

Interactive comment on “Interpreting last glacial to Holocene dust changes at Talos Dome (East Antarctica): implications for atmospheric variations from regional to hemispheric scales” by S. Albani et al.

S. Albani et al.

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Dear Simon,

thank you for your constructive comments on our manuscript. We reply here within the open discussion to some of the main points that you have raised, while a full point-to-point response will come with the edited version of the manuscript.

Best regards, Samuel Albani and co-authors

Comment: In the discussion TALDICE and EDC dust fluxes during LGM, ACR and C80

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early Holocene are compared. Looking at Fig. 4b it is evident that after approx. 5.5 kyr correlation of the two records becomes suddenly very high compared to the ACR and early Holocene periods. How does this correspond to the authors' hypothesis of changed wind patterns and strong local sources at Talos Dome during the Holocene? Extend the discussion with this part of the dust fluxes.

Response: If a higher correlation was evident during the late Holocene, the interpretation within the conceptual framework that we have developed in our work would be that, due to the decrease in the local dust flux, dust deposition from remote sources would be relatively more relevant and as such more similar to what we observe at EDC, under the assumption of a common dust source during that period – which is not obvious as we discussed. In any case, a closer inspection of Figure 4b would reveal that the apparent very high correlation is mostly imprinted in the smoothed curves, whereas the raw data show a less clear evidence of in-phase short-term (sample-to-sample) patterns (see also response to Aloys Bory). We think that at the present resolution of the profile, it is not possible to give any reasonable interpretation on variability at time scales shorter than the ones that we have discussed.

Comment: In general, the suggested wind pattern change leading to the changes in dust deposition at Talos Dome needs to be elaborated further: 1) It is mentioned that “advection from Antarctic sources varied only slightly in relation to the major climate changes” (p 156 lines 22-23). However, during the Holocene changes in wind directions/strength leading to reduced transport from local dust sources are suggested to explain the decreasing dust input during the Holocene (p 157 lines 15 – 21). On the other hand, additional wind pathways from the Ross Sea at present conditions are mentioned (p 156 lines 6 – 13), which would in turn lead to enhanced transport of local dust to Talos Dome. These arguments are contradicting each other.

Response: The arguments do not contradict, since with “major climate changes” we refer here specifically to the glacial termination, with no intent to generalize to the full time span of the record. We try to clarify this point, thanks for highlighting this apparent

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discrepancy.

Comment: 2) Following the authors' arguments on p 157 line 24 to p157 line 5 the mechanism would be (strongly simplified): more ice in the Ross Sea = less winds from the Ross Sea area to Talos Dome, and vice versa. However, this contradicts the decreasing trend in dust flux at Talos Dome during the Holocene and the before suggested wind pattern changes.

Response: The first statement that the reviewer reports ("more ice in the Ross Sea = less winds from the Ross Sea area to Talos Dome") sounds correct based on what we wrote in the text, however drawing the conclusion of a contradiction sounds like a misunderstanding: we motivate below, and try to clarify this in the text. Concerning the atmospheric circulation, less winds from the Ross sector is due to the presence of a Ice shelf/sheet (Ross Ice Sheet) during LGM and deglaciation, with the ice front position/open sea ice hundreds kms far from present position. During the second part of Holocene the variations of the sea ice extent have an impact on the atmospheric circulation/wind patterns. The impact of Ross Ice Sheet on atmospheric circulation could be very important and stable for thousand year, whereas the sea ice extension have less impact and is more variable. However, we never identified preferential source areas for dust linked to the Ross Sea pathway compared to the Southern Ocean one. We consider the potential source areas (based on Delmonte et al. 2010b) as widely sparse, and we have at present no clue to be more precise on this. Based on the timing of the events, we therefore state that a higher proportion of winds from the Ross Sea looks less favorable to local dust deposition at Talos Dome instead. We will clarify this in the text.

Interactive comment on Clim. Past Discuss., 8, 145, 2012.

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