

Data Paper

Keishi Shimada, Ryosuke Makabe, Shintaro Takao, Tsuneo Odate. Physical and chemical oceanographic data during Umitaka-maru cruise of the 58th Japanese Antarctic Research Expedition in January 2017. *Polar Data Journal*. 2020, 4, p.1-29. <https://doi/10.20575/00000010>

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1st submission

Editor Start Date: 12/26/2018

Editor Stop Date: 5/6/2019

Reviewer #1 (3/8/2019–3/22/2019)

Reviewer #2 (3/14/2019–3/16/2019)

Reviewer #1: Anonymous

This paper provides high-quality oceanographic monitoring data in the Southern Ocean. Such data is valuable for understanding the current/future state of the Southern Ocean as well as global climate, and hence worth to be published as a data report. However, the minor revision with careful proofreading by a native speaker is highly recommended. Also, please provide page and line numbers at next revision.

Title

change to "Physical and chemical oceanographic data" for clarification of your data. Also, change "Umitaka-maru-cruises" to "Umitaka-maru-cruise".

Abstract

Line 1 - change to "physical and chemical oceanographic data", as suggested for the Title.

Line 2 - change "As a part of Japanese Antarctic Research Expedition (JARE) 58 research project" to "As a part of 58th Japanese Antarctic Research Expedition (JARE) research project".

Line-4 - change "(salinity, dissolved oxygen, nutrients)" to "(salinity, dissolved oxygen, and nutrients)".

Line 5 - "locate along 110E transect" to "located along 110oE transect"

Line 7 - "cruise track taken between Fremantle and Hobart" to "cruise track between Ports of Fremantle and Hobart"

Line 10 - should provide the formal name of XCTD, not abbreviated one.

### 1. Background & Summary

Line 14 and elsewhere - There are some kinds of expression for JARE, such as JARE-7, JARE-50th, JARE-58, etc. These should be unified throughout the paper.

Line 19 - "oceanographic observation as well as publication of the JARE Data Reports publication series" to "oceanographic observations as well as publications of the JARE Data Reports series"

Line 21 and elsewhere - what "season" means?

Line 30 - "in-situ observations" to "in-situ oceanographic observations"

Line 33 - in addition to cruise name "UM-16-08", "year of observation" is also needed here.

### 2. Study sites

Line 1 - "field observations" to "in-situ oceanographic observations"

Line 2 - same as above, add "Ports of".

### 3. Materials, methods and technical validation

"Conductivity" should be also included as data obtained from CTD and XCTD, since CTD and XCTD originally measure "conductivity", not "salinity".

Line 3 - "phosphate ( $\mu\text{mol L}^{-1}$ ), silicate ( $\mu\text{mol L}^{-1}$ )" to "phosphate ( $\mu\text{mol L}^{-1}$ ), and silicate ( $\mu\text{mol L}^{-1}$ )"

#### 3.1 TSG

Line 4 - here, you describe "conductivity and temperature sensor". Please unify throughout the paper.

##### 3.2.1 CTD system configuration

Line 2 - "here after" to "hereafter"

Line 4 - "Primary and Secondary" to "primary and secondary".

Line 5 - ", altitude sensors" to ", and altitude sensors".

Line 6 - "Pre-cruise calibration" to "Pre-cruise calibrations"

Line 7 -you describe "conductivity sensor" in Table 2, but "salinity sensor" in the text.

### 3.2.4 Post cruise calibration

Line 8 - why the direct comparison with SBE 35 was not done during the UM-16-08 in 2017?

Line 15 - "T " is confusable with temperature, since you already used "T " in the previous equation as temperature.

Line 23 to 26 - How long the pressure data was obtained on deck at each CTD cast? Also, the on deck pressure data was obtained both before and after each CTD cast?

### 3.3 Water sampling

Line 9 - what kinds of contaminations do you assume here?

#### 3.4.1 Sampling

Line 5 - "Niskin bottle" to "Niskin bottles"

#### 3.4.2 Measurement

Line 3 - confusing, what "0.005-42" means?

Line 4 - unit of salinity should be unified, "PSS-78" or "PSU".

#### 3.4.3 Quality control

Please clearly specify the accuracy of salinity for this cruise and whether the accuracy satisfies the GO-SHIP requirement or not.

#### 3.5.1 Sampling

Line 9 - "Niskin bottle" to "Niskin bottles"

### 3.5.3 Quality control

Please clearly specify the accuracy of DO for this cruise and whether the accuracy satisfies the GO-SHIP requirement or not.

### 3.6.1 Sampling

Line 2 - "three times" to "3 times"

### 3.6.4. Quality control

Line 5 - "20 deg C" to "20oC."

Lines 21 and 23 - there is not Table 5.

Fig.1

-Put the labels showing locations of Ports of Fremantle and Hobart on the map.

Caption of Fig.1

- "square indicate" to "square indicates"

- "X-CTD" to "XCTD"

- please specify that triangles represent which salinity samples?

Fig.3

- modify the horizontal axis range of the bottommost panel, because |max| value of 0.0035 is out of range.

Fig.6

- vertical axis is "Number of samples", not "Frequency"

Table 6

- should be Table 5?

Reviewer #2: Anonymous

## General comments

This manuscript (PDJ-D-18-00008) indicates the Physical and chemical data during Umitaka-maru cruises of the 58th Japanese Antarctic Research Expedition. You described methods in a manner that will make reproduction possible by a third party that acquires similar data and makes similar observations. And, you explained the data files and formats so that other researchers can reuse them by reading this section. In addition, you provided information that legitimates the reliability of data. However, I am wondering for the before 58th. Did you also check data from 52th and can we compare 58th with before 58th? I am strongly recommend you to publish not only 58th but also before in this data manuscript.

## Specific comments

1, Title: Chemical =>Biogeochemical

2, Abstract: we need High quality physical and chemical data not only southern ocean and but also other ocean area. So, you will remove "southern ocean" from first sentence of abstract.

3, Introduction: You did ocean observation from JARE-52. How about data? Did you publish for data paper? If not you can include in this paper including data quality check. It is important to keep data quality, otherwise no one can only use JARE-58.

4, Through text: unit of volume is mixing (cm<sup>3</sup>, mL etc). Please use one unit.

5, Figure 1: you will add the Antarctica map as inset in the Figure 1 because it may difficult to understand where in the Southern Ocean.

6, Figure 7: did you write this figure by yourself? Just copy and past from company manual? Check copyright policy.

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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 also would like to apologize for not providing both page and line number on the manuscript. During revision, we found mistake in description of

estimation of nutrients repeatability (final of paragraph section 3.6.4. Quality control). So, please note that the paragraph was considerably re-written. Also, revised manuscript had been edited by carefully by two native-English-speaking professional editors from ELSS, Inc. (<https://www.elss.co.jp/en>). 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) Title change to "Physical and chemical oceanographic data" for clarification of your data. Also, change "Umitaka-maru-cruises" to "Umitaka-maru-cruise".

This is reasonable. We changed the title to "Physical and chemical oceanographic data during Umitaka-maru cruise of the 58th Japanese Antarctic Research Expedition in January 2017", accordingly.

Comment 2) Abstract Line 1 - change to "physical and chemical oceanographic data", as suggested for the Title.

We added the word "oceanographic", accordingly.

Comment 3) Line 2 - change "As a part of Japanese Antarctic Research Expedition (JARE) 58 research project" to "As a part of 58th Japanese Antarctic Research Expedition (JARE) research project".

This is reasonable. We changed the sentence, accordingly.

Comment 4) Line-4 - change "(salinity, dissolved oxygen, nutrients)" to "(salinity, dissolved oxygen, and nutrients)".

We added "and", accordingly.

Comment 5) Line 5 - "locate along 110E transect" to "located along 110oE transect"

We added "o" between "O" and "E", accordingly. Also, "Syowa (69-00S, 39-35E)" (line 13 of 1. Background & Summary) is changed to "Syowa (69°00'S, 39°35'E)".

Comment 6) Line 7 - "cruise track taken between Fremantle and Hobart" to "cruise track between Ports of Fremantle and Hobart"

We added "Ports of" before Fremantle, accordingly.

Comment 7) Line 10 - should provide the formal name of XCTD, not abbreviated one.

We changed "XCTD" to "expendable CTD", accordingly. Likewise, we changed the word "XCTD" in line 6 of 2. Study sites to "eXpendable CTD (XCTD)"

Comment 8) 1. Background & Summary Line 14 and elsewhere - There are some kinds of expression for JARE, such as JARE-7, JARE-50th, JARE-58, etc. These should be unified throughout the paper. This is reasonable. We unified the expression to JARE-XXth (XX indicates sequential number).

Comment 9) Line 19 - "oceanographic observation as well as publication of the JARE Data Reports publication series" to "oceanographic observations as well as publications of the JARE Data Reports series"

We changed the sentence, accordingly.

Comment 10) Line 21 and elsewhere - what "season" means?

As pointed out, the word "season" was ambiguous in the context. Hence, we changed "JARE-51th of the 2009/2010 season" to "JARE-51th in 2009/2010". Similarly, "JARE-52 of the 2010/2011 season" (line 27 of 1. Background & Summary) was changed to "JARE-52th in 2010/2011", accordingly.

Comment 11) Line 30 - "in-situ observations" to "in-situ oceanographic observations"

The word "oceanographic" is added, accordingly.

Comment 12) Line 33 - in addition to cruise name "UM-16-08", "year of observation" is also needed here.

This is reasonable considering consistency with expressions for JARE (e.g., JARE XXth in 20YY/ZZ). Hence, "UM-16-08 cruise" is changed to "UM-16-08 cruise in 2017"

Comment 13) 2. Study sites Line 1 - "field observations" to "in-situ oceanographic observations"

We changed "field observations" to "in-situ oceanographic observations", accordingly.

Comment 14) Line 2 - same as above, add "Ports of".

We added "Ports of", accordingly.

Comment 15) 3. Materials, methods and technical validation "Conductivity" should be also included as data obtained from CTD and XCTD, since CTD and XCTD originally measure "conductivity", not "salinity".

This is reasonable. Conductivity should also be included to remove ambiguity in description of the instruments. The word "salinity (PSS-78)" was changed to "conductivity (S/m)" in the sentence describing CTD, XCTD and TSG observations. Also, we added following sentence in the paragraph to introduce salinity.

“For CTD, XCTD, and TSG observations, salinity (PSS-78) is also derived from conductivity, temperature, and pressure using algorithm for practical salinity scale, 1978<sup>10</sup>.”

Comment 16) Line 3 - "phosphate ( $\mu\text{mol L}^{-1}$ ), silicate ( $\mu\text{mol L}^{-1}$ )" to "phosphate ( $\mu\text{mol L}^{-1}$ ), and silicate ( $\mu\text{mol L}^{-1}$ )"

We added “and” before “silicate”, accordingly.

Comment 17) 3.1 TSG Line 4 - here, you describe "conductivity and temperature sensor". Please unify throughout the paper.

Throughout the manuscript, we unified the description so that readers can understand that parameter we directly observed is “conductivity” and not “salinity”, accordingly.

Comment 18) 3.2.1 CTD system configuration Line 2 - "here after" to "hereafter"

We changed "here after" to "hereafter", accordingly.

Comment 19) Line 4 - "Primary and Secondary" to "primary and secondary".

We changed "Primary and Secondary" to "primary and secondary" in the description of temperature and conductivity sensors, accordingly.

Comment 20) Line 5 - ", altitude sensors" to ", and altitude sensors".

We added “and” before “altitude sensors”, accordingly. Also, the “sensors” was changed to “sensor” because we have only one altitude sensors.

Comment 21) Line 6 - "Pre-cruise calibration" to "Pre-cruise calibrations"

We changed "Pre-cruise calibration" to "Pre-cruise calibrations", accordingly.

Comment 22) Line 7 -you describe "conductivity sensor" in Table 2, but "salinity sensor" in the text.

As pointed out, description “salinity sensor” is ambiguous and hence, changed to “conductivity sensor”.

Comment 23) 3.2.4 Post cruise calibration Line 8 - why the direct comparison with SBE 35 was not done during the UM-16-08 in 2017?

The reason that direct comparison between primary temperature sensor (03P2863) and SBE 35 (Deep Ocean Standards Thermometer) was not conducted derives from limitation in our fund. Namely, we do not own SBE 35. In 2015, however, we fortunately had an opportunity to borrow SBE 35 from Dr. Uchida of JAMSTEC. Considering the valuable contribution from Dr. Uchida, we added our gratitude

to acknowledgment.

Comment 24) Line 15 - "T " is confusable with temperature, since you already used "T " in the previous equation as temperature.

This is reasonable, we applied T (upper case letter) for temperature and t (lower case letter) for time in the revised manuscript.

Comment 25) Line 23 to 26 - How long the pressure data was obtained on deck at each CTD cast? Also, the on deck pressure data was obtained both before and after each CTD cast?

The on-deck pressure was obtained for 2 minutes both before and after each CTD cast. We consider that the description for on-deck pressure acquisition was not enough in the previous manuscript. Thus, we added following sentence in the revised manuscript (line 192-193).

“The on-deck pressure was measured for 2 minutes both before and after each CTD cast.”

Comment 26) 3.3 Water sampling Line 9 - what kinds of contaminations do you assume here?

We assumed contamination induced by air that entered the Niskin bottles. We considered that the explanation was not enough in the previous manuscript and hence, the sentence was changed to following in the revised manuscript (Line 205-207 in the revised manuscript).

“Considering the sensitivity against contamination induced by air that entered the Niskin bottles, samples were collected in order of dissolved oxygen, salinity, and nutrients.”

Comment 27) 3.4.1 Sampling Line 5 - "Niskin bottle" to "Niskin bottles"

"Niskin bottle" is changed to "Niskin bottles", accordingly.

Comment 28) 3.4.2 Measurement Line 3 - confusing, what "0.005-42" means?

We consider that the description was ambiguous and hence, the sentence was re-written as follows (line 232-236).

“Sample salinity was determined using a Salinometer (Model 8400B “AUTOSAL”, Guildline Instruments Ltd., S/N 63904). The nominal range of the instrument was 0.005-42 (PSS-78), and its accuracy was better than  $\pm 0.002$  (PSS-78) over 24 hours without re-standardization. The maximum resolution of the salinometer was better than  $\pm 0.0002$  (PSS-78) at salinity of 35 (PSS-78).”

Comment 29) Line 4 - unit of salinity should be unified, "PSS-78" or "PSU".

This is reasonable. We unified the salinity unit to “PSS-78”, accordingly.

Comment 30) 3.4.3 Quality control Please clearly specify the accuracy of salinity for this cruise and

whether the accuracy satisfies the GO-SHIP requirement or not.

This is reasonable. The last paragraph of the sub-section was re-written as follows. Related to the revision, the reference for GO-SHIP standard is added.

“The accuracy of this overall method was assessed by using 19 pairs of replicate samples taken from the same Niskin bottle. The average and the standard deviation of the absolute difference among the 19 pairs were 0.00046 and 0.00050 PSS-78, respectively (Fig. 6). The accuracy, which was determined by adding the above average and standard deviation to give 0.00096 PSS-78, satisfied both the WOCE<sup>13</sup> (0.002 PSS-78) and GO-SHIP<sup>14</sup> (0.001 PSS-78) requirements.”

Comment 31) 3.5.1 Sampling Line 9 - "Niskin bottle" to "Niskin bottles"

We changed "Niskin bottle" to "Niskin bottles", accordingly.

Comment 32) 3.5.3 Quality control Please clearly specify the accuracy of DO for this cruise and whether the accuracy satisfies the GO-SHIP requirement or not.

This is reasonable. The last paragraph of the sub-section was re-written as follows.

“The overall accuracy of this procedure was assessed by 19 pairs of replicate samples obtained from the same Niskin bottle. The standard deviation of the replicate measurement, estimated following Dickson et al. (2007)<sup>19</sup>, was 0.18  $\mu\text{mol L}^{-1}$ . The accuracy stipulated by WOCE<sup>13</sup> and GO-SHIP<sup>14</sup> requirements is that twice the standard deviation should be less than 0.5% of the highest concentration found in the ocean. By using the maximum dissolved oxygen concentration determined during the cruise (360.5  $\mu\text{mol L}^{-1}$ ) as a reference for the highest concentration found in the ocean, this criteria becomes 1.8  $\mu\text{mol L}^{-1}$ . Hence, our accuracy satisfied both WOCE<sup>13</sup> and GO-SHIP<sup>14</sup> requirements.”

Comment 33) 3.6.1 Sampling Line 2 - "three times" to "3 times"

We changed "three times" to "3 times", accordingly.

Comment 34) 3.6.4. Quality control Line 5 - "20 deg C" to "20oC."

We changed "20 deg C" to "20°C", accordingly.

Comment 35) Lines 21 and 23 - there is not Table 5.

Table number given to “table 6” in the previous manuscript should be “5”. Hence, the description in this subsection remained the same and table number was changed from “6” to “5”, accordingly.

Comment 36) Fig.1

- Put the labels showing locations of Ports of Fremantle and Hobart on the map.

We added label of the location of Ports of Fremantle and Hobart on the map, accordingly. Also,

following sentence is added to caption. Inlet map is also added to provide location of the observation site.

“Diamond and inverted triangle indicate locations of Ports of Fremantle and Hobart, respectively.”

Comment 37) Caption of Fig.1

- "square indicate" to "square indicates"

We changed "square indicate" to "square indicates", accordingly.

- "X-CTD" to "XCTD"

We changed "X-CTD" to "XCTD", accordingly.

- please specify that triangles represent which salinity samples?

We specified in revised manuscript that the triangles in fig. 1 represent position where salinity samples were obtained from TSG intake, accordingly.

Comment 38) Fig.3

- modify the horizontal axis range of the bottommost panel, because |max| value of 0.0035 is out of range.

This is reasonable, we expanded the horizontal axis of bottommost panel so that |max| value to be included in the range.

Comment 39) Fig.6

- vertical axis is "Number of samples", not "Frequency"

We changed vertical axis of fig. 6 from "Frequency" to "Number of replicate samples", accordingly.

Comment 40) Table 6

- should be Table 5?

As pointed out, the table number given to “table 6” should be “5”. Hence, it was changed from “table 6” to “table 5”, accordingly.

Response to reviewer #2;

We would like to thank Referee for his thorough reading of our manuscript and positive assessment with very constructive comments.

One of the major concerns is the treatment of preceding data to JARE 58th (UM-16-08) in 2017. As

described in detail as response to comment 3), however, we are planning to publish preceding/succeeding data separately, considering instrumental and methodological differences among the observations, and long-term continuity of our project.

We would like to apologize for not providing both page and line number. Also, during revision, we found mistake in description of estimation of nutrients repeatability (final of paragraph section 3.6.4. Quality control). So, please note that the paragraph was considerably re-written. Revised manuscript had been edited by carefully by two native-English-speaking professional editors from ELSS, Inc. (<https://www.elss.co.jp/en>). 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) Title: Chemical =>Biogeochemical

This is reasonable. However, considering consistency with our project (physical and chemical oceanographic observations), it is desirable to remain the word "chemical" unchanged. Also, we added the word "oceanographic" to remove ambiguity of data and we changed " Umitaka-maru-cruises" to "Umitaka-maru-cruise".

Comment 2) Abstract: we need High quality physical and chemical data not only southern ocean and but also other ocean area. So, you will remove "southern ocean" from first sentence of abstract.

As pointed out, our point that the Southern Ocean is pivotal in the meridional overturning circulation of the global oceans, was not clear in the sentence. Thus, the first sentence was re-written as follows. "Connecting all major ocean basins, the Southern Ocean is pivotal in the meridional overturning circulation of the global oceans. High quality physical and chemical oceanographic data in the Southern Ocean are thus critical for improved understanding of future climates."

Comment 3) Introduction: You did ocean observation from JARE-52. How about data? Did you publish for data paper? If not you can include in this paper including data quality check. It is important to keep data quality, otherwise no one can only use JARE-58.

As pointed out, we started observation along 110°E from JARE-52th in 2011 and preceding data to JARE-58th are not published yet. We do recognize the importance of publishing those data with certified quality.

Considering following 2 aspects, however, we are planning to publish preceding/succeeding data separately.

One aspect is instrumental and methodological differences among the observations. Namely, in accordance with GO-SHIP manuals, we have improved both our instruments and methods, year by year. To certify data quality, on the other hand, careful validation, assessment, and description for

instruments, methods, and accuracy are indispensable. We considered that it is impossible to keep the manuscript readable and concise, if the manuscript is to cover whole the patterns.

Another aspect is long term continuity of our project. For fixed term project, it is reasonable to publish all the obtained data at the end of the term. However, as for our case, end is not defined (JARE-58th is chosen to firstly to be published because it is a beginning of JARE phase IX).

Comment 4) Through text: unit of volume is mixing (cm<sup>3</sup>, mL etc). Please use one unit.

This is reasonable. Considering consistency with unit of the final product ( $\mu\text{mol L}^{-1}$ ), we unified unit to ml, and L.

Comment 5) Figure 1: you will add the Antarctica map as inlet in the Figure 1 because it may difficult to understand where in the Southern Ocean.

We added inlet map to provide location of the observation site in the Southern Ocean, accordingly.

Comment 6) Figure 7: did you write this figure by yourself? Just copy and past from company manual? Check copyright policy.

We thank for your concern. Although it may be counterintuitive, the flow diagrams in figure 7 are composed by our self, based on manual provided by BL Tec K.K..

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2nd submission

Editor Start Date: 6/6/2019

Editor Stop Date: 9/12/2019

Reviewer #1 (9/11/2019–9/11/2019)

Reviewer #1:

The revised manuscript is improved to be readable and understandable, particularly the descriptions regarding the accuracy of your dataset that was my major concern. I appreciate your responses and revisions and recommend that the manuscript is published. Please find below minor editorial comments and a suggestion for consideration.

P.2, line 45. Perhaps "taken en route"?

p.3, line 50. Please change "JARE 50th" to "JARE-50th".

p.10, line 234. I'm still confused by "0.005-42". What "-42" actually means? Please clarify that with a supplementary explanation.

Corrected according to above comments.

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Editorial Office's note

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Original Data

Keishi, S., Ryosuke, M., Shintaro, T., Tsuneo, O. Physical and chemical data during Umitaka- maru cruises of the 58th Japanese Antarctic Research Expedition in January 2017 1.00, Arctic Data archive System (ADS), Japan, 2018. <https://doi.org/10.17592/001.2018122001>.

Postscript by editorial office,

The above Path had been not available. (accessed 2020-10-12)

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