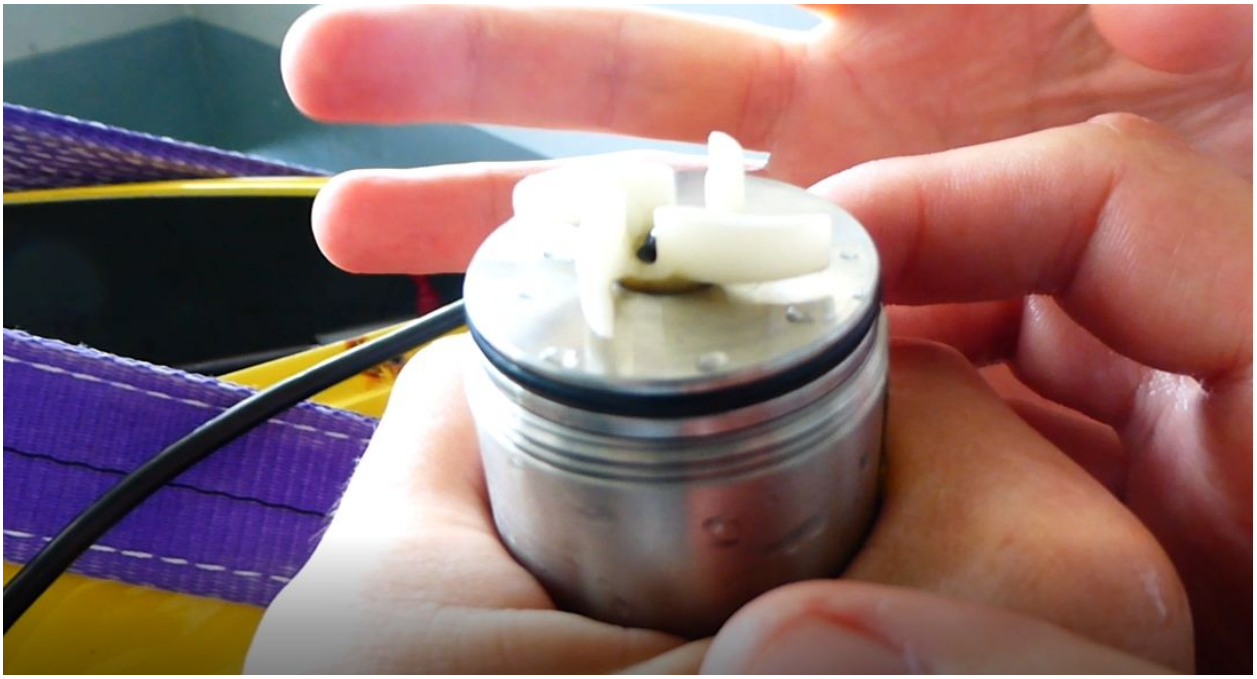

MELMAS18 glider CTD issue and data correction.

Gerin R. and Pacciaroni M.

SOMMARIO:

Introduction:

During 2018, a 1st field experiment in the Eastern Levantine with gliders was carried out. Three ocean gliders (one Italian and two Israeli) were operated between May 24 and July 23 (Gerin et al., 2019). The glider was equipped with a Sea-Bird Scientific GPCTD (temperature, salinity and density).
During the mission, the down- and up-cast CTD data collected by the SG554 glider were compared and it was discovered that the temperature and salinity (conductivity) profiles were extremely different (see for example Temperature plot of Figs. 1 and 2). Several hypotheses were made (tube or inlet obstruction, inlet and outlet tubes mounted reversed after the CTD maintenance, pump not primed or bubble inside) and several solutions were attempted (switch off and on the CTD pump, increase the pc_interval) without any success.

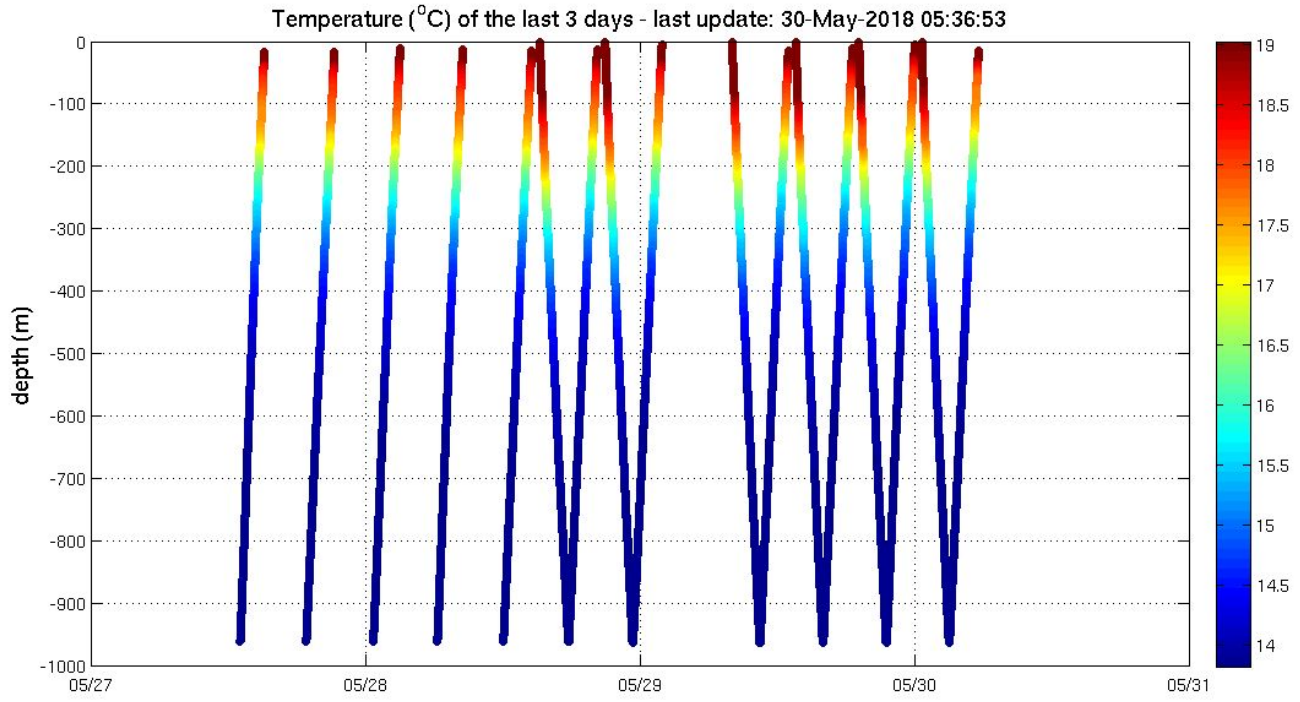

Fig 1. Scatter plot of CTD Temperature data recorded by SG554.

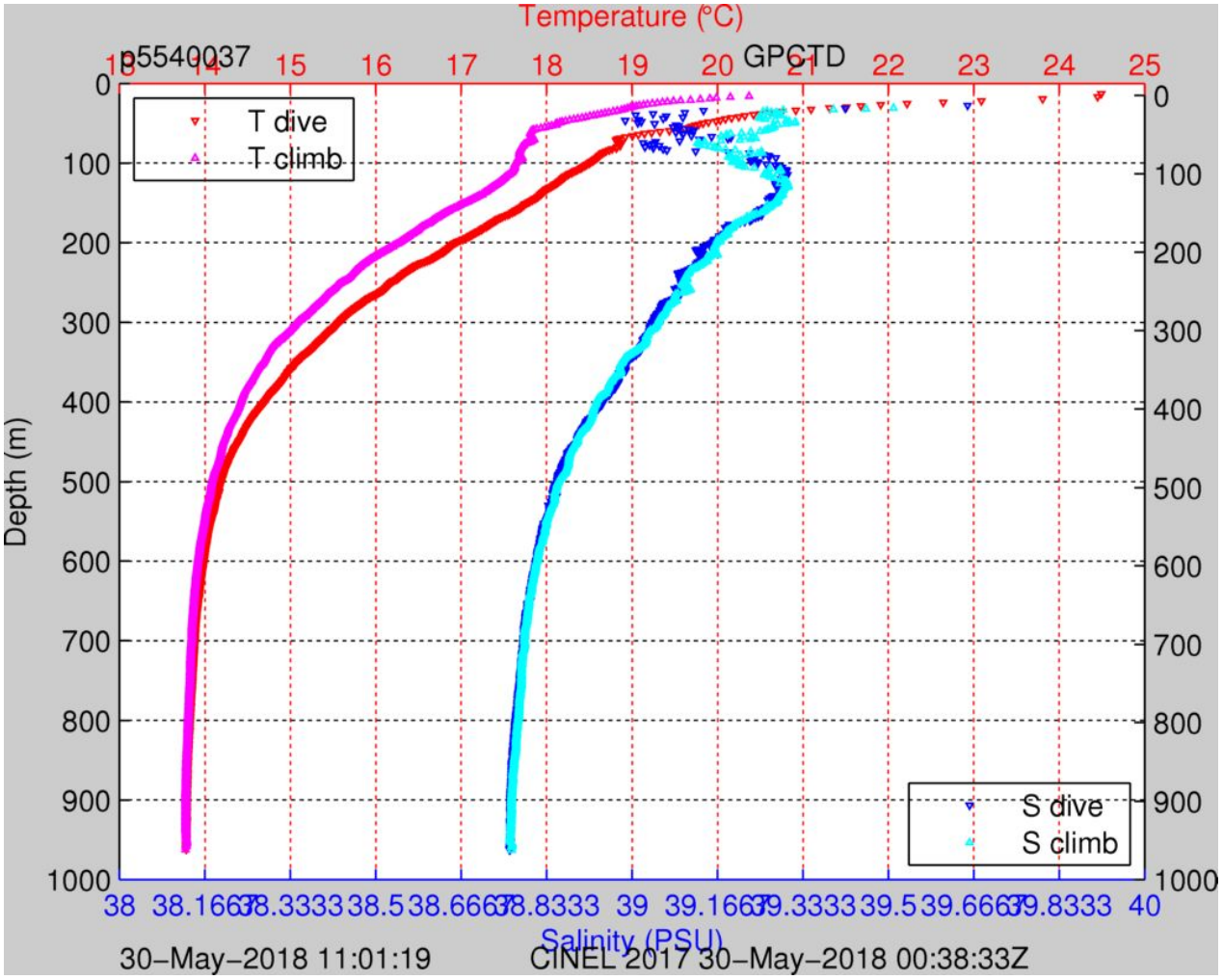

Fig 2. CTD plot generated by the Kongsberg software.

SG554 CTD issue:

After the glider recovery the CTD pump were inspected and the magnet of the impeller shaft was found broken (Fig. 3).

Fig 3. Broken magnet of the impeller shaft.

SG554 CTD data inspection:

The temperature data recorded by the CTD and by the AAnderaa Oxygen sensor were compared (Fig. 4) evidencing that the AAnderaa Temperature was always in the middle of the CTD temperature, confirming the issue of the CTD pump.

A qualitative analysis of the data collected during a previous glider mission, demonstrated that the Aanderaa temperature values are precise and perfectly match with the CTD up-cast profile, therefore they eventually can be used instead of the CTD temperature data (Fig. 5).

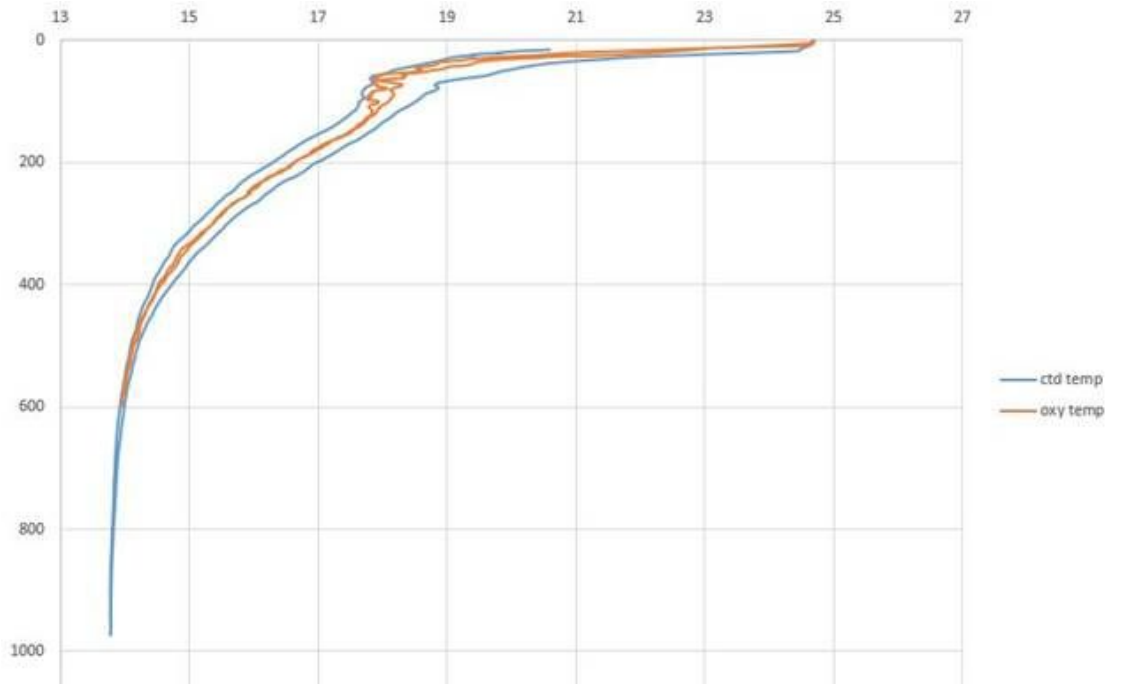

Fig 4. Comparison of the CTD and AAnderaa temperature of one dive of the Melmas18 mission.

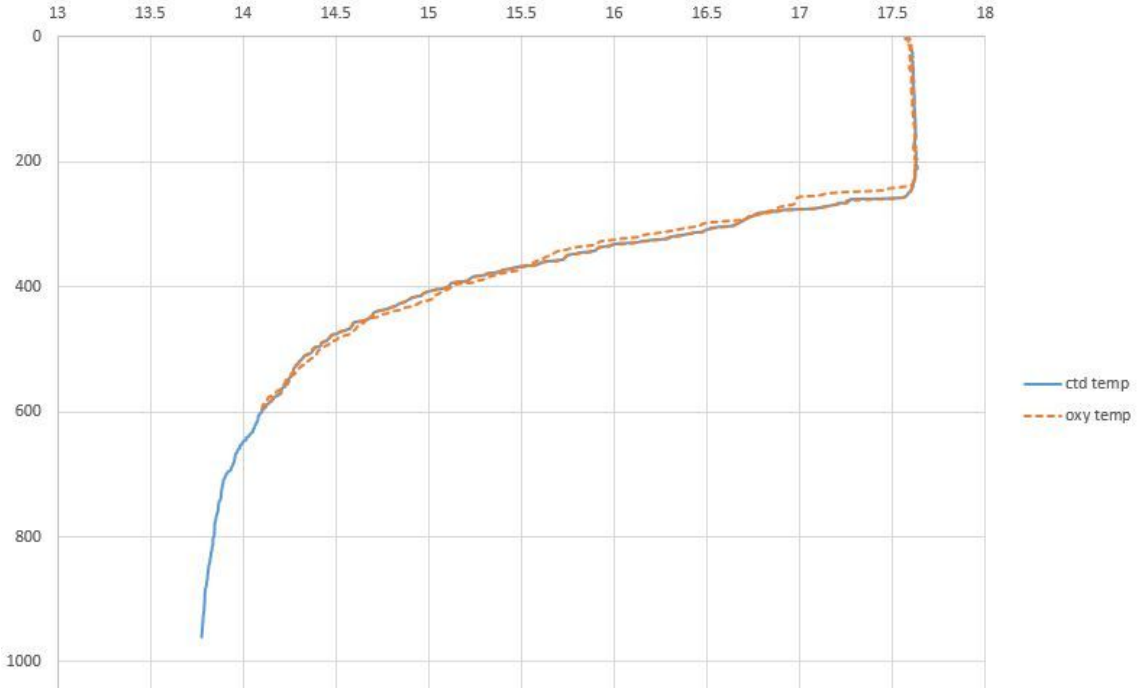

Fig 5. Comparison of the CTD (up-cast only) and AAnderaa temperature of one dive of the Cinel17 mission.

Unfortunately, there is no substitute sensor for the salinity. Therefore only an average between the down- and up-cast is possible.

SG554 CTD data correction:

To check for the best average criteria, the closest profiles (in time and space) of the SeaExplorer #12 and SG554 gliders were find out and their data were deeply investigated. The 2 gliders, were very close to each other in four occasions (see Table 1).

Glider	Date	Dive	Distance (km)
SG554	2018-06-17 T11:15:20	115	3.82
SeaExplorer #12 (M141)	2018-06-17 T14:09:01	46	
SG554	2018-06-21 T21:54:49	135	7.47
SeaExplorer #12 (M141)	2018-06-22 T02:33:49	85	
SG554	2018-06-26 T14:59:51	152	4.26
SeaExplorer #12 (M141)	2018-06-27 T09:57:49	128	
SG554	2018-07-01 T12:41:21	174	6.52
SeaExplorer #12 (M141)	2018-07-01 T03:19:17	154	

Tab 1. Closest glider dives during the Melmas18 mission.

The down- and up-cast profiles (TCD temperature and salinity data from SeaExplorer #12 and SG554 and the temperature from the Aanderaa oxygen sensor of SG554) were vertically averaged in 5 meters depth windows (overlapped by 50%). The results obtained from the mean, median, mean ± 1 standard deviation and mean ± 2 standard deviation were considered. The mean of the data inside two times the standard deviation was selected as criteria to correct the SG554 CTD data (see Figs. 6 and 7). The difference with respect to the temperature recorded by the Aanderaa sensor is given in Fig. 8 and 9. Temperature, salinity and potential density anomaly along the entire mission before and after the correction are shown in Figs. 10, 11 and 12.

The 5-m binned and corrected data were saved in matlab format in the file named “Melmas-18_2_CTD_5m_corrected.mat” which is stored in cayman at: storage/sire/dati/glider/seaglider/amerigo/missions/melmas18-2/

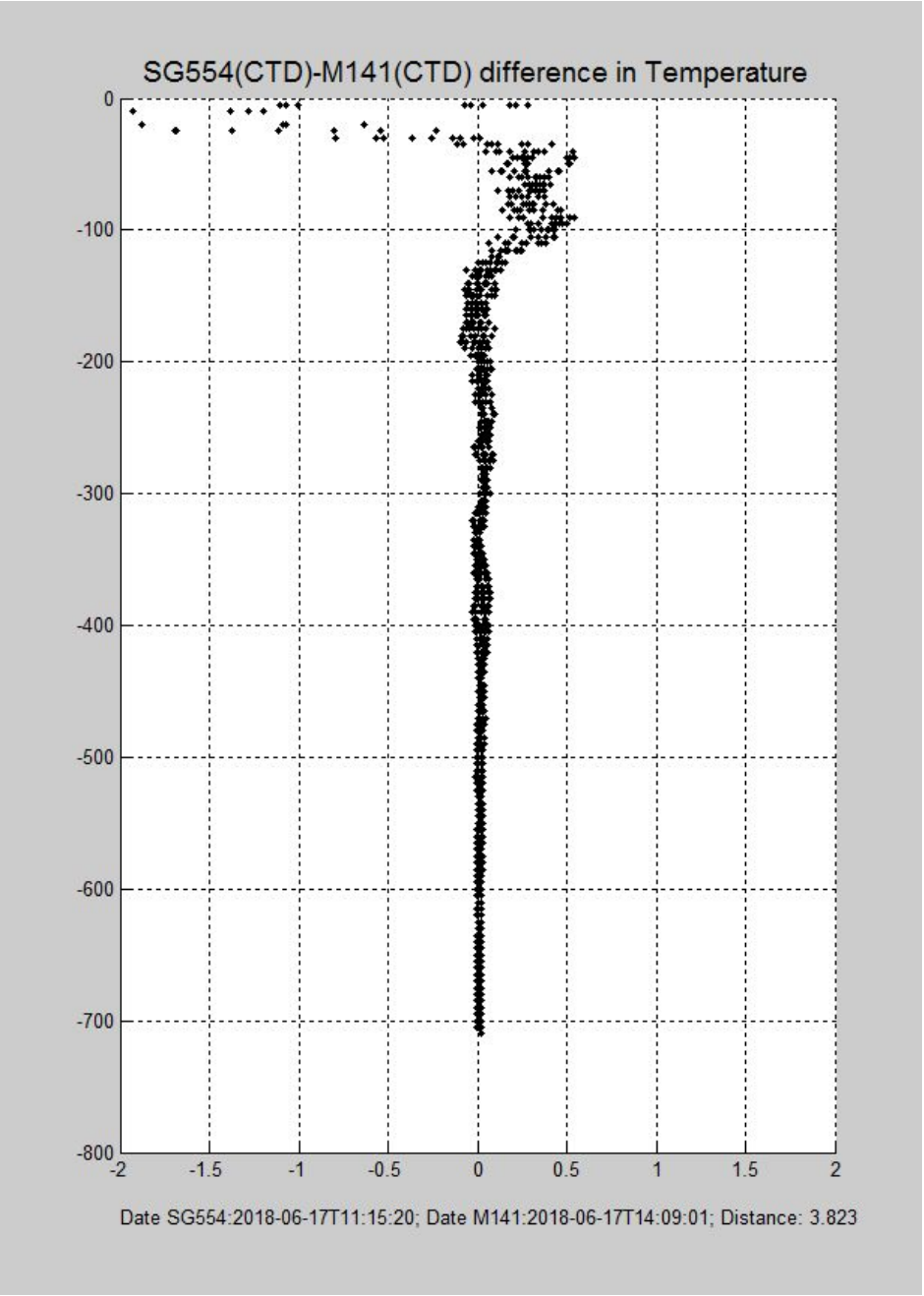

Fig 6. SG554 and M141 temperature (CTD) difference for the closest dive (17 June).

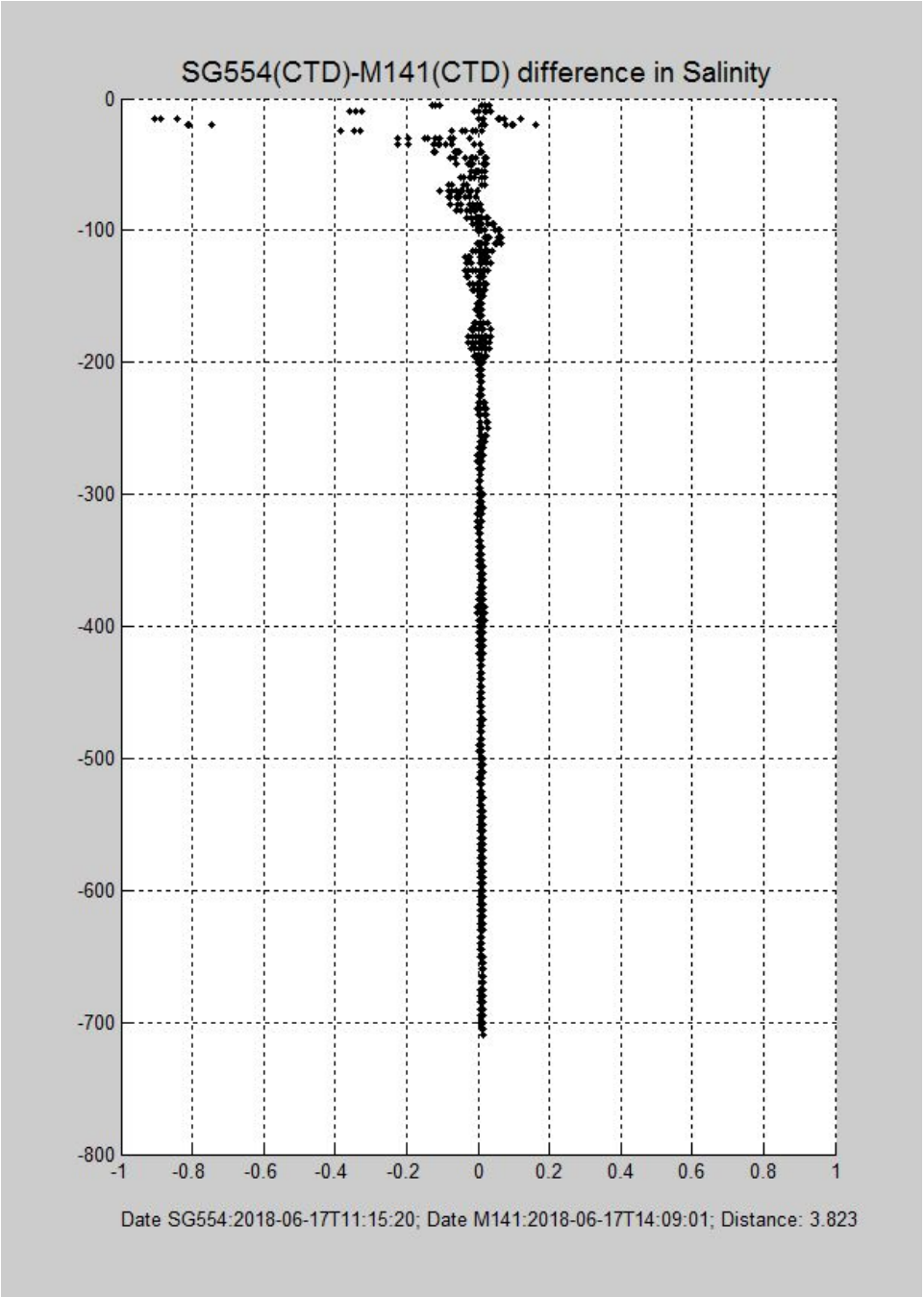

Fig 7. SG554 and M141 salinity (CTD) difference for the closest dive (17 June).

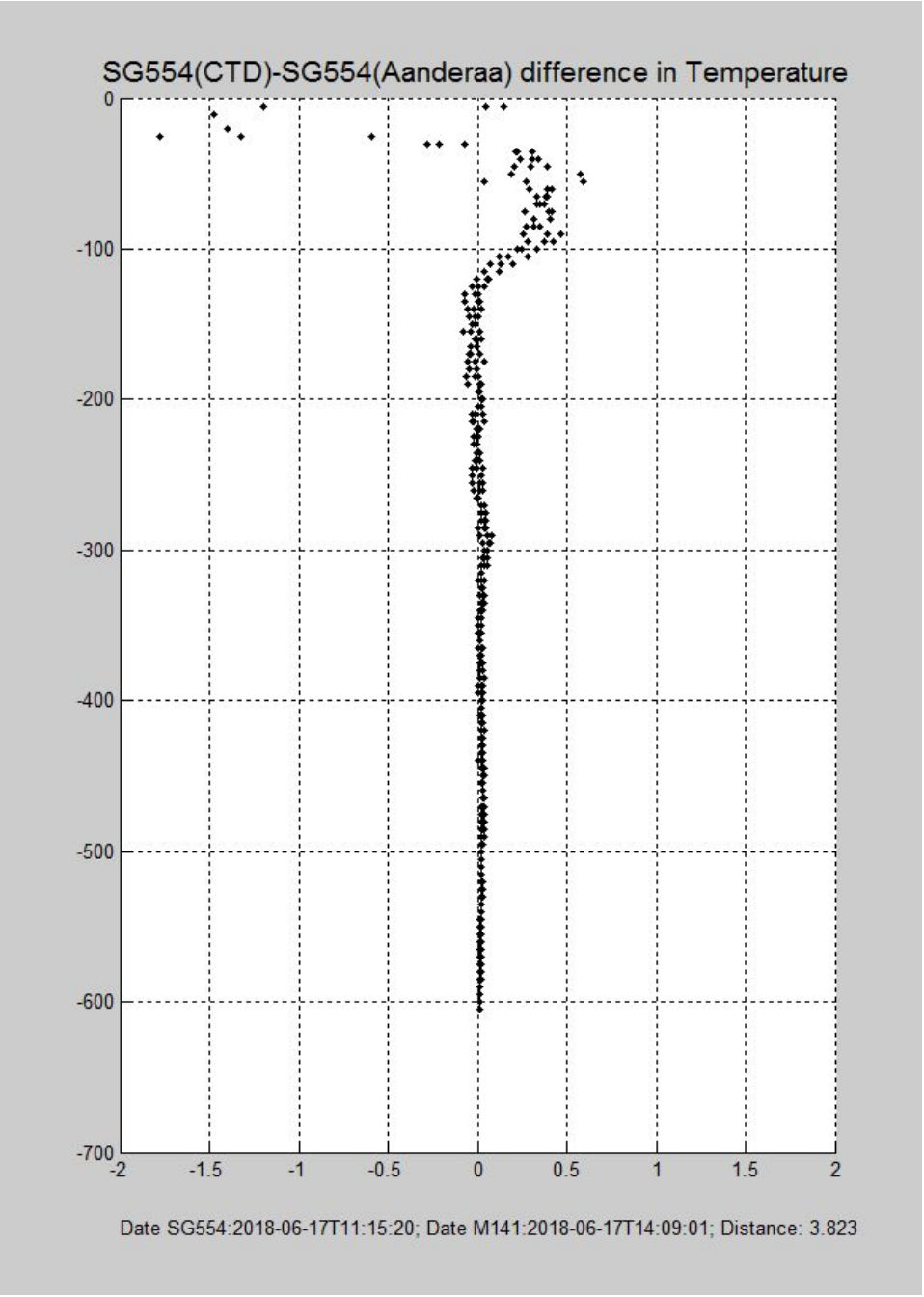

Fig 8. Temperature differences between SG554 Aanderaa sensor and SG554 CTD.

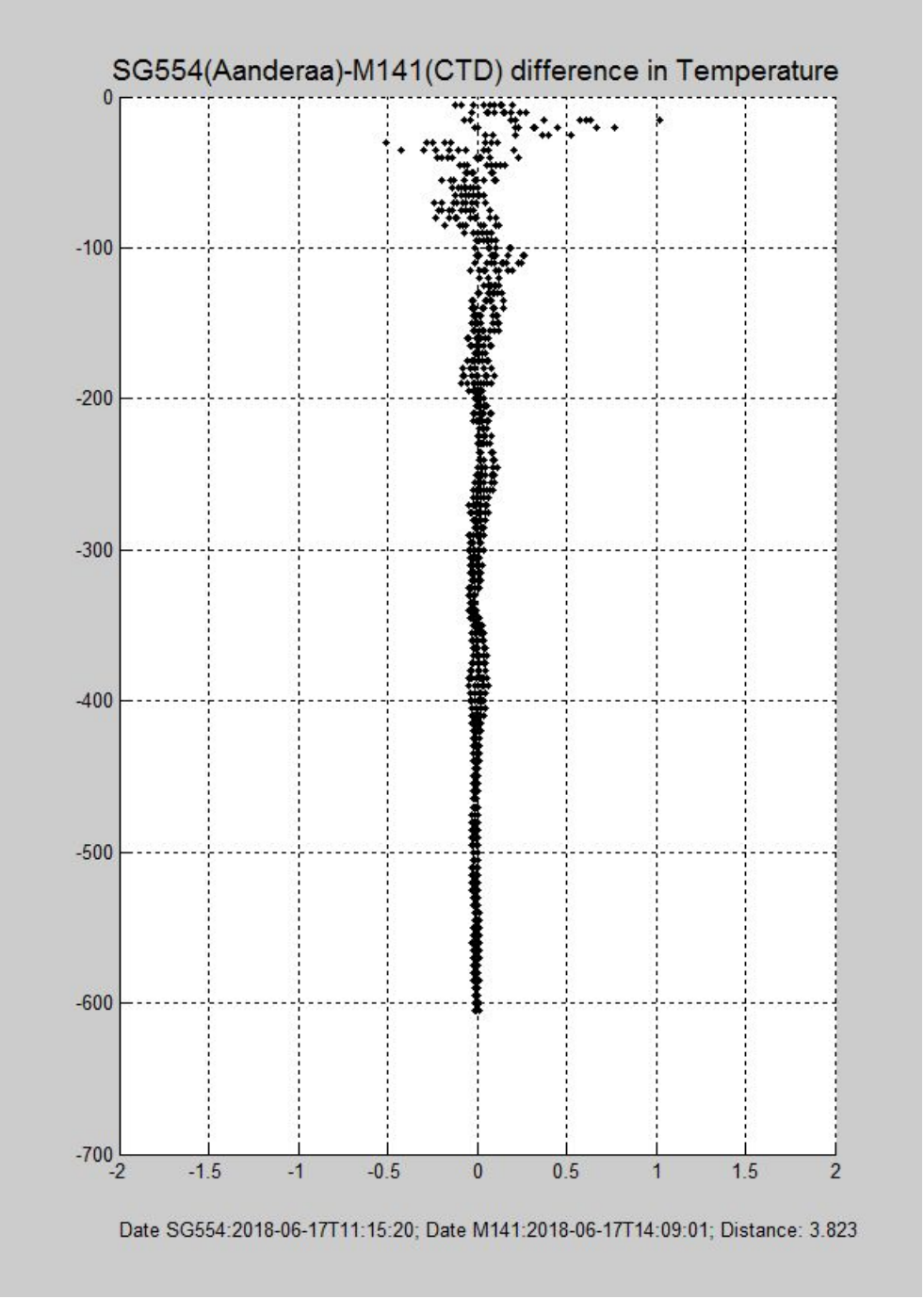

Fig 9. Temperature differences between SG554 Aanderaa sensor and M141 CTD.

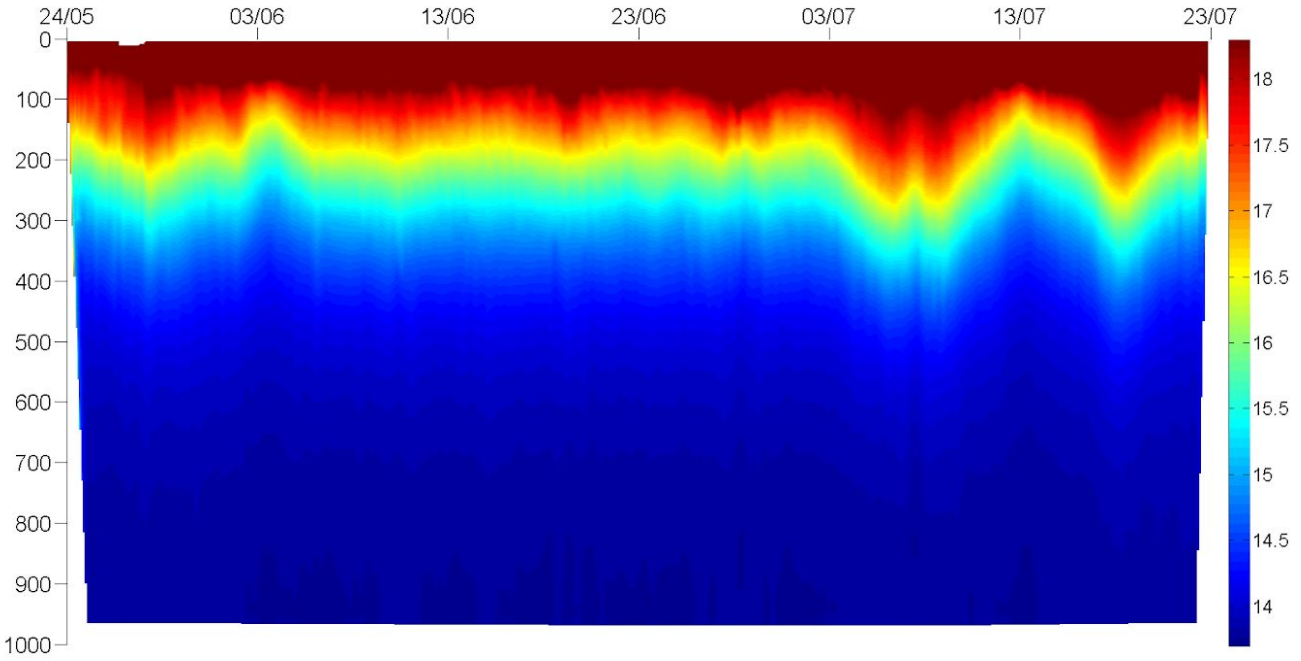

Fig 10. SG554 and M141 temperature (CTD) of the entire mission.

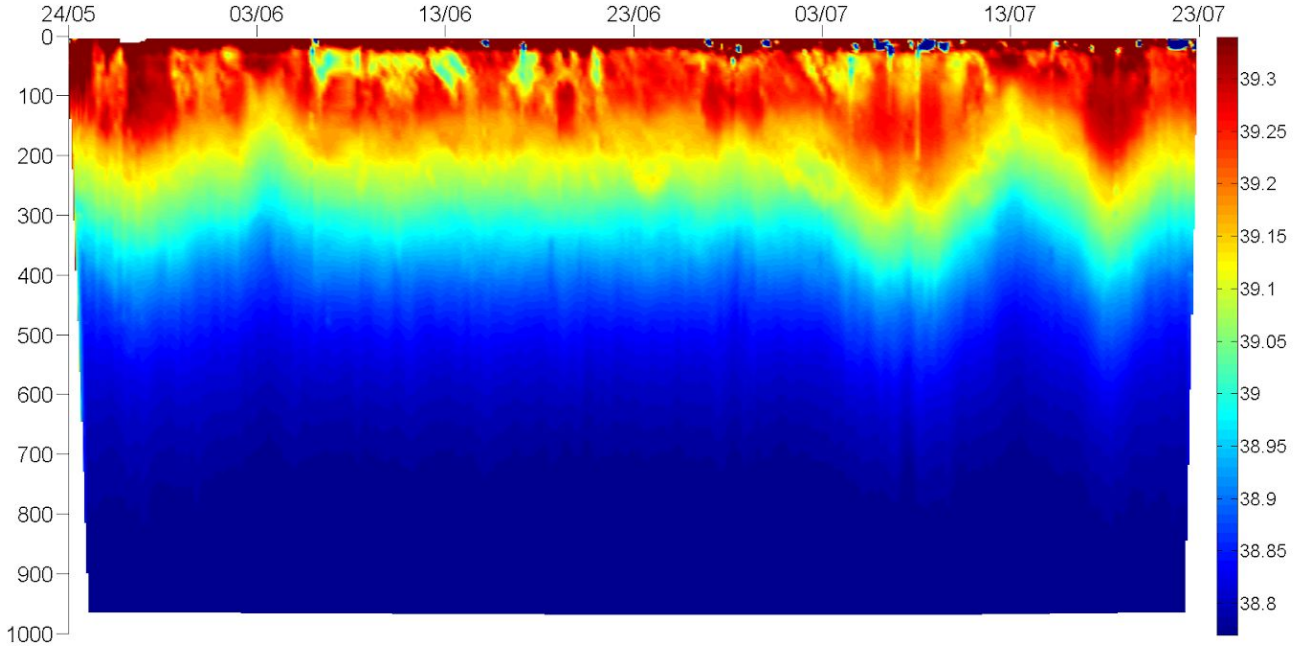

Fig 11. SG554 and M141 salinity (CTD) of the entire mission.

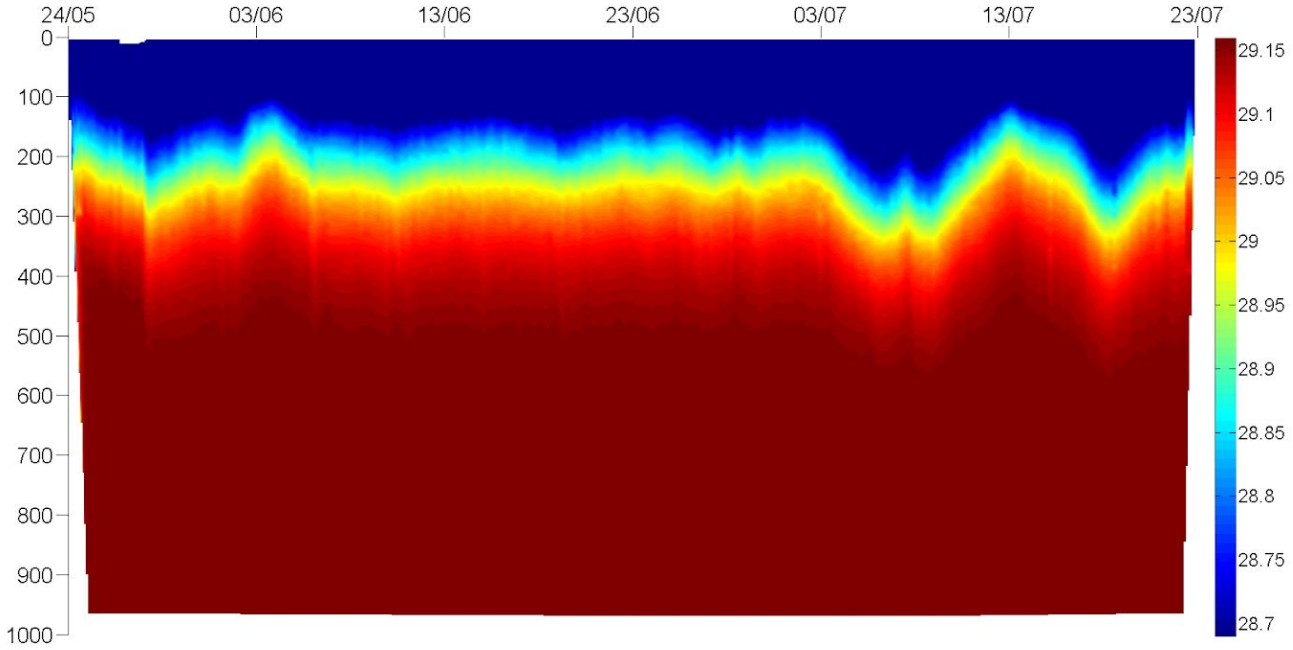

Fig 12. SG554 and M141 potential density anomaly (CTD) of the entire mission.

Acknowledges:

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References:

Gerin R., Pacciaroni M., Poulain P.-M., Mauri E., Bussani A., Zuppelli P., Menna M. and Gildor H. (2019). Glider and drifter activity during 2018 in the framework of the MELMAS project. Rel. OGS 2019/32 OCE 11 MAOS, Trieste, Italy, 14 pp.