

## **Response to interactive comment by Andrew Russell**

Reviewer's comments are identified by SC and authors' by AC

SC: Interesting study on Antarctic dust and links with circulation. I thought I should leave a few comments on some aspects of the paper:

AC: We are so thankful for the encouraging and valuable suggestions.

SC: P1842 L11: should that be 1980s or 1985?

AC: It is 1985.

SC: P1842 L11-13: If this pattern is driven by an increasing SAM index then wouldn't you expect westerlies to increase in "strength" (does strength mean speed?) rather than easterlies? Maybe this is discussed in the paper but it is hard to understand in isolation in the abstract.

AC: Yes, we intended to discuss wind speed. In the revised text, we have consistently used "wind speed" to avoid confusion.

SC: P1842 L26: Russell and McGregor (2010) have a section (5.3) on dust in their review of atmospheric circulation reconstructions from Antarctic ice cores - it might be worth citing that here.

AC: The above paper has been cited.

SC: P1843 L29: Marshall (2003) would be a good paper to cite here as it looks at the SAM trends in observations (re-analyses have had problems in this region due to a lack of input data).

AC: The above paper has been extensively cited.

SC: L1847 L11: I think it would be worth mentioning other studies that have used back trajectories and cluster analysis in the Antarctic region here, there's a section (4.2) on this in Russell and McGregor (2010).

AC: We have cited relevant papers, including the above, in the revised text.

SC: P1850 L23: why was 10 days chosen? Do back trajectories have any skill on this timescale (and is there a citation to back it up)? Section 3.2: Are 4 months of back trajectories really enough to link the dust patterns to changes in the SAM?

AC: Li et al. (2010) have performed a simulation of dust transport in South America and found that it takes 4–5 days for dust to reach high-latitude South Atlantic after its emission and ~7 days for the dust to reach Antarctica. Further, Stohl and Sodemann (2010) found that age of Antarctic air in the lowest 100 m of the atmosphere in the cDML for August is 3 – 4 days and for January it is 4 – 7 days. Accordingly, the 10 days trajectory simulation time is sufficient to understand dust deposition at the present core site.

Since a detailed trajectory study is beyond the scope of this study, we have computed representative back-trajectories for one month each of the two major periods before and after 1985. These periods were chosen since they are in the same phase of

El-Nino Southern Oscillation (ENSO) and ENSO has a known linkage with southern hemisphere climatic variability (Michelle and Thompson, 2006).

SC: P1851 L28-29: What is the correlation between the SAM and the dust flux? This would be a more convincing argument.

AC: We have now used statistical techniques in the revised text to support the causal relation between the SAM and dust flux at the core site. The analysis revealed a strong positive correlation ( $r= 0.68$ ;  $p = 0.00000001$ ) indicating the role of SAM on dust transportation over East Antarctica. The same has been included in the revised manuscript.