

## ***Interactive comment on “Internal hydraulic control in the Little Belt, Denmark. Observations of flow configurations and water mass formation.” by Morten Holtegaard Nielsen et al.***

### **Anonymous Referee #2**

Received and published: 5 June 2017

The manuscript “Internal hydraulic control in the Little Belt, Denmark. Observations of flow configurations and water mass formation” by Nielsen et al. investigates observations in the northern part of the Little Belt during two-layered, southward flow and connect them to hydraulic control. Two configurations are described, where either the upper or the lower layer is the active and accelerating one. These configurations are dependent on the depth of the pycnocline on the upstream side. The finding of this study are interesting and worth publishing, after following comments are addressed.

Line 25: Although many readers may be familiar with the concept of hydraulic control, it would be useful to give a short definition (with reference) of this concept in the

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introduction as it is the main topic of this study.

Line 48-49: please include references to these studies.

Line 119ff: Baltic → Baltic Sea (several times)

Method section: It would be great to have all observations used in this study shortly described in form of a table including information about location (refer to figure 1 using the station/transect numbers), the observation period, what was observed and how, and important notes (e.g. that there was an inflow during the observation period).

The name of section 3 (Methods) should be renamed to “Observations” and the name of section 4 (Observation and discussion) to “Results”

How do other processes, for example wind mixing, may have impacted the observed signals and their interpretation?

Line 205-206: please explain in more detail why effects, such as mixing can be ruled out.

Line 209: please quantify “short enough”

Line 229: please discuss the “considerable adjustment” in more detailed

Line 233ff: the definition of the two layer system in the cross-strait transects in Figure 5 is somehow unclear. Which case, described here, is assigned to the situation in Figure 5? Please clarify.

Line 260ff: The computed Froude numbers indicate a change from subcritical to supercritical flow. Please discuss in more detail how this finding gives evidence that the situation is subject to hydraulic control.

Line 267-268: How is the location of the point of control be influenced by friction/entrainment?

Line 310ff: The description of the distributions of chlorophyll a is somehow confusing.

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Please first describe Figure 7 and then Figure 8.

Line 381: How can hydraulic control be used to quantify the transport of water masses, the mixing between them and also the influence of other processes?

Figure 1: To more easily identify the position of the stations, it would be great if the station positions could be more highlighted and the transects should be given a numbering. The depth contours are difficult to distinguish.

Figure 2: In the title it is written that the length of the transect being measured from the northern end (assuming distance=0), but looking at the figure itself and the text, it looks like the approximately two layered water masses are located at 50 km distance. Please include in the figure, where north and south is or the starting/ending coordinates.

Figure 3 The different curves are difficult to distinguish and need to be clarified

All figures showing salinity: The unit is missing everywhere, is it g/kg?

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