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Ocean Science Discussions

# *Interactive comment on* "A new 3-D-modelling method to extract subtransect dimensions from underwater videos" *by* L. Fillinger and T. Funke

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Dear Referee #3,

Thank you very much for your careful reading and helpful comments. We are happy to receive your appreciation of our work and hope to address adequately all issues in the following answer and the revised manuscript.

- Regarding the algorithmic background:

PhotoModeler is a commercial software. We chose it because it is user-friendly and relatively easy to use without need of knowledge in computer programming. One drawback of this approach is that the algorithm running in the background is not publicly available. This might be frustrating for a more advanced user. Our intent here is not to



detail all the challenges linked with 3-D modelling software but to present the concept of modelling as an option for obtaining transect dimensions. We will briefly mention this drawback in the revised manuscript and refer to the work of Beall et al (2010), Brandou et al (2007), Pizarro et al (2004) and Sedlazeck et al (2009) for algorithm development.

- PhotoModeler is time consuming:

We agree that the figures we give in the paper on the time needed to obtain transect lengths are not representative of how the differences between the methods are. In the revised manuscript we will convert them into time needed to compute the length of 1m of transect and summarized them in a table, which will be included and commented in the results and discussion. (see joined Fig.1)

- p3884, l18: as suggested, we replaced "bottom" with "seafloor"

- p3885-3886: camera resolution

An error has been made concerning the camera resolution during typesetting, which we didn't spot while proof-reading. Of course the resolutions should be written as 720×576 px and 1920×1080 px, we will carefully control that this error is not repeated in the revised manuscript.

- p3885-3886:camera specifications and file formats:

We will add the camera lens and focal length in the revised manuscript (Trytech typhoon PAL: 3.6-82.8mm F1.6-3.6; Sony FCBH11: 5.1-51mm, F1.8-2.1; Kongsberg oe 14-502: 5.1-51mm, F1.8-2.1). The shutter speed has not been recorded by our video systems. The 3-D models were built only for fully zoomed out sequences, so that the camera parameters would stay constant.

The original video formats were as follow. Dive A: SD video recorded on mini-DV (.avi, DV Video). Dive B: HD videos recorded by nanoFlash recorder on SD cards (.mov, mpeg2). Dive C: videos recorded by nanoFlash recorder on SD cards (.mxf, mpeg2).

The extracted video sequences were all saved in the same format (.mpg, mpeg2), taking care of conserving the original resolution and frame rate. The frames were then extracted as jpeg images and this format was conserved throughout the processing.

- p3886, l20: cruise/campaign/expedition

In the revised manuscript we will provide more details on the Chile expedition: “The third data set was recorded in February 2012 during the expedition Errina2012 on MV Explorador. The station Guadalupe (51°10.14’S, 74°56.171’W) was located in the steep-sloped Guadalupe Channel in Chilean Patagonia.”

- p3891, l5 and others: correlation work

Scaling error/SD distance to the substrate (p3891, l5): The standard deviation of the distance to the substrate reflects the “amount of change” in the distance from the camera to the substrate, i.e. the roughness of the small scale topography and the difficulty of keeping a stable distance in a high relief environment. The scaling error increases when the scale itself is not properly measured. In Chile (dive C), the altimeter was disturbed by the topography (there were sometimes superimposed objects in the centre of the image) and a delay of even 1s in time synchronization could mean a great change in the distance to the substrate. It is thus not surprising that the scaling error increases when the relief is more pronounced (SD distance to the substrate bigger). Although this issue is mentioned on p3893, l24 of the original manuscript, we will elaborate more on it in the revised manuscript.

USBL/3-D (p3892, l12): The difference between the length computed from 3-D models and the length obtained from acoustic positioning tends to increase with the measured distance. After smoothing, the USBL ROV track looks quite straight on a small scale, erasing any small curve. The 3-D method integrates all small scale movements and the topography. Measuring a longer distance increases the number of small deviations from the straight line thus increasing the difference between both lengths. This issue was only cursorily treated in our original manuscript (p3896, l8) without reference to the



correlation. A more elaborate explanation will be provided in the revised manuscript.

DVL/3-D projected (p3892, l23): We didn’t discuss this result but the explanation is similar to the USBL/3-D correlation. The DVL considers a straight distance travelled from the start to the end point (similar to the 3-D linear) but the projected 3-D values integrate the topography. The amount of deviation from the straight line hence increases with the distance travelled. We will integrate this explanation to the revised manuscript.

- p3893, l15: “apart” The two parallel lasers were placed at a distance of 20 cm (apart) from each other for dive A and 5 cm for dive B, thus representing a 20 or 5 cm horizontal scale in the centre of the videos. We will rephrase the sentence in the revised manuscript.

- p3897, l18: Split sentence

New version: “Applicable on a variety of setups, it is an alternative to compute subtransect dimensions when more traditional methods can’t be employed. For example image scaling, underwater acoustic positioning or DVL bottom tracking may fail due to unsuitable camera setups, unavailability of instruments, inaccurate measurements and difficult environmental conditions such as high relief.”

- p3898,l15-16: supplementary material As suggested, the link to the supplementary material stored in the PANGAEA database will be moved to the Method section, at the end of the 2.2.1. PhotoModeler chapter

- abbreviations: We will take care to reduce the number of abbreviations used in the text, reintroduce them regularly to the reader and eliminate them from the headers in the revised manuscript

- English editing: The revised manuscript will be thoroughly checked by our native speaking colleague before re-submission.

References:

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| Method | Dive | Number subtransects | Total length computed [m] | Computing time complete dive [h] | Computing time one subtransect [minutes] | Computing time one meter [minutes] |
|---|---|---|---|---|---|---|
| 3D | A | 52 | 341 | 88 | 101.5 | 15.5 |
| | B | 71 | 586 | 107 | 90.4 | 11.0 |
| | C | 55 | 182 | 80 | 87.3 | 26.4 |
| USBL | B | 71 | 458 | 1.5 | 1.3 | 0.2 |
| DVL | C | 37 | 126 | 15 | 24.3 | 7.1 |

**Fig. 1.** Time needed to compute transect length for each of the three methods