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Biogeosciences Discussions

Interactive comment on "Coral Patch seamount (NE Atlantic) – a sedimentological and macrofaunal reconnaissance based on video and hydroacoustic surveys" *by* C. Wienberg et al.

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We would like to thank Philippe Blondel for taking the time to examine our manuscript. We really appreciate his comments on our manuscript in particular as he is a renowned expert in the field of hydroacoustic classification. We are happy to follow the adjustments Philippe recommended, in particular with respect to a clarification of the textural classification scheme used for our study (see below).

_"Hydroacoustic textural classification": general comment: I was left unsure of how the "hydroacoustic textural classification" worked. How are these acoustic textures computed? I admit this is something I have a direct interest in, and it was very pleasing

to see some of my articles on the subject referenced here. But was it the approach used? The references seem instead to point to Howell et al. (2010, 2011), in which the acoustic textures are not really defined. It will be very nice to see a clear explanation of how these textures are defined, and how the supervised classification is performed in practice (were training areas selected? How? How many?). This is an important point, as it underpins how much confidence one can have in the actual classification. It works well, if it matches ca. 85% of the video observations, but how does it work? I am sure the authors can rapidly summarise the approach used to define these textures, and it will be a great advantage to this article.

response: As recommended by Philippe, in the revised version of the manuscript (subchapter 2.4 "MBES backscatter analyses and seabed classification") we will give some more detailed information on the methodology of the textural seabed characterisation which was computed by means of the QPS Fledermaus Geocoder Tool (FMGT v.7.3.3pre; see also response to comment P18717 L18-19, where we explain the "FMGT patch analyser" in detail). We agree with Philippe, Howell et al. (2010, 2011) do not describe the textural classification used for their studies in great detail. To avoid any misunderstanding these references are replaced by following reference: "Erdey-Heydorn, 2008: An ArcGIS seabed characterization toolbox developed for investigating benthic habitats, Mar. Geod., 31, 318-358", as the classification procedure we applied is closely related to the method described in this publication. For the textural classification, nine training and nine test sites were selected which will be defined/explained in the revised "Methods" chapter. The location of these sites will also be indicated in Figure 7A (3 & 4) showing the textural classification map and the "side-scan" mosaic grid.

We are also happy to revise our manuscript with respect to the following:

_P18713 L6: comment: were the two grab samples (collected in 1997) analysed by the authors for the present study, or by others, earlier (in which case a reference would be necessary)?

response: The two grab samples presented in our study were collected during a R/V Victor Hensen cruise in 1997. The faunal content was taxonomically analysed by H. Zibrowius an expert on scleractinian cold-water corals (who is kindly acknowledged) and the data were provided by A. Freiwald (Senckenberg am Meer, Wilhelmshaven, Germany; also acknowledged) who was the chief scientist of the cruise. The data of this taxonomic analysis were never published before (not even in a cruise report) and A. Freiwald kindly offered the data for our publication. We invited him to join the author list but he refused as his colleague at Senckenberg, L. Beuck, is already one of the co-authors. Nevertheless, as already Reviewer #1 asked for more detailed information on these grab samples, we will add some more details to the revised "Method" chapter (and Table 1).

_P18714 L9: comment: the authors use the FGDC-CMECS (2012) scheme, which seems perfectly adequate. But how does it compare with the EUNIS classification scheme often adopted in other studies? Does it overlap, converge or differ? It might be interesting to relate the FGDC-CMECS classifications to their EUNIS equivalents (in brackets), just for easier comparison with other studies or approaches.

response: There are many marine habitat classifications available in the literature. As stated by Philippe, the EUNIS habitat classification constitutes one of the several representative and widely applied approaches (see Davies et al. 2004: EUNIS Habitat Classification Revised 2004). However, unfortunately the EUNIS classification scheme does not provide universal coverage and is not universally accepted as it focusses on specific geographic regions and/or limited portions of the seascape (in particular the littoral zone), hence its application for wider use is somehow problematic. In contrast, the FGDC-CMES classification scheme “encompasses waters from the head of tide or inland incursion of ocean salinity to the splash zone of the coasts to the deepest portions of the oceans”. It addresses “attached or suspended biota in the water column and on or in bottom sediments. Scale size ranges from colonies or aggregations of microscopic organisms to megafauna/-flora”. In addition (and for our study very

important), it addresses “the grain size and composition of marine substrates and major structural features of the environment (geoforms and hydroforms) to characterise coastal and marine ecosystems”. Based on these aspects, we decided to apply the FGDC-CMES classification scheme for our study as it is most suitable for the classification of seamount habitats and to describe all components in a structured manner which attribute to these habitats. To give EUNIS equivalents for the FGDC-CMES classification (as suggested by Philippe) is somehow problematic as EUNIS habitat types are arranged in a hierarchy (with level 1 being the highest; e.g. level 1: A “Marine habitat”, level 2: A6 “Deep-sea bed”, level 3: A6.7 “Raised features of the deep-sea bed”, level 4: A6.72 “Seamounts”, but then no further sublevel differentiating the different substrate types covering a seamount!), whereas FGDC-CMES is based on different groups of non-hierarchical groups of components (substrate components, biotic components, water column components etc.).

_P18715 L26: comment: “Total propagated uncertainties (TPU)” are not defined. They should. What do they consist in, exactly?

response: Total propagated uncertainties (TPU) were used to validate the final grid-product. In order to generate TPU values for each sounding, the uncertainty estimates for each of the contributing sensor measurements had to be combined using a propagation algorithm. The results are separated in uncertainty estimates for the depth (DpTPU) and the horizontal position of the sounding (HzTPU), and scaled to the 95% confidence interval which is equivalent to 1.96x the standard deviation. This information will be added to the revised Methods subchapter 2.3 "Hydroacoustic imaging and topographic zonal classification".

_P18717 L18-19: comment: what does the “FMGT patch analyser” actually do? How does it work? Please explain with enough detail that no doubt is left.

response: The QPS Fledermaus Geocoder Tool (FMGT v.7.3.3pre) was used for the post-processing (and semi-automated seabed characterisation) of the MBES backscat-

ter data. The FMGT patch analyser allows to compute or manually select the appropriate values for the current patch to run an "angle vs. range analysis" (ARA; for further details see Fonseca et al., 2008; Fonseca and Mayer, 2007). This method of seafloor characterisation is build-up of the comparison of the actual backscatter angular response with expected acoustic response curves based on a well-established mathematical model, the Jackson model (for further details on this method/model see Jackson et al., 1986; Mulhearn, 2000). As the Jackson model does not consider seabed classes such as bedrocks and boulders, which are an important component of the seabed on Coral Patch seamount, the model could not directly be applied. Nevertheless, the applied FMGT patch analyser was used to gain knowledge of similar textural signatures outside the ground-truthed areas (see also response to the comment on the "hydroacoustic textural classification" above). The FMGT patch analyser and how it works will be described in more detail in the revised manuscript.

additional references: Fonseca, L., and Mayer, L.: Remote estimation of surficial seafloor properties through the application angular range analysis to multibeam sonar data, Mar. Geophys. Res., 28, 119-126, 2007. Fonseca, L., Brown, C. J., Calder, B., Mayer, L., and Rzhanov, Y.: Angular range analysis of acoustic themes from Stanton Banks Ireland: A link between visual interpretation and multibeam echosounder angular signatures, Appl. Acoust., 70, 1298-1304, 2009. Jackson, D. R., Winebrenner, D. P., and Ishimaru, A.: Application of the composite roughness model to high-frequency bottom backscatter, J. Acoust. Soc. Am., 79, 1410-1422, 1986. Mulhearn, P. J.: Modelling acoustic backscatter from near-normal incidence echo sounders - Sensitivity analysis of the Jackson model, DSTO, Maritime Operations Division, Aeronautical and Maritime Research Laboratory, Melbourne, Australia, 35 pp., 2000.

_General comment "CTD": comment: Only 1 CTD was deployed. Might it affect the validity of the acoustic corrections over the large area surveyed? And if so, is it enough to worry about? (this will not only depend on the processing scheme, but also on how textural classification is finally achieved). How variable is the general hydrography in

this area? It would be nice to reassure the readers that this single CTD profile does not affect significantly the acoustic part of the survey.

response: To verify the validity of our acoustic corrections (based on one single CTD measurement recorded on the 5th of March 2008), we searched the CORIOLIS-database (www.coriolis.eu.org) for additional data available for the area around Coral Patch seamount (please note: data should be recorded during a similar time frame as the EM300 MBES mapping: 6th of March 2008). The CORIOLIS data centre is managed and hosted by Ifremer (France) and provides, e.g., in situ data for parameters such as temperature and salinity derived from ARGO profiling floats and XBTs (expendable bathythermograph; operated from a vessel; only temperature data). We found three data sets, (1) ARGO 6900126 recorded on the 26th of March 2008 (W of Coral Patch: 34.46°N, 15.70°W, down to 1,400 m water depth), (2) ARGO 6900691 recorded on 2nd of March 2008 (NW of Coral Patch: 35.43°N, 10.62°W, down to 2,000 m water depth), and (3) XBT profile ZCDJ6 recorded on the 16th of March 2008 (N of Coral Patch: 35.45°N, 11.66°W, down to 880 m water depth), which we compared to our CTD data. A comparison of the temperature data of the four data sets (see figure attached) clearly showed that the same water masses are encompassed by the four different stations and just in the upper 200-400 m of the water column slight differences in temperature occurred.

Response to minor comments:

_P18710 L24: "pelagic ones" will be revised to "pelagic organisms".

_P18713 L15: "self-made" will be revised to "purpose-built".

_P18715 L13: "adjusted" will be revised to "maintained".

_P18717 L8: In the revised version, the term side-scan will be quoted each time it appears in chapter 2.4 (and figure caption).

_P18720 L12: 85% of all coral observations were found to comprise dead colonies or

coral rubble, just 15% were found to be alive. This information will be added to the text.

_P18721 L11 and P18729 L6: "i.a." will be revised to "i.e.".

_P18729 L1:"threats fish stocks" will be revised to "threatens fish stocks".

We would like to thank Philippe again for making these useful recommendations, we will ensure they are considered in a revised manuscript if the editor makes this recommendation.

Sincerely,

Claudia Wienberg, Paul Wintersteller, Lydia Beuck and Dierk Hebbeln.

Interactive comment on Biogeosciences Discuss., 9, 18707, 2012.

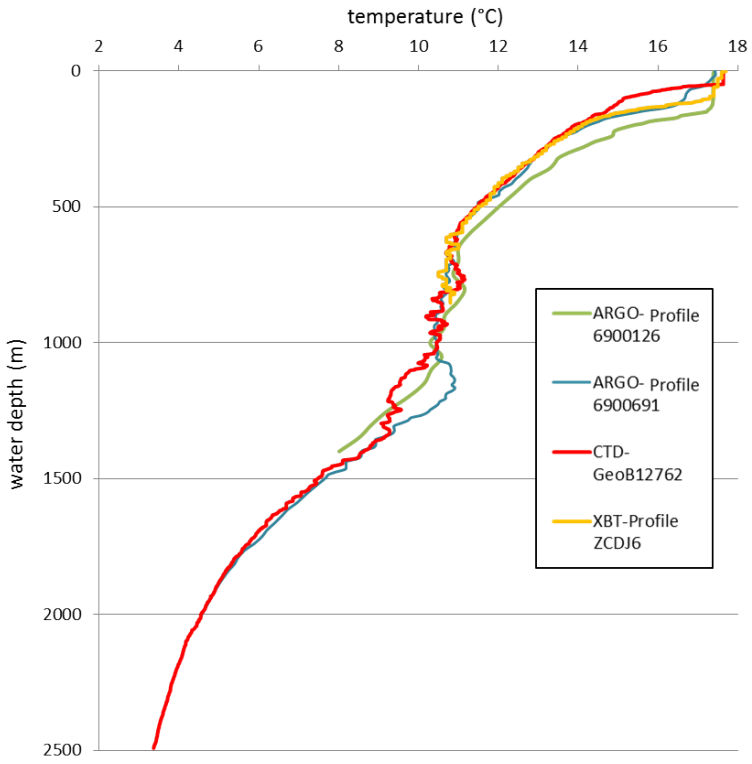

Fig. 1. Temperature vs. water depth derived from 2 ARGO, 1 XBT and our CTD stations

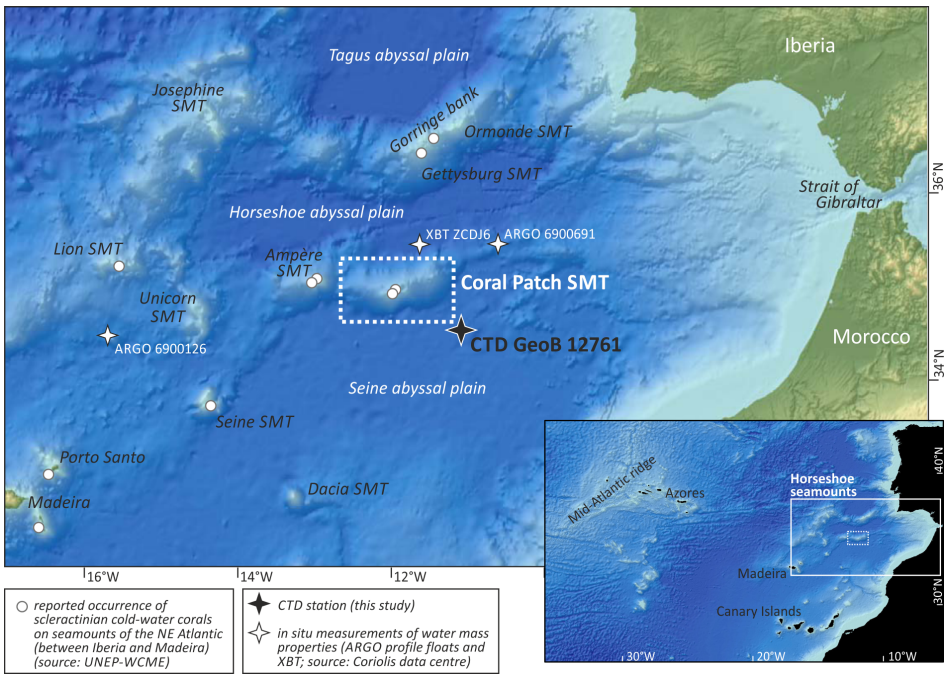

Fig. 2. Revised Fig. 1

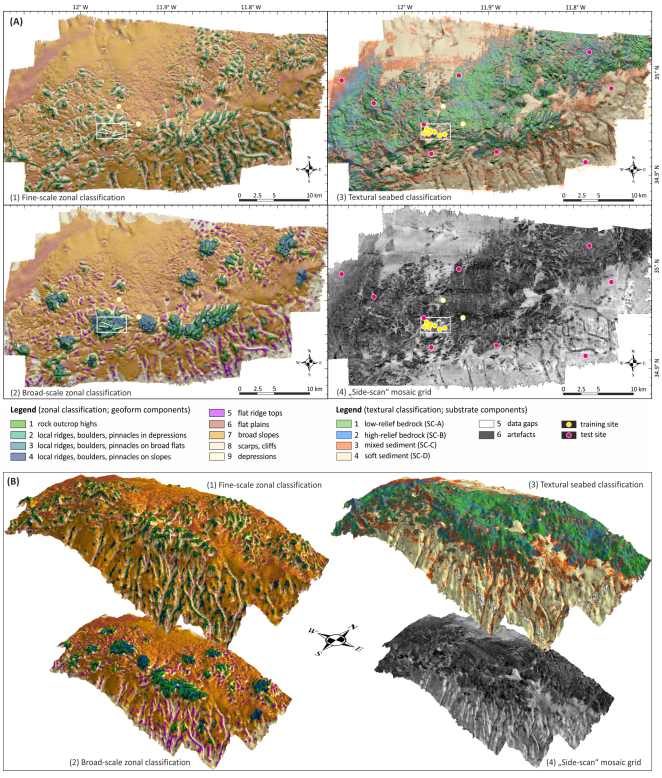

Fig. 3. Revised Fig. 7