “data_dictionary_optics_microcasi.csv” file contains the description and units of all parameters included in each dataset (each csv file). Parameter’s names are based on SeaBass standardized field names when possible (https://seabass.gsfc.nasa.gov/wiki/stdfields).

Dataset Contact:

Name	Affiliation	Email
Veronique Theriault	UQAR	veronique_theriault2@uqar.ca

Instruments:
NA

Sampling and Analysis:
NA

References:
NA

watercolumn_station_microcasi.csv

Description:
This dataset is used as a reference table and contains basic information on stations sampled for optical data parameters. Date, time, latitude, longitude, boat used, water depth, secchi disk and forel-Ule scale are the parameters given for each station. The “station_id” column is the primary key to which other datasets can refer to perform joins.

Dataset Contact:

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Veronique Theriault	UQAR	veronique_theriault2@uqar.ca

Instruments:
NA

Sampling and Analysis:
NA

References:
NA

Ed_cops_long_microcasi.csv

Kd_10p_cops_long_microcasi.csv

Kd_1p_cops_long_microcasi.csv

Rb_cops_long_microcasi.csv

Rrs_cops_long_microcasi.csv

Description:
Optical parameters measured in situ include remote sensing reflectance at sea surface (Rrs), diffuse attenuation coefficient (Kd, at 1 and 10 percent of Ed), downwelling irradiance (Ed) and bottom reflectance (Rb) using the C-OPS. Refer to the “watercolumn_station_microcasi.csv” dataset for additional information on the station sampled, based on the “station_id” column.

Start Date: 2017-09-11
End Date: 2017-09-14

Dataset Contact:

Name	Affiliation	Email
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Instruments:

Instrument Type	Manufacturer	Model	Instrument Features / Calibration
Compact Optical Profiler System (C-OPS)	Biospherical Instruments	SN 13	

<u>Sampling and Analysis:</u>

Sampling: Optical data was gathered both inside and outside the Bay of Sept-Îles. The sampling at sea was made on a fisherman boat based at the Sept-Iles port. Three to five C-OPS profiles were performed on each station. Most of the time, the boats were drifting during the measurements and the instrument was kept outside any disturbance or boat shadow. In very shallow waters (less than 2 m) where tidal currents were strong, the boats were anchored to stay on station and the instruments were transported away from the boat shadows.

Analytical procedure: The C-OPS data were processed in R software with the “Cops” package first developed by Dr. B. Gentili at the Laboratoire d'Océanographie de Villefranche (LOV) and now maintained by Dr S Bélanger (the source code is available at https://github.com/belasi01/Cops). The data processing respects the NASA protocols (Mueller et al. 2003) but additional features have been developed to optimize the data processing.

Wavebands available on the C-OPS systems used from 2016 to 2019.

UQAR SN 13
NA
320
330
340
380
NA
412
443
465
490
510
532
555
NA
589
625
665
683
694
710
780
875

References:

- Mueller, James L et al. 2003. Ocean Optics Protocols For Satellite Ocean Color Sensor Validation , Revision 4 , Volume I: Introduction, Background and Conventions

Rrs_asd_long_microcasi.csv

Description:
Above water reflectance measured with the ASD. Refer to the "watercolumn_station_microcasi.csv" dataset for additional information on the station sampled, based on the "station_id" column.

Start Date: 2017-09-11
End Date: 2017-09-14

Dataset Contact:

Name	Affiliation	Email
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Instruments:

Instrument Type	Manufacturer	Model	Instrument Features / Calibration
Spectroradiometer	Analytical Spectral Device (ASD)	FieldSpec Handheld 2	Calibrated spectralon panel used as reference

Sampling and Analysis:
Sampling: The instrument was used from a boat at each station. The instrument had a spectral resolution of ~3 nm covering a spectral range from 325 to 1075 and was fitted with a bare fiber optic with a 25° field of view (FOV).

Analytical procedure: The remote sensing reflectance (Rrs) was computed following Mobley 1999, based on the total upwelling radiance from the water as measured by the instrument; the skylight reflectance that depends upon the sun-viewing geometry, sea state (i.e., wind speed) and instrument FOV; the sky radiance coming from the direction of specularly reflected sky light; the up-welling radiance and reflectance of the spectralon panel. The instrument integration time and dark current subtraction were systematically applied for each radiance measurement. The solar zenith angle of ~40° and an azimuth difference between the solar and sensor planes between 90 and 135° was chosen to minimize the sun glint contamination (Mobley 1999). The wind speed and sun-view geometry was recorded systematically to perform the sky glint correction. Several methods were tested to correct the sky glint. A total of 9 methods (See https://srscm03.uqar.ca/belasi01/asdsvc for details on methods, Kutser et al, 2013; Jiang et al., 2020; Ruddick et al., 2005, 2006) were compared. The selected method assumes null reflectance in both UV (350-380nm) and in NIR (890-900nm) ranges. These assumptions allow a direct estimation of the fresnel reflectance (r_{sky}) in the UV and NIR. A linear interpolation of r_{sky} was calculated between the UV and NIR to obtain a spectrally varying r_{sky}.

References:

- Mobley 1999,Estimation of the remote-sensing reflectance from above-surface measurements, Applied Optics, 36:38,7442, Optical Society of America,10.1364/AO.38.007442
- Jiang, Dalin, Bunkei Matsushita, and Wei Yang. 2020. “A Simple and Effective Method for Removing Residual Reflected Skylight in Above-Water Remote Sensing Reflectance Measurements.” *ISPRS Journal of Photogrammetry and Remote Sensing* 165 (March): 16–27. https://doi.org/10.1016/j.isprsjprs.2020.05.003.
- Kutser, Tiit, Ele Vahtmäe, Birgot Paavel, and Tuuli Kauer. 2013. “Removing Glint Effects from Field Radiometry Data Measured in Optically Complex Coastal and Inland Waters.” *Remote Sensing of Environment* 133: 85–89. https://doi.org/10.1016/j.rse.2013.02.011.
- Ruddick, Kevin, Vera De Cauwer, and Barbara Van Mol. 2005. “Use of the near Infrared Similarity Reflectance Spectrum for the Quality Control of Remote Sensing Data.” *Proceedings of the SPIE International Symposium on Optics and Photonics: Remote Sensing of the Coastal Oceanic Environment* 2005 (August).
- Ruddick, Kevin G, Vera De Cauwer, Young-Je Park, and Gerald Moore. 2006. “Seaborne Measurements of near Infrared Water-Leaving Reflectance: The Similarity Spectrum for Turbid Waters.” *Limnol. Oceanogr.* 51 (2): 1167–79.