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Interactive comment on "Quantification of the fine-scale distribution of Mn-nodules: insights from AUV multi-beam and optical imagery data fusion" *by* Evangelos Alevizos et al.

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We welcome all recommendations from comments of reviewer #1 and we appreciate the time and effort put to review this manuscript. Below we present our reply for each of the reviewer's points:

a) Presentation of the work: It is suggested that some parts from the Results section should belong to the Methods and some parts from the Discussion section should belong to the Results. Reply: This suggestion is accepted and respective action will be taken in final version. b) It is suggested that there is insufficient information about the aim of the study and lack of description of the state-of-the-art. Reply: Paragraph

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1.3 includes the state of the art regarding the absence of high resolution mapping approaches of Mn-nodule quantification (lines 126-136). We can describe in more detail that until now there was not a standard approach for analysing AUV hydro-acoustic datasets for predicting/classifying Mn-nodule densities and that this is one of the aims of the study. The second aim is to highlight the fact about the local heterogeneity of the deep sea seafloor and that this heterogeneity needs to be acknowledged in many other studies. c) It is suggested that there is a conflict between categorical results and continuous variable under examination (Mn-nodule densities). The author suggests that additional justification should be provided regarding the selection of unsupervised methods outputting categorical information about Mn-nodule densities. Reply: We think that any continuous variable can also be expressed or grouped within ordinal classes. Thus, we have chosen to present efficient approaches for semi-quantitative mapping of Mn-nodules using unsupervised classification methods. d) It is suggested that the ISODATA algorithm should include bathymetric derivatives as well for classification Reply: For comparability with the Bayesian method (that is based only on backscatter data) here we considered that the ISODATA classification scheme should also only include backscatter information. However, we will expand the paper to also use bathymetric derivatives for classification with the ISODATA and Random Forests algorithm. Further we plan to make a quantitative comparison of all the classification results and use them to calculate the total weight of Mn-nodules in the mapped area.

e) It is suggested to develop the Discussion section more on the morpho-bathymetric factors that are related to the fine scale variability of Mn-nodule densities. Reply: This review point is appreciated; however the aim of the paper was not to discuss the reasons for the local scale heterogeneity of the Mn-nodule distribution. Additional data would be needed as currents, sediment rates, geochemical gradients, sediment composition, and others. In the present study we focus on the methodologies that offer good results regarding Mn-nodule mapping. We did that because we think that the current state of the art suffers from a lack in methodological approaches that are required to produce Mn-nodule maps from high resolution data as ours. f) It is required to

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provide further justification regarding potential auto-correlation effects on the training samples. Reply: The training samples were produced using the tool 'Randomly Split Table Into Training and Test Records' from the MGET toolbox. The random character of the tool function results in training samples where they found to be evenly distributed throughout the study area and having captured much of the data variability. Some local autocorrelation effect may be present and a semivariogram analysis can offer a robust estimate of the range of autocorrelation effect.

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