

Response to RC1

We appreciate Prof. Stein's valuable comments and suggestions, as we highly appreciate his proven experience and wide publication background with Arctic research. We are therefore grateful for the opportunity to improve the manuscript according to his comments and ideas. Comments seem very positive and are constructive, and also give some valid references to be considered. He said that manuscript is well written paper and is certainly of interest and an important puzzle piece for the still needed more detailed reconstruction of the history of the East Siberian Ice Sheet, especially in context and relationship to the other major circum-Arctic ice sheets.

Response to specific comments:

Comment: The lithologies of the key cores of this study can also be correlated to the Polarstern cores, and their age model based on the new findings of O'Regan et al. (2020) seems to support the old tentative age model we have used for our Polarstern cores. From several of these Polarstern cores (including key cores PS2757 and 2761) detailed mineralogical and geochemical data have been produced within three PhD studies (Behrends, 1999; Müller, 1999; Schoster, 2005; part of the data is published in Behrends et al., 1999; Müller and Stein, 2000; Schoster et al., 2000). These data including heavy minerals, clay minerals, and major & minor elements, have been used to reconstruct (1) the provenance, source areas and transport mechanisms of the terrigenous sediment fractions and, based on these data sets, (2) the history of the Eurasian and East Siberian ice sheets (Fig. 2). The extent and timing of proposed ice sheets in northern Siberian during MIS 4 and/or MIS 6 are discussed (Fig. 2b; cf., Arkhipov et al., 1986,1995; Müller, 1999). As one example, the heavy mineral record from Core PS2757 is shown in Figure 2c. I recommend that some of these data should be considered and discussed in the present paper.

Response: We will respond to that comment by adding an additional paragraph with highlighted references in the discussion where the results from the Polarstern cruises are discussed especially related to heavy mineral distributions. We will focus on some similarities with Behrend's (1999) work on PS2757, which could be quite similar to the data from SWR-29GC.

Comment: Stein highlighted that the reconstruction of provenance, source areas and transport mechanisms of the terrigenous sediment fractions as well as the history of the Pliocene-Pleistocene Eurasian and East Siberian ice sheets is one of the key objectives of the IODP Expedition 377 (ArcticOcean Paleooceanography – ArcOP) scheduled for autumn 2022. The locations of the potential IODP sites are in the neighborhood of the cores discussed here. Thus, the results of the studies by Alatarvas et al. as well as our own previous studies on Polarstern material may give ground truth information that is important and helpful for the interpretation of the coming IODP data.

Response: This is a relevant notice and importance of this type of studies and the upcoming ArcOP expedition will be mentioned in discussion of the manuscript.