

Quality Issue #002: CDOM drift

| Issue number: 2 | | | |
|--|------------|---|----------------------------------|
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| Version | Date | Comments | Authors |
| 1 | 2023-07-07 | Creation of document | Chiara Monforte and Callum Rollo |
| 2 | 2023-07-28 | Added info on new missions: SEA069_M15; SEA077_M24 and SEA078_M14 | Chiara Monforte |
| 3 | 2023-08-21 | Correction of a typo of flag value in the legend table | Chiara Monforte |
| 4 | 2023-09-21 | Added info on new mission: SEA056_M64; SEA079_M14 and SEA076_M19 | Chiara Monforte |
| 5 | 2023-10-06 | Added info on new mission: SEA077_M25 and SEA078_M15 | Chiara Monforte |
| 6 | 2023-11-13 | Added info on new mission: SEA079_M16 | Chiara Monforte |
| 7 | 2023-11-20 | Added info on new mission: SEA066_M52 and SEA076_M21 | Chiara Monforte |
| 8 | 2023-12-07 | Added info on new mission: SEA077_M28 and SEA078_M19 | Chiara Monforte |
| 9 | 2024-01-08 | Added info on new mission: SEA076_M22 and SEA079_M18 | Chiara Monforte |
| 10 | 2024-01-10 | Added info on new mission: SEA077_M29 and . Corrected info on mission SEA066_M52 | Chiara Monforte |
| 10 | 2024-01-10 | Corrected info on mission SEA076_M21 and SEA076_M22 | Chiara Monforte |
| 11 | 2024-01-30 | Added info on mission SEA068_M30 | Chiara Monforte |
| 12 | 2024-02-08 | Added info on mission SEA078_M22 and SEA076_M24 | Chiara Monforte |
| 13 | 2024-03-08 | After long communication with the sensor manufacturer (Sea-Bird Scientific) and having observed stable results since the removal of the copper plate, we have decided to removed the suspect flags described as 'D' in this report and classify data as good ('A' in this report). This change applies to all mission after November 2022 (unless otherwise specified in the table below) | Chiara Monforte |

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1 Introduction

An ongoing issue affects CDOM in glider with the FLBBCD sensor deployed from 2022-09-01. In the affected datasets, CDOM values show a temporal decrease. From 2022-12-01, the protective copper plate covering the sensor was removed on all the gliders deployed in Bornholm and Gotland. This resolved the temporal decrease, but some sensors displayed a temporal increase. Investigation is ongoing and data quality remains uncertain. All affected datasets have been flagged. Check the variable `cdom_qc`. The table below (Table 1) shows an updated list of all the mission deployed with a FLBBCD sensor, color-coded by severity. Flag column corresponds to data quality: suspect (3), fail (4), and good (1).

Table 1: Info summary for all the missions deployed with a FLBBCD sensor. The different basins mentioned in the ‘Location’ column, follow the division made by HELCOM which is shown in A.1

| Glider | Mission | Location | Mission Start date | Sensor Serial | Issue description | Flag |
|---------------|---------|---|--------------------|---------------|-------------------|------|
| SEA044 | 25 | Skagerrak | 2020-08-20 | 5948 | A | 1 |
| SEA055 | 16 | Bornholm Basin | 2020-10-31 | 5925 | A | 1 |
| SEA066 | 52 | Western Gotland Basin | 2023-11-18 | 7564 | A | 1 |
| SEA068 | 27 | Eastern Gotland Basin | 2022-07-27 | 7564 | B | 4 |
| | 30 | Bornholm Basin | 2024-01-30 | 7564 | A | 1 |
| SEA069 | 15 | Bornholm Basin | 2023-07-26 | 7564 | A | 1 |
| SEA076 | 8 | Bornholm Basin | 2022-10-05 | 7485 | B | 4 |
| | 9 | Bornholm Basin | 2022-10-20 | 7485 | B | 4 |
| | 13 | Northern Baltic Proper, Eastern Gotland Basin | 2023-01-13 | 7485 | A | 1 |
| | 16 | Eastern Gotland Basin, Northern Baltic Proper | 2023-04-11 | 7485 | A | 1 |
| | 17 | Western Gotland Basin | 2023-06-20 | 7485 | A | 1 |
| | 19 | Western Gotland Basin | 2023-09-06 | 7485 | A | 1 |
| | 21 | Åland Sea | 2023-11-17 | 8201 | E | 4 |
| | 22 | Western Gotland Basin | 2024-01-07 | 8201 | E | 4 |
| | 22 | Åland Sea | 2024-02-07 | 8201 | E | 4 |
| SEA077 | 11 | Bornholm Basin | 2022-09-06 | 7522 | B | 4 |
| | 12 | Bornholm Basin | 2022-10-03 | 7522 | B | 4 |
| | 13 | Bornholm Basin | 2022-10-12 | 7522 | B | 4 |
| | 15 | Bornholm Basin | 2022-11-13 | 7522 | B | 4 |
| | 17 | Bornholm Basin | 2022-12-08 | 7522 | C | 4 |
| | 18 | Bornholm Basin | 2023-01-10 | 7522 | C | 4 |
| | 21 | Eastern Gotland Basin | 2023-03-16 | 7522 | A | 1 |

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Table 1: Info summary for all the missions deployed with a FLBBCD sensor. The different basins mentioned in the ‘Location’ column, follow the division made by HELCOM which is shown in A.1 (Continued)

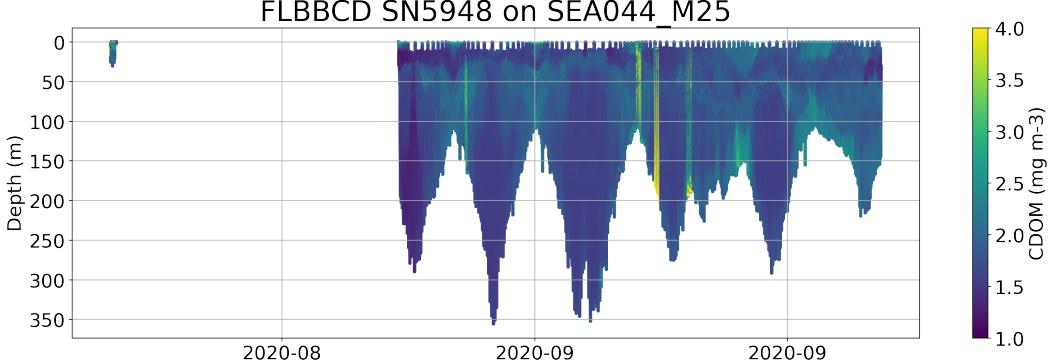
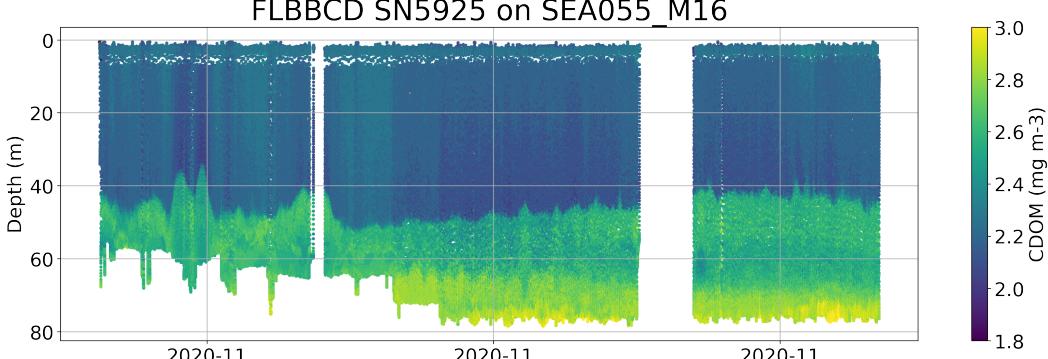
| | | | | | | |
|---------------|----|--|------------|------|---|----|
| | 22 | Eastern Gotland Basin, Northern Baltic Proper | 2023-05-16 | 7522 | A | 13 |
| | 24 | Eastern Gotland Basin, Northern Baltic Proper | 2023-07-28 | 7522 | A | 1 |
| | 25 | Eastern Gotland Basin, Northern Baltic Proper | 2023-10-06 | 7522 | A | 1 |
| | 28 | Eastern Gotland Basin, Northern Baltic Proper | 2023-12-06 | 7522 | A | 1 |
| | 29 | Åland Sea | 2023-12-06 | 7522 | A | 1 |
| SEA078 | 11 | Northern Baltic Proper, Eastern Gotland Basin | 2023-03-16 | 7563 | A | 1 |
| | 12 | Eastern Gotland Basin | 2023-05-16 | 7563 | A | 1 |
| | 14 | Western Gotland Basin | 2023-07-28 | 7563 | A | 1 |
| | 15 | Western Gotland Basin | 2023-10-06 | 7563 | A | 1 |
| | 19 | Western Gotland Basin | 2023-12-06 | 7563 | A | 1 |
| | 22 | Northern Baltic Proper, Eastern Gotland Basin | 2024-02-06 | 7563 | A | 1 |
| SEA079 | 9 | Northern Baltic Proper, Eastern Gotland Basin | 2023-02-14 | 7619 | A | 1 |
| | 11 | Eastern Gotland Basin | 2023-04-11 | 7619 | A | 1 |
| | 12 | Eastern Gotland Basin, Northern Baltic Proper | 2023-06-20 | 7619 | A | 1 |
| | 14 | Eastern Gotland Basin, Northern Baltic Proper | 2023-09-06 | 7619 | A | 1 |
| | 16 | Eastern Gotland Basin, Northern Baltic Proper | 2023-11-11 | 7619 | A | 1 |
| | 18 | Eastern Gotland Basin, Northern Baltic Proper | 2024-01-07 | 7619 | A | 1 |

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| Legend | | Flag |
|--------|---|------|
| A | Data is good | 1 |
| B | Apparent temporal decrease in the intensity of the CDOM signal. Cause unknown. | 4 |
| C | Apparent temporal increase in the intensity of the CDOM signal. Cause unknown. In this mission, the protective copper plate over the CDOM sensor was removed. | 4 |
| D | Previous deployments with this sensor showed a temporal decrease in CDOM. The copper plate protecting the optics sensor was removed and this issue appears to be resolved in this mission. The issue with the sensor has not yet been identified, further controls are recommended. | 3 |
| E | High values of CDOM raw counts. The cause of the issue is still unknown. The relative variability may be intact but absolute values are unreliable. | 4 |

2 Examples

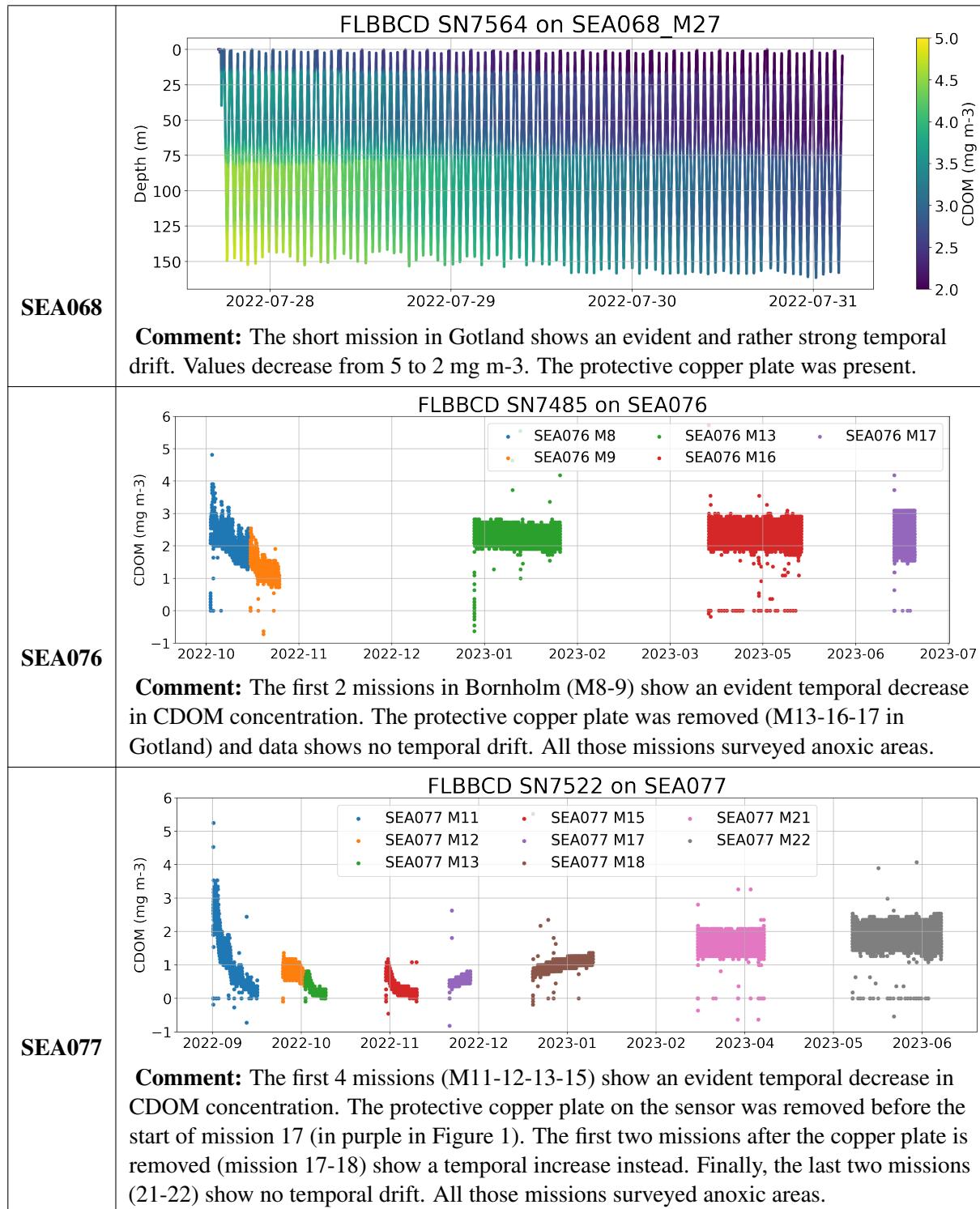
Table 2: CDOM data for each glider to highlight the evolution of the observed issue.

| Glider | Plots |
|--------|---|
| SEA044 | <p style="text-align: center;">FLBBCD SN5948 on SEA044_M25</p>  <p>Comment: This mission in summer 2020 in Skagerrak showed no temporal drift. The protective copper plate was present.</p> |
| SEA055 | <p style="text-align: center;">FLBBCD SN5925 on SEA055_M16</p>  <p>Comment: This mission in late 2020 in Bornholm, where the glider surveys anoxic water, showed no temporal drift. The protective copper plate was present.</p> |

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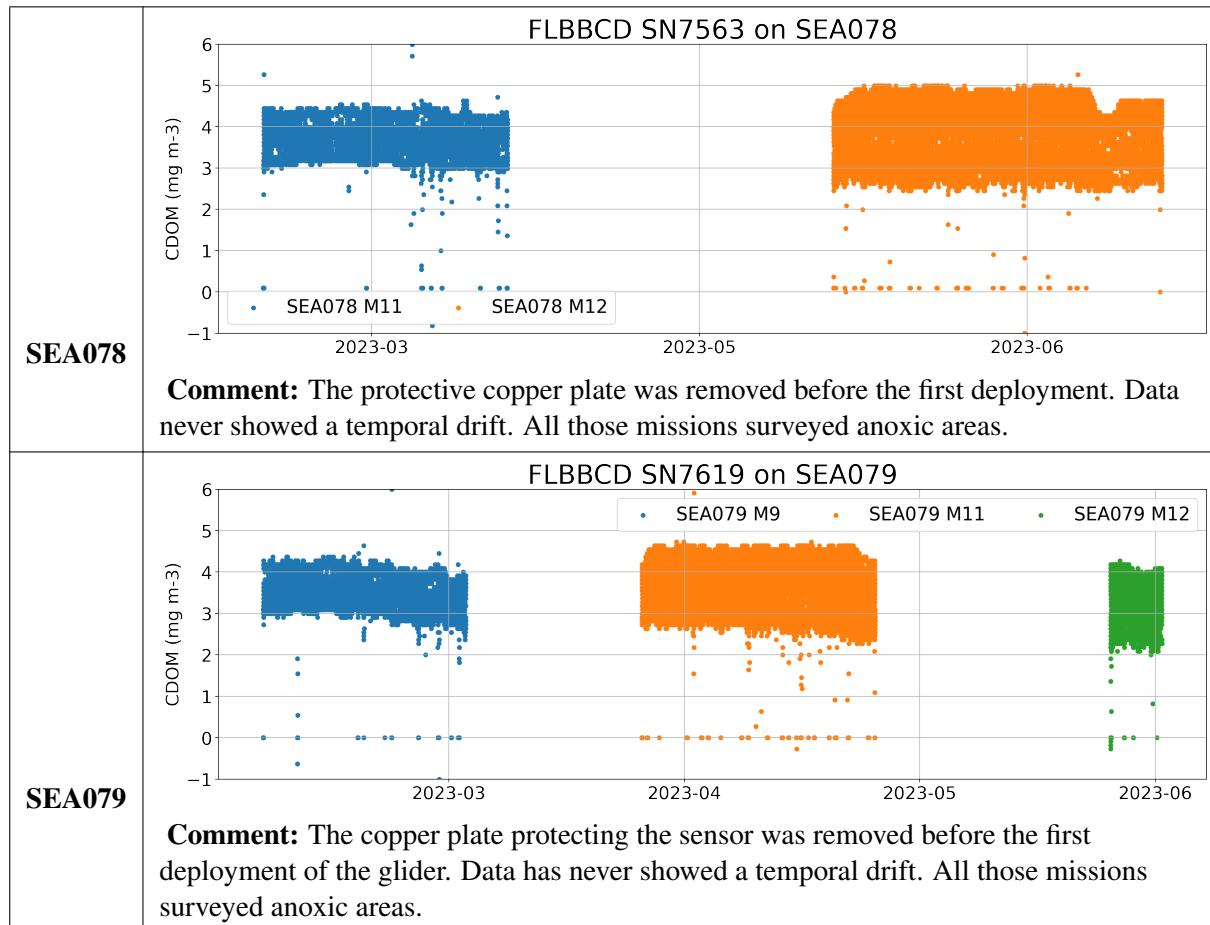
Table 2: CDOM data for each glider to highlight the evolution of the observed issue. (Continued)



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A Appendix



Figure A.1: Map of the Baltic Sea showing the 17 sub-basins (Map taken from <http://stateofthebalticsea.helcom.fi/in-brief/our-baltic-sea/>)