Comments were very helpful and we have revised the manuscript according to the comments.

Response to the general comments:
We asked Editorial Support (Anna Feist-Polner) of Copernicus Publications to introduce us English editing company affiliated with BG. Editorial Support said that they can send the paper to their copy editor, when the manuscript has been accepted for final publication. Is it OK? Or, should we send the manuscript to the other editing company (etc. ELSS, Japan)?

Response to the specific comments:

Comment1: P11248 L9-10: “The Bering and Chukchi Sea shelves in the western Arctic Ocean, which are among the largest continental shelves in the world, are known to have….” -> “The Chukchi Sea shelf is one of the largest continental shelf in the world and has high biological productivity (e.g.....).” to simplify the sentence.

Response to Comment1:
We have simplified the sentence.

Comment2: P11248 L20-25: Delete the sentence “The surface mixed layer in the Arctic Ocean has a seasonally……runoff.” because this is repeated in the next sentence “In the Canada basin, the surface mixed layer has a seasonally ......runoff,“.

Response to Comment2:
We have deleted the sentence.

Comment3: P11248 L25: Delete “covering the surface layer” as PMLW was just explained in the previous sentence as “surface mixed layer”.

Response to Comment3:
We have deleted “covering the surface layer”.
Comment 4: P11248 L25: It is not clear how the PMLW in the Canada Basin “contributes to sea ice formation”. Is it because of stratification? If so, I do not find why it is mentioned here. Please clarify the meaning of this sentence.

Response to Comment 4: We have deleted the sentence “The PMLW covering the surface layer contributes to sea ice formation in the fall and winter.”.

Comment 5: P11248 L26-29: The definition of CDW. Is this (T ·1.7 to ·1.0 and S>31.8) from Anderson et al. (2013)? I do not find the word “CDW” or its definition in the Anderson’s paper.

Response to Comment 5: We have revised and added sentences as follows,

Page 11248, Line 25 – 29,
Cold, dense water (CDW), which is characterized by its low temperature (-1.7 oC) and relatively high salinity (32 – 33), is created as a result of sea ice formation and brine production, forming upper and lower halocline layers (Anderson et al., 2013).

Page 11249, Line 4
The lower halocline layer water is formed by the mixture of CDW and AW.

Page 11251, Line 22
We defined the cold dense water (CDW) with temperature = ·1 ~ ·1.7 oC, salinity = 32~34, which includes modified CDW as a result of mixture of AW in lower halocline layer.

Comment 6: P11249 L8-9: “We also attempted to find a clue that will help explain....”-> We also compare VOIs with nutrients and Chl a and discuss possible processes to produce VOIs in seawater.”

Response to Comment 6: We have revised the sentence accordingly.
Comment 7: P11249 L18: “general description of the R/V Mirai” -> “general information of the R/V Mirai cruise”?

Response to Comment 7:
We have revised as follow,
“general information of the MR12-E03 ”

Comment 8: P11251 L07-18: N deficit is due to denitrification, which is a part of decomposition of the organic matter. “influence of organic matter decomposition in the sediment over the shelf” -> “influence of denitrification in shelf sediments”

Response to Comment 8:
We have revised accordingly.

Comment 9: P11252 station numbers. “St 78-80” -> “St 78 and 80”, same for other station numbers on this page. P11252 L20-24: Same as above. St 1-70 usually indicates stations from 1 to 70. If it is too many stations to list in the text, just refer to Table 2.

Response to Comment 9:
We have revised the order of station numbers. Please see the revised manuscript.

Comment 10: Also, name of the area should be the same as defined in Table 2. “southern Chukchi shelf”, not “southern Chukchi area”.

Response to Comment 10:
We have revised the name of area throughout the manuscript. Please see the revised manuscript.

Comment 11: “In the present study, the southern Chukchi Sea area (St1-74) was.......area (74N).”
In the present study, we divided our study area into three groups: Southern Chukchi slope, Central Chukchi shelf-slope, and Northern slope-basin, defined as area between Bering Strait and 71N, 71N and 74N and north of 74N, respectively (Table 2).

Response to Comment 11:
We have revised the sentence accordingly.

Comment 12: Section 3. “We regard any X...X as “high” in the western Arctic Ocean”. In response to reviewer’s comment, authors are revising the text to “We set average concentrations of …..to threshold values of each compound. We use the terms of “high” and “low” as “higher than the threshold...”.
I think the word “threshold” is not correct. It is just an average. Authors do not need to set any “threshold” or define “high” and “low”, but can simply mention “concentrations higher than the average were observed.....” in the text and “concentrations higher than the average are denoted in bold” in the footnote of tables. Please do not repeat “We regard any....” or “We set threshold.....”. for all parameters.

Response to Comment 12:
We have revised the manuscript accordingly. We have not used the words “regard any” or “set threshold” for all parameters. We have mentioned as follows.

Page 11253, Line 11 – 17,
The averages of Chl a in ACW in the surface mixed layer (0.75 μg L⁻¹) and the subsurface layer (0.67 μg L⁻¹) were higher than the total average in all Pacific-origin Water.

Please see other modifications in the revised manuscript.

Comment 13: P11255 L3: “N** minima (or N-deficit minima)” If N** has to be mentioned here, its definition and explanation is needed.

Response to Comment 13:
We have deleted the description “N** minima”.

-> “In the present study, we divided our study area into three groups: Southern Chukchi slope, Central Chukchi shelf-slope, and Northern slope-basin, defined as area between Bering Strait and 71N, 71N and 74N and north of 74N, respectively (Table 2).”
Comment 14: Figures 2 and 3: X-axis for N-deficit should be negative according to the equation in the text.

Response to Comment 14:

We have revised the figures accordingly.

Comment 15: P11257 L27: CH2I2> CH2ClI?,  P11258 L14: two plots->two data points

Response to Comment 15:

We have revised the manuscript accordingly.