Review notes

General: This paper presents the design and preliminary deployment data from a new type of imaging sediment trap for use in abyssal environments. The authors have done an admirable job describing the Sedimentation Event Sensor (SES) and showing that it is robust and ready for scientific use. I have only a few minor revisions to request, mostly to ensure that the details most relevant to future scientific use are included, and to trim out some of the details that are less relevant. I suspect the authors will be able to address most of my comments with information already on hand. If they cannot do this in certain cases (ie, adjusting fluorescence solid standards' thickness and pigmentation), they should add a few lines discussing the related uncertainty. I mention a couple of other references; those not already in the bibliography are listed below this review. Specific line comments follow.

Specific:

Lines 43-49 – This long, enumerated list could be broken up for easier reading…?

Lines 93, Fig. 2, Fig. 3 – Cleaning brushes – they present a lot of surface area and collect organic material. Presumably they serve as a great substrate for a healthy microbial community – how fast do they foul? A brief description of what the brushes look like after recovery, whether they clean as well months into the deployment, and whether they are easily replaced with fresh brushes would be good.

Lines 144-145 – Unclear what is meant by mechanical and optical distances. Can you add a diagram of all of the optical and imaging components? While these are described in detail in the text it would be easier to follow with a visual.

Lines 146 – What does depth of field "+1.6/-3.2 mm" mean ? Please clarify.

Lines 172, 177 – The notation "590 x 10 nm" is unfamiliar to me. I assume it means a band centered at 590 nm, but I don't know whether 10 nm is the bandwidth or the half bandwidth, nor whether this is the bandwidth at half-maximum sensistivity or ….? Please be more specific.

Lines 177 – What is the spectral shape of the blue LED illumination? 480 +/- 30 nm is quite wide so the initial spectrum is important as well.

Lines 209-230 – Fluorometer calibration vs. area of 6mm-thick fluorescent-dyed PMA is interesting and a good first pass. However, this procedure did not test the possibility of self-shading by optically thick accumulated particles (they could be optically thick if geometrically thick, or if there is just a high density of pigment). By "self-shading" I mean a particle can be thick or strongly pigmented enough that the interior may not absorb as much of the excitation light as the exterior. It would be useful to vary the pigmentation or the thickness of the calibration disks as well as the area, as these variations would make a better parallel to actual particles.

Lines 263-339, Figures 5 and 6. I think the description of the Mission Plan (Lines 295-306) and general discussion of the system's flexibility for different missions is useful to the scientific reader. However, the rest of the information in this section can be removed without compromising the paper's ultimate goals. This is not to say that details such as the software architecture and mission text file format are unimportant – but they are not necessary to a scientific description of the instrument. Rather, they would make more sense to include in the SES technical manual.

Line 401 – I think you mean that seawater filters out the longer wavelengths? (or shorter frequencies?)

Lines 413-416 – Please explain more precisely how you computed the reported attenuation factors. Is it correct that the reported value is a function both of the stage area covered and the thickness of the accumulated material?

Figure 8a: Left-hand y-axis maximum tick label should be 100%, not 1000%.

Figure 8b: Could you replace the red dots with horizontal bars that show the 10-day collection time period for each trap sample? Also, add a text annotation in red pointing out the "clog" in the sediment trap. Could you format panels 8 and b so that their x-axes align, and so the reader can more easily see when 690 nm fluorescence aligns with light attenuation and when it does not?

Lines 439-441 – Please provide more detail on trap sample handling. Specific questions that are relevant here: In what depth of water were the station M traps deployed? (Were they at the same depth as the SES?) Were the sample bottles filled with poisoned brine? How long were samples held prior to retrieval? How were samples handled between return to the lab and freeze-drying? Perhaps there is another reference that has already detailed the Station M trap sampling protocols, that you could cite here—that would also be acceptable.

Lines 451-453 – This non-linearity may be true at high loadings but there is no reason to assume that attenuance by particles is not a linear function of mass at low loadings. If the accumulated material is not completely opaque then Beer's Law should apply. See Estapa et al. (2013) and Bishop et al. (2016) for related discussions.

Lines 475-476 – Was there a qualitative difference visible in the images of the collected material between these two periods? If so, it would be illustrative to show some of the image data.

Paragraph starting line 500: This "compare and contrast" section feels abrupt and out of place in the discussion. It might be better to move some of the material into the introduction/background section, perhaps returning briefly to table 2 in the discussion if you feel the point-by-point comparison is necessary. At the very least, a "segue" sentence leading into this paragraph is necessary. Also, note that Bishop et al. (2016) contains the most recent CFE data and description. I believe that paper states that the CFE does NOT transmit image data via satellite, and there may be other small inaccuracies. You may want to double check the details in this text and in your table 2.

Paragraph starting line 515 (“Future work…”): This instrument would also be useful (particularly the fluorescence capability) for upper-mesopelagic work if a high-aspect ratio cylindrical tube could be substituted for the conical trap, and the mechanism mounted on a surface tethered, drifting array. See Buesseler et al. (2007) for a discussion of hydrodynamic issues with conical traps in shallow water, however.

References:

Bishop, J. K. B., M. B. Fong, and T. J. Wood. 2016. Robotic observations of high wintertime carbon export in California coastal waters. Biogeosciences Discuss. 2016: 1–32. doi:10.5194/bg-2016-62

Estapa, M. L., K. Buesseler, E. Boss, and G. Gerbi. 2013. Autonomous, high-resolution observations of particle flux in the oligotrophic ocean. Biogeosciences 10: 5517–5531. doi:10.5194/bg-10-5517-2013