

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2022-66**

Anonymous Referee #1

Referee comment on "Mesoscale observations of temperature and salinity in the Arctic Transpolar Drift: a high-resolution dataset from the MOSAiC Distributed Network" by Mario Hoppmann et al., Earth Syst. Sci. Data Discuss.,
<https://doi.org/10.5194/essd-2022-66-RC1>, 2022

Review of Hoppmann et al., "Mesoscale observations of temperature and salinity in the Arctic Transpolar Drift: a high-resolution dataset from the MOSAiC Distributed Network" submitted for publication in Earth System Science Data.

This is a solid manuscript that I recommend for publication after mildly major revision. The writing and figures are generally very clear. There are some confusing explanations that could use some attention.

My major comment concerns a disconnect that I see between the Introduction, which has a significant discussion of the submesoscale, and the rest of the paper, which lacks analysis on these scales. See my comments near the end. The manuscript's title has the word "mesoscale" and the eddy analysis supports this. But why is there so much discussion of the submesoscale in the Introduction?

Line 61: Perhaps change "mesoscale scales" -> "mesoscales"

Lines 93 and 101: "upstream in the Transpolar" ie insert "in"

Line 101: "2019/20" -> "2019", yes?

Line 114: cut the word "already."

Line 116-117: "the measurements ensued away from the inflow of warm Atlantic Water through the Fram Strait and as close as possible to the Siberian continental slope" I am not sure what you mean by this. Also, I suspect that "ensued" might not be the best choice of verb.

Line 119: "to achieve that aim" What aim?

Line 129: An egg has a pointy end; this buoy hull looks more oval, or perhaps "flattened oval"?

Line 133: Your buoy naming convention is a bit odd, ie the use of the capital letter "O" instead of the number zero "0." But it is your choice. As noted below, this gets sloppy in the section about the eddy, when both "O" and "0" are used.

Paragraph starting at Line 135: I got a bit confused here. I thought perhaps the CTDs recorded 2-minute data, and then every 10 minutes, all of these data were sent to the satellite. I think instead, the satellite gets only a subsample of the 2-minute data, i.e., 10-minute sampling, is this correct? I wonder if you can make this clearer.

Lines 153-158: This material confused me. The CTDs have pressure accuracy of 0.02 - 0.002 dbar, but the transmission limitation degraded this to 0.1 dbar. So this is a significant reduction in data quality, right? Your text seems to indicate that it's no big deal.

Further, Table 2 indicates that the pressure accuracy is always 0.1 dbar, even for the CTD data. Why? I thought a direct download could give you 0.02-0.002 dbar. I guess I'm missing something.

Line 191: "an upper threshold of 0.8 m s⁻¹ was applied" Why?

Line 220: what is "sim"? I suspect it is some kind of word processing code.

Line 222: How do you define "suspicious?"

Line 227: How do you define "questionable?"

Line 233: "When CTD data was available..." This caused me some confusion, because the buoy has CTDs. Perhaps you can add a sentence like this to make it clearer: "Buoy data" means all data uploaded to the satellite from the buoys, including from the CTDs, at 10 min sampling, while "CTD data" refers to the directly downloaded CTD data from recovered buoys at 2 min sampling. Is that right?

Table 2: Is the surface temperature thermistor really accurate to 0.01 degC? I think these are usually not so good, e.g., 0.1 or 0.05 at best.

Line 395: The MLD is not evident to me from this figure. How was it computed?

Line 397: Perhaps change "a corresponding decrease in temperature" -> "a corresponding decrease in temperature along the freezing line"

Lines 399-400: Perhaps change this text to: "...partly explained by a combination of upward mixing of deep salty water from below and salt rejection during ice formation from

above, both forced by two February storms (with wind speeds up to 16 ms⁻¹ and air temperatures of XX degC)."

Lines 400-401: why is "vertical mixing properties" in quotation marks?

Line 403: I can't see MLD in Figure 4.

Line 404: What is "air-line distance?"

Line 413: "The position of the eddy remains approximately the same" The same as what?

Lines 417 & 419: check your velocity units. m⁻¹ is wrong, yes?

Line 417: "estimated diameter of the eddy" estimated how?

Line 421: Here you are using zero "0" instead of capital "O." There are several other examples in this eddy section.

Line 426: "by a factor of" i.e., add "a"

Line 428: "radii" -> "radius"

Lines 431-432: Great point!

Line 439: "measured the the upper ocean quasi-synoptically over submesoscales" Two comments: (1) cut one "the" (2) Your introduction has a lot of material about submesoscales, but the paper itself has no corresponding analysis. I suggest you either cut / trim down the introduction material on this subject, or do more work to follow up on it. For example, you could create a histogram for one or all the buoys with a horizontal axis of Δx = the distance travelled by a buoy over 2 or 10 minutes. If you have a lot of sampling between 100 m – 10 km (or maybe shorter? Your introduction implies that Arctic submesoscales are shorter) then yes, you can justify this statement on Line 439 and the extensive discussion of this subject in the Introduction.

But I would also ask this question: Did you really need to sample at 2 or even 10 minutes? What if you sampled hourly, or even daily? What would this histogram look like? I suppose I am suggesting that you do some analysis to find the right time interval for buoy data recording to adequately sample the submesoscale, as you claim without proof that you are doing now.

Line 473: code is available "upon request." Is this sufficient for this journal? Should it instead be available on github or equivalent?