We thank the referee for constructive comments. In the following the detailed response to the reviewer's comments are listed. We thank the Editor for allowing us to modify the manuscript in order to address the comments raised by the reviewers.

Reviewer #1
Conditions and mechanism of upwelling occurring at the Baltic Sea has not been fully recognized yet, so the study concerning single summer upwelling events at the south- western Belt Sea seems to be highly noteworthy. Authors use varied data to charac- terize the two summer upwelling events which occurred close to the Boknis Eck in July 2010. Using data provided by the underwater glider is most innovating and it enables to research circumstances before and after upwelling in multiple dimensions. Upwelling conditions are comprehensively characterized concerning the water temperature, salin- ity, ventilation (oxygen) and chlorophyll concentration. Furthermore, authors refer up- welling events to the wind speed and direction, using hourly observational data from two neighboring meteorological stations. I find the scientific results and conclusions
included in the text clearly presented and I think the figures are clear and good quality. The paper is properly structured. I did not notice any technical mistakes in the text and figures. I would recommend the manuscript to be published in the Biogeosciences as it is.

Author's response:
We very much appreciate that the referee is happy the way we presented our results. Nevertheless, we hope that the now modified manuscript is still in line with the conclusion of reviewer #1.

Reviewer #2
This article makes use of glider and wind data time series to analyze the impact on the water column of two upwelling events in a shallow coastal region of the Baltic Sea. The approach uses the potential energy before and after the upwelling events to measure the irreversibility of the upwelling process. This establishes the existence or not of diapycnal mixing during the upwelling event.
The article is well written and clear and the conclusions are supported by the results. From my point of view the article is ready for publication. However I would like to point out two minor comments that resulted from reading the article.

Minor comments:

Page 2768 line 10. Discrepancies between satellite SST and in situ data are suggested to occur due to the coarse temporal sampling of the satellite. I would also add the fact that the SST imagery is a spatial average on the pixel size. Another source of discrepancy could be the proximity to the land border where satellite data is less accurate.

Author's response:
We fully agree and added the spatial sampling problem to the text.

Page 2768 line 28 and Page 2773 line 7. I would briefly mention how far is expected to be the no lateral inflow hypothesis from reality.

Author's response:
The introduction to the "simple upwelling model" has been fundamentally changed in the revised version (also in response to reviewer #3 comments). The observations of the depth average flow stands as it is.

Page 2770 line 2 and Page 2774 line 10. I think the role of turbulent mixing mechanism at the near sea surface (like waves) be also briefly discussed in the context of the experiment.

Author's response:
Indeed near surface processes such as waves or Langmuir circulation cell have an impact on the mixing in particular in such shallow areas under discussion here and references are included (as well as mentioned in the text).

Reviewer #3:
After reading the ms I have to confess that I am not able to identify the sense of the paper. The authors play with data, but they neither posed a scientific question nor any hypotheses. So the goal of the paper remains unclear. The fact that regional upwelling occurs in the Baltic Sea is well known.

Authors Response:

It this manuscript the authors investigate the occurrence and frequency of wind driven summer upwelling at the Boknis Eck time series site (BE). BE is a ship based (monthly visits) time series in the western Baltic Sea (Belt Sea) and one of the longest time series of physical, biological and chemical parameters in the Baltic proper (see also www.bokniseck.de as well as other papers that belong to the *BG Special Issue - Boknis Eck Time Series Station (SW Baltic Sea)*).

The authors utilize high-resolution hydrography and biogeochemical data from a glider survey at BE in combination with wind data from a nearby meteorological station to derive the specific wind forcing conditions that triggered two summer upwelling events observed in the glider data. The analysis confirms the general view that the wind intensity is a good indicator for upwelling intensity. Moreover, basic mechanisms for coastal upwelling in shallow waters such as the offshore/onshore flow and the heaving and relaxation of the density field depending on the strength of the wind forcing are identified from the glider data.

By using the wind time series that goes back to 1982, a time series of wind impulse for the BE area is derived, which in turn is aligned with the monthly BE ship visits. In this way, all summer BE ship visits under the impact of wind driven upwelling are reconstructed. Finally, the BE time series of selected parameter-anomalies (mean seasonal cycle removed) and investigate in respect to upwelling forced anomalies. It can be shown that strong upwelling and large anomalies are well aligned. Moreover, the wind intensity and direction threshold derived in this study may enable future investigators at BE to identify whether a specific data set was under the impact of upwelling or not and which in turn may help interpreting the data.

From a technological point of view it could be shown that autonomous gliders are a useful vehicle in recording the temporal evolution of parameter fields under the impact of short term upwelling events in very shallow coastal areas of the Baltic Sea.

Reviewer #3:
I also cannot identify any new aspect concerning the theory of upwelling. There is no progress in improved understanding of upwelling compared to the classical papers of Yoshida and Mao (1957, J Mar. Res. 16, 40-53) and Yoshida (1967, Jpn. J. Geophys. 4, 1-75).

Authors Response:

Please accept that this paper is a discussion of observational data and not a theoretical paper. As such its purpose is not primarily to advance the theory of upwelling but to identify theoretical aspects of upwelling in observational data. It is very likely that this comments is a result of (1) the lack of clear writing of the manuscript and (2) not citing the relevant theoretical papers. Both of these points have been addressed in the revised manuscript.

Reviewer #3:
It is also not clear why the authors combine high resolution data for very short periods with monthly mean monitoring data.

Authors Response:

As outlined above (response to first comment) we probably were not clear enough in our wording about "what" we do and "why". However, we are confident that the reformulated text does explain the connection in a clear and comprehensive way.

Reviewer #3:
The aspect of diapycnal mixing is rather confusing. On P 2767 L23-24 I read the statement "we were interested if diapycnal mixing was associated with upwelling" followed four lines later by the statement "we ignore any effect diapycnal mixing may have".
And it ends with the statement "diapycnal mixing is assumed to be small. (P2772 L23-24).

Authors Response:

This section has been reformulated to explain in more detail our strategy.

Reviewer #3:
Furthermore I cannot understand how the authors conclude that Kelvin waves do not play a significant role?

Authors Response:

We have indeed not correctly explained our conclusion. For the single point observations with the glider we cannot exclude the role of a Kelvin wave in the upwelling during the survey week in July 2010. However, inspecting the satellite images the propagation of the upwelling along the coast cannot be identified.
When identifying the wind driven upwelling in the BE time series we were able to align many surveys with anomalous parameter records, and what appeared as "data outliers" of the time series, to strong upwelling events. However, certain anomalous events could not be aligned with wind-induced upwelling and other processes such as upwelling initiated by Kelvin Waves may explain them. We now added a statement to the text. Revisiting the work by Gill & Clarke (Deep Sea Res. 1974) confirmed our assumption that in the shallow waters and close to the coast we are operating here the local wind effect should be dominating.