Earth Syst. Sci. Data Discuss., author comment AC1
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Reply on RC1

Julian Sievers et al.

Author comment on "An integrated marine data collection for the German Bight – Part 1: Subaqueous geomorphology and surface sedimentology (1996–2016)" by Julian Sievers et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-47-AC1, 2021

General Comment 1:

In the introduction, the authors state bathymetric regular 50 m gridded digital terrain models (DTMs) were provided from 1982 to 2012 for the inner German Bight. However, the presented work concerns the bathymetric terrain models spanning 1996 to 2016 as a 10 m regular grid. It should be explained why the authors did not consider the data spanning 1982 to 1996. This should be clarified since this would clearly enrich the numerical modelling results of the second publication, for example.

Reply/Action:

The introduction describes the "state of the art" of publicly available data sets including AufMod, which was concluded in 2012, at the beginning of EasyGSH-DB, starting ~2016. This papers granted aim was to generate and provide synoptic bathymetric, morphodynamic and sedimentological data for 20 years (1996 to 2015, compare part II of this publication (Hagen et al, 2021)).

If older data were to be considered, AufMods 50m grid resolution and EasyGSH-DBs 10m grid resolution would produce apparent morphological changes in areas, where small scale structures – like small tidal channels – would appear "closed" due to coarse grid points only on the structures flanks in AufMod but adequately portrayed in EasyGSH-DB. Quick manual-optical analyses regarding this point showed that this could lead to apparent morphological changes of more than 5m, which would automatically invalidate all further analyses and morphodynamical products.

Individual operators of numerical models are, of course, free to utilize both bathymetric and sedimentological data sets from AufMod and EasyGSH-DB, but they have to properly adress the grid-resolution issue on their own accord.

As this paper is, as stated in the abstract (lines 17 and following) and introduction (lines 58 and following), presenting EasyGSH-DB results in its grants constraints and not a "free" morphological analyses study – where further considerations regarding other data sets would be mandatory – we do not see the neccessity for further clarifications in that regard.

General Comment 2:

When considering approximation, interpolation, or extrapolation methods as, for example, for the surface sedimentological data sets, different confidence levels are to be expected. What is the expected accuracy for the given products? This should be clarified by the authors.

Reply/Action:

The accuracy of the models, both bathymetric and sedimentological, has two parts.

On the one hand, the accuracy clearly depends on the accuracy of the base data sets. This is usually unknown, as it is not provided in meta data or additional documentation. Typically, the most accurate topographic/bathymetric data sets are generated from airborne laser scanning and have vertical tolerances of +- 15 to 20 cm. Bathymetric data sets like single or multi beam echo sounders are usually estimated to be around 20 cm as well, but this does not consider a) the actual surface that is to be portrayed (top of mud layer or top of solid ground) and b) the fact that uncertainties rise with water depth. As the height of the water column increases, so do the deviations of estimations of travel speeds to real travel speeds of signals. This factor is unknown and/or not provided. Thus, for the sedimentological extrapolation we use an uncertainty estimating factor (lambda). Accuracy of sieving or laser diffraction methods to calculate cumulative functions from sedimentological analyses is unknown and/or not provided.

On the other hand, the accuracy of the model depends as indicated on the methods used. Typically, the bathymetric DTMs use some variant of linear interpolation and thus if a data set is measured at the time stamp of the DTM (01.07.YYYY 00:00:00), the DTM would portray the data set 100% and the accuracy would be identical to the data sets accuracy. As the temporal distance increases, the confidence decreases. The provided data source maps attached to each DTM show for every single grid point which two data sets were used for interpolation and what their time stamps were. Temporal distances can be calculated by the user and used as a measurement of confidence. Sedimentological models were created by anisotropic Shepard interpolation, which guarantees a 100% representation of the sedimentological base data if the point and time of the model coincides with the sample.

In short, generally the accuracy of the models can only be crudely estimated for the bathymetric DTMs, as only bathymetric data sets have in some cases a (at least generalized) scalar accuracy information. Due to the interpolations properties, all data sets will be represented 100% nonetheless provided they are located at a grid point to the models timestamp.

Due to the scarse base information regarding uncertainty of bathymetric measurements and non-existent base information regarding uncertainty of sedimentological analyses, we do not see the possibility to adequately assess model accuracy/uncertainty in the constraints of this paper. Further analyses in these regards would warrant a further paper decoupled from any given grant, where this could be properly adressed.

Technical Correction 1:

Line 99 'data set hat metadata attached'. Please, verify the writing.

Reply/Action:

"hat" should be "has" and will be changed in the revised manuscript.

Technical Correction 2

Figure 8b: the units given the morphological drive units (MD) appear to be 'm a-1'. Please, check it.

Reply/Action:

Morphological drive is calculated as a range between the maximum rate of change and the minimum rate of change and thus has to be $m*a^{-1}$.

Further explanation of morphological drive will be added in the revised manuscript. Unit in legend to $m*a^{-1}$ will be added in the revised manuscript.

Technical Correction 3:

Line 277: ‘were used in its creation’ not ‘where used in its creation’

Reply/Action:

Will be changed in the revised manuscript.