Biogeosciences Discuss.,
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Interactive comment on "Rapid environmental responses to climate-induced hydrographic changes in the Baltic Sea entrance" *by* Laurie M. Charrieau

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General comments: It would be good to include a discussion about the sedimentology in the area. For examples, how can you be confident that the coarser sandier part in the top of the core is not part of a natural succession of a migrating bar? Were any duplicate cores takes from the wider area that show the same feature? Is there any other data from 1870-1953 interval that provides evidence for pollution (e.g. trace metals in benthic foraminifera for examples?)

Reply: It is challenging to obtain sediment cores in the Öresund, due to limited sediment deposition areas and high current velocities. Therefore, cores from the wider

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area are not available for comparison with our core. As for the migrating bar, we do not have any evidence suggesting such phenomena in the area. We have now modified the discussion and added references to support the pollution suggestion during the period 1870-1953.

Minor comments: - freeze drying of sediments poses a risk of losing more fragile foraminifera, including organic walled specimens, Reply: We agree with the reviewer that freeze-drying sediment can cause loss of some of the most fragile specimens. However, the freeze-drying process was probably not a major problem for the general faunal distribution. Moreover, we found organic linings of foraminifera in our sediment. These organic linings were found undamaged, even though they could easily be broken by manipulating them with a brush. Thus, we think that the risk of losing fragile forms was minimum in our samples.

- lines 323-330: from figure 8 it seems that there are periods with high and low VAV, but there does not seem to be a direct response within the assemblage of FOR-B2, Reply: In our interpretation, the UAV was one of the most important factors to explain the foraminiferal assemblage, as showed in Figure 9. However, the resolution of our sub-sampling for foraminifera and sedimentological parameters limit the possibility to accurately resolve very short events, such as those in the topmost part of the VAV reconstruction.

- could the higher accumulation rates (figure 4) be partially related to the top 10 cm being less compacted (and dense) compared with further downcore in the sediments? Reply: We agree with the reviewer that less compact sediment in the top part of the sediment sequence is contributing to the higher sedimentation rate on this section.

We would like to thank Reviewer 2 for the insightful and helpful comments that we think have significantly improved our manuscript.

Kind regards,

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Laurie M. Charrieau, on behalf of the authors: Karl Ljung, Frederik Schenk, Ute Daewel, Emma Kritzberg and Helena L. Filipsson.

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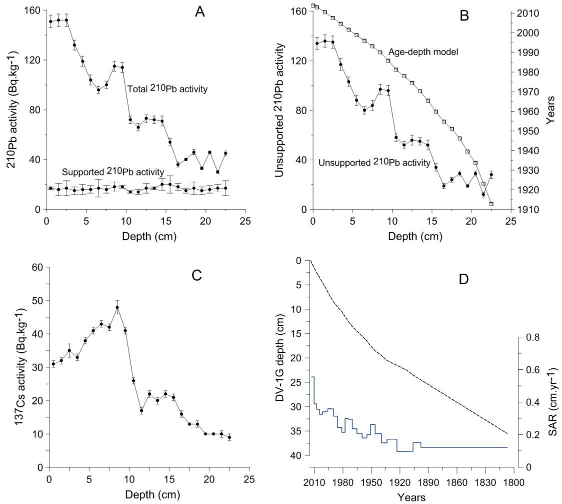

Figure 4. Age-depth calibration for the sediment sequence from the Öresund (DV-1). A) Total and supported ^{210}Pb activity. B) Unsupported ^{210}Pb activity and the associated age-model. C) ^{137}Cs activity. The peak corresponds to the Chernobyl reactor accident in 1986. D) Age-depth model for the whole sediment sequence based on ^{210}Pb dates and calculated sediment accumulation rates (SAR).

Fig. 1. Age-depth calibration for the sediment sequence from the Öresund (DV-1).

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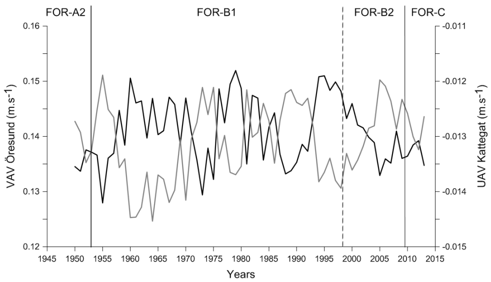

Figure 8. South-North flow (VAV) in the Öresund (dark line) and West-East flow (UAV) in the Kattegat (light line) between 1950 and 2013. Foraminiferal zones indicated.

Fig. 2. South-North flow (VAV) in the Öresund (dark line) and West-East flow (UAV) in the Kattegat (light line) between 1950 and 2013.

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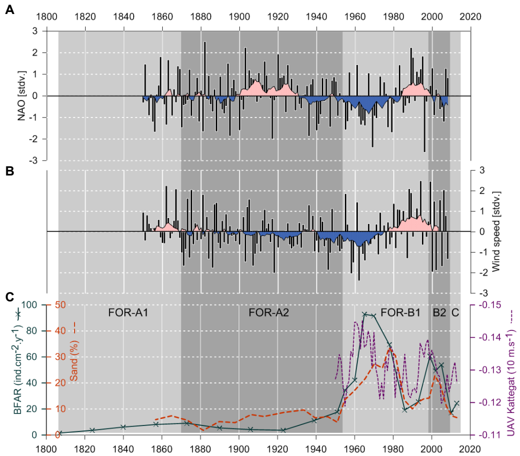

Figure 9. A) NAO index for boreal winter (December to March), data from Jones et al. (1997). B) Variations of near-surface (10 m) wind conditions (October to March), data from Schenk and Zorita (2012). Both NAO index and wind speed data are normalized on the period 1850-2008 and show running decadal means. C) BFAR, percentage of sand fraction and West-East flow (UAV) in the Kattegat. Foraminiferal zones indicated.

Fig. 3. A) NAO index for boreal winter, B) Variations of near-surface (10 m) wind conditions, C) BFAR, percentage of sand fraction and West-East flow (UAV) in the Kattegat

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