The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2021-160-RC2, 2021

Comment on tc-2021-160

Anonymous Referee #2

Referee comment on "Regional variability of diatoms in ice cores from the Antarctic Peninsula and Ellsworth Land, Antarctica" by Dieter R. Tetzner et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-160-RC2, 2021

This study presents new diatom records from four ice core records across the Antarctic Peninsula and Ellsworth Land, Antarctica. A ~20-year annual record of diatom taxa is produced from three of the cores, while a sub-annual record of diatom taxa from 2002-2006 is produced from all four ice core records. Relative differences in diatom taxa between the coastal and inland sites suggest differing source regions. The authors also assess interannual variability of the diatom record at each site based on the sub-annual data. Through these data, changes in environmental conditions are assessed. These data are of importance for paleoenvironmental reconstructions.

The paper is well written and in a mature state. These original data are of broad interest to the Antarctic paleoclimate community. I recommend the following clarifications to improve the manuscript:

Specific comments:

Figure 5 and MSA: It is mentioned in the methods that the ROIC ice core was dated using the annual cycles of major ion concentrations, and MSA is used in Figure 5c to identify the austral summer based on the maxima of MSA.

As this study crosses multiple disciplines, not every reader will know what MSA is and understand its use here. MSA should be introduced earlier on in the manuscript (only mention is line 129) as to what it is, how it is interpreted at this site, and what the maximum represents.

This may be a missed opportunity in the discussion for ROIC site, as MSA can be an

indicator of winter sea ice extent or summer primary productivity (i.e., Thomas et al., 2019 as cited; Abram et al., 2013), and the relative timing of the MSA peak to the diatom peaks could add an interesting aspect to the discussion.

Line 331/376: The text emphasizes the 'dominance' of marine diatoms in the record, when they are just over 58% (line 307) in some instances. The authors also state they cannot "rule out **minor** contributions from exposed sediments in fresh/brackish-water bodies." in line 341. Given that in some instances marine diatoms only make a little over half the assemblages I suggest the authors rephrase these sentences as 'dominance' could overemphasize the marine contribution. The same could be said about **'minor'** minimizing contributions from fresh/brackish water bodies.

Line 344: SSIZ and POOZ are used to describe 'seasonal sea ice zone' and 'permanently open ocean zone' with a reference to section 2. However, neither of these acronyms are used or defined in section 2. SSIZ is defined in the caption of Figure 1. POOZ isn't mentioned until the caption in Table 3. As these acronyms are used extensively in the discussion, they should be defined and described in main text in section 2 and not just in the captions.

Section 5.2 Inter-annual variability:

This section provides some interesting insights, but the assessment of changing environmental conditions influencing diatom concentrations could be strengthened (from line 413 onwards).

First off, regarding the decadal variability. Why were these subsets chosen? As they differ between sites, they seem arbitrary. The discussion could instead focus on the overall increasing trend, rather than the differences between the subsets, particularly as the discussion of the changes in atmospheric circulation and sea ice dynamics is only regarding 'recent decades' and not these specific periods.

However, since these data were subdivided, it would strengthen the discussion to be more specific about the trends in environmental conditions over each decade analysed.

For example in Line 423: Regarding the 'recent decrease in the area of the ABS SSIZ mentioned in Parkinson, 2019– the overall trend is negative, but there has been a slight increasing trend since ~2010. This would then perhaps suggest an increase in the distance of the SSIZ relative to the 1999-2008 period.

While data for the specific decades analysed may not be readily available for all

environmental conditions mentioned in the text, the authors should make improvements where possible.

Minor comments:

Abstract, line 16: "yield a novel wind paleoenvironmental proxy" – suggest 'paleoenvironmental proxy' as authors acknowledge other environmental factors may influence diatom content in ice cores such as sea ice extent.

Line 28: "over long distances" – if possible, be more specific here (ex: over XX kms)

Line 44: "ocean" is capitalized

Figure 1: SSIE and PSIE are difficult to read/see in the main figure – perhaps outline these in white (but keep them filled in with color) to make them stand out more?

Coastal polynyas: The transect in Figure 1 identifies coastal polynyas as a feature in this area. There are several in this region, yet no mention of coastal polynyas is made in the text or how polynya variability may impact these records.

Lines 89 and 95: "XXth century"

Table 1 caption: When describing SIE – perhaps refer to section 3.3 which provides the source of the data. The caption does an excellent job of explaining how these distances were calculated but does not identify the source of the data which is presented later.

Figures 2-5, Part C: The color used for SIDI can be hard to differentiate from the total diatom concentration (particularly with a printed version)– an alternate color or line marker may be more suitable. However, this is up to the author and editor's discretion.