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Climate of the Past Discussions

Interactive comment on "The 3.6 ka Aniakchak tephra in the Arctic Ocean: a constraint on the Holocene radiocarbon reservoir age in the Chukchi Sea" *by* Christof Pearce et al.

Anonymous Referee #3

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General comments

The manuscript under review, submitted to Climate of the Past, discusses the outcome of a targeted search for the 3.6ka Aniakchak tephra in a marine sediment core from Herald Canyon in the Chukchi Sea. The study uses the 3.6ka volcanic age marker to derive a time-specific marine radiocarbon reservoir-age offset for the area. The volcanic age marker further allows concrete correlations to be made to other marine cores in the area as well as correlations to terrestrial and ice core records. The manuscript is clear, well written and provides important new information for the research communities involved in particular in teprhochronological work and stratigraphical/chronological work, but also over all for those studying global climate change in a paleo-perspective.

Specific comments (comments are marked by page number followed by the line number).

1 24 Bioturbation is mentioned to be 10 cm, but later on it is discussed as 15 cm.

9 03 Where does the estimate of 15 cm bioturbation come from? Line 33 on page 8 states a theoretical mixing depth of maximum 10 cm. The abstract does also talk about a 10 cm depth.

3 21-23 The authors point out the ongoing debate about the absolute age of the tephra marker. In light of that discussion it might be interesting to show how much/if any difference to the reservoir age it makes to use other age estimates for the Aniakchak Tephra.

5 15 I understand that this was a targeted search for a specific tephra marker, nonthe-less it would be interesting to know where the broad tephra peak tapers out. Does it return to background levels? When does the reworking stop, and one could also speculate why it stops.

In light of the above comment do the grains show any visible means of reworking? How are their edges, are they still as sharp or have they rounded down?

7 02 What about x-radiographs, is the tephra discernible there?

7 04 Since the samples were sieved at 25 μm, that will by default become the lowest observed grain size, there could still be smaller sized tephra grains.

7 20-21 "Concentrations of shards larger than 250 μm are low (<1%), but appear to correlate to tephra concentrations, where tephra abundance maxima coincide with small increases in the presence of coarser grained clasts (Figure 4)." I am not very convinced of this correlation; there are also instances where tephra peaks are not accompanied by a peak in larger than 250 μm shards.

Technical corrections (marked by page number followed by the line number (or Figure

number)).

4 12 Wrangel Island is not marked on Figure 1.

7 08 “and vary around what is considered background levels until 715 cm.” This seems to be in opposition to the statement on page 8, line 28 (see below comment). Please clarify.

8 28 “major increase in tephra concentration above background levels at 711.5 cm” However, Line 8 on page 7 states 715 cm.

9 09 Consider changing “maxima” to “peaks” in the following sentence: “The grain size distribution in samples from Core 2PC shows that maxima of tephra. . .”

18 03 Consider changing “mentioned in the manuscript text” to “mentioned in this study”

18 13 Please list also the depths of the samples analyzed.

18 17 The figure caption for Figure 4c states >125 μm but on figure 4 (at the top of the graph) it reads <125 μm.

20 Figure 2 The figure uses “(a)” and “(b)” rather than “a” and “b” as the other figures do.

21 Figure 3 It would be interesting to see also the lower-Si parts of the reference tephra. Perhaps denote them in open circles.

22 Figure 4c same comment as for 18 17.

22 Figure 4e It would be beneficial to add on 4e the isochron depth range and depths of samples which have been analyzed for major oxide composition, similar to what is displayed in Figure 2.

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