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Climate of the Past Discussions

Interactive comment on "Iron fluxes to Talos Dome, Antarctica, over the past 200 kyr" *by* P. Vallelonga et al.

Anonymous Referee #2

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In the manuscript, the authors present new Fe data over the past 200 kyr from the Talos Dome (TD) ice core. They find that fluxes of Fe at TD were greater than those at Dome C (EDC), with the greatest difference during interglacial periods. Based on the comparison of Fe fluxes between TD and EDC, the authors discuss sources and transport pathways of Fe, which are consistent with those of dust discussed by earlier papers. The authors estimate the contribution of Fe fertilization to the glacial drawdown of CO2, and draw a conclusion similar to that of an earlier paper, which was not directly based on Fe data. The new Fe data obtained by this study give supporting evidence for earlier findings. With the new Fe data, the authors also show that fluxes of dust, nssCa and Fe are decoupled on millennial to centennial time scales, and that nssCa and Fe should not be used as quantitative proxies for mineral dust. Since dust and nssCa are often used as proxies for Fe, this finding gives an important warning to the ice core

community. The new Fe data obtained in this study contribute to our understanding of sources and transport pathways of mineral dust, and its interactions with climatic and environmental changes. The manuscript could be considered for publication if the following comments are addressed adequately.

1. P. 6097, L.3 Can authors estimate the proportion of undissolved Fe? It should be explained in the text why undissolved Fe does not affect the conclusions of this manuscript.

2. The authors use dust and nssCa data from earlier papers, and calculate Fe/dust ratios. As they discuss variations on millennial to centennial time scales in detail, error estimates for nssCa, dust and Fe/dust ratios should be written in the manuscript to confirm that the errors do not affect the conclusions. I'm concerned about the errors, because the EDC dust data from different instruments (Abakus and Coulter Counter) show slightly different values (Lambert et al., 2008). Error estimates for accumulation rates at EDC and TD on millennial to centennial time scales are also necessary.

3. P. 6097, L.16, Fe concentrations Does this mean Fe fluxes?

4. P. 6097, L.18-L.19, variability in the Fe and dust fluxes Coefficients of variation should be presented in Table 1.

5. P. 6099, L.20-L.21 Though L.13 mention about centennial-scale variations, I don't see a consistent change in dust and Fe fluxes and dust size fractions on millennial to centennial time scales. A consistent change can be seen only on longer time scales. The text should be revised to make this clear.

6. P. 6100, L. 10 The authors need to explain how nssCa (both for EDC and TD) was calculated.

7. P.6100, L.27-L.29 I don't understand what this means. Dust and Fe fluxes around MIS 4 and MIS 6 are higher than interglacial values.

8. P. 6101, L13-L.16 This contradicts with P. 6010, L. 3-L.4. Furthermore, I think it is

difficult to estimate the contribution of Fe fertilization using Rothlisberger's method. It just gives the possible maximum contribution.

9. P. 6108, dust fluxes are from Delmonte et al. (2010). I think that the original data are from Lambert et al. (2008)?

10. Fig. 3. The authors could add the stable isotope data in Fig. 3 and discuss how dust, Fe etc are related (or unrelated) to temperature variations on millennial to centennial time scales.

Interactive comment on Clim. Past Discuss., 8, 6093, 2012.