

“Understanding Mn-nodule distribution and related deep-sea mining impacts using AUV-based hydroacoustic sensing and optical observations” by Anne Peukert et al.

General comments

The paper presents new results for variation of nodule distribution in seafloor and for dispersion of sediment plume by disturbance experiment. The main contents of the manuscript, i.e. (1) nodule distribution in accordance with changes in seafloor morphology and (2) evaluation of environmental impact experiment, were conducted by several previous studies in 90's and early 2000's. However, this paper provides valuable and important data by application of high resolution mapping and imaging analyses using AUV survey.

Such small-scale and high resolution work will be essential for preparing the development of deep-sea mining and establishing relevant environmental guidelines. And thus, the paper will be of interest to scientists and engineers of various fields related to deep sea minerals. The most part I think the authors provide sound interpretation and conclusion supported by their data and analyses. However, I found some part, mainly about nodule coverage and abundance, need to be expressed more clearly (see the specific comments below). I think the paper needs improvement mostly in use of the term “nodule coverage” for more restricted meaning. Once the authors have done this I think the paper will be suitable for publication.

Specific comments (including technical comments)

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.

Pg. 2 line 8 the reference should be corrected

Pg. 2 line 21 use superscript for km²

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)

Pg. 6 line 7 and line 30 add the references for data sources

Section 3.1 Nodule coverage

Variation of nodule coverage associated with seafloor morphology is one of main contexts of the manuscript. Sometimes the term nodule coverage is used as nodule abundance in sections of results and discussion, which makes some confusion. For example, what is the meaning of variation of nodule coverage? Does it mean the difference of actual abundance of nodule or difference of occurrence of nodule (i.e. variation of sediment cover). In other words, the results indicate a small (or local) scale variation of nodule coverage. Does it caused by difference of nodule growth or just reflecting different sediment distribution without significant change of condition for nodule growth? To avoid such confusion, I recommend that authors at least provide a definition for the term “coverage” used in this study possibly in “Introduction” or “Methodology”.

As the authors mentioned in the manuscript, the photographs cannot reflect accurate nodule abundance. If this is the case, the authors should examine their interpretation on the observed variation of nodule coverage carefully. For example, the authors wrote that “The presented data show that favorable nodule growth/occurrence conditions coincide with gentle sloping sites and low relief depressions, where sediment is assumed to accumulate slowly”(Pg. 18 line 24-25). However, if the variation of coverage cannot represent the actual change of abundance, we cannot say that a certain location of slightly high coverage is more favorable site for nodule growth. In my view, natural variation of sediment resuspension by bottom current in accordance with topographical change appears as more plausible explanation for the observed variation of nodule coverage.

Of course, the authors should have some freedom of interpretation, but some of interpretation appears to be speculation without supporting data. 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.

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.

Pg. 13 line 12 and 14. Please check the figure number.

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.

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.

Pg. 17 line 6. What is the CoMoNoD? Need explanation or information for readers who are not aware of the algorithm by Schoening (2017).

Pg. 17 line 30 check the misspelling “and”

Pg. 19 line 13 Water currents can be replaced by Bottom currents

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.

Please use parenthesis for reference citation within a sentence.