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Interactive comment on "Biological and environmental rhythms in (dark) deep-sea hydrothermal ecosystems" *by* Daphne Cuvelier et al.

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This is an interesting study in which the authors report on early results from deep-sea observatories. As the importance of the deep sea and the significance of surface-to-bottom connections become more widely recognized, there is great value in the descriptions in this paper and the techniques being used to explore the role of environmental variables.

In particular, the temperature data presented in this paper contradicts the widely-held view that the deep sea is a stable and 'timeless' environment. It is really interesting that at the NEP, temperatures showed tidal periodicity. This high-frequency variability of temperatures, if related to feeding behavior or chemosynthesis, enables analogy to

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the diel cycling of photic ecosystems. Furthermore, the data presented in this paper on tubeworm visibility (presumably a proxy for feeding), suggests a relationship between temperature and activity at NEP. The longer-term (9-month) data on temperature also suggests trends on sub-annual to annual timescales, providing another timescale of deep-sea variability. These findings on temperature open more questions as to the role of surface processes (seasonal cycles, climate modes, deep water formation, anthropogenic influence) in determining the assembly and functioning of deep-sea communities.

Overall, this paper is very results-focused, with a limited discussion of ecological implications. Most significantly, there are two features of the data that are interesting to me, but which were not explored.

The first is the temporal resolution of the data. Given the 6-hour resolution of the imaging data, I find the recurring importance of 6-hour and 12-hour periodicities and lags to be a bit disconcerting. It makes sense to treat the two datasets identically, defaulting to the one with lower temporal resolution. However, the NEP site has continuous images available, and these could be analyzed at a finer temporal resolution. It would be nice to see some discussion of the effects this might have on the results. Analyzing the NEP data at higher temporal resolution would also enable an analysis to see if the 6-hour 'tidal' periodicity is robust. It would also be helpful to more precisely discuss the link between geographic location and the tidal lag; it is not immediately obvious to me that the two locations should show that kind of synchronicity in tidal cycles, because they are in different basins and their latitudinal positions vary by 10 degrees. On this topic, I also wonder why the authors chose to analyze the percent coverage of microbial mats on a 12-hour frequency. (Presumably this is done in some kind of image-processing software and so should require far less effort than the other analyses that are done on a 6-hour basis.)

The second feature of the data that I believe should be addressed is the difference in the size of the areas studied. There is approximately an order of magnitude difference

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in the surfaces analyzed; but, this difference is never explicitly mentioned in the text or in the caption of the schematic figure. Looking at the two schematics (Fig 2), if the MAR schematic were divided into 10 pieces, I predict that there would be significant variation among those pieces in terms of taxonomic densities. This fine-scale spatial variation seems important to the ecological conclusions that are drawn, especially since there was far more periodicity seen at NEP (smaller FOV) than at MAR (larger FOV). If these taxa (particularly the polynoids and buccinids) move (whether for foraging or other reasons) over a space that is larger than the NEP FOV but smaller than that of the MAR FOV, this could account for their periodicity in one site and not the other. Given the depth and temperature of these sites, and the taxa in question, we might expect slow movement. Therefore, the 6-hour or 12-hour periodicity could merely be an artifact of the time these animals require to cover their foraging range.

Another area where the paper would benefit from an expanded discussion are the multivariate regression trees (MRT) and redundancy analysis (RDA), which led to temporal split groups and an ordination plot, respectively. What do the temporally consistent groups tell us about the functioning or succession of this ecosystem? Do we expect this community to exhibit variation in densities of various taxa on a timescale of 23 days or less? Since few of these taxa are expected to have trophic interactions between them, are they likely to compete for space, for nutrients, for uptake of microbial biomass? Given that temperature is the only environmental variable included in the RDA for NEP, is it surprising that RDA1 explains so much of the variance? What additional information about the vent communities can we gain from Figure 8?

Finally, I have a few other small comments:

1. Figure 2: I am unable to find the white arrow that is referenced in the caption. Is it blending into the white used to indicate the probe? These two schematics would also benefit from having scale bars, or alternately you could include the area represented by them in the caption.

2. Figure 8: Would it be possible to adjust the axis limits? RDA1 (horizontal position) should be much more important than RDA2 (vertical position), but this seems to be obscured by the way that the data are displayed. Also, there is a discrepancy between the figure and the text for the NEP RDA1 % variance explained.

3. Section 4.1.3, on the regional taxa, is purely descriptive and for that reason would fit better in the results rather than the discussion.

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