Biogeosciences

Discussions

Interactive comment on **"Deep-sea benthic communities and oxygen fluxes in the Arctic Fram Strait controlled by sea-ice cover and water depth"** *by* **Ralf Hoffmann et al.**

Anonymous Referee #2

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Hoffmann et al. Review, Feb 2018 The authors present an impressive data set from the western and eastern sides of Fram Strait, the Atlantic gateway with the only deep-water inflow into and outflow out of the Arctic Ocean. Deep-sea biological communities and processes are inherently difficult to sample and measure, respectively. The presented data set - comprising both - is indeed a treasure and one of many valuable results of the long-term HAUSGARTEN observatory. There are actually so many variables measured that the reader is a bit challenged to follow the story at times. The article undoubtedly merits publication, but requires some adjustments. I suggest the following: 1. The introduction will benefit from turning the lists of which factors depend on which other factors into a narrative explaining how they influence each other. This change would neces-

sarily make the introduction a bit longer, but improve the logic, flow and justification for the study. Also, the authors would help the reader by providing a bit of background why they estimate remineralization of new production rather than calculating it because they can. 2. The discussion (especially 4.1 and 4.2) repeats the results to a large extent. Instead, it should place the results in the context of the extensive literature from the area and beyond. I recommend the authors summarize their findings more concisely and discuss their results in the context of, for example, the pan-Arctic scale Progress in Oceanography issue from 2015, primary productions model estimates covering the area, the series of three articles from Patrai – Codispoti 2013 etc. 3. Water depth and vertical flux are well-documented highly influential factors structuring benthic communities both in terms of biodiversity and biomass/abundance anywhere in the ocean, in addition to sea ice cover. While these factors are mentioned in the discussion (without much literature support actually), it should also be noted more prominently that eastern Fram Strait receives constant inflow of particle rich Atlantic water, and this advective input adds to the vertical flux (see for example Wassmann et al. 2015 PiO for a summary). It is indeed complex to separate out the effects of water mass properties including particle content, and ice cover – a fact that should be acknowledged. 4. The authors said they struggled to find some relevant information (e.g. on primary production) for the western Fram Strait side, and therefore used values from the central Arctic. They might consider the results of the SFB313 that spent years investigating East Greenland including the slope, including carbon remineralization, primary production, benthic community structure etc., http://www.springer.com/us/book/9783540672319. Was the region never covered in any of the primary production models? Some additional useful information from eastern Fram Strait is also available, e.g. Wlodarska-K. et al. 2004 in DSRII. Small corrections / comments: P4 l6 I would not call primary production and oxygen flux an ecosystem component, they are rate measurements of processes. The benthic community is an ecosystem component. P4 Delete l6-8 (redundant to previous sentence). L4 l9 Rather 'nutrient concentrations' (or which property of nutrients?) P4l10 If this is to be general across the globe, add 'In general, benthic community ...'

P4l14 and elsewhere. I was taught 'therefore' never starts a sentence. P4l20 'Western' Arctic is a rather undefined term, since different nations use it in very different ways, rather give the region. P4l21-22 Unclear how the 'better fit' works when one doesn't know what other factors were included. P4l34 No need to repeat the three references for the same aspect since already given in l28 P5l17ff What time period is considered when talking about stable ice cover here? What time period is considered in the number of 0.6 years per decade? (And somewhere in the discussion the author talk about ice thinning, a bit of a contradiction.) P6l4 Why combine sea ice cover and nutrients under one sub-header? I suggest separating those sections. P5l6 rather 'Study area and field sampling' or 'Study area and sample collection'. None of the sample preparation or processing is described here. P6l9 Although both 'data are' and 'data is' is allowed per some dictionaries, it really should be 'data are' (one datum, several data). P6l15 Provide a reference for the nutrient measurement method. P6l20 Which property of phospholipids and proteins and organic matter was measured – presumably concentrations? P6 section 2.3 The methods description is extremely abbreviated, but it is an editor decision if this is sufficient. P7 2.4 What taxonomic resolution was aimed for? P12l6 It would be appropriate to include the nutrient profiles (at least upper water column) into the MS figures rather than the supplement given that the nutrient inventories provide the basis to the level of primary production possible (although measured after the bloom was done presumably). At the very least some concentration ranges should be mentioned. Define 'surface'. P12l16 Why 'indicates'? Later you test this! P12l12 There are different opinions on this, but given that I would find at least a range of densities etc. presented (as is done in the next section 3.4). At the very least, table 2 should be referenced here so that the reader can find the results. P13l31-32 add 'rather than an actual interannual difference' P14l5 Just above you wrote the different is likely related to the months, while this line states it is a spatial difference. Both may be true, but as written the statements seem contradictory. P14l26 Significant indeed, but the authors should mention that the global R values are rather low, same with the macrofauna results. P15 l10 perhaps add ' marginally not significant' P15l16 As phrased, this

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is not a question. P15l23 Grammar. If there were a strong link ... we would expect .... (conditional) P16l14/15 This is not the right place to mention this point, move to figure caption or results text. P16l27 opposite to our expectations or in contrast to our expectations. The following PCA sentence is grammatically incorrect. The PCA only shows .. but does not test ... P19l4 The Kortsch paper is on shallow nearshore hard bottom communities, not quite the right reference here. P19l10 In earlier sections the authors talk about 'stable ice conditions' in Fram Strait, while here they state that ice is thinning. Specifying by which metric the conditions are stable will relieve the contradiction. P19l14 My understanding of the Boetius et al. paper is that these authors discussed the high Melosira biomass to be generated on the shelf and maintained (but not produced) over the basin through constraint resupply of –albeit low – nutrients during ice drift, not as a consequence of increasing algal biomass in the central Arctic. General: Someone should switch German to English comma rules throughout. Table 2. Use same number of decimals within one parameter (e.g. days with sea ice has between zero and two decimals). Table 3. Spell out HSC and LSC. Figure 1. Specify time frame for 'general summer sea ice extent', by month and period. Figure 3. Indicate if any of the differences between EG and WS were statistically significant. This and other figures explain abbreviations or say in caption where they are explained. Figure 6. Typos: Arctic missing 'c'. Sauter et al. and Bourgeois et al. missing periods after al.