

Data Paper

Satoshi Kimura, Takashi Kikuchi, Amane Fujiwara, Andrew Mahoney, Hajo Eicken and Theodore Goda. Sea-ice motion and oceanographic data from the Beaufort Sea to the Chukchi Borderland in March–December 2020. *Polar Data Journal*. 2021, 5, p.60–68. <https://doi.org/10.20575/00000027>.

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1st submission

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Reviewer #1 (2/2/2021–2/05/2021)

Reviewer #2 (2/12/2021–2/12/2021)

Reviewer #1: Anonymous

In the manuscript entitled "Sea-ice motion and oceanographic data from the Beaufort Sea to the Chukchi Borderland in March - December, 2020", authors provide GPS and hydrographic data from buoys deployed in offshore region of the Alaska. The deployment of buoys and the design of ice-tethered buoy, which is placed in center of the array, is well designed to obtain temporal evolution of sea ices and under ice condition. Thus, provided data is undoubtedly important. The manuscript is reasonably well-written and details of data is generally clear. I thus consider that both the manuscript and provided data substantially benefit the readers. Although being subject to minor revision, the manuscript is almost ready for publication. I have a few minor comments as listed below.

Throughout the manuscript: Please provide line number and page number from the next opportunity for submitting.

Fig. 1: Can you provide location of the Prudhoe Bay.

Table 1: Please unify the format for geographical position (longitude and latitude) throughout the manuscript. (In table 1 and figure 2, you adopt negative values for longitude in western hemisphere. But "W" is appended after longitude numeric in figure 1.)

Buoy Design

Line 3: "two concentric clusters...". Should "two" be "Two (uppercase letter)"? and the sentence seems to be incomplete to me, although I could understand what you meant.

Fig. 2: same as table 1.

Line 11: Should "come" modified to "came"? or modify the sentence as "The temperature and CTD sensors were calibrated by the manufacture; Pacific Gyre Inc. and Sea-Bird Scientific, respectively.". (The sentence is provided just for an example.)

Line 11: Can you provide accuracy for Temperature Pod and CTD sensors (seabird 37 IM).

Fig. 3: Although I could understand it, it is ambiguous. Please provide information of deployed sensors in the caption (e.g., gray rectangle indicate Temperature Pod provided by Pacific Gyre Inc., ...). Also, the sentence "the carriage name in the NetCDF data file is provided in parentheses" given as image data should be given in the caption with some modifications.

Data Overview and Validation

Line 2: Please provide location of Barrow Canyon in figure 1.

Lin 8: Can you provide sampling interval of ITP 114 somewhere in the manuscript? Also, it is possible to detect short time-scale fluctuations as in case of JAM-WB-0003?

Reviewer #2: Anonymous

This paper shows the oceanographic observations beneath sea ice obtained by an ice-tethered buoy and surrounding sea-ice motions obtained from 9 GPS buoys in the late ice-growth and sea ice melt season along trajectories from the Beaufort Sea to the Chukchi Borderland in the Pacific sector of the Arctic Ocean. Method was well written and clear for the readers. I will provide some comments which help reader to understand.

1. This kind of observation includes both temporal and spatial variabilities. So, it would be great if you mention that which effect was significant in this area.

2. Figure. 1: how about other buoys? Were they same position as JAM-WB-0003? If so, you will indicate "Figure 1. Bathymetry of the Beaufort Sea to the Chukchi Borderland and the JAM-WB-0003 and other buoys track deployed during ICEX 2020." for example. For ITP #114, it is great if you will add position/track in this figure to understand the spatial relationship to compare the data.

3. Time series of sea ice concentration near JAM-WB-0003 (in Figure 4?) will help to understand the relationship between oceanographic data.

4. You will show the thickness of sea ice because pressure was 10 dbar. It means that about 10 m from water surface (not depth from bottom of the sea ice?).

5. As the ice thins during the summer, the buoy sinks to the ocean. I understood. But, it means that measurement depth changed before and after the sinks, meaning the measurement of different environment. Because melting season show the strong vertical gradient for water structure, it may best if you will consider to keep same depth measurement (even only temperature) to monitor the same depth. For example, if you will put temperature pod at 7 m depth and at 10 m depth for 37IM, and when sink, this temperature pot moved to 10 m. Therefore, you can keep the measurement for all times at the same depth which provide more comprehensive data set and we can remove the discussion for the effect of sink of sensor on the variation of data.

6. Figure 4b. It is great if you will add the freezing temperature expected from salinity to understand the freezing onset (e.g., end of Oct).

Authors Response:

We thank two reviewers for careful evaluation of the manuscript. Our responses to the comments are below in bold font, and reviewer's comments are in italic font.

Throughout the manuscript: Please provide line number and page number from the next opportunity for submitting.

Done

Fig. 1: Can you provide location of the Prudhoe Bay.

Done

Table 1: Please unify the format for geographical position (longitude and latitude) throughout the manuscript. (In table 1 and figure 2, you adopt negative values for longitude in western hemisphere. But "W" is appended after longitude numeric in figure 1.)

We thank the reviewer for pointing out the inconsistent use of the format. We have decided to use the sexagesimal format throughout the manuscript.

Buoy Design

Line 3: "two concentric clusters ···". Should "two" be "Two (uppercase letter)"? and the sentence seems to be incomplete to me, although I could understand what you meant.

We meant to write “On March 12, five “Universal Tracker” (UT) GPS buoys (JAM-UT-0001 – JAM-UT-0005) and four “Ice Tracker” (IT) GPS buoys (JAM-IT-0001 – JAM-IT-0004) were placed in two concentric clusters,

centered on Camp Seadragon.” It is now fixed in line 82-84.

Fig. 2: same as table 1.

The units for geographical position is now consistent.

Line 11: Should "come" modified to "came"? or modify the sentence as "The temperature and CTD sensors were calibrated by the manufacture; Pacific Gyre Inc. and Sea-Bird Scientific, respectively." (The sentence is provided just for an example.)

We adopt the reviewer’s suggestion in line 93.

Line 11: Can you provide accuracy for Temperature Pod and CTD sensors (seabird 37 IM).

Now in line 94.

Fig. 3: Although I could understand it, it is ambiguous. Please provide information of deployed sensors in the caption (e.g., gray rectangle indicate Temperature Pod provided by Pacific Gyre Inc., ...). Also, the sentence "the carriable name in the NetCDF data file is provided in parentheses" given as image data should be given in the caption with some modifications.

Modified in line 102-106.

Data Overview and Validation

Line 2: Please provide location of Barrow Canyon in figure 1.

Done

Lin 8: Can you provide sampling interval of ITP 114 somewhere in the manuscript? Also, it is possible to detect short time-scale fluctuations as in case of JAM-WB-0003?

The ITP 114 is set to profile every 2-4 hours with a vertical resolution of ~1 m with descending speed of ~0.25 m/s. The sampling rate of ITP 114 profiler data is not as high as JAM-WB-0003; however, the profiler has enough temporal resolution to detect daily fluctuations. See line 114-119.

Reviewer #2:

1. This kind of observation includes both temporal and spatial variabilities. So, it would be great if you mention that which effect was significant in this area.

Characterizing the observation requires to define the variable, for example, deformation rate for sea-ice, change in potential energy for the ocean, and describe computation procedure. The scientific aspect of analyzing the data is beyond the scope for the data journal. We are currently working on analyzing the presented dataset to

characterize the temporal and spatial variabilities of sea-ice deformation and oceanic conditions.

2. Figure 1: how about other buoys? Were they same position as JAM-WB-0003? If so, you will indicate "Figure 1. Bathymetry of the Beaufort Sea to the Chukchi Borderland and the JAM-WB-0003 and other buoys track deployed during ICEX 2020." for example. For ITP #114, it is great if you will add position/track in this figure to understand the spatial relationship to compare the data.

The new Figure 1 incorporates the ITP #114 track with the JAM-WB-0003 track. We did not include tracks from other buoys in Figure 1, because it makes the figure hard to understand with many crossing lines and labels. Instead, we show the initial position of the other buoy with respect to the JAM-WB-0003 in Figure 2, and the distances of the buoys from the JAM-WB-0003 with respect to time is shown in Figure 4a.

3. Time series of sea ice concentration near JAM-WB-0003 (in Figure 4?) will help to understand the relationship between oceanographic data.

Unfortunately, we do not measure the sea-ice concentration.

4. You will show the thickness of sea ice because pressure was 10 dbar. It means that about 10 m from water surface (not depth from bottom of the sea ice?).

This is correct.

5. As the ice thins during the summer, the buoy sinks to the ocean. I understood. But, it means that measurement depth changed before and after the sinks, meaning the measurement of different environment. Because melting season show the strong vertical gradient for water structure, it may best if you will consider to keep same depth measurement (even only temperature) to monitor the same depth. For example, if you will put temperature pod at 7 m depth and at 10 m depth for 37IM, and when sink, this temperature pot moved to 10 m. Therefore, you can keep the measurement for all times at the same depth which provide more comprehensive data set and we can remove the discussion for the effect of sink of sensor on the variation of data.

Thank you for the insights. We are planning to put more sensors so that we get comprehensive data set on temperature and salinity beneath the ice for the next trial.

6. Figure 4b. It is great if you will add the freezing temperature expected from salinity to understand the freezing onset (e.g., end of Oct).

The point of this paper to present the dataset, so we did not include the freezing temperature. The freezing temperature can be calculated from the temperature, salinity, and pressure presented in Figure 4.

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Editor Stop Date: 3/2/2021

Editorial Office's note

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