

### Author's response to Referee #1

We would like to thank you for your comments and very constructive suggestions. Your feedback on the manuscript is very valuable, and it will help us to improve the manuscript. We have been discussing thoroughly and extensively your suggestions and criticism, and therefore it has taken some time to respond.

The original project work included a technical part (as presented in the present manuscript) as well as a geomorphological part with a morphometric analysis of the test site. We decided to focus on the technical part in order to provide all details for the community, which is still emerging in the field of airborne green laser scanning and imaging. However, based on your comments and suggestions we will include the morphometric analysis in order to demonstrate the application for mapping morphological units in high energy intertidal environments, and specifically in relation to the vast intertidal flats in the Wadden Sea, which are otherwise impossible to map with full coverage in high detail.

The general comments and the evaluation points deal with some overall issues. Since these issues are first introduced in the general comments and then elaborated on in one or more of the evaluation points, we have decided to address each issue separately rather than addressing every point. We find that the issues addressed in the general comments and in the evaluation points can be summed up under the following headings:

#### 1) Novelty

We acknowledge that it can be difficult to grasp the novelty of our proposed processing method. After all it is not the first time that a seamless DEM across the land-water transition zone has been derived from green LiDAR, and the main processing steps (filtering, water surface detection, refraction...) are unavoidable when processing such datasets. However, we do see our manuscript as being novel in these following ways (which we will work on clarifying):

- The water surface detection method is new, and it relies on simple concepts, which we have not seen in other studies. We will make this clear by referring to existing water surface detection methods in the manuscript (this links to issue #5). However, it is our experience that detailed descriptions of water surface detection methods, which focus on deriving the water surface from only a green LiDAR dataset (no NIR LiDAR data), are indeed very rare to come across.
- The entire data processing method has never (from what we know) been openly described to such a high level of detail, which makes the processing repeatable. Of course the commercial LiDAR companies have their workflows but there is always a tendency to keep the minor steps in their workflow hidden. Therefore we argue that our manuscript in the very detailed description of the workflow provides new knowledge to a broader audience.
- As already mentioned, we have decided to include a morphological classification part in the manuscript, based on the processed DEM. By this, we will add context to the manuscript, which will be novel in the sense that we make our own composition of classification tools and criteria (this is elaborated under issue #2).

## 2) Morphological quantitative measurements

We are aware that the manuscript is very technical in its present state, with the focus on the data processing and quality assessment. Even though we did not show an application of the processed DEM, we have, as already mentioned, worked on a morphological classification analysis tailored to the sandy intertidal flats of the Wadden Sea. We acknowledge that the present manuscript will be improved by adding a scientific (morphometric and morphological) analysis; and, moreover, making this addition will put the data collection and processing into an application context. Therefore we will add the morphological classification to the present manuscript.

## 3) Context

The technical part of data processing will be put in an application context by adding the morphological classification analysis (issue #2). With this addition, we will clarify the reason for data collection and processing.

## 4) Extended discussion

We acknowledge that we can improve the discussion by elaborating more on the scientific implications of our data collection, processing and results as well as on the state-of-the-art within water surface detection. We will modify the discussion so it includes:

- The implications of our LiDAR data collection and processing in the context of a morphological classification application.
- Implications of the dead zone and recommendations for future surveys.
- A comparison between our water surface detection methods and existing methods.

## 5) More references to relevant literature

We will discuss our water surface detection method further against existing methods and in doing so we will refer to more relevant literature within this subject. Besides, we will generally put further effort in supporting our claims with references to peer-reviewed papers.

## 6) “Lessons learned”

We think that it is a good recommendation and that it will improve the paper if the lessons learned (recommendations for future surveys) are expressed in a clear way. We will implement this in the discussion.

We find these six points to be the major concerns outlined in the review. The modifications involved in dealing with the issues require some major amendments to the manuscript, but thereafter it will be improved by being more scientific, novel and with a clear context of application.

We are currently working on addressing all the specific comments and reorganizing the manuscript, while we await the reply from the editors.

Once again thank you for your time reviewing the manuscript. We would look forward to submitting a revised version addressing and incorporating your comments and suggestions.