

## ***Interactive comment on “Acidification-vulnerable carbonate system of the East Sea (Japan Sea)” by Taehee Na et al.***

### **Anonymous Referee #2**

Received and published: 9 January 2020

**Summary** This paper presented some new carbonate data, which can potentially improve our understanding of the evolution of ocean acidification in the deep Japan Sea. The data are important, but not that abundant. The authors' idea, which attributes horizontal gradients of DIC as signal of re-initiated deep convection in the deep Japan Basin as also supported by recent low AOU observation there, seems to be right. I think this manuscript has the potential to be published but some fundamental revision must be taken before the manuscript can be accepted.

The major points are 1. The writing. The text sometimes reads bad, and I will show some examples. 1.1 The abstract is not compact and arguments in it are not supported by any data, so it makes the readers feel that the paper is written in a subjective way. For instance, there are a lot of 'similar', 'high', 'low', 'faster' used between line 23 and

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34, but not a single number is provided, which finally successfully confused me.

1.2 Some arguments are short and too simple, but not quite completed. For instance, the authors stated 'The trend of TA was not clear, although the values in the Japan Basin were generally lower than at the other sites', but they didn't say why. TA can be generated by CaCO<sub>3</sub> dissolution at depth, the authors can do a quick check to see if CaCO<sub>3</sub> supply from the upper ocean is lower in the Japan Basin. They actually provided some information already between line 214 - 217.

1.3 Expression is sometimes misleading. e.g., Line 303-304: "The acidification trend may be reversed depending on the deep-water ventilation rate. " Are the authors arguing that Japan and Ulleung basins may turn to become alkalizing if the deep water ventilation rate is higher? How could this happen? Please clarify.

2. The data are quite scarce and discussion based on the data is not deep. To improve the discussion, the authors can either improve their data set, or compared their data with model simulations (e.g., Luo and Boudreau, Future acidification in marginal seas: A comparative study of the Japan Sea and the South China Sea. Geophysical Research Letters, 43(12), 6393-6401, 2016.).

minor points:

Line 22: "...in which to investigate..." change to "...for investigating..."

Line 26-27: "...(AOU) values, it was also found to have similar DIC content of the deep waters. However, the TA..." change to "...(AOU) values and DIC content of the deep waters, the TA..."

Line 30: "...acidification by CO<sub>2</sub>..." change to "...acidification caused by CO<sub>2</sub>..."

Line 34-35: "Both slowed deep-water ventilation, and the intrusion of..." change to "Both reduced deep-water ventilation and intrusion of..."

Line 50, 109, 141, 142, 163 and 166: Avoid using abbreviation at the beginning of a

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sentence (e.g., ES, DO or TA).

Line 58: "...act as a 'natural laboratory' that can be used to examine more easily how..." change to "...be used as a 'natural laboratory' to examine how..."

Line 86-87: change "during" to "in"

Line 88: delete "but this time only"

Line 93-95: "A standard material, provided by A. Dickson at the Scripps Institution of Oceanography, USA, was analyzed frequently, including each time a new titration cell was installed." Please reword the whole sentence. Give more information about the standard.

Line 95-96: "of the reported values" A reference is needed here.

Line 105: "...pH was not measured and instead was estimated from..." change to "...pH was only estimated from..."

Line 107: "...were calculated..." change to "...were also calculated..."

Line 108: Was the CTD calibrated?

Line 125-126: "...but below this upper layer the values are uniform, falling within..." change to "...but are relatively constant below this upper layer, within..."

Line 127-128: "by Central Water, Deep Water, and Bottom Water" Missing "the"

Line 129: "...at depths of between..." change to "...at depth between..."

Line 148: "...at depths..." change to "...at depth..."

Line 173: How was the calcite saturation horizon calculated? Please clarify.

Line 175: "...in 1999, after which time it..." change to "in 1999, while it..."

Line 193: "...carbonate saturation states..." change to "...carbonate saturation state..."

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Line 202: “...only at depths > 500 m...” change to “...at depth below 500 m...”

Line 214: “...at depths...” change to “...at depth...”

Line 232: “...is a change in...” change to “...is change in...”

Line 239: “...Japan and Ulleung basins...” change to “...Japan Basin and Ulleung Basin...”

Line 242-243: delete “depths of ”

Line 247: delete “with which”

Line 256: change “most probably” to “more likely”

Line 257: “...rather than a slowing of the...” change to “...rather than weakening of the...”

Line 262: “A consequence...” change to “The consequence...”

Line 263-264: “...ion concentrations and a low pH buffer capacity...” change to “...ion concentration and a small buffering capacity of pH...”

Line 266: “...in the pH...” change to “...in pH...”

Line 271: “A reduced supply...” change to “Reduced supply...”

Line 308 “...by slowed ventilation...” change to “...by reduced ventilation...”

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