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SOP development process

1) Initial SOP was drafted by Patricia López-García, Tom Hull, Sören Thomsen and Johannes Hahn.
2) Two expert sessions during OceanGliders Best Practice Workshop, May 11 - 25 2021. Additional authors joined: Bastien Y. Queste, Gerd Krahmann, Charlotte Williams, Mun Woo, Charitha Pattiaratchi, Laurent Coppola, Tania Morales, Virginie Racape, Claire Gourcuff, John Allen, Eva Alou, Nikolas D. Zarokanellos First community and user feedback was provided during the workshop by attendees.
3) SOP moved to this repository by: Patricia López-García, Tom Hull, Sören Thomsen in September 2021.
4) Next step: Several months of community review on GitHub starting in October 2021.

Introduction

This standard operating procedure (SOP) document for dissolved oxygen (DO) aims to guide the user through the steps necessary for collection of good quality dissolved oxygen using gliders for both real time and post deployment data streams.

Aanderaa Optodes

Aanderaa optodes are the most widely used oxygen sensor on gliders and a large body of work has now been dedicated to their characterisation (e.g. (Bittig et al. 2018)). These sensors are based on the oxygen luminescence quenching of a platinum porphyrin complex (fluorescent indicator) that is immobilized in a sensing foil. These offer low power consumption, good long-term stability, low fouling sensitivity while not being sensitive to H2S or freezing. Aanderaa optodes have seen several important developments since they were introduced in 2002, with various hardware and firmware revisions which we outline below.

Hardware design: blue or black

While mostly cosmetic, the colour of the optode is a useful short-hand for the two main optode designs. The 3835 and 4835 optodes both feature a black housing with the temperature sensor integrated into the base of the sensor near the connector. This results in a large thermal mass and increases the response time of the temperature sensor significantly. The blue 4330 and 4831 sensors move the thermistor next to the sensing foil which results in much improved performance of the temperature sensor. All optodes other than the 4831 use a 10 pin Lemo connector, these connectors can't be connected when wet and are prone to crevice corrosion. The 4831 is therefore recommended with it's Subconn wet-pluggable connector. Older optode versions (3830) have a titanium housing in the same form factor as the 3835. Some early Slocum gliders were delivered with optodes of type 5013, these are identical to the 3830.

Foil type: F or standard

Most optodes use the PreSens PSt3 foil (PreSens - Precision Sensing GmbH), these have as standard a black opaque protective layer protecting the pink sensing layer. For glider applications the "F" type foils are typically preferred as these remove the opaque layer which results in much faster diffusion across the foil, and therefore faster sensor response (8 s compared to ~ 25 s (Bittig et al. 2014)). However, removal of the protective layer makes the foil more susceptible to UV radiation, and is known to reduce the sensor stability, especially when exposed to strong sunlight. Newer 4330F and 4831F optodes (Since July 8th 2018) use an improved formulation of the Presens fast foil which are less sunlight sensitive and have much lower noise levels. These can be identified by their white appearance. It is recommended that older F-type instruments (with the pink foils) are upgraded with these improved foils. Otherwise foils should typically not be replaced unless mechanically damaged (light intrusion) as older foils perform better, with less drift than new ones.

RBR coda T.ODO

JFE Advantech RINKO

Pre-deployment operations

Storage and cleaning

Sensor integration

Pre-deployment calibration

Missions execution

Real time data processing & Quality Control

Post-recovery operations and calibrations

Delayed Mode Quality Control (DMQC)

Data delivery to public open access archives

Acknowledgement

The coordination of producing this document was supported by the European Commission via the EuroSea.eu project under H2020 funding (Grant agreement 862626) and GROOM || Horizon 2020 research and innovation programme (Grant agreement No 951842).

Patricia Lopez-Garcia was supported by TechOceanS project which received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000858 (TechOceanS). This output reflects only the author's view and the Research Executive Agency (REA) cannot be held responsible for any use that may be made of the information contained therein.

Tom Hull was supported by "Alternative framework to assess marine ecosystem functioning in shelf seas" (https://projects.noc.ac.uk/altereco/). AlterEco represents a pilot study of a novel monitoring framework to deliver improved spatiotemporal understanding of key shelf sea ecosystem drivers through the use of autonomous systems, primarily underwater gliders. It was funded by the UK National Environment Research Council (NERC), the UK government's Department for Environment, Food and Rural Affairs (Defra), the World Wide Fund for Nature (WWF) grant numbers NE/P013899/1, NE/P013902/2, NE/P013740/1 and NE/P013864/1.

This work also contributes to the MOOSE network, which is funded by the CNRS-INSU and the French Ministry for Education and Research (ILICO).

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