

Interactive comment on “The calcium-dust relationship in high-resolution data from Dome C, Antarctica” by F. Lambert et al.

F. Lambert et al.

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Thank you for the constructive criticism. We agree that the scientific discussion is not strong enough. As the aim of this paper is to publish the data to make it accessible to the scientific community at large, we will submit a revised manuscript that will feature separate discussions of the calibration of dust data obtained with the Bern and the Copenhagen devices with more in-depth error estimates. It will focus on the data description and the interpretation will be much reduced.

We will address the Ruth et al. papers in more detail. We will also insist more on the differences and similarities between Greenland and Antarctica, as what has been demonstrated in one is not necessarily valid in the other.

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"p.1120, lines 15-19, The writing here is very unclear, as the authors seem to be comparing previous interglacials with the LGM and Ca and nssCa with Ca and insoluble dust...If a comparison is being made it should be done more clearly."

The last sentence is especially tortuous. The paragraph will be rewritten.

"p.1123, lines 1-9. I think that the observation of a distinct change in dust-calcium correlation since 600 ky BP is perhaps the most novel finding of this ms. It should be discussed in much more detail and treated with reference to other species which have been determined in the ice. More work should be done to identify whether this is an artefact of the crystal structure and deformation effects or whether this is an actual climatic signal. I find that this ms, which is struggling for novelty, would do well to embrace such an interesting facet of the dataset. pp1124/5. The discussion of the strange behavior during MIS16 may possibly be related to the changed Ca behavior in the oldest 200 kyr of the record. I think that the discussion of MIS 16 behavior needs to also be treated with regard to the crystal structure and other proxies in this well-measured ice core, in order to more appropriately distinguish matrix effects from climatic effects."

Unfortunately, physical properties data are few and far between at this depth (only two data points between 600 and 700 ka). Although many species have been measured on this core, few have a usable resolution in the bottom part. We know from these measurements that the temperature in the lowest part of the core rises above -10°C and approaches the melting point. It is therefore possible that migration recrystallization occurs. We also know that dust concentration affects (crystal) grain size, and that the recrystallization occurs differently during warm and cold stages (i.e. low and high dust content). However, the inverse effect of grain recrystallization on dust is unclear. It has been postulated that melting along the grain boundaries produced the dust particle aggregates found in the lowest part of the core. This could have led to a loss of particle count and affected the dust-Ca ratios. It is also possible that not all the calcium in the dust particles is dissolved during the normal measurement procedure. A prolonged

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stay in melt-water could have dissolved a larger amount of calcium from the dust, thus increasing the relative calcium content.

"The presentation and discussion of Figure 6 leaves much to be desired. To begin with, the authors might consider using the blue end of the scale for colder climate regimes and the red end for warmer climate regimes. It seems strange that only one glacial termination is discussed. Obviously the most recent termination would be the best resolved but cannot be used due to the large gap in the data, so perhaps MIS 13-11 could be used for comparison to see if the trends in Fig 6 are repeatable? Further, it seems strange to describe dust as "interglacial" based on its nssCa/dust ratio and infer that this dust originates from South America. A growing body of evidence indicates that South America is not a unique source of dust to Antarctica, especially during interglacials, so it seems to be a quite tenuous link that is drawn from behavior observed in MIS 7-5 to South American glacial dynamics. The authors could spend much more time here developing a stronger appreciation for what such an enormous dataset has to offer."

The scientific discussion will be much shortened in the revised manuscript, as we will focus on the data itself. Figure 6 and its discussion will be removed.

Interactive comment on Clim. Past Discuss., 7, 1113, 2011.