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Interactive comment on "Low pCO_2 under sea-ice melt in the Canada Basin of the western Arctic Ocean" *by* Naohiro Kosugi et al.

Anonymous Referee #1

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Low pCO2 under sea-ice melt in the Canada Basin of the western Arctic Ocean

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Anonymous referee #

General comments

This paper describes results from a single cruise conducted in the autumn of 2013. The hydrography in the region investigated is complex and with large seasonal signatures.

The analysis of water types from salinity and alkalinity provides a convincing picture of

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Discussion paper

the distribution af water from different sources and is thus a key to the interpretation of the surface and water column data on dissolved oxygen and carbon dioxide.

The primary result reported, as seen from the title of this communication, is a low subsurface pCO2 and negative AOU in the Canada Basin. The authors suggest that this feature, a hidden CO2 sink formed previously in the year, may have significance in the changing Arctic Ocean. Two figures are used to demonstrate this feature, numbers 5 and 6. Strangely, there are much more pCO2 data points for Canada Basin Water in Fig. 6 than in Fig 5e. Fig. 6 indicates a qualitative relation between pCO2 and AOU. This rewiever finds it necessary that to maket he paper acceptable for publication, the authors explore these relations deeper and quanitatively in order to underpin the roles of photosynthesis, respiration and mixing. Also to examine the likely influence of time from formation to observation.

Specific comments

Page Line

3 1 Add information on where cruise started and refer to Fig. 3.

3 8 Is the instrument calibration response linear? What is the estimated uncertainty of measurements reported significantly outside the calibration range?

3 9 Add reference to the "WMO scale“.

3 16 Name of author is here Midorikawa but Mirorikawa in the list of references.

3 26 Were the DIC bottles closed after filling?

3 28 The reference (Nippon ANS, Japan) is unsufficient for a description of the instrumentation of extraction/coulometric titration system.

4 4 To which depth were water samples collected?

4 8 Change "same physical conditions“ to "same potential temperature and salinity

conditions“.

4 10 How were the chlorophyll measurements calibrated?

4 14 The reference (Nippon ANS, Japan) is unsufficient for a description of the instrumentation used for TA measurements.

4 18 Which computation package is used to compute ocean carbonate chemistry?

5 7 Change TARRO to TArro

6 5 Analysis of satellite imaginery is not mentioned in the Data and Methods section. Which data and how processed needs to be added.

6 9 The calculation of CO2 flux and quantification of ?pCO2 reduction needs more detail.

6 20 Change "High“ to "Near equilibrium“conditions.

7 10 At what depth lies the NSTM?

7 19 Suggest changing "affected“ to "contributed to“.

7 31 A figure is needed to illustrate the distinctiveness of the CBW subsurface minima.

14 Fig.1 The placement of this figure as Fig. 1 is strange. It should be after Data and Methods.

15 Fig. 2 The placement of this figure as Fig. 2 is strange. It should be after Data and Methods.

19 Fig.5 Using the calendar date of data collection on the x-axis is unusual. Particularly as there is no date information with the cruise tracks in Fig. 3. Is it possible to use distance sailed instead?

20 Fig. 5f The colour scale does not include the blue observed at lower depths.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2017-148/bg-2017-148-RC1-supplement.pdf

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