THE UNIVERSITY OF WESTERN AUSTRALIA

Ulysse Lebrec
Ph.D. Student
Centre for Energy Geoscience / School of Earth Sciences

Dear Robin Beaman,

Thank you so much for providing such in depth comments on the manuscript and the associated datasets. Please find below our response to your main comments and how we plan to integrate them.

We are very grateful for the thorough review of the English. As a non-native English speaker, improving the quality and clarity of the writing is a continuous and never-ending challenge. We will integrate your re-writing suggestions in the next revision of the manuscript, and we believe that this will greatly improve the quality of the manuscript. Similarly, we have reviewed your suggested references and will include them accordingly.

Best regards,

Ulysse Lebrec, on behalf of the authors.

Our understanding is that your two main comments are as follow:

Include the LADS LiDAR data in the compilation

The LADS LiDAR dataset was made available to us under Creative Commons licensing CC BY-NC-SA which forbids any commercial use of the data. Any remix or transformation of the data should also carry the same licence. On the other hand, AusSeabed data portal, used to share the compilation, is based on Creative Commons licensing CC BY hence allowing commercial use.

Our understanding is that we are therefore not allowed to include the LADS LiDAR dataset in the compilation as this would breach the LADS LiDAR dataset CC BY-NC-SA licence.

Reprocess the seismic derived bathymetry to include refined velocity models

In the absence of site-specific sound velocity profiles, we made the decision to use a constant value to convert seismic-derived bathymetry from the time to the depth domain instead of using more refined approaches such as polynomial equations. The value of 1500 m/s was retained by averaging the sound velocity values that were sometimes specified in the navigation file headers of the seismic surveys. Importantly, this conversion was only performed for the reflection-derived bathymetry. In the case of navigation-derived bathymetry, the input data was already in depth and, most of the time, velocities were not available at all, hence forbidding back calibration. Reflection-derived bathymetry includes 26 surveys with an average depth of circa -750 m.

You mentioned in your comments the 'CSIRO software SVP builder' that can generate synthetic SVP profiles using climatology data anywhere around Australia. After enquiring about it, it appears to be an earlier version of the Doris software https://www.doris-svp.org/ which is published by IFREMER and SHOM and uses climatology data from the World Ocean Atlas 2013 (https://climatedataguide.ucar.edu/climate-data/world-ocean-atlas-2013-woa13). To the best of our knowledge this is the only tool available to generate such synthetic profiles.

The University of Western Australia,
Perth WA 6009 Australia

E ulysse.lebrec@research.uwa.edu.au
ulysse.lebrec@ngi.no

We generated a few profiles within the area of interest to compare the differences between the resulting values with the constant 1500 m/s used in the manuscript. It should be noted that the tool returns more depth/velocity pairs in shallow waters (i.e., the vertical interval between two velocity points increases with depth). We therefore filtered the synthetic profile values to obtain meaningful averages. The resulting average velocities per depth interval is presented in Table 1. This comparison indicates that for most intervals the difference is below 0.5%.

The software does not provide quantifiable uncertainties for neither the climatology data used as input nor for the computation of the velocities themselves, it is therefore not possible to fully assess by what extent the synthetic profiles would actually improve the results.

Additionally, the difference in velocities should be looked at in the context of seismic surveys vertical resolution. For the most part, seismic surveys are acquired with a vertical sampling rate of 2 to 4 ms and frequencies comprised between 40-150 hertz (MBES surveys use frequencies 1000s of times higher). Moreover, as presented in the manuscript, morphologies from the reflection derived bathymetry exhibit increasing vertical distortion in shallow waters, overwriting by an order of magnitude any offset related to the sound velocity model.

In light of the above, we believe that there are not enough elements to support a reprocessing of the reflection derived bathymetry using synthetic sound velocity profiles. The uncertainties associated with sound velocity profiles are covered by the current data limitation sections and data accuracy tables.

We certainly agree that the use of site-specific sound velocity profiles should become part of the best practice to produce reflection seismic-derived bathymetry. However, we think that the actual accuracy gain from the inclusion of synthetic sound velocity profiles should be further assessed and that such task extends beyond the scope of this paper.

Table 1 Comparison of average velocities from Doris with a constant value of 1500 m/s

Depth Interval (m)	0-250	0-500	0-750	0-1000	0-1500	0-2000
Avg Velocity (Doris) m/s	1526.37	1512.74	1505.2	1500.86	1496.58	1495.1
% difference with 1500 m/s	1.72	0.84	0.34	0.05	0.23	0.32

Additional comments.

we have included below additional questions raised in the PDF document. Comments and text editing suggestions that are not specifically mentioned are regarded as “accepted” and will be included in the next revision of the manuscript.

Line 57 – Change ‘shelf’ to ‘Shelf’. But it is not really full bathymetry coverage of the NWS – only the southern or western part of the NWS (as per your description in Line 30).

The combination of this dataset with the compilation you produced over the Northern Territory results in a full coverage of the NWS.

Line 126. Could you incorporate 4.1.2 with 4.1.

While we agree that in this specific case having a sub section for data source is a bit superfluous, the idea was to have the same section breakdown for each datatype.

Line 131. How did you deal with noise < 150 m?

Whenever possible we used navigation-derived bathymetry instead of reflection-derived bathymetry as this issue is specific to reflection-derived bathymetry. However, in some areas, navigation data was either not available or not dense enough to generate a grid. In such case we included the reflection-derived bathymetry because we consider that, while the relative elevation of a given seabed feature compared to another one might be inaccurate, the actual morphology is still valid and adds value compared to the Australian Bathymetry and Topography grid. The bottom line is that we dealt with the noise by choosing which survey to include in the compilation, but we did not apply any specific correction to filter that noise as we could not find an accurate method to precisely quantify it. This is explained in section 4.5.

Line 394. How were small water bodies automatically removed?

We first generated a raster domain shapefile (a shapefile delineating the boundaries of a raster) where each feature – in this case polygons – corresponds to an individual water body. We then filtered the shapefile to only keep the polygon corresponding to the main water body and used it to clip the bathymetry, effectively resulting in the removal of all disconnected water bodies. We will add a clarification in the text.

Line 406 What do you mean by mesh of 500 m?

A grid (fishnet) of points separated by 500 m along the X and Y axis. We will add a clarification in the text.

Line 429 – I think you are looking at the wrong IHO publication. You want S-44 Edition 6.0 0: https://iho.int/en/standards-and-specifications Your error values would likely conform to Order 2 of Table 1, and this is worth quoting in the text.

The document cited in the text https://iho.int/uploads/user/pubs/standards/s-57/S-57_e3.1_Supp3_Jun14_EN.pdf refers to Zone Of Confidence (see p 17). We are happy to use S-44 instead as the point remains the same.

Line 463 Sensing tool what is that?

We are referring to the different types of bathymetry (e.g., seismic vs satellite vs MBES). We will rephrase to say just that.

Data availability. Error when loading shapefile and use of the term 'bathymetry domain'.

The shapefile is pretty heavy (1.9Gb). Given that by default Arcmap/catalogue only has 2Gb of ram this can easily make the software crash.

The term domain refers to the coverage of the datasets included in the compilation. I believe you used the term lineage in your own compilation. The term 'domain' corresponds to the name of the ArcGIS geoprocessing tool used to generate the file and is, to the best of our knowledge, commonly used in GIS.