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JAMSTEC RIGC GOORC GOERG

Release of the recalculated MILA GPV

1. Background

According to a manufacturing problem that occurred a few years ago, high salinity drift of the Sea Bird Scientific CTD sensor, whose S/Ns are within 6000-7000 and within 8100-9200, occurs more frequently than usual (see Argo Program Office homepage; https://argo.ucsd.edu/argo-salty-drift-salinity-data-issue-notice-2021/). Many floats equipped with CTD sensors in the above serial number range are in operation, and as a result, there is a salty bias error exceeding the target salinity accuracy of 0.01 in the real-time data. It is estimated that about 25% of real-time profile data can be affected by this bias.

Recently, it became clear that this salty bias affected Argo products that mainly used Argo profile data in real-time mode (Barnoud et al. (2021)). Since MILA GPV emphasizes immediacy and mainly uses Argo profile data in Real-time mode, MILA GPV is recalculated using the Argo profile data in the latest quality control stage.

2. The target period of recalculation

From January 2015 to December 2020

3. Argo profile data used for recalculation

The Core-Argo profiles downloaded from Global Data Assembly Center on 10th March 2021 and satisfying the condition in Table 1 of Hosoda et al. (2010) were used for recalculation. As you can see in Fig.1, in particular, the number of profiles used for recalculation increased by about 1000 to 2000 profiles.

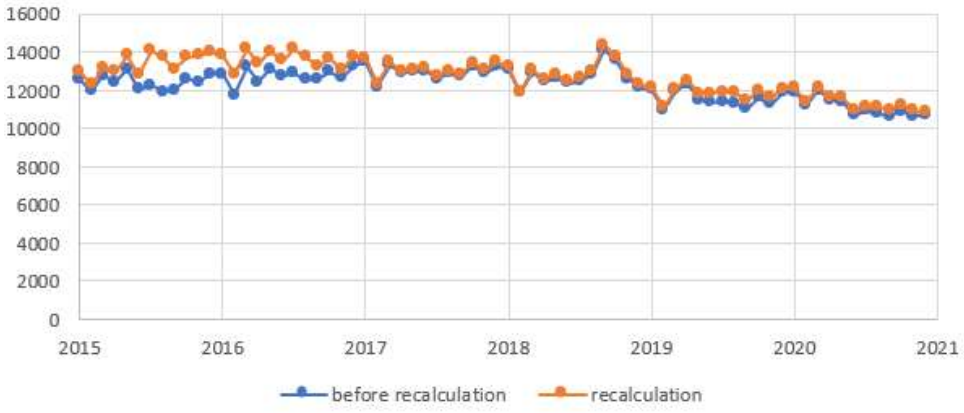

Figure 1 Time series of the number of Core-Argo profiles for recalculation

Regarding the Argo quality control procedure, Core-Argo profile data is classified into three modes according to the stage of quality control as follows: Real-time mode, Adjusted mode, and Delayed mode. We used the pressure, temperature and salinity values with the highest quality control stage in each profile for recalculation. Figure 2 shows the percentages of the quality control mode of Argo profile data of each month in the recalculation dataset. Although MILA GPV had hardly included Delayed mode profile, Delayed mode profiles accounted for about 70% from 2015 to the middle of 2018 for recalculation.

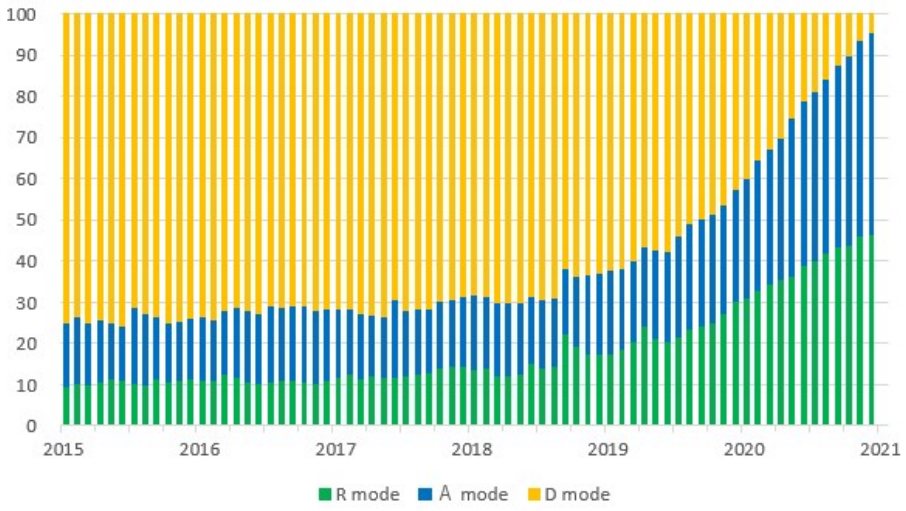

Figure 2 Time series of the ratio of Argo profile quality control mode for recalculation

4. Comparison the recalculation result with pre-recalculation one

In the monthly MILA GPV data set, the difference between the recalculation and the pre-calculation in each grid of the following parameters was calculated.

① Mixed layer depth
② Temperature in mixed layer
③ Salinity in mixed layer
④ Density in mixed layer

Except from the latter half of 2016 to 2017, the recalculated version has a global mean decrease salinity in mixed layer and a corresponding decrease in density. In addition, mixed layer depth defined by the density became shallower from 2015 to 2016.

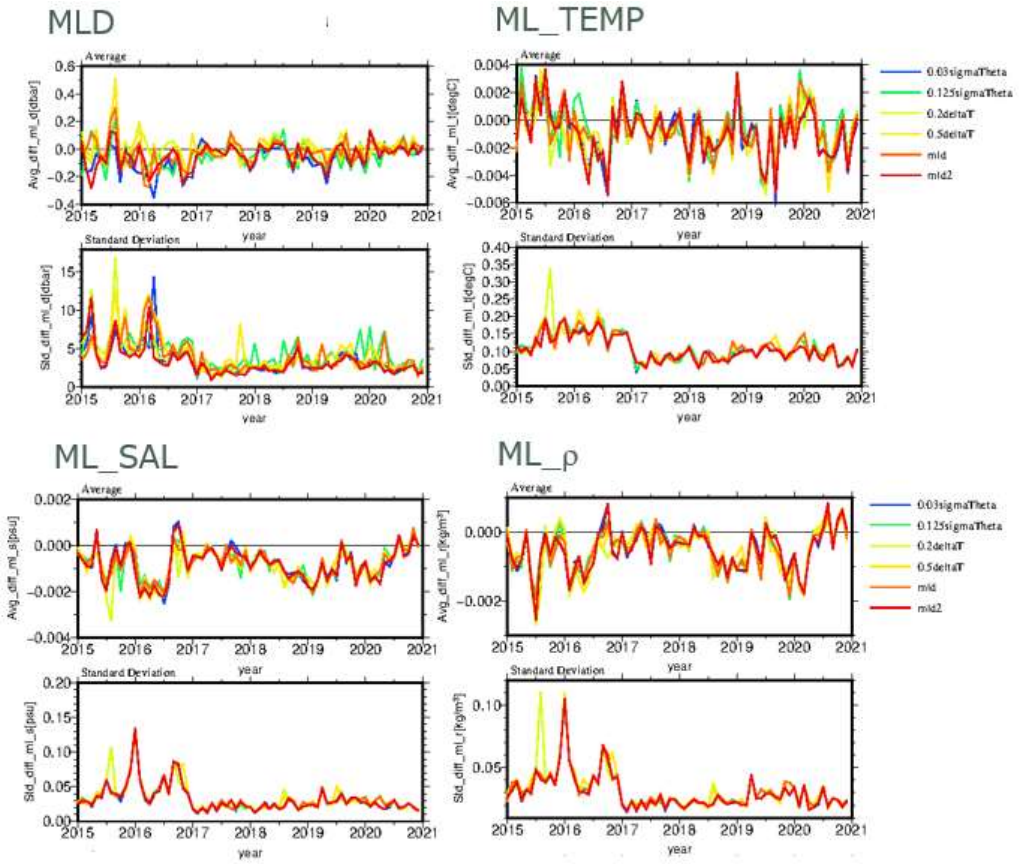

Figure 3 Time series of global mean and standard deviation of the difference between the recalculation and the pre-calculation of the parameters: (upper left) mixed layer depth, (upper right) temperature in mixed layer, (lower left) salinity in mixed layer, and (lower right) density in mixed layer. Colored lines mean definition of mixed layer depth.

Figure 4 shows the deviation map of parameters in mixed layer estimated from differences between recalculation version data set and pre-recalculation version data set in March 2016. The salinity and density in mixed layer decrease in the tropical and subtropical Pacific Ocean. This is because the Argo salinity profile is corrected to fresher in these areas. The mixed layer depth has become shallower globally due to recalculation, about 1.5dbar even in the Southern Ocean, where the shallowing is remarkable.

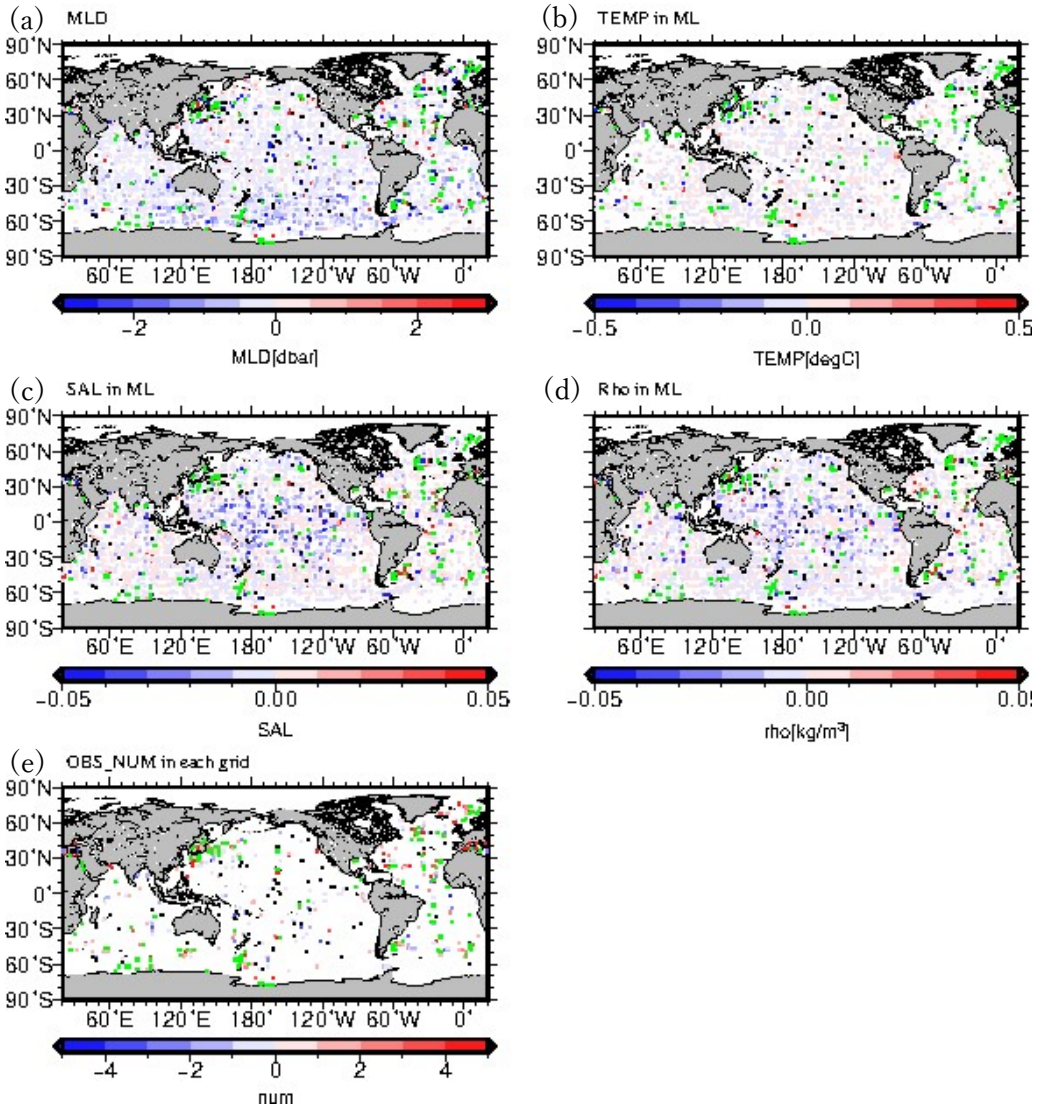

Figure 4 the deviation map of the following parameters of recalculation version data set from pre-recalculation version data set, defined as mixed layer depth that density difference is equal to + 0.03kg/m^3 from the density at 10dbar in March 2016: (a) mixed layer depth, (b) temperature in mixed layer, (c) salinity in mixed layer, (d) density in mixed layer, and (e) the number of profiles in each grid. The green dots represent the grid where the Argo profile only existed for the first time in the recalculation. The black dots mean the grid where the Argo profile no longer exists in recalculation.

5. Format of dataset

(1) Format

There is no change of format and variable names in data files (see the MILA GPV manual).

(2) Notes

The target period of the recalculation is as described above, and before 2015, it is not subject to this recalculation. The recalculation history of the dataset before 2015 is as follows.

【Previous recalculation data】

August 11th, 2015

【The target period of the previous recalculation】

From January 2001 to December 2014

6. Future plan

The dataset will be released in the following two types.

Table 1 the type of MILA GPV

Type	Contents	Creation frequency	Update frequency
Near-Real-Time (NRT)	Created using Argo profile data for one month two months before the creation date.	monthly	None
Delayed-Mode (DM)	Recalculated using the Argo profile data in the latest quality control stage.	Once a year	Once a year

The NRT type emphasizes immediacy and is only open for the last year. The DM type is the recalculation data set using the Argo profile data in the latest quality control stage for the entire period. As shown in Fig. 2, about 70% of the profiles are delayed mode before about 3 years from now. Therefore, the DM type of MILA GPV is better data set using the Argo profile.

【Reference】

Barnoud, A., Pfeffer, J., Guerou, A., Frery, M.-L., Simeon, M., Cazenave,A., et al. (2021), Contributions of altimetry and Argo to non-closure of the global mean sea level budget since 2016. *Geophysical Research Letters*, *48*, e2021GL092824. https://doi.org/10.1029/2021GL092824

Hosoda, S., Ohira, T., Sato, K., and Suga, T. (2010), Improved description of global mixed-layer depth using Argo profiling floats. *J. Oceanogr.*, 66, 773-787.