CRUISE REPORT

R/V Aranda

Cruise 5/2021

EuroArgo-Matka

17. May - 27. May 2021

This report is based on preliminary data and is subject to changes.

CRUISE 5/2021, EUROARGO RISE MATKA
17. May - 27. May 2021

Chief scientist: Simo-Matti Siiriä

INTRODUCTION

The main targets for this cruise were hydrographic measurements of the state of The Bothnian sea, and installation, replacement and maintenance of measurement equipment.

Hydrographic measurements aimed to study the water exchange and circulation on the area, as well as to function as reference data for circulation models. Main work here was done in Bothnian Sea, where a grid of 8x7 CTD points was measures, once completely and another time with selected snits due time constrains. In addition to this, CTD profiles were measured through the Archibelago sea on the way to Bothnian Sea, and through Aland Sea and Lagskär deep on return trip. Total 143 CTD profiles were measured during the cruise. Additionally water samples were taken from the measuring points through Archipelago Sea. Locations of CTD measurements can be seen in Figure 1, and the measuring points in Appendix 1.

The equipments installed consisted in total of 6 Argo floats; two Apex to replace active FMI floats, (old ones were were also recovered), two Arvor with RBR CTD sensors for testing, two Provor, one with RAMSES irradiance sensor, one with SUNA nitrate sensor (which malfunctioned and was lost). RBR and Provor float deployments were part of the EuroArgo-Rise program. Gotlands Wave buoy was replaced. 2 ADCP and 2 single-point current meters were installed near IU 2 and IU 3 on Archipelago, and one wave buoy and a single-point current meter was installed ear fishery close to Eurajoki. Locations for each devices can be seen on Figure 1.

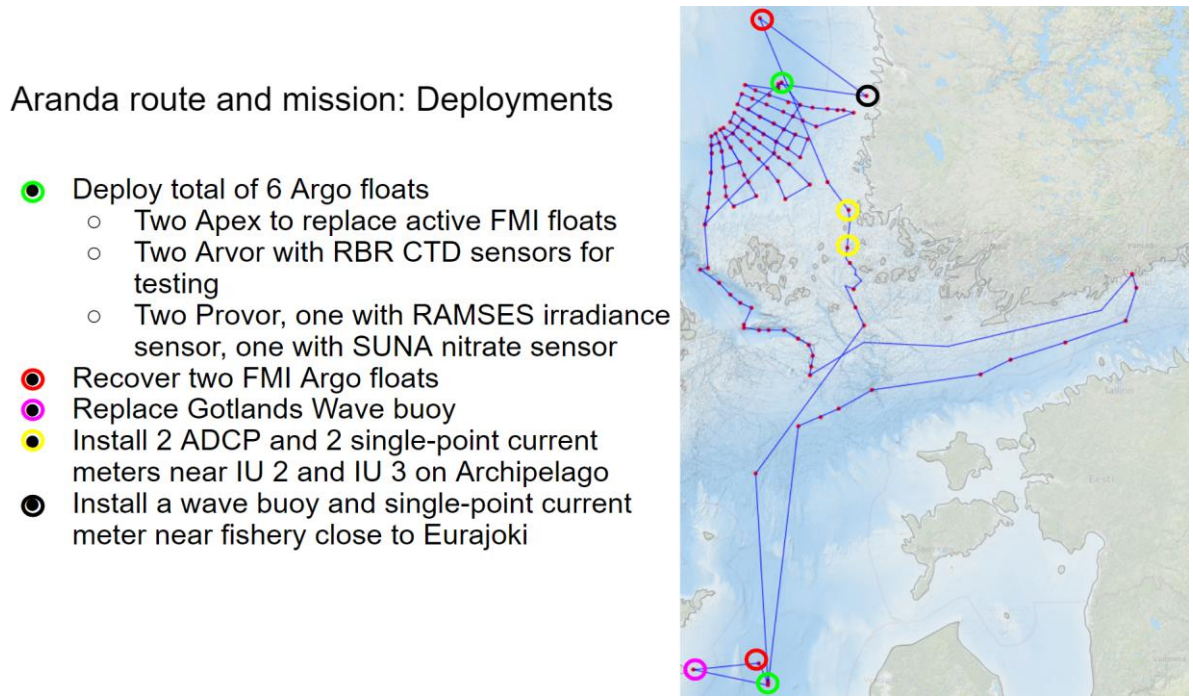

Figure 1: Route map with CTD measurement points, and installed instruments indicated.

OBSERVATIONS

Total of 143 CTD profiles were measured during the cruise. Quick overview of the temperature salinity and oxygen situation througout the cruise can be seen in figure 2. As the profiles are plotted on time axis, the leftmost part show the measurements on the Gulf of Finalnd and Baltic Proper, following shallow part measurements on Archipelago Sea. Main part on the middle is the grid measurements performed on the Bothnian Sea, (Further on Figures 3. – 5.). Rightmost part is the measurements through Ålands Sea and Lågskär.

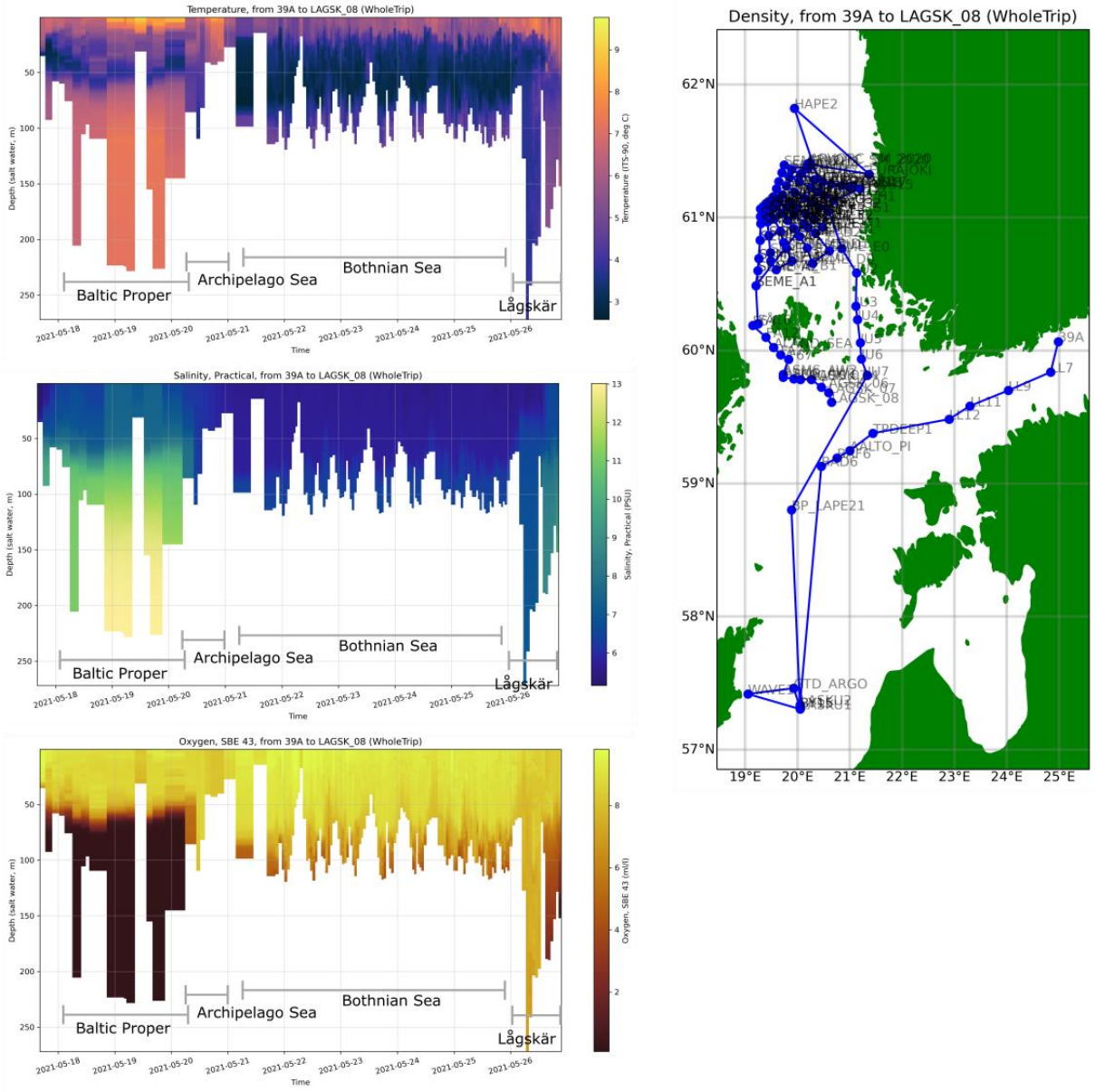

Figure 2: Temperature (up), salinity (middle) and Oxygen measurements throughout the cruise. X axis is measurement time. Map on the right shows the route starting from Helsinki.

Observations on Bothnian Sea

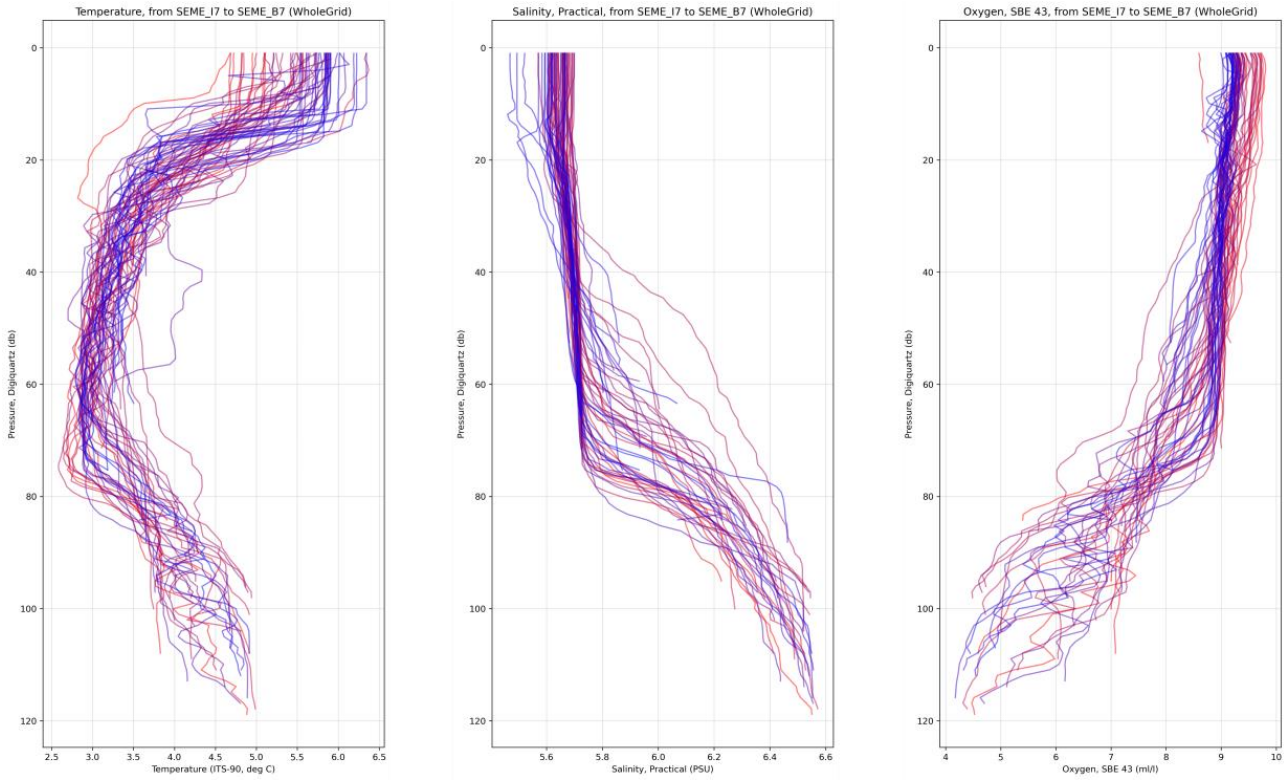

Figure 3: Profile clouds from the CTD measurements on the Bothnian Sea. Left: Temperature , Middle: Salinity, Right: Oxygen.

In oprder to measure short tame changes on the stratification of the Bothnian Sea, we managed to measure part of the Bothnian Sea Grid twice. Some changes on the structure were seen between these two runs. Figure 4. shows selected snits on the grid on the first run. In figure 5. can be see comparison of one snit to the measurements took roughly 2.5 days later. It can be seen that the fluctuation of the watermasses have moved the dense water peak considerably.

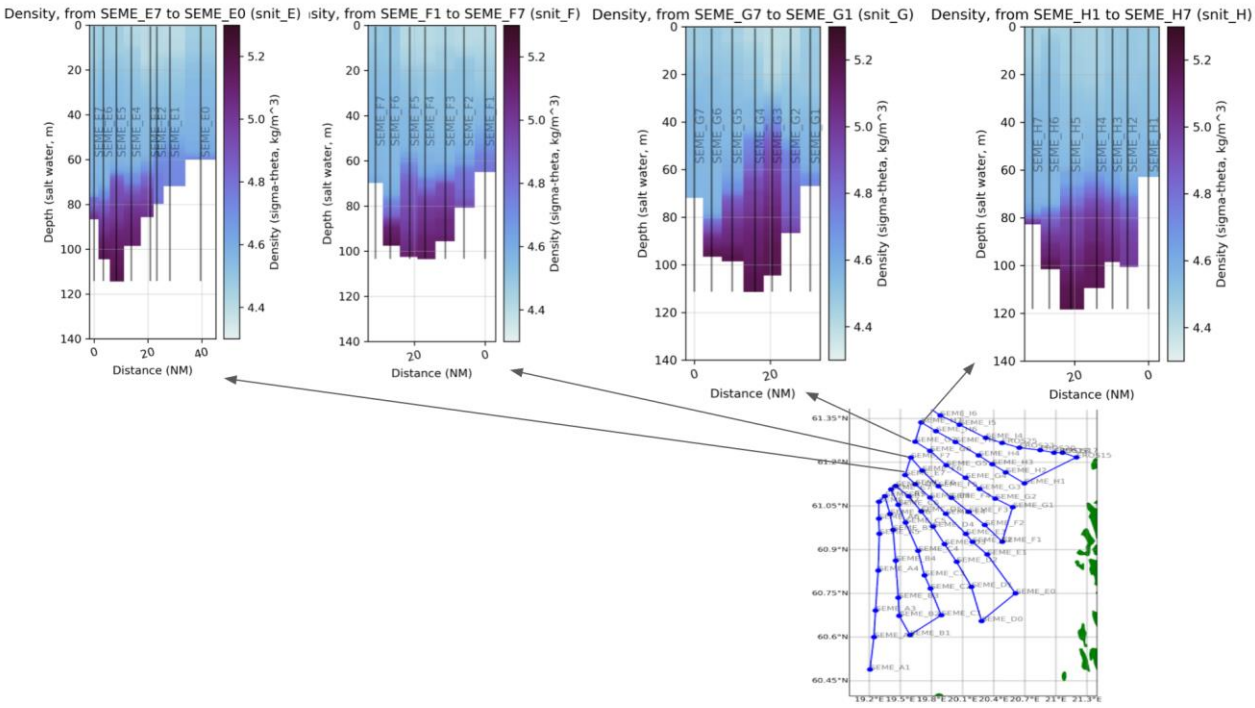

Figure 4: Density measurements on the snits with the first, complete run.

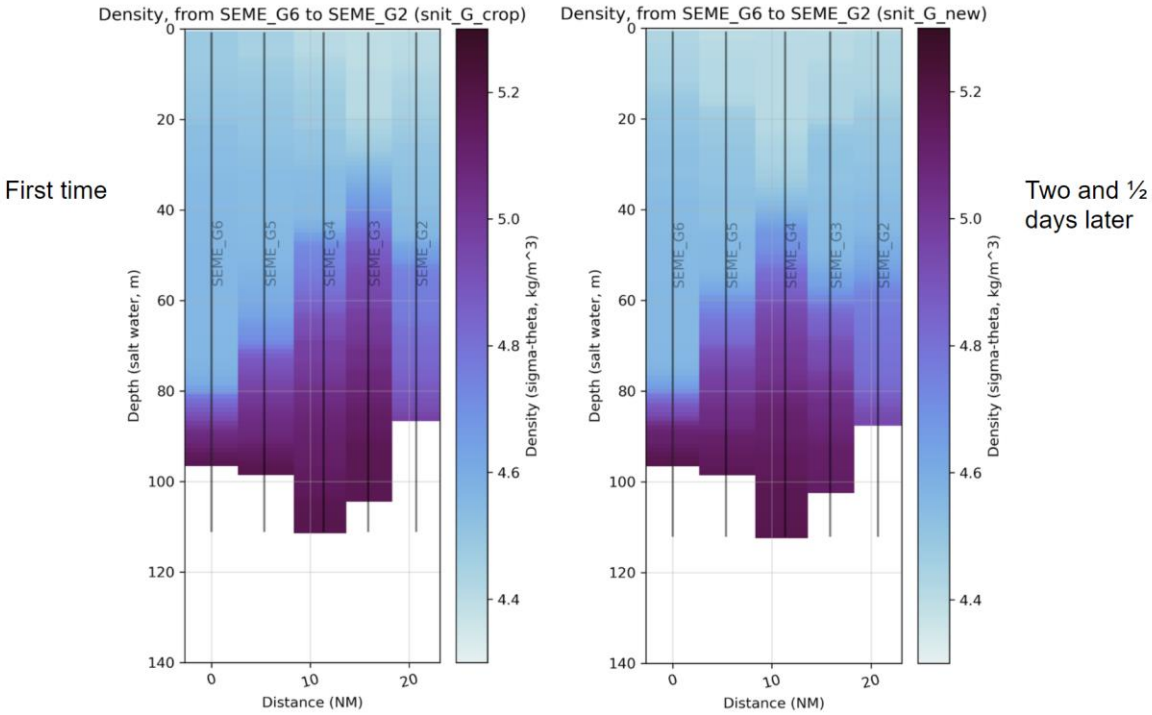

Figure 5: Comparison of snit G2. Changes in water density profiles within 2.5 days.

Observations on Gulf of Finland, Baltic Proper, Archipelago

CTD measurements from the Gulf of Finland can be seen on Figure 6. Measurements on Baltic Proper, on Figure 7. and the measurements on Archipelage on Figure 8.

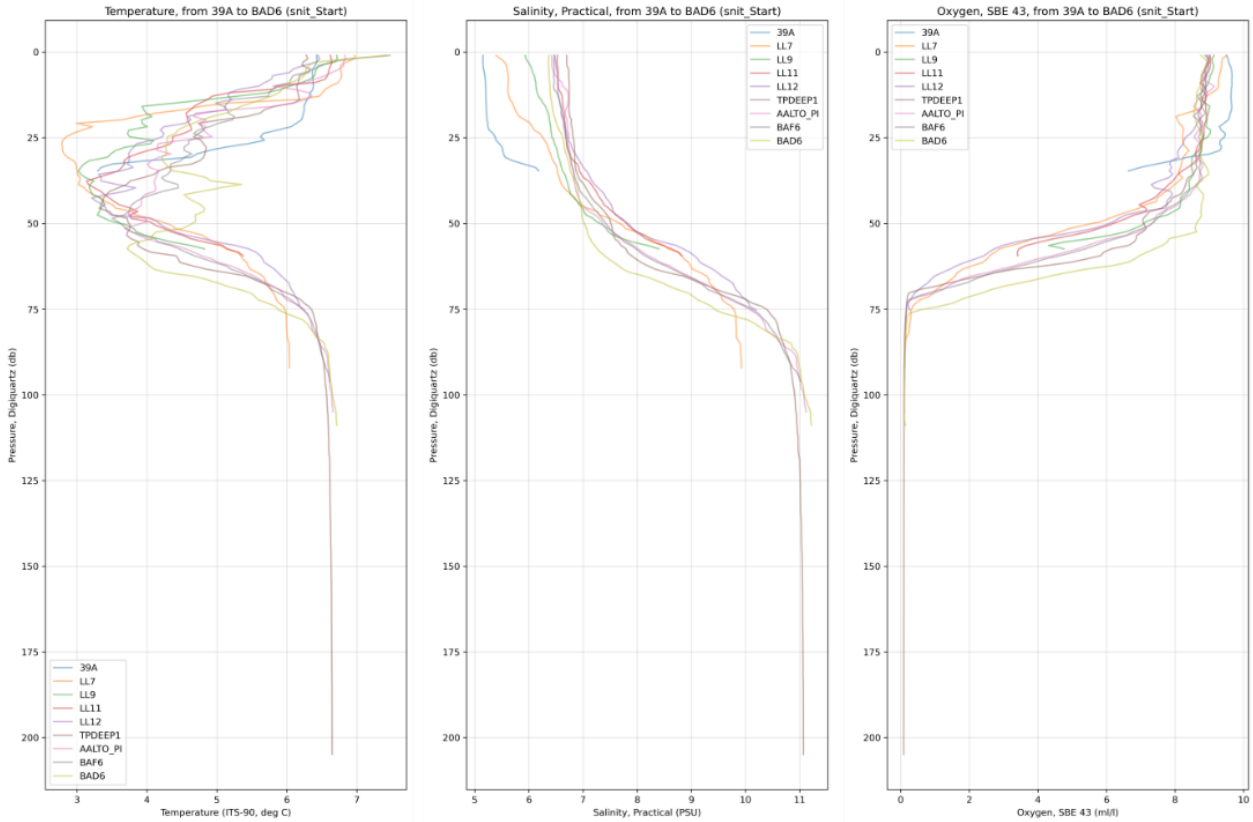

Figure 6: Measurements from Gulf of Finland. Left: Temperature, Middle: Salinity, Right: Oxygen

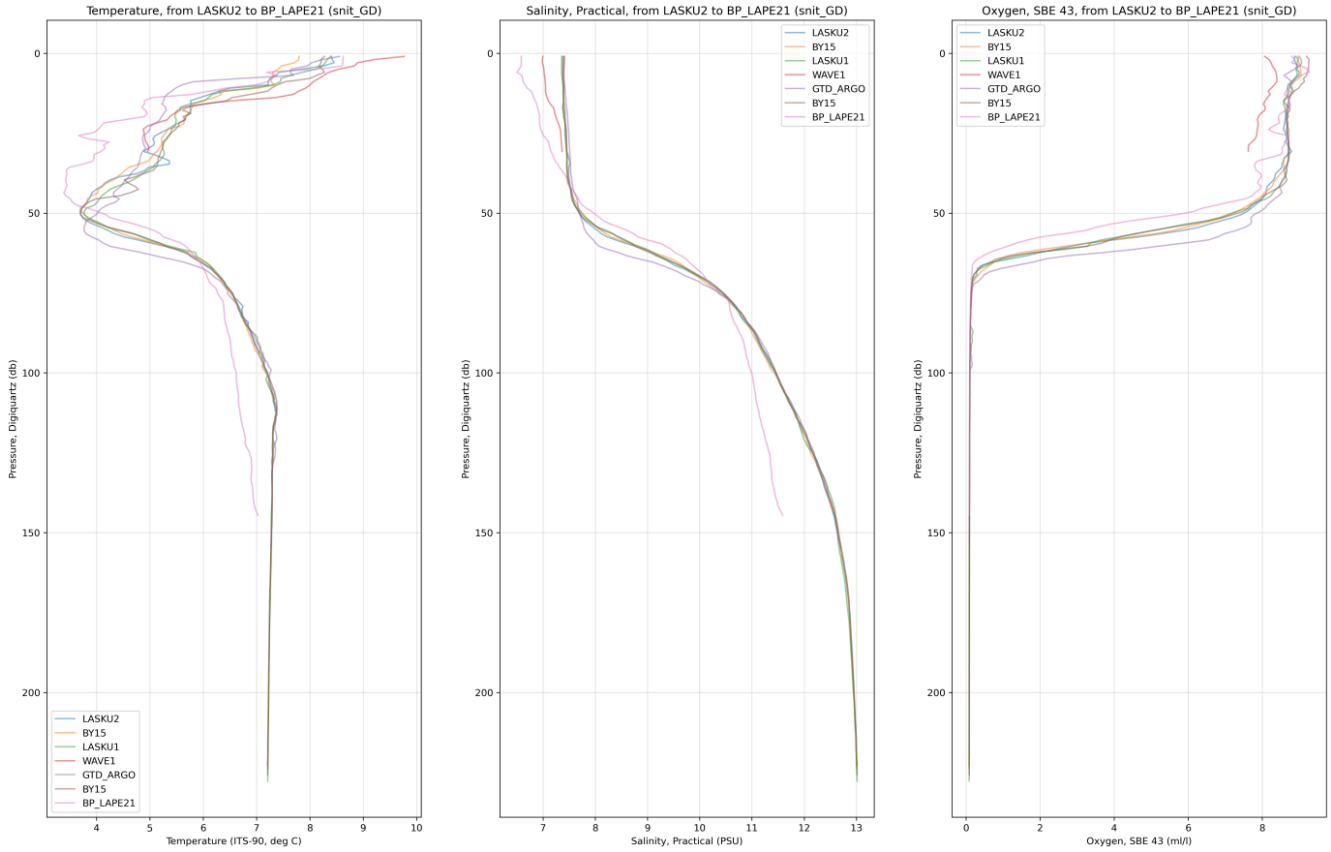

Figure 7: Measurements from Baltic Proper. Left: Temperature, Middle: Salinity, Right: Oxygen

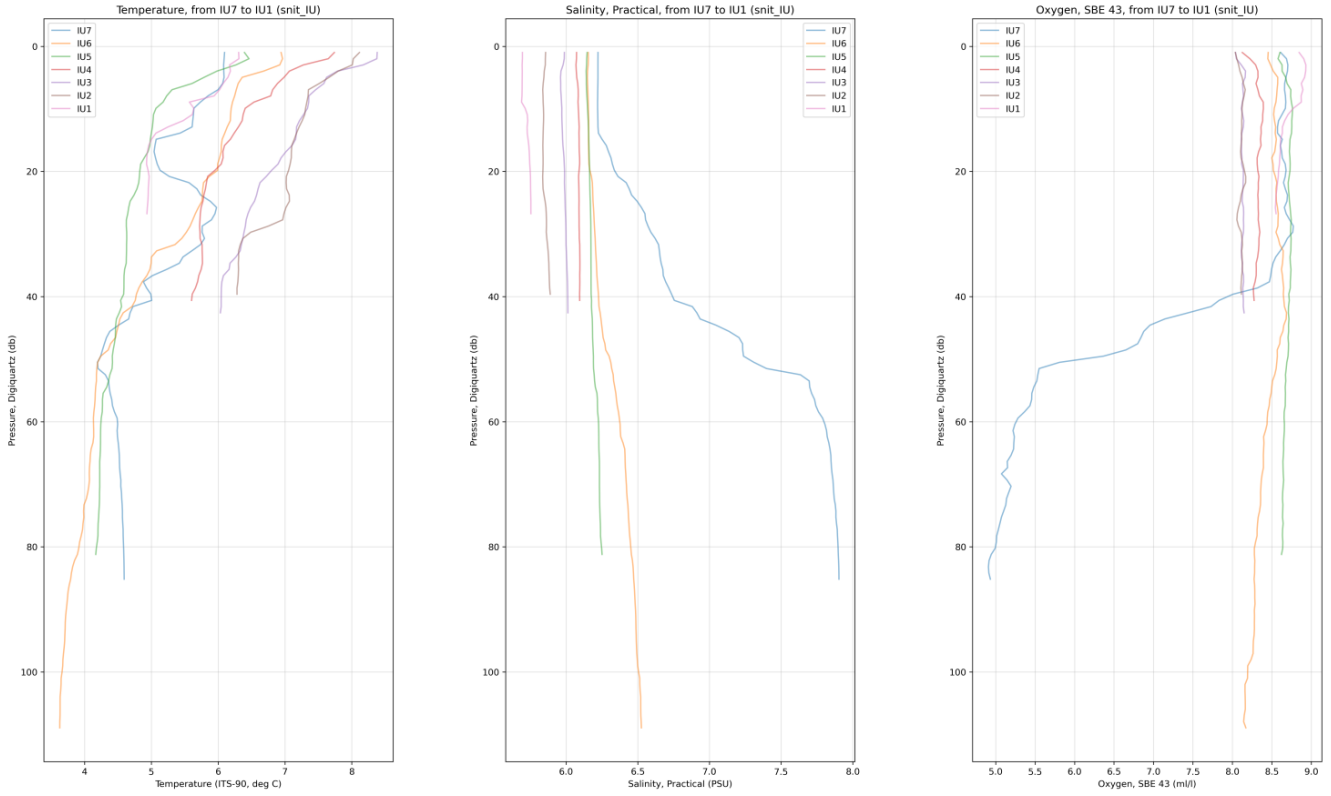

Figure 8: Measurements from Archipelago Sea. Left: Temperature, Middle: Salinity, Right: Oxygen

WEATHER

Mon 17.05.2021: partly cloudly, slight rain. Low wind.
Tue 18.05.2021: Fog, low wind.
Wed 19.05.2021: half cloudy, low wind.
Thu 20.05.2021: clear day, wind rising a bit
Fri 21.05.2021: clear, wind rose up to 13 m/s, delayed installations
Sat 22.05.2021: Cloudy, low wind
Sun 23.05.2021: Cloudy, winds 9 m/s at morning, towards evening 12 m/s
Mon 24.05.2021: Clear and low wind (2-3 m/s)
Tue 25.05.2021: Clear and calm
Wed 26.05.2021: Rainy and cloudy, winds from 14 m/s to 18 m/s, complicated measurements.
Thu 27.05.2021: Partly cloudy, winds still high, no measurements planned.

SCIENTIFIC STAFF

Chief Scientist:

Simo-Matti Siiriä (FMI)

Participants:

Hedi Kanarik (FMI)

Tuomas Kärnä (FMI)

Pekka Kosloff(FMI)

Ship master:

Thord Vaenerberg

Departure from Helsinki on Monday 17.5.2021 19.00 Local time

Arrival to Helsinki on Thursday 27.5.2021 16.00 local time

Appendix 1: List of all measurement points:

Index 0101, 39A 60° 4.010' N, 24° 58.820' E, depth 42.0 m

Index 0102, LL7 59° 50.790' N, 24° 50.270' E, depth 102.0 m

Index 0103, LL9 59° 42.010' N, 24° 1.800' E, depth 66.0 m

Index 0104, LL11 59° 35.010' N, 23° 17.800' E, depth 66.0 m

Index 0105, ll12 59° 29.010' N, 22° 53.810' E, depth 82.0 m

Index 0106, TPDEEP1 59° 22.700' N, 21° 26.470' E, depth 214.0 m

Index 0107, AALTO_PI 59° 14.880' N, 20° 59.960' E, depth 112.0 m

Index 0108, BAF6 59° 11.500' N, 20° 45.400' E, depth 106.0 m

Index 0109, BAD6 59° 7.800' N, 20° 27.400' E, depth 116.0 m

Index 0110, LASKU2 57° 20.220' N, 20° 2.910' E, depth 232.0 m

Index 0111, BY15 57° 19.240' N, 20° 2.940' E, depth 235.0 m

Index 0112, LASKU1 57° 18.240' N, 20° 2.930' E, depth 239.0 m

Index 0113, WAVE1 57° 25.090' N, 19° 3.170' E, depth 37.0 m

Index 0114, GTD_ARGO 57° 27.660' N, 19° 55.600' E, depth 163.0 m

Index 0115, BY15 57° 19.200' N, 20° 3.000' E, depth 235.0 m

Index 0116, BP_LAPE21 58° 48.210' N, 19° 53.100' E, depth 155.0 m

Index 0117, IU7 59° 48.790' N, 21° 20.150' E, depth 93.0 m

Index 0118, IU6 59° 56.210' N, 21° 13.260' E, depth 118.0 m

Index 0119, IU5 60° 3.490' N, 21° 11.900' E, depth 89.0 m

Index 0120, IU4 60° 14.000' N, 21° 8.800' E, depth 49.0 m

Index 0121, IU3 60° 20.000' N, 21° 6.800' E, depth 50.0 m

Index 0122, IU2 60° 35.010' N, 21° 7.800' E, depth 47.0 m

Index 0123, IU1 60° 46.010' N, 20° 50.790' E, depth 34.0 m

Index 0124, HAPE2 61° 49.260' N, 19° 56.480' E, depth 107.0 m

Index 0125, EURAJOKI 61° 19.580' N, 21° 22.080' E, depth 24.0 m

Index 0126, ARVORC_SM0 61° 24.140' N, 20° 11.390' E, depth 123.0 m

Index 0127, LASKU3 61° 23.080' N, 20° 11.320' E, depth 122.0 m

Index 0128, LASKU4 61° 22.080' N, 20° 11.320' E, depth 122.0 m

Index 0129, SEME_I7 61° 23.740' N, 19° 44.590' E, depth 93.0 m

Index 0130, SEME_I6 61° 21.660' N, 19° 53.000' E, depth 117.0 m

Index 0131, SEME_I5 61° 19.780' N, 20° 4.090' E, depth 127.0 m

Index 0132, SEME_I4 61° 17.050' N, 20° 19.320' E, depth 116.0 m

Index 0133, EROS25 61° 16.000' N, 20° 28.800' E, depth 103.0 m

Index 0134, EROS23 61° 15.010' N, 20° 38.800' E, depth 84.0 m

Index 0135, EROS20 61° 14.500' N, 20° 50.790' E, depth 59.0 m

Index 0136, EROS18 61° 13.990' N, 20° 58.800' E, depth 52.0 m

Index 0137, EROS17 61° 14.010' N, 21° 3.830' E, depth 45.0 m

Index 0138, EROS15 61° 13.020' N, 21° 11.780' E, depth 23.0 m

Index 0139, SEME_H1 61° 7.680' N, 20° 41.710' E, depth 70.0 m

Index 0140, SEME_H2 61° 9.960' N, 20° 30.920' E, depth 108.0 m

Index 0141, SEME_H3 61° 11.630' N, 20° 23.150' E, depth 106.0 m

Index 0142, SEME_H4 61° 13.420' N, 20° 15.280' E, depth 117.0 m

Index 0143, SEME_H5 61° 16.210' N, 20° 1.840' E, depth 127.0 m

Index 0144, SEME_H6 61° 18.420' N, 19° 50.570' E, depth 116.0 m

Index 0145, SEME_H7 61° 20.240' N, 19° 42.000' E, depth 91.0 m

Index 0146, SEME_G7 61° 16.240' N, 19° 38.530' E, depth 80.0 m

Index 0147, SEME_G6 61° 14.370' N, 19° 47.180' E, depth 103.0 m

Index 0148, SEME_G5 61° 11.410' N, 19° 56.490' E, depth 107.0 m

Index 0149, SEME_G4 61° 8.830' N, 20° 7.660' E, depth 120.0 m

Index 0150, SEME_G3 61° 6.540' N, 20° 15.730' E, depth 112.0 m

Index 0151, SEME_G2 61° 4.540' N, 20° 24.820' E, depth 94.0 m

Index 0152, SEME_G1 61° 2.770' N, 20° 34.930' E, depth 74.0 m

Index 0153, SEME_F1 60° 55.660' N, 20° 28.880' E, depth 73.0 m

Index 0154, SEME_F2 60° 59.090' N, 20° 18.790' E, depth 89.0 m

Index 0155, SEME_F3 61° 1.800' N, 20° 9.610' E, depth 104.0 m

Index 0156, SEME_F4 61° 4.700' N, 19° 59.400' E, depth 110.0 m

Index 0157, SEME_F5 61° 7.080' N, 19° 51.900' E, depth 111.0 m

Index 0158, SEME_F6 61° 10.310' N, 19° 42.610' E, depth 104.0 m

Index 0159, SEME_F7 61° 12.980' N, 19° 36.000' E, depth 77.0 m

Index 0160, SEME_E7 61° 9.400' N, 19° 32.750' E, depth 94.0 m

Index 0161, SEME_E6 61° 7.480' N, 19° 38.680' E, depth 112.0 m

Index 0162, SEME_E5 61° 4.760' N, 19° 47.120' E, depth 122.0 m

Index 0163, SEME_E4 61° 1.380' N, 19° 56.200' E, depth 107.0 m

Index 0164, SEME_E3 60° 57.270' N, 20° 7.850' E, depth 94.0 m

Index 0165, SEME_E2 60° 55.600' N, 20° 11.700' E, depth 87.0 m

Index 0166, SEME_E1 60° 53.040' N, 20° 20.150' E, depth 78.0 m

Index 0167, SEME_E0 60° 45.020' N, 20° 36.580' E, depth 67.0 m

Index 0168, SEME_D0 60° 39.310' N, 20° 16.960' E, depth 48.0 m

Index 0169, SEME_D1 60° 46.350' N, 20° 11.070' E, depth 65.0 m

Index 0170, SEME_D2 60° 51.510' N, 20° 2.490' E, depth 77.0 m

Index 0171, SEME_D3 60° 55.150' N, 19° 55.520' E, depth 105.0 m

Index 0172, SEME_D4 60° 58.780' N, 19° 48.820' E, depth 121.0 m

Index 0173, SEME_D5 61° 1.930' N, 19° 41.910' E, depth 125.0 m

Index 0174, SR5 61° 5.000' N, 19° 34.770' E, depth 125.0 m

Index 0175, SEME_D7 61° 7.140' N, 19° 27.300' E, depth 73.0 m

Index 0176, SEME_C7 61° 6.420' N, 19° 24.510' E, depth 90.0 m

Index 0177, SEME_C6 61° 3.250' N, 19° 28.800' E, depth 115.0 m

Index 0178, SEME_C5 60° 59.590' N, 19° 32.980' E, depth 119.0 m

Index 0179, SEME_C4 60° 53.770' N, 19° 40.250' E, depth 92.0 m

Index 0180, SEME_C3 60° 48.730' N, 19° 43.880' E, depth 83.0 m

Index 0181, SEME_C2 60° 46.000' N, 19° 47.380' E, depth 71.0 m

Index 0182, SEME_C1 60° 40.500' N, 19° 53.610' E, depth 60.0 m

Index 0183, SEME_B1 60° 36.430' N, 19° 35.550' E, depth 64.0 m

Index 0184, SEME_B2 60° 40.400' N, 19° 29.290' E, depth 69.0 m

Index 0185, SEME_B3 60° 44.110' N, 19° 28.800' E, depth 71.0 m

Index 0186, SEME_B4 60° 51.760' N, 19° 27.250' E, depth 96.0 m

Index 0187, SEME_B5 60° 58.090' N, 19° 25.770' E, depth 116.0 m

Index 0188, SEME_B6 61° 1.350' N, 19° 23.960' E, depth 120.0 m

Index 0189, SEME_B7 61° 5.030' N, 19° 20.980' E, depth 83.0 m

Index 0190, SEME_A7 61° 3.890' N, 19° 17.520' E, depth 110.0 m

Index 0191, SEME_A6 61° 0.410' N, 19° 17.510' E, depth 114.0 m

Index 0192, SEME_A5 60° 57.300' N, 19° 17.840' E, depth 117.0 m

Index 0193, SEME_A4 60° 49.710' N, 19° 17.160' E, depth 94.0 m

Index 0194, SEME_A3 60° 41.470' N, 19° 15.610' E, depth 75.0 m

Index 0195, SEME_A2 60° 36.000' N, 19° 14.700' E, depth 70.0 m

Index 0196, SEME_A1 60° 29.320' N, 19° 12.390' E, depth 68.0 m

Index 0197, SEME_E3 60° 57.260' N, 20° 7.860' E, depth 94.0 m

Index 0198, SEME_F3 61° 1.800' N, 20° 9.610' E, depth 104.0 m

Index 0199, SEME_G3 61° 6.540' N, 20° 15.740' E, depth 112.0 m

Index 0200, SEME_H3 61° 11.640' N, 20° 23.140' E, depth 106.0 m

Index 0201, EROS25 61° 16.010' N, 20° 28.770' E, depth 103.0 m

Index 0202, ARVORC_SM1 61° 24.710' N, 20° 13.940' E, depth 117.0 m

Index 0203, SEME_G6 61° 14.370' N, 19° 47.170' E, depth 103.0 m

Index 0204, SEME_G5 61° 11.410' N, 19° 56.470' E, depth 107.0 m

Index 0205, SEME_G4 61° 8.830' N, 20° 7.650' E, depth 120.0 m

Index 0206, SEME_G3 61° 6.530' N, 20° 15.730' E, depth 112.0 m

Index 0207, SEME_G2 61° 4.540' N, 20° 24.780' E, depth 95.0 m

Index 0208, SEME_F2 60° 59.110' N, 20° 18.810' E, depth 89.0 m

Index 0209, SEME_F3 61° 1.810' N, 20° 9.600' E, depth 104.0 m

Index 0210, SEME_F4 61° 4.690' N, 19° 59.420' E, depth 111.0 m

Index 0211, SEME_F5 61° 7.080' N, 19° 51.900' E, depth 110.0 m

Index 0212, SEME_F6 61° 10.300' N, 19° 42.600' E, depth 104.0 m

Index 0213, SEME_E6 61° 7.470' N, 19° 38.680' E, depth 112.0 m

Index 0214, SEME_E5 61° 4.760' N, 19° 47.120' E, depth 122.0 m

Index 0215, SEME_E4 61° 1.390' N, 19° 56.170' E, depth 106.0 m

Index 0216, SEME_D4 60° 58.780' N, 19° 48.830' E, depth 127.0 m

Index 0217, SEME_D5 61° 1.930' N, 19° 41.920' E, depth 125.0 m

Index 0218, SR5 61° 5.000' N, 19° 34.780' E, depth 124.0 m

Index 0219, SR5 61° 5.000' N, 19° 34.780' E, depth 124.0 m

Index 0220, SEME_C6 61° 3.250' N, 19° 28.820' E, depth 115.0 m

Index 0221, SEME_C5 60° 59.580' N, 19° 33.000' E, depth 119.0 m

Index 0222, SEME_C4 60° 53.780' N, 19° 40.240' E, depth 93.0 m

Index 0223, SEME_B4 60° 51.750' N, 19° 27.230' E, depth 95.0 m

Index 0224, SEME_B5 60° 58.080' N, 19° 25.760' E, depth 116.0 m

Index 0225, SEME_B6 61° 1.350' N, 19° 23.930' E, depth 119.0 m

Index 0226, SEME_A6 61° 0.410' N, 19° 17.530' E, depth 114.0 m

Index 0227, SEME_A5 60° 57.310' N, 19° 17.840' E, depth 117.0 m

Index 0228, SEME_A4 60° 49.720' N, 19° 17.180' E, depth 95.0 m

Index 0229, SEME_A3 60° 41.480' N, 19° 15.600' E, depth 75.0 m

Index 0230, SEME_A2 60° 36.000' N, 19° 14.700' E, depth 71.0 m

Index 0231, SEME_A1 60° 29.320' N, 19° 12.390' E, depth 68.0 m

Index 0232, F_16 60° 12.000' N, 19° 14.800' E, depth 135.0 m

Index 0233, F64 60° 11.380' N, 19° 8.540' E, depth 279.0 m

Index 0234, F_12 60° 6.000' N, 19° 23.800' E, depth 250.0 m

Index 0235, ALAND_SEA 60° 1.320' N, 19° 32.720' E, depth 213.0 m

Index 0236, FA7 59° 58.010' N, 19° 40.760' E, depth 214.0 m

Index 0237, F67 59° 56.010' N, 19° 49.790' E, depth 208.0 m

Index 0238, ASMS_AW2 59° 49.230' N, 19° 43.660' E, depth 72.0 m

Index 0239, ASMS_AW1 59° 47.910' N, 19° 43.650' E, depth 100.0 m

Index 0240, F69 59° 47.220' N, 19° 55.790' E, depth 197.0 m

Index 0241, LAGSK_02 59° 47.010' N, 20° 3.500' E, depth 198.0 m

Index 0242, LAGSK_04 59° 47.010' N, 20° 16.000' E, depth 181.0 m

Index 0243, LAGSK_06 59° 43.540' N, 20° 27.130' E, depth 161.0 m

Index 0244, LAGSK_07 59° 41.040' N, 20° 35.770' E, depth 138.0 m

Index 0245, LAGSK_08 59° 36.650' N, 20° 38.880' E, depth 159.0 m