

Data Paper

Keishi Shimada, Kunio T. Takahashi, Ryosuke Makabe, Masato Moteki and Jota Kanda. Physical and chemical oceanographic data during Umitaka-maru cruise of the 60th Japanese Antarctic Research Expedition in January 2019. Polar Data Journal. 2022, 6, p.43–65. <https://doi.org/10.20575/00000041>.

(Received 3/22/2022; Accepted 8/1/2022)

1st submission

Editor Start Date: 3/23/2022

Editor Stop Date: 3/29/2022

Editor comments to the Author: Naohiko Hirasawa

Dear Dr. Shimada,

Thank you for submitting your paper to PDJ.

The purpose of this data paper is to explain and publish the data observed at Umitaka-maru. Two papers on similar observations in the past have already been published. Many of the descriptions in this paper overlap with the previous two papers, as they are the result of continuous and repeated activity in the Antarctic Research Expedition. In general, it is difficult to recognize such a paper as an independent one, so we would like to share with you the idea of the editorial board in such cases. Please consider the following points and consider revising the manuscript.

1. In the abstract, please describe that this observation is repeated every year and what number this paper is. In addition, describe the previous paper(s) to be referred to.
2. In the body of the manuscript, emphasize only the differences from the previous papers. As for the points that are not different from the previous papers, please make the description to the extent that the readers can get an overview of the whole, and refer to the previous papers for most of them to avoid duplication of contents.

Sincerely,

Naohiko Hirasawa, NIPR

Editor in charge

Authors Response:

Dear Editor:

We would like to submit revised manuscript entitled “Physical and chemical oceanographic data during Umitaka-maru cruise of the 60th Japanese Antarctic Research Expedition in January 2019” for publication as an article in the

Polar Data Journal.

We have modified our manuscript per requests from editorial board. Per request, descriptions regarding to details of basic methodology were extensively reduced and were referred to the previous papers in the revised manuscript. Descriptions critical to data validations such as details of instruments and quality control, on the other hand, remained as they were. Also, abstract is modified so that it includes description on point that the observation is repeated every year and description of sequential number of the relevant manuscript. Having not enough examples of abstract which includes references in previous literatures, however, we are not fully confident of our manner of referencing previous papers in the abstract. So, would you please check whether the current manner is acceptable for the Polar Data Journal? Thank you for your consideration. I look forward to hearing from you.

Sincerely,

Keishi Shimada

2nd submission

Editor Start Date: 4/25/2022

Editor Stop Date: 6/14/2022

Reviewer #1 (5/9/2022–6/10/2022)

Reviewer #2 (5/9/2022–5/11/2022)

Editor comments to the Author: Naohiko Hirasawa

Dear Authors,

Thank you for submitting the manuscript to the PDJ.

The comments from the two reviewers have arrived, and I have attached them below. Their and my opinion is “minor revision”. We would appreciate it if you could return the revised manuscript according to the reviewer's comments. I will only add a view of the editorial board on a comment (see below) in the first half of the Reviewer# 2.

"Abstract" of a manuscript might be provided alone separated from the main body of the manuscript. Therefore, citation should not be included, or full information should be included in Abstract. Please check the guideline of the Polar Data Journal.

The reviewer's comments are considered plausible, and the author's first paper provided a complete description. This paper is published annually on similar observational data that are repeated annually. We are currently in the process of revising the editorial board's guideline on such cases. Therefore, before circulating the papers to the reviewers, we

asked the reviewers that they simplify the paper by quoting past papers in the abstract as a request from the editorial board. The paper submitted this time is the result of responding to that request, and the editorial board will accept it.

Sincerely yours,

Naohiko Hirasawa

National Institute of Polar Research

PS. We also thank the two reviewers.

Reviewer #1: Anonymous

Authors present high-quality physical and chemical oceanographic data in the Southern Ocean. These data are valuable for monitoring and understanding current/future changes in the Southern Ocean environment. Therefore, I think the paper be worth for publication after minor revisions suggested below.

Comments:

1. Line 69: Maybe "were" not "was".
2. Lines 84-86: Please add time resolutions for sea surface temperature and conductivity measurements.
3. Lines 85-86: Please show except cruise track for Australian EEZ in Figure 1.
4. Line 88: Maybe "accuracies" not "accuracy".
5. Lines 100-103: Please add time or vertical resolutions for pressure, temperature, conductivity and altitude.
6. Lines 126 and 138: There is no "Eq. 1". The numbers of equations may be not correct. It means that "Eq. 2" may be "Eq. 1" and "Eq. 3" may be "Eq. 2".
7. Lines 138 and 140: There is explanation for 't', however there is no 't' in the equation. Please check the equation.
8. Line 165: Correct depth is "2,500" ?
9. Line 259: Should be "3.6.4" to "3.6.2".

Reviewer #2: Hiroshi Uchida

This manuscript reports the CTD/water sampled data and TSG data obtained from Umitaka-maru in 2019. Although the required information about the data set is generally described, I suggest that the following points be revised to consider before publication.

Please check the guideline of the Polar Data Journal for Supplementary Information. Supplementary Information is usually provided as a separate document, and referred in the manuscript supplementary, for example "(see Supplementary Information Fig. S1)".

"Abstract" of a manuscript might be provided alone separated from the main body of the manuscript. Therefore,

citation should not be included, or full information should be included in Abstract. Please check the guideline of the Polar Data Journal.

1. Lines 84-89: Information of time interval of the TSG data should be noted in the manuscript.
2. Line 88: "accuracy" -> "accuracies"
3. Lines 88-89: The nominal accuracy of the temperature sensor does not guarantee the accuracy of the temperature measurement for seawater temperature at 4.3 m depths because of a change in temperature between the intake and the TSG instrument (e.g. Figs 2 and 3 in Uchida [2018] TSG, Guideline of Ocean Observations, vol. 8, chap. 1 [in Japanese]). Magnitude of the error can be estimated from the CTD profile data by comparing the CTD temperature data at 4.3 m and the TSG temperature data.
4. Lines 91-92: If the contents of "section 3.1 of reference 1" and "section 3.1 of reference 2" are equal, then either "reference 1" or "reference 2" can be referenced. If the content differs between the two, the respective references should be clearly stated. Lines 119, 176, 186, 217, 252, and 257 should be similarly revised.
5. Line 105: According to the manufacturer's manual, initial accuracy for the pressure sensor is 0.015% of full scale range. What is the full scale range of the pressure sensor? If the full scale range of the pressure sensor used is 10,000 psia (6900 dbar), the initial accuracy is calculated to be 1.0 dbar.
6. Line 130: Temperature bias ($\sim 0.001^{\circ}\text{C}$) due to the viscous heating effect (Uchida et al., 2007) also remains. If the bias is not compensated for, it should be considered in the uncertainty estimation.
7. Lines 138-140: There is no "t"-term in Eq. 3, and "+" might be missing for the coefficient "c6".
8. Lines 179-180: "maximum", "better than", and " $\pm$ " should be removed from the sentence.
9. Line 189: "Standard Sea Water (SSW)" -> "IAPSO Standard Sea Water (SSW)"
10. Lines 205-206: Is the calculation equation same as that used in Line 238 (Dickson et al. 2007, standard deviation of replicate samples)? (It should be the same.)
11. Line 271: The manufacturer of CRM should be noted here, although it is noted in the caption of Supplementary Table S4.

Table 1: Is the bottom depth data applied for a sound speed correction and for a draught correction (depth of the ship-mounted depth recorder)? Was the minimum distance above bottom measured by the altimeter of the CTD system? The bottom depth data completely agree with the maximum depth of the CTD plus the minimum distance above bottom. I am very surprised at such complete agreement.

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. We believe that your points are now taken and helped us a lot to improve our manuscript. Our response follows, one by one (in red), the list of the reviewer's comments.

1. Line 69: Maybe "were" not "was".

Thank you for pointing this out. We changed "was" to "were", accordingly.

2. Lines 84-86: Please add time resolutions for sea surface temperature and conductivity measurements.

This is reasonable. We added explanation for temporal resolution (a minute) in L.85 of the revised manuscript, accordingly.

3. Lines 85-86: Please show except cruise track for Australian EEZ in Figure 1.

This is reasonable. Fig. 1 was modified so that cruise track within Australian EEZ can be distinguished by line color (gray is assigned). Please also note that figure caption was also modified accordingly.

4. Line 88: Maybe "accuracies" not "accuracy".

Thank you for pointing this out. We changed "accuracy" to "accuracies", accordingly.

5. Lines 100-103: Please add time or vertical resolutions for pressure, temperature, conductivity and altitude.

This is reasonable. We added explanation that data were obtained at 24 Hz in L. 106 of the revised manuscript, accordingly.

6. Lines 126 and 138: There is no "Eq. 1". The numbers of equations may be not correct. It means that "Eq. 2" maybe "Eq. 1" and "Eq. 3" may be "Eq. 2".

Thank you for pointing this out. Equation numbers are corrected, accordingly.

7. Lines 138 and 140: There is explanation for 't', however there is no 't' in the equation. Please check the equation.

Thank you for pointing out the inconsistency. The explanation for 't' is removed from the manuscript, accordingly.

8. Line 165: Correct depth is "2,500"?

Thank you for pointing this out. The second "2000" was corrected as "2,500", accordingly.

9. Line 259: Should be "3.6.4" to "3.6.2".

Thank you for pointing this out. "3.6.4" was corrected as "3.6.2", accordingly.

Reponse 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 (in red), the list of the reviewer's comments.

1. Please check the guideline of the Polar Data Journal for Supplementary Information. Supplementary Information is usually provided as a separate document, and referred in the manuscript supplementary, for example "(see

Supplementary Information Fig. S1)".

Thank you for pointing this out. While we could not find description about structure and/or formatting of Supplementary Information, we consider that we should follow the suggested general style. Besides that, we decided to move the supplementary figures and tables to the main text because they are necessary materials that present the main points of the published data.

2. "Abstract" of a manuscript might be provided alone separated from the main body of the manuscript. Therefore, citation should not be included, or full information should be included in Abstract. Please check the guideline of the Polar Data Journal.

Thank you for pointing this out. This comment is reasonable, and the editor also agrees this. We thus deleted relevant sentences from abstract, accordingly

3. Lines 84-89: Information of time interval of the TSG data should be noted in the manuscript.

This is reasonable. We added explanation for temporal resolution (a minute) in L.85 of the revised manuscript, accordingly.

4. Line 88: "accuracy" -> "accuracies"

Thank you for pointing this out. We changed "accuracy" to "accuracies", accordingly.

5. Lines 88-89: The nominal accuracy of the temperature sensor does not guarantee the accuracy of the temperature measurement for seawater temperature at 4.3 m depths because of a change in temperature between the intake and the TSG instrument (e.g., Figs 2 and 3 in Uchida [2018] TSG, Guideline of Ocean Observations, vol. 8, chap. 1 [in Japanese]). Magnitude of the error can be estimated from the CTD profile data by comparing the CTD temperature data at 4.3 m and the TSG temperature data.

This is reasonable. We assessed temperature differences between TSG temperature and sea surface temperature estimated from CTD profile (CTD SST), which is estimated by averaging temperature above 10 m. We used CTD SST instead of temperature at 4.3 m because shallower data above 5 m was not obtained in all the observed points due to rough conditions. While statistical significance is likely not enough due to smaller degree of freedom, the result was consistent with that of the Fig. 2 of Uchida [2018]. That is, the differences are in range of 0.2-0.8 °C and having decreasing tendency as the SST increases from 0.0 to 15.0 °C (please see fig. rev1 below).

While fig. 2 of Uchida [2018] (or fig. rev1) reveals the possibility that we can correct TSG temperature based on empirical formulation, we consider that observing intake temperature is more substantial. We thus added following sentences in the revised manuscript.

"Please note that TSG temperature is likely increased by 0.2 – 0.8 °C due to warming along the flow path between the water intake and the temperature sensor; the temperature increase is estimated by comparison with near surface temperature (above 10 m) obtained by CTD. We thus plan to deploy the temperature sensor in the proximity of the water intake."

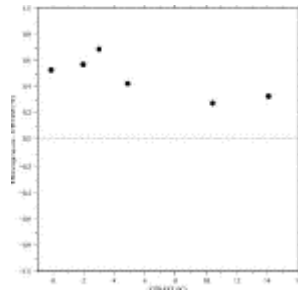


Figure rev1. Temperature differences between TSG temperature and CTD Sea Surface Temperature (SST). CTD SST is estimated by averaging temperature above 10 m at each observation site and compared with TSG temperature. Differences are plotted as a function of the CTD SST.

6. Lines 91-92: If the contents of "section 3.1 of reference 1" and "section 3.1 of reference 2" are equal, then either "reference 1" or "reference 2" can be referenced. If the content differs between the two, the respective references should be clearly stated. Lines 119, 176, 186, 217, 252, and 257 should be similarly revised.

This is reasonable. We revised lines 91-92, 119, 176, 186, 217, 252, and 257 of the manuscript so that only reference 2 (in the original manuscript) is referenced because contents of "section 3.1 of reference 1" and "section 3.1 of reference 2" are equal.

7. Line 105: According to the manufacturer's manual, initial accuracy for the pressure sensor is 0.015% of full scaler range. What is the full scale range of the pressure sensor? If the full scale range of the pressure sensor used is 10,000psia (6,900 dbar), the initial accuracy is calculated to be 1.0 dbar.

Thank you for pointing this out. The nominal accuracy for pressure described in the manuscript (0.9 dbar) was based on wrong value for full scale range of the pressure sensor (6,000 dbar). According to the manufacturer's manual, full scale range of the pressure sensor is 10,000 psia (6900 dbar), thereby we modified the nominal accuracy for pressure to 1.0 dbar.

8. Line 130: Temperature bias ($\sim 0.001^{\circ}\text{C}$) due to the viscous heating effect (Uchida et al., 2007) also remains. If the bias is not compensated for, it should be considered in the uncertainty estimation.

Thank you for pointing this out. Effect of the viscous heating effect was not considered. Hence, the sentences after line 130 (in the original manuscript) are modified to include the temperature bias ($\sim 0.001^{\circ}\text{C}$) due to the viscous heating effect.

9. Lines 138-140: There is no "t"-term in Eq. 3, and "+" might be missing for the coefficient "c6".

Thank you for pointing out the inconsistency. The explanation for 't' is removed from the text and "+" is added before coefficient c6, accordingly.

10. Lines 179-180: "maximum", "better than", and " $\pm$ " should be removed from the sentence.

This is reasonable. "maximum", "better than", and " $\pm$ " were removed from the sentence, accordingly.

11. Line 189: "Standard Sea Water (SSW)" $\rightarrow$ "IAPSO Standard Sea Water (SSW)"

Thank you for pointing this out. "IAPSO" is added before "Standard Sea Water (SSW)", accordingly.

12. Lines 205-206: Is the calculation equation same as that used in Line 238 (Dickson et al. 2007, standard deviation of replicate samples)? (It should be the same.)

Thank you for pointing this out. Equation for estimating precision is same for salinity and dissolved oxygen concentration. Thus, we modified the sentence which explains precision for dissolved oxygen concentration to be consistent with that for salinity. (Please note also that Dickson et al. 2007 was removed from reference list.)

13. Line 271: The manufacturer of CRM should be noted here, although it is noted in the caption of Supplementary TableS4.

This is reasonable. Thus, we added the manufacturer in the sentence.

14. Table 1: Is the bottom depth data applied for a sound speed correction and for a draught correction (depth of the ship-mounted depth recorder)? Was the minimum distance above bottom measured by the altimeter of the CTD system? The bottom depth data completely agree with the maximum depth of the CTD plus the minimum distance above bottom. I am very surprised at such complete agreement.

Thank you for this comment. Based on our scientific goal which focuses on changes in Antarctic Bottom Water, priority was given to obtaining distance from the bottom accurately. For this purpose, we defined the bottom depth as sum of maximum depth of the CTD plus the minimum distance above bottom which is obtained by altimeter. Also, the differences from depth obtained by ship-mounted depth recorder were generally within 10 m, although it occasionally exceeds a few tens of meters (these large differences are likely induced by topographic structure with small spatial scale). Please note that a draught correction is applied to the ship-mounted depth recorder and sound speed correction were applied using the gridded dataset for the Southern Ocean (Shimada et al. 2017).

Reference

Shimada, K., S. Aoki, K. I. Ohshima, Creation of a Gridded Dataset for the Southern Ocean with a Topographic Constraint Scheme. *J. Atmos. Oceanic Technol.*, 2017, 34, 511–532, doi: 10.1175/JTECH-D-16-0075.1.

3rd submission

Editor Start Date: 7/13/2022

Editor Stop Date: 7/28/2022

Editor comments to the Author: Naohiko Hirasawa

Thank you for sending the revised manuscript and the answers to the comments from the reviewers.

I judge that revised paper is basically acceptable because it responds appropriately to the comments of the reviewers.

However, please consider including the explanation for the last comment (Comment 14) of Reviewer#2 and the paper cited at that time. I will submit this opinion to the editorial board, so please let us know if you intend to make any corrections about this point.

Naohiko Hirasawa

Editor in Chief comments to the Author: Akira Kadokura

Dear authors,

As the Editor pointed out, as for your reply to the last comment (Comment 14) of Reviewer#2 and the paper cited in the reply, please consider to include the explanation and the cited paper in the revised manuscript.

Editor in Chief

Authors Response:

Our response to the Editor's comment is as follows.

Editor's comment: I judge that revised paper is basically acceptable because it responds appropriately to the comments of the reviewers. However, please consider including the explanation for the last comment (Comment 14) of Reviewer#2 and the paper cited at that time. I will submit this opinion to the editorial board, so please let us know if you intend to make any corrections about this point.

This is reasonable. The explanations and cited paper in our response to the Comment 14 of the reviewer#2 are added to caption of table 1 in the revised manuscript. The Added sentences were as follows.

“Please note that bottom depth is defined as sum of the maximum depth observed by CTD and the minimum distance above bottom obtained by altimeter. The differences from bottom depth obtained by ship-mounted depth recorder (sound speed correction is applied using the gridded dataset for the Southern Ocean²⁴) were generally within 10 m.”

Please also note that cited paper is added to the reference list of the revised manuscript (No. 24).

4th submission

Editor Start Date: 8/1/2022

Editor Stop Date: 8/1/2022

Editor Comments to the Author: Naohiko Hirasawa

To Dr. Shimada,

Thank you for sending the revised manuscript.

I will submit my opinion to the editorial board that the revised manuscript is acceptable.

Naohiko Hirasawa

Editorial Office's note

Calculate checksum date: 8/4/2022

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Hash link: <http://id.nii.ac.jp/1434/00000041> > hash list