

Quality Issue #001: RINKO-AROD-FT optodes

Issue number: 1			
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Version	Date	Comments	Authors
1	2023-07-07	Creation of document	Chiara Monforte and Callum Rollo

1 Introduction

A fault has affected dissolved oxygen concentration values on all gliders with the AROD RINKO dissolved oxygen sensor deployed from 2022-12-01. In the affected datasets, oxygen concentration is around 100 $\mu\text{mol m}^{-3}$ less than expected. This offset decreased during the mission at a non linear rate. All affected datasets have been flagged with the variable `oxygen_concentration_qc`. We are working to fix the affected sensors.

The table below (Table 1) shows an updated list of all the mission deployed after 2022-12-01 with an AROD RINKO 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 mission deployed after 2022-12-01 with an AROD RINKO sensor. The different basins mentioned on 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
SEA076	13	Northern Baltic Proper, Eastern Gotland Basin	2023-01-13	41	C	3
	16	Eastern Gotland Basin, Northern Baltic Proper	2023-04-11	66	D	4
	17	Western Gotland Basin	2023-06-20	66	E	4
SEA055	52	Skagerrak, Kattegat	2022-12-01	58	C	3
	53	Skagerrak, Kattegat	2022-12-21	58	C	3
	54	Skagerrak, Kattegat	2023-01-20	58	C	3
	56	Skagerrak, Kattegat	2023-02-27	58	B	4
SEA045	73	Bornholm Basin	2022-12-16	39	C	3
	74	Bornholm Basin	2023-02-02	39	B	4
	75	Bornholm Basin	2023-03-16	39	B	4
	79	Bornholm Basin	2023-05-30	58	E	4
SEA063	55	Bornholm Basin	2023-03-01	71	C	3
	60	Bornholm Basin	2023-04-22	39	D	4
SEA079	9	Northern Baltic Proper, Eastern Gotland Basin	2023-02-14	69	B	4
	11	Eastern Gotland Basin	2023-04-11	68	D	4

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Table 1: Info summary for all the mission deployed after 2022-12-01 with an AROD RINKO sensor. The different basins mentioned on the 'Location' column, follow the division made by HELCOM which is shown in A.1 (Continued)

	12	Eastern Gotland Basin	2023-06-20	69	E	4
SEA044	72	Skagerrak, Kattegat	2023-02-06	70	B	4
	75	Skagerrak, Kattegat	2023-03-18	70	C	3
	77	Skagerrak, Kattegat	2023-04-14	70	D	4
	78	Skagerrak, Kattegat	2023-05-04	70	D	4
	79	Skagerrak, Kattegat	2023-05-31	70	D	4
	81	Skagerrak, Kattegat	2023-06-16	70	D	4
SEA067	41	Bornholm Basin	2023-04-04	39	D	4
	42	Bornholm Basin	2023-05-09	67	D	4
	44	Bornholm Basin	2023-06-18	58	D	4
SEA077	21	Eastern Gotland Basin	2023-03-16	66	B	4
	22	Eastern Gotland Basin, Northern Baltic Proper	2023-05-16	41	D	4
SEA056	56	Bornholm Basin	2022-12-09	50	C	3
	57	Bornholm Basin	2022-12-17	50	C	3
	62	Bornholm Basin	2023-05-09	69	D	4
SEA078	11	Northern Baltic Proper, Eastern Gotland Basin	2023-03-16	68	B	4
	12	Eastern Gotland Basin	2023-05-16	71	D	4

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Legend		Flag
A	Data is good	1
B	Deterioration of the foil has caused uncorrectable errors in the dissolved oxygen concentration. Values are observed to be substantially lower than the reference CTD cast at deployment. There is an apparent non-linear temporal increase in dissolved oxygen concentration throughout the mission.	4
C	Dissolved oxygen concentration values may be inaccurate. Deterioration of the foil has caused uncorrectable errors and non-linear temporal drift in other missions with this sensor during this timeframe. We have not observed issues in this particular mission, but we recommend caution when using this data.	3
D	The absolute values of the oxygen data can be unreliable. The relative variability is confirmed to be valid and no temporal drift exist has been observed. Absolute values may be inaccurate and lower than reference data. Re-calibration of the sensor is required.	4
E	Following issues with the oxygen sensor, a 2-point calibration has been performed (the exact date can be found in the mission metadata). This 2-point calibration has been applied to the data. The values at 0 and 100 % saturation are accurate. Absolute values between these two extremes may be inaccurate. The relative variability is confirmed to be valid and no temporal drift occurs. During tests, values outside the manufacturer acceptance range have been observed when compared to the output from a reference sensor. This issue is particularly evident around 100µmol/l.	4

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2 Examples

Few example missions from the Gotland Basin are shown below (Figure 1). Oxygen saturation over depth is presented and data is colored by time (in days since deployment). Some missions exhibit an evident temporal drift (SEA079_M9; SEA077_M21; SEA078_M11) with saturation values increasing from around 50% to just below 100% in about 25 days.

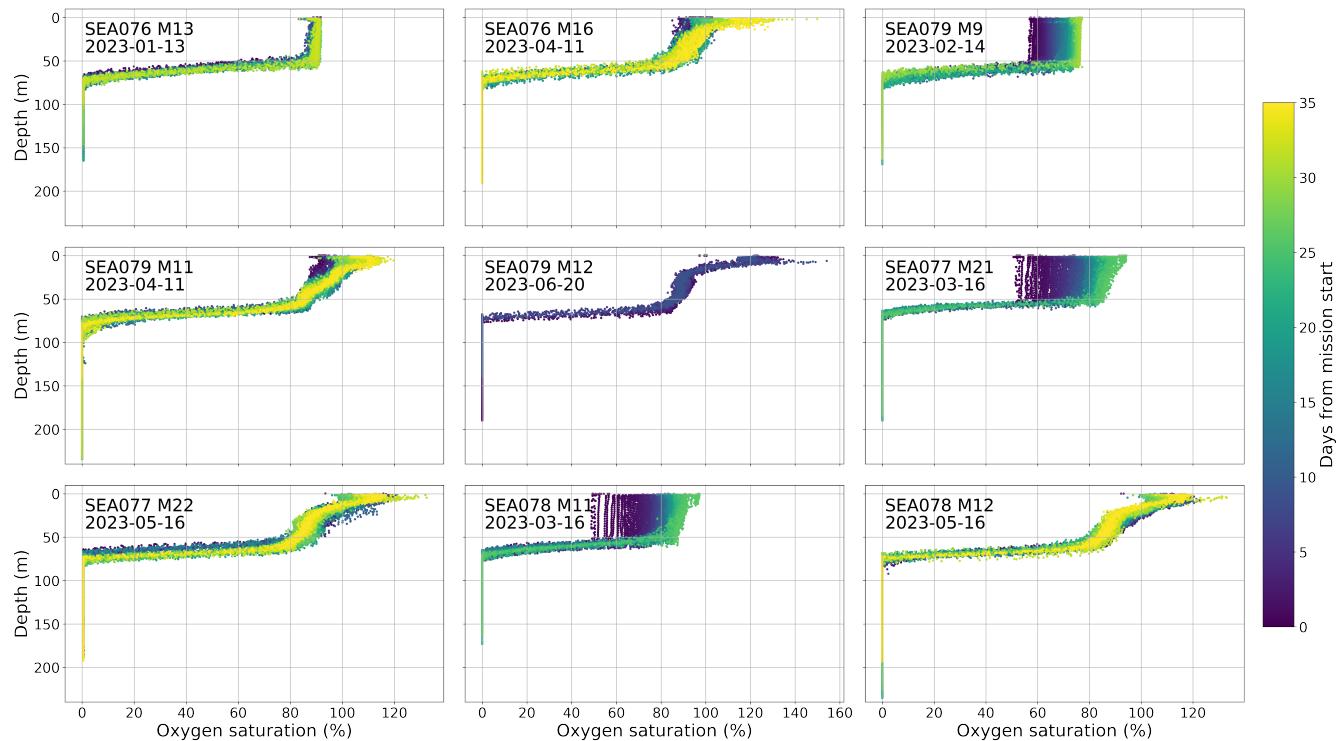


Figure 1: Oxygen saturation plotted over depth and colored by time (in days since deployment) for 9 missions in the Gotland Basin. Glider serial and mission number as well as the deployment date are noted on the top left of each subplot.

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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/>)