Review of Kudryavtseva and Soomere: Satellite altimetry reveals spatial patterns of variation in the Baltic Sea wave climate

Manuscript "Satellite altimetry reveals spatial patterns of variation in the Baltic Sea wave climate" by Kudryavtseva and Soomere utilises satellite altimeter data to estimate spatial and temporal variations in the significant wave height in the Baltic Sea. This is interesting work, since it is the first time altimeter data has been this extensively used to evaluate the wave conditions in the Baltic Sea. The Authors have evaluated the representativeness of their dataset and studied the statistical significance of the results. Earlier studies are cited and discussed in many places, but the comparison to them and the related discussion should be more comprehensive, especially if the reliability of the earlier studies is questioned. And as the altimeter dataset has been thoroughly validated, it should be indicated, whether the significant findings (trends, spatial patterns) are in the area, where the accuracy of the altimeter data was found to be adequate and if not, how it affecst the results and their interpretation. I also suggest that some of the figures would be redrawn to better illustrate the content and support the conclusions made by the Authors. Furthermore, colour scales that better describe the differences and are able to show where the differences are significant between adjacent pixels (for example from cmocean) would better emphasize their content and make their interpretation easier.

Some specific comments:

Abstract

The abstract could better reflect the content of the paper. The validation of the dataset is not main point in this paper, since it is already published. And is it necessary to name some of the satellites in the abstract? Maybe some more information should be presented about the reliability of the trend and the spatial patterns, since they are major part of this study.

Introduction

Has satellite altimeter data been used to evaluate the wave conditions in other regional seas? The references in the introduction (Hermer et al., Young et al.) are focusing more on global oceans or large domains.

Data and methods

Could the information about the satellites used in this study be presented in a table (name of satellite, period of measurements, coverage, accuracy, …). It is difficult to gather this information from the text, since its scattered to many places.

Page 2, line 21. Here it is said, that there is data from nine satellites, but in the abstract the Authors state that data from ten satellites was used.

Page 3, lines 5 -8. Expressions 'less convincing' and 'poorer' are quite general in nature and do not tell the reader, whether there is bias, or larger scatter in the comparison against in-situ data from smaller sub-basins or nearshore location. Although a comprehensive validation is presented in the earlier paper, the summary here should have enough facts (as numbers or with more precise expressions) to give a more comprehensive picture of the altimeter data quality in different areas of the Baltic Sea.

Page 3, lines 27-28. Which ice product is used to estimate the ice concentration in the Baltic Sea and what is the accuracy of this product? And how it affects the interpretation of results in areas,

where there is large variation in the extent of seasonal ice cover?

Page 6, line 23. 0.3 degree grid cell (c. 33 km) is quite large considering comparison against coastal visual observations. Have you considered using smaller grid cells, additionally to the present comparison and analysis, or simply selecting the nearest locations from the altimeter data to the locations of the visual observation.

Page 6, lines 25- 28. The number of match-up pairs in Liepaja and Ventspils should be added. Although, there is a big difference in the number of observations between the early and later years of satellite mission, the tracks and coverage of the satellites are different and it is not clear how this reflects to coastal areas, in which these comparisons are made.

Results

Page 4, lines 15-16. Is the mismatch of inter-annual variation between the present dataset and the datasets presented by Soomere and Räämet and Soomere et al.? It is not quite clear, whether the Authors refer here to the previous sentence or to something else. It is not also clear, why this signals the importance of ice information in wave modelling. Please be more precise in expression and provide analysis/comparison that support these claims.

Page 4, lines 17-18. "heavily questions the reliability of existing wave reconstruction" - This is quite strong statement and what is its justification. More analysis on the reliability of this reconstruction should be presented before declaring all the existing ones as questionable.

Fig 4. The right panel representing the number of observations has some white cells in areas for which there is value presented on the left panel (for example in the Gulf of Finland and Gulf of Riga). If there are no observations for these areas (or does the white color indicate something else), how can the linear trends be calculated and presented?

Figures 2 and 4. Why is different pixel size used to present the mean values of significant wave height and the linear trends?

Page 5, lines 27-28. It is not clear to me from Fig. 4a that there is a strong spatial pattern. And which smaller sub-basins are meant here? It seems . Maybe the color scale is not optimal to support these findings (at least on my screen or in the printed paper version). To my eyes it looks that there are large variations in the whole sea area and also within the basins.

Fig 5b. It is difficult to interpreted the colours under the crosses. Is it necessary to have them in the Figure?

Discussion and conclusions

I would expect more discussion on whether the significant changes were found in areas, which showed good accuracy in the validation against in-situ data. How the 'less-convincing' match in the smaller sub-basins affects the interpretation of the results. And what about the coastal areas? They were reported to have 'poorer' quality in the validation. Comparison against visual observation was said to show fairly good qualitative correspondence, but the correlations were quite low.

Lines 18-20: To my understanding the Baltic Sea is rather small and therefore, there the effect of wind direction might be more important due to changes in fetch. Is this true for all regional seas?