

Data Paper

Keishi Shimada, Shintaro Takao, Kunio T. Takahashi, Yujiro Kitade, Jota Kanda and Tsuneo Odate. Physical and chemical oceanographic data during Umitaka-maru cruise of the 59th Japanese Antarctic Research Expedition in January 2018. Polar Data Journal. 2021, 5, p.11–36. <https://doi.org/10.20575/00000023>.

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1st submission

Editor Start Date: 11/2/2020

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Reviewer #1 (11/20/2020–12/18/2020)

Reviewer #2 (11/24/2020–12/28/2020)

Editor Comments to the Author:

The paper describes the physical and chemical data observed in January 2018 in the Southern Ocean south of Australia. The relevant data have been obtained by the Japanese Antarctic Research Expedition for many years and have been published as the JARE Data Report. Repeated observations every year are necessary to know the long-term trends of change in the region and valuable for understanding climate change such as global warming. Therefore, it is highly meaningful to publish this paper on PDJ.

Please consider the review comments before publication and revise as necessary.

Reviewer #1: Anonymous

This paper is reasonably well-written and the methods and technical validations are well described. I recommend publication with only a modest amount of revision as per my following comments.

1. Section 3.6.4: Wako merged FUJIFILM Finechemicals Co., Ltd. In 2018. The company name changed to FUJIFILM Wako Pure Chemical Corporation. It is recommended that the new company name be listed along with the old company name.
2. Fig. S5: The text in the figure is garbled.
3. Fig. S6, S7: The text fonts to the right of the station name are too small.

Thank you for the opportunity to comment on this manuscript.

Reviewer #2: Anonymous

This paper presents high-quality physical and chemical oceanographic monitoring data in the Indian Sector of the Southern Ocean. Such routine data is valuable for detecting changes in the ocean environment under the ongoing climate change and understanding the Southern Ocean's current/future state and global climate. Therefore, I think the paper worth to be published as a data report after minor revisions suggested below.

Minor comments and suggestions:

Abstract

Line18 - please define what "physical" and "chemical" oceanographic data is.

Lines 20–23 - I suggest clearly stating your observations are routine ones here.

1. Background & Summary

Line 32–42 - bottom water freshening is introduced as scientific motivation for the monitoring observation. Just recently, however, some papers demonstrate that reversals of freshening trend of the bottom water (e.g., Aoki et al., 2020, Sci Rep; Silvano et al., 2020, NCEO); I suggest you mention the recent oceanic changes as well by citing these relevant papers.

2. Study sites

I think the name of this section is better to be "Observation sites".

3. Materials, methods and technical validation

Line 73 - should insert "observations" after "CTD".

3.1 TSG

Line 83 - "Conductivity" should be also included, since the TSG system originally measure "conductivity", not "salinity", as you mentioned in Line 85.

Line 85 - please specify the accuracy of the TSG sensors.

3.2 CTD

Lines 103–105 - please provide the accuracy of your CTD sensors.

Line 125 - add "depth" after "closure".

3.6.3 Data processing - why you use bullet points style only in this section?

Figures:

Fig.1 - some triangles are very hard to see. Please make them more visible.

Fig.S2 - what "boundary" means? Why you refer to the pressure of 950 dbar as "boundary"?

Fig.S3 - I think general readers cannot understand "double conductivity ratios before and after correction". Please explain to them a little bit more. In addition, the double conductivity ratios show a sudden drop and then gradually increase. Is it a general case?

Fig.S4 - these diagrams are the author's original? If not, please cite appropriate papers.

Authors Response:

Response to reviewer #1;

We would like to thank referee for his thorough reading of our manuscript and positive assessment with very constructive comments. All your points helped us a lot, especially on increasing accuracy and hence, understandability of description. We believe that your points are now taken and helped us a lot to improve our manuscript. Our response follows, one by one, the list of the reviewer's comments.

Comment 1) Section 3.6.4: Wako merged FUJIFILM Fine chemicals Co., Ltd. In 2018. The company name changed to FUJIFILM Wako Pure Chemical Corporation. It is recommended that the new company name be listed along with the old company name.

Authors

This is reasonable. Considering the traceability, the sentence was re-written as follows.

“For the nitrite standard, we used “nitrous acid iron standard solution (NO₂- 1000, Lot TWN2722, Code No. 140-06451)”, provided by Wako (since after 2018, the corporation is re-named as FUJIFILM Wako pure Chemical co.).”

Comment 2): Fig. S5: The text in the figure is garbled.

Authors

Thank you for pointing this out. Although the cause is not clear, we have corrected the garbled characters in the figures.

Comment 3): Fig. S6, S7: The text fonts to the right of the station name are too small.

Authors

Thank you for pointing this out. Font size of positions and date given in right hand side of station name are increased as much as possible.

Response to reviewer #2;

We would like to thank Referee for his thorough reading of our manuscript and positive assessment with very constructive comments. We believe that your points are now taken and helped us a lot to increase understandability our manuscript. Our response follows, one by one, the list of the reviewer's comments.

Comment 1): Line18 - please define what "physical" and "chemical" oceanographic data is.

Authors

We added "(temperature, salinity, and dissolved oxygen)" and "(nutrients)" after the word "physical" and "chemical", respectively.

Comment 2): Lines 20-23 - I suggest clearly stating your observations are routine ones here.

Authors

This is reasonable. The sentence was re-written as follows.

"As part of the 59th Japanese Antarctic Research Expedition, and also as a part of annually conducted monitoring observations, we have obtained high-quality Conductivity-Temperature-Depth (CTD) and water sampling data (salinity, dissolved oxygen, and nutrients) at 6 sites located along a 110°E transect in January 2018."

Comment 3): Line 32-42 - bottom water freshening is introduced as scientific motivation for the monitoring observation. Just recently, however, some papers demonstrate that reversals of freshening trend of the bottom water (e.g., Aoki et al., 2020, Sci Rep; Silvano et al., 2020, NCEO); I suggest you mention the recent oceanic changes as well by citing these relevant papers.

Authors

This is reasonable. We agree that not only technic but also scientific motivation for the monitoring observation should also be updated and intensified. We re-written the paragraph (line 37-42 in the previous manuscript) as follows and relevant references are added.

"Since after 1990s, rapid and widespread freshening, possibly linked to enhanced basal melting of the Antarctic Ice Sheet (e.g., Rignot et al., 2013), was observed in the Southern Ocean^{4, 5}. There also has been clear evidence of warming in AABW, which may reflect reduction in meridional overturning circulation^{6, 7, 8}. Further, both freshening and warming induced remarkable sea level rise⁹. In the latest study, however, reversals in freshening trend of the AABW, possibly due to decrease in basal melting of the Antarctic Ice Sheet¹⁰ and/or increase in sea ice formation in the source region of AABW¹¹ is reported. Considering these non-monotonic signals in the Southern Ocean, high-quality data obtained from sustained annual monitoring observations are undoubtedly critical for an improved understanding of future climates."

Comment 4): 2. Study sites- I think the name of this section is better to be "Observation sites".

Authors

I agree that the “Observation site” is suitable than “Study site” and thus modified accordingly.

Comment 5): Line 73 - should insert "observations" after "CTD".

Authors

Thank you for pointing this out. The word “observations” was added accordingly.

Comment 6): Line 83 - "Conductivity" should be also included, since the TSG system originally measure "conductivity", not "salinity", as you mentioned in Line 85.

Authors

This is reasonable. We replaced the word “salinity” by “conductivity” and added “(and hence salinity)” after it.

Comment 7): Line 85 - please specify the accuracy of the TSG sensors.

Authors

Nominal accuracy was added as the final sentence of the paragraph (line 89-90 in the revised manuscript).

Comment 8): Lines 103-105 - please provide the accuracy of your CTD sensors.

Authors

This is reasonable. Sentence describes nominal accuracy was added (line 109-113 in the revised manuscript).

Comment 9): Line 125 - add "depth" after "closure".

Authors

This is reasonable. The word “depth” was added accordingly.

Comment 10): 3.6.3 Data processing - why you use bullet points style only in this section?

Authors

Thank you for pointing this out.

The data processing described in this section is not that complicated and hence, priority should be given to consistency throughout the manuscript. We thus modified this section to general style.

Comment 11): Fig.1 - some triangles are very hard to see. Please make them more visible.

Authors

Thank you for pointing this out. We have increased size of all the symbols to increase visibility. Also, the color of triangles (TSG sampling points) was changed to gray to increase the contrast between circles (CTD points). Please note that the figure caption is also modified accordingly.

Comment 12): Fig.S2 - what "boundary" means? Why you refer to the pressure of 950 dbar as "boundary"?

Authors

Thank you for pointing this out. We now consider that the word “boundary” is ambiguous in this context. We intended to show the differences between CTD and bottle salinity separately with respect to depth where they were observed. This is because that background vertical gradient, which may affect the difference when the vertical distance between CTD sensors and Niskin bottles (e.g., ~1 m) is considered, is confirmed to be large in shallower layer above 950 dbar and small in deep layer below the depth. To reduce ambiguity, we have modified the relevant part of figure caption as follows.

Before the modification:

The lower two panels are histograms of the differences after the calibration. Panels are sub-divided according to observed pressure (boundary is 950 dbar)

After the modification:

The lower two panels are histograms of the differences after the calibration and are divided according to observed pressure. Here, 950 dbar is chosen as the separation depth because background vertical salinity gradient, which may influence the salinity difference between CTD and bottle through vertical distance between CTD sensors and Niskin bottles (e.g., ~1 m), increases/decreases above/below this depth.

Comment 13): Fig.S3 - I think general readers cannot understand "double conductivity ratios before and after correction". Please explain to them a little bit more. In addition, the double conductivity ratios show a sudden drop and then gradually increase. Is it a general case?

Authors

This is reasonable. The figure caption was modified to add explanation more in detail.

Your concern on sudden drop in the double conductivity ratio (end of 2018/1/8) is also reasonable. It was fortunate that number of samples measured during the drop was small and overall influence was negligible (the differences between CTD and bottle salinity shown in fig. 4 are average level among the previous cruises), however, the salinometer was likely unstable at that time. The rate at the moment of sudden drop was 1 order larger than average drift rate in the previous cruises.

Although we consider that rapid laboratory temperature change as a candidate because the drop occurred during ship was rapidly moving southward, both the sudden temperature change in laboratory and salinometer bath was not detected by deployed thermometer (one thermometer for each) and the cause is not clear. To avoid being influenced by such a sudden drift, we should not make measurement during rapid meridional moving and also, we would like to increase number of laboratory thermometer to make the cause clear.

Comment 14): Fig.S4 - these diagrams are the author's original? If not, please cite appropriate papers.

Authors

We assumed that the reviewer 2 refers to Fig. S5 in this comment because the word “diagram” is reasonable for Fig. S5 rather than Fig. S4.

We thank for your concern. Although it may be counterintuitive, the flow diagrams in figure S5 are composed by our self, based on manual provided by BL Tec K. K.

2nd submission

Editor Start Date: 1/28/2021

Editor Stop Date: 2/10/2021

Editor Comments to the Author:

Thank you very much for sending revised manuscript.

I propose to the editorial board to accept as it is.

Editorial Office's note

Calculate checksum date: 2/18/2021

Algorithm:SHA256

Hash link: <http://id.nii.ac.jp/1434/00000023> > hash list