

## ***Interactive comment on “Ventilation of the Northern Baltic Sea” by Thomas Neumann et al.***

### **Anonymous Referee #1**

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The paper reports recent observation-based finding of the ventilation event in the bottom water of the Bothnian Bay in March, 2017. The authors conclude that the ventilation is most probably happened due to mixing of Bothnian Sea and Bothnian Bay surface water which resulted in formation of dense water, which was able to replace the older bottom water.

General assesment Unfortunately, I cannot recommend this manuscript in the present shape for publishing. Major revision is required. Although, the theme is interesting and the narrative is logical, there is a problem with the message, the authors are trying to deliver. As a matter of fact, they could not support by their data any of the hypotheses, which could explain the origin of the highly-oxygenated bottom water at the solitary station 19. In the Conclusion section the authors agree that the ventilation mechanism, they suggested is highly speculative, since it is not confirmed strongly by any independent data at hand. There are also several questions to the text, which are listed

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below.

#### Questions/comments

Abstract. The abstract is not sufficiently informative. Basically, there is just one sentence, which describes, what this paper is about. I would suggest to exclude all general wording about the Baltic Sea, but to add more about the essence of this paper.

Page 2, lines 2-3: I would suggest to add more detailed explanation (not just reference on Peterson, 2018), how melting sea ice can produce considerable salt fluxes into the ocean? This is quite a new knowledge, and it is important to explain it in more details.

Page 2, lines 3-4: The references to Aagaard,et al., (1981) and Skogseth et al. (2008) are not relevant in this context. These papers describe specific events of dense water formation and do not consider general theory of this event at all. Taking into account that the authors are considering horizontal advection, as the most probable mechanism of the surface water densification in the Bothnian Bay, I would suggest them to read papers by Shapiro et al (2003) and Ivanov et al. (2004), which summarized all known mechanisms of dense water formation and cascading (not only in the Arctic, but worldwide).

Page 15, lines 19-20: “In areas shallower than the pycnocline, dense water can accumulate at the sea floor and form density driven plumes guided by topography”

This is very speculative statement, which is not confirmed by the provided measurements, but only by the references to the older studies, where this idea was also rather claimed, but not strongly supported.

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