

Interactive comment on “The southern hemisphere at glacial terminations: insights from the Dome C ice core” by R. Röthlisberger et al.

Anonymous Referee #1

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Review of Rothlisberger et al The southern hemisphere at glacial terminations: insights from the Dome C ice core

General comments:

The authors present a new analysis of three proxy records from the EPICA Dome C ice core, and address the relative timing of change, or phasing, among temperature, dust, and sea salt aerosol during terminations. This is an interesting analysis – using a relatively simple statistical technique, the authors provide quantitative information on the timing and rate of change of the different proxy records, and in particular show that various thresholds must be reached at different times. I agree with the authors that the approach in some ways oversimplifies the true complexity of the terminations.

However, as they note, the point of using an approach such as RAMPFIT is to identify the major properties of a system that can then be analyzed. As such, I think this is a very useful and informative exercise, and provides important information on various aspects of Southern Hemisphere climate during the last 9 terminations, something that only the Dome C data can provide. The paper is clear and well written, concise, and will certainly be of interest to Climate of the Past readers. I have only a few comments for the authors to consider during revision.

Specific comments:

section 2.1: The discussion of change points in this section is unclear. I assume that the authors mean the inflection points in the accumulation, nssCa, and ssNa concentration data are different, hence flux calculations will be affected. However, the definition (in this context) of change points is not given until the next section with RAMPFIT. Please clarify this sentence to avoid confusion.

figure 4: the plot for T IV in my version was very faint and difficult to read. However, this figure is altogether difficult to read; please find a way to make the individual plots larger, commensurate with the importance of the figure to the main points of the paper. Also, I think the colors of the various proxy records are mixed up in the plot I have. For example, deltaD is blue in some plots and green and red in others. Please double check and correct.

section 3.1: the discussion of the dust threshold here does not seem to fully address the main point, i.e. that at some point during the termination warming a threshold is reached beyond which no further decrease in dust concentration occurs. There is a good summary of the potential source areas and various factors in South America that may contribute to changes in dust flux, however the discussion never focuses on what may be responsible for the constant lower flux level that is reached. Is there some feedback among precipitation, circulation, vegetation, etc. that may be responsible? Another related aspect, which was not addressed in the analysis, is the variability in

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dust flux during both glacial, transition, and interglacial periods. A quantitative assessment of the variability may provide additional insight into the relevant processes.

section 3.2: the last sentence in the first paragraph is awkward – the usefulness of sea salt records as a proxy does not become saturated, it simply may cease to exist. Please clarify.

section 3.3 and figure 8: I think it would be useful to add the rate of change data for nssCa and ssNa flux to the figure, even if they are relatively constant.

Conclusion section: the addition of a brief discussion of sea ice/CO₂ relationships here seems out of place, and probably better suited for the discussion section. This is potentially a very important point, and should be discussed in more detail rather than briefly mentioned in the conclusions.

Technical comments:

section 3.3: the brackets around (Masson-Delmotte et al) should be removed.

Interactive comment on Clim. Past Discuss., 4, 761, 2008.

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