# pmza_metadata_optics

| Project Name | Start Date | End Date | Lat range | Lon range |
|---|---|---|---|---|
| PMZA | 2015-06-03 | 2017-05-17 | 48.6789<br>48.576 | -68.55<br>-68.5942 |

| 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). Optical buoy of the Atlantic Zone Monitoring Program (PMZA-RIKI) 2015 to 2017: optical data [Version 1.0] Data published on St. Lawrence Global Observatory-SLGO. [https://slgo.ca]. Access date: [YYYY-MM-DD].

**Project Description:**
The Atlantic Zone Monitoring Program (AZMP) of Fish and Oceans Canada (DFO), or Programme de Monitorage de la Zone Atlantique (PMZA), includes a network of autonomous oceanographic buoys across the coastal waters of the Maritime provinces of Canada. The station named PMZA-RIKI just in front of Rimouski was equipped with an autonomous buoy in 2002, including multispectral sensors dedicated to satellite validation of radiometric products. In 2015, a project was put in place to assess the quality of the radiometric measurements available at the station PMZA-RIKI in order to use these data for the validation of operational ocean color radiometric products. The station was visited on several occasions from 2015 to 2017 onboard DFO small (i.e. 30-foot length) craft boats. The database includes several datasets (csv files) related to water optical properties and water biogeochemistry. This particular dataset refers to the optical parameters sampled within the water column.

These datasets were partially presented in Belanger et al. 2017 where more details about the sampling and analysis strategies can be found.


- Bélanger, Simon and Carrascal-Leal, Claudia and Jaegler, Thomas and Larouche, Pierre and Galbraith, Peter, 2017. Assessment of radiometric data, Journal of Atmospheric and Oceanic Technology, 4:877-896, Volume 134, doi:10.1175/JTECH-D-16-0176.


**Funders:**

Department of Fisheries and Oceans (DFO)

# Datasets Table of Content

# data_dictionary_optics_pmza.csv

**Description:**
The “data_dictionary_optics_pmza.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_pmza.csv

**Description:**
This dataset is used as a reference table and contains basic information on stations sampled from a boat. 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:**

| Name | Affiliation | Email |
|---|---|---|
| Veronique Theriault | UQAR | veronique_theriault2@uqar.ca |

**Instruments:**
NA

**Sampling and Analysis:**
NA

**References:**
NA

# Ed_cops_long_pmza.csv

# Kd_10p_cops_long_pmza.csv

# Kd_1p_cops_long_pmza.csv

# Rrs_cops_long_pmza.csv

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

Start Date: 2015-06-03
End Date: 2017-05-17

**Dataset Contact:**

| Name | Affiliation | Email |
|---|---|---|
| Simon Bélanger | UQAR | Simon_Belanger@uqar.ca |

**Instruments:**

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

**Sampling and Analysis:**
*Sampling*: On each occasion, 3 to 5 light profiles were carried with a Compact-Optical Profiling System (C-OPS) from boat next to the buoy to determine the AOPs. Most of the time, the boats were drifting during the measurements and the instrument was kept outside any disturbance or boat shadow

*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 system used

| 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

# a_long_pmza.csv

**Description:**

Spectral non-water absorption coefficient (a) measured in situ with the a-sphere. Refer to the "watercolumn_station_pmza.csv" dataset for additional information on the station sampled, based on the "station_id" column.

Start Date: 2015-06-03
End Date: 2017-05-17

**Dataset Contact:**

| Name | Affiliation | Email |
|---|---|---|
| Simon Bélanger | UQAR | Simon_Belanger@uqar.ca |

**Instruments:**

| Instrument Type | Manufacturer | Model | Instrument Features / Calibration |
|---|---|---|---|
| a-sphere | HOBILabs | | Factory calibrated before field campaign |

**Sampling and Analysis:**

*Sampling*: Vertical profiles of the spectral non-water absorption coefficient (*a*) were done from a boat using an a-sphere. The HOBILabs a-sphere is a submersible teflon integrating sphere. The instrument was factory calibrated before the field campaign with pure water. The a-sphere measures the absorption at 1500 wavelengths between 360 and 764 nm, that are binned at 1 nm resolution.

*Analytical procedure*: For the a-sphere, raw data were converted into absorption coefficients using the manufacturer software and calibration files. The parameter was corrected for temperature and salinity as measured with the CTD at the same depth using the coefficients published by Röttgers et al.  2014.

**References:**


- Röttgers, D. McKee, and C. Utschig, 2014. Temperature and salinity correction coefficients for light absorption by water in the visible to infrared spectral region. Opt. Express, 22, 25 093–25 108, doi:10.1364/OE.22.025093.

# bbp_long_pmza.csv

**Description:**
Backscattering coefficient of particles (bbp) measured in situ with the Hydroscat-6. Refer to the "watercolumn_station_pmza.csv" dataset for additional information on the station sample, based on the "station_id" column.

Start Date: 2015-06-03
End Date: 2017-05-17

**Dataset Contact:**

| Name | Affiliation | Email |
|---|---|---|
| Simon Bélanger | UQAR | Simon_Belanger@uqar.ca |

**Instruments:**

| Instrument Type | Manufacturer | Model | Instrument Features / Calibration |
|---|---|---|---|
| HydroScat-6P | HOBILabs | | Factory calibrated before field campaign |

**Sampling and Analysis:**
*Sampling*: Vertical profiles were done from a boat using an hydroscat-6. The Hydroscat-6 measured the volume scattering function at 140º, β(140) with bands centered at 394, 420, 470, 532, 620 and 700 nm.

*Analytical procedure*: The bbp for HS6 is derived from integrating the β(140). Next the attenuation of scattered photons along the detector's viewing pathlength is corrected using the total absorption coefficient measurements from the a-Sphere (see a_long_pmza.csv.) following Doxaran et al. (2016). For the effects of salinity on the pure seawater scattering, correction after Zhang et al (2009) has been performed. The processing has been implemented in the Riops R package (https://github.com/belasi01/Riops) (Araújo and Bélanger, 2022).

**References:**

- Carlos A.S. Araújo, Simon Bélanger, 2022. Variability of bio-optical properties in nearshore waters of the estuary and Gulf of St. Lawrence: Absorption and backscattering coefficients, Estuarine, Coastal and Shelf Science, Volume 264,2022,107688,ISSN 0272-7714,https://doi.org/10.1016/j.ecss.2021.107688.

- Doxaran et al., 2016. D. Doxaran, E. Leymarie, B. Nechad, A. Dogliotti, P. Gernez, E. Knaeps, Improved correction methods for field measurements of particulate light backscattering in turbid waters, Opt Express, 24 (2016), pp. 5415-5436, 10.1364/OE.24.003615.
- Zhang, X., L. Hu, and M.-X. He, 2009: Scattering by pure seawater: Effect of salinity. Opt. Express, 17, 5698–5710, doi:10.1364/OE.17.005698.