

Interactive comment on “Sea–ice and water dynamics and moonlight impact the acoustic backscatter diurnal signal over the eastern Beaufort Sea continental slope” by Igor A. Dmitrenko et al.

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Abstract: To which degree will the ADCP "see" suspended particles? Is it really true that suspended particles can mask the backscatter signal from zooplankton? I think this should be included in the discussion as a separate topic

Introduction: Line 45: Zooplankton samples taken 13 years after the mooring was deployed? I would suggest that the part on zooplankton samples is taken out, as it in reality have very little added value. This applies throughout the manuscript

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Line 46: "The environmental factors controlling DVM in the seasonally ice-covered Arctic areas,..., remains poorly assessed". There have been numerous studies documenting that it is light that is proximate cue for DVM, both in the Arctic and elsewhere. So if you mean that proximate cues are poorly studied, I would disagree. However, if you are referring to other environmental factor and their effect on DVM, then this is a topic not merely poorly studied in the Arctic, but in general. The effect of upwelling/downwelling is also a novel and important contribution to the understanding of DVM in general! I would recommend rewriting this so that it becomes clearer?

Line 48: To avoid confusion, I would refer to Cohen et al 2020 (table 3.1) with definition of polar night...since you are discussing light levels, the most correct term is actually "civil twilight" which occur during polar twilight when the sun is less than 6 degrees below the horizon. The same applies for the other locations mentioned in the sentences below (need to separate between the definition of types of twilight and polar night periods)

data: Line 83-100: Wallace et al 2010 and later Hobbs et al 2018 used and published a procedure on how to infer ice-cover from an upward-looking ADCP. This would provide a good and in situ data source for ice cover at the mooring site

Lines 101-115: I would argue that this part should be deleted. The samples were collected no less than 13 years after the mooring was deployed, and actually relatively far away from the mooring site. There need to be some seriously strong arguments (that are not provided) for using these samples as a reference point for which scatterers were present 11-13 year earlier. The strength of the manuscript is NOT decreased by omitting these data (quite the opposite, I would argue) - much of the discussion is still valid without referring to zooplankton nets taken in September 2016.

Lines 201-206: Check values...disregarding atmospheric refraction, the polar day and polar night are symmetrical. atmospheric refraction will prolong the observed polar day, but hardly as much as presented here (20 days longer polar day compared to the polar

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night).

Discussion Line 438-440: DVM during the polar night is most likely not "diurnal movement of zooplankton towards the surface at dusk", but rather the opposite (movement away from the surface during the short period of increased illumination at around noon). Suttle, but important distinction in order to understand the process of DVM during the polar night (see recent literature on polar night zooplankton and dvm)

Section 7.4: How does this study deviate from previous studies (e.g. from Svalbard) that have aimed at studying the effect of water masses, halo- and pycnoclines, etc?

General comment: I find the results in relation to an absolute threshold of light ($\text{lux}=1$) interesting, but I think the authors have a lot to gain from presenting a more thorough discussion on the importance of light intensity vs rate of change. Most published papers emphasise the rate of change as the important cue. Also, the use of lux is not very common in studies of DVM - is it possible to relate lux to absolute quantities of photons? This would enhance comparison with previous studies.

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