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Interactive comment on "Understanding Mn-nodule distribution and related deep-sea mining impacts using AUV-based hydroacoustic sensing and optical observations" *by* Anne Peukert et al.

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Reviewer 3: Section 1.1 Pg. 2, lines 17-24. As authors mentioned, detailed small-scale investigations are rare in previous work. However, advantages of the small-scale investigation are not described well in the manuscript. It will be helpful if authors can provide some specific issues on nodule distribution which cannot be understood in previous conventional ship-based studies in the Introduction. Authors Comment: As shown in this study, there are local scale changes in Mn-nodule occurrence, and this variability can be correlated to detailed morphological changes, which is relevant information

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to understand Mn-nodule forming - processes (p.2, line 18-19). The local variability studied here is of importance for habitat-studies (section 4.1 p.16, line 5ff) as next to the topographic setting, the nodule availability is of importance for determining local marine habitats i.e. hard grounds. Following your suggestion this has been added in section 1 (p.2, line 18, see DC). Document Changes: Moreover, the substrate changes considered in this study provide relevant information for estimating size and heterogeneity of local-scale habitats. AC: Last but not least, only data in the detailed scale considered here can provide reliable information on morphology, which is essential for planning possible mining tracks, since not the entire terrain is suitable and obstacles need to be taken into account for the development of mining gear. This information was added in section 5 p.34, lines 27-29 (see DC). DC: Areas that appeared suitable of mining (slopes <=3°) in ship-based bathymetric data showed steeper relief (slopes >3°) in higher resolution AUV-based data.

R3: Pg. 2 line 8 the reference should be corrected AC: Has been corrected.

R3: Pg. 2 line 21 use superscript for km2 AC: Has been corrected.

R3: Section 1.3. Pg. 5. Fig. 2. Geographic Information (i.e. latitude and longitude) needs to be added in the figures showing study area. It will be more helpful if the authors can provide an index map which shows location of study area with some useful information (regional topography or sediment type, for example). AC: Since the study area is located within the German claim area for resource exploration the exact location is not published within this study (this was discussed with the BGR as contractor of the area). We added the coordinates of the center of the working area in Figure 2 caption (DC). The regional topography is shown in Figures 2 and 3 and is described in the text (section 1.3). DC: Black squares mark the study area (center 117°1 W 11°51N) shown in Figure 3.

R3: Pg. 6 line 7 and line 30 add the references for data sources AC: Has been added.

R3: Section 3.1 Nodule coverage: [. . .] Thus, I recommend the authors only use the

term "nodule coverage", provide a definition or meaning of variation of nodule coverage in this study, and reorganize the manuscript accordingly. AC: In section 2 p.8, line 31 the Mn nodule coverage considered here is defined (percent coverage per image). Following your suggestion "per image" was added for clarification. We mistakenly used the term "abundance" and changed it to the correct term "coverage" throughout the manuscript. DC: p.8, line 31: "percent coverage per image"

R3: Pg. 8 line 26-27, Fig. 5. The description in the sentence is not clearly shown in Fig. 5C. When variation of nodule coverage is shown together with the bathymetric profile in Figure 5C, it will be easy to see the correlation. Please add color indexing layer above the bathymetric profile in Fig. 5C. AC: We considered your suggestion and edited Figure 5. The bathymetric profile with the resolution of the AUV-based bathymetry, color coded with the Mn-nodule coverage, was added to the ship-based bathymetric profile.

R3: Pg. 13 line 12 and 14. Please check the figure number. AC: Has been corrected. DC: Figure 6B

R3: Pg. 16 Fig. 10. Providing large photos of same location before and after the EBS will be helpful. This can be added in Fig. 10 or be presented as appendix figure. AC: Considering the navigational error coming along with the AUV data (discussed in p.9, line1), it is not possible to show one photo of the exact same location before and after the EBS experiment even though the exact track was programmed for the AUV survey (p.6, lines 29-30). However, it is reasonable to compare the entire track, where specific patterns (containing of various continuous images) can be used for the recognition of the same areas (p.9, lines 2-3). Due to the absence of large features on the seafloor in the studied area (large enough to not being buried by the resettling sediments) making a recognition of the exact same area possible, such a comparison figure is not shown in this study. We believe the mosaic in Figure 10 shows the burial effect of the EBS-induced sediment cloud sufficiently.

R3: Pg. 16 line 5. I cannot understand the meaning of size of area, 0.49 km2. Does it an area of photo survey in Abyss 168 or Abyss 169 in Fig. 9? If so, please add information. AC: it means the total area that was covered with AUV imagery. For clarification this information was added as suggested to the mentioned passage. DC: "0.49km2 that is completely photo-mapped"

R3: Pg. 17 line 6. What is the CoMoNoD? Need explanation or information for readers who are not aware of the algorithm by Schoening (2017). AC: It is briefly described in section 2 p.6 line 32ff. For further information the reference is cited and the content of the paper does not need to be given here.

R3: Pg. 17 line 30 check the misspelling "and" AC: Has been corrected.

R3: Pg. 19 line 13 Water currents can be replaced by Bottom currents AC: Has been replaced as suggested.

R3: Pg. 19. Some of paragraphs are too long and need splitting. This is especially for the last section of discussion (4.3 Sediment plume re-settling), but also for some other part of the manuscript. AC: Sub-sections have been added in section 4.3.

R3: Please use parenthesis for reference citation within a sentence. AC: Has been corrected.

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