

Interactive comment on “Differences between the glacial cycles of Antarctic temperature and greenhouse gases” by A. W. Omta

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I would like to thank Referee 2 for the comments. However, I do feel that a brief clarification is warranted.

The focus of the article is differences between the glacial cycles of Antarctic temperature and CO₂. The Referee raises a key question at the bottom of the second page of comments (C346): “Given the similarity claims by the author between temperature, CO₂ and CH₄, why is CO₂ not a function of obliquity also?” The answer is that it isn’t: even though the 100-kyr cycles are dominant in each of the signals, the Fourier spectra of Antarctic temperature and CH₄ also have a rather strong contribution at the 41-kyr obliquity frequency which is almost entirely absent in the spectrum of CO₂. Although this difference between the respective Fourier spectra was noticed by Petit et al. (1999),

C407

the possible origins and implications of this difference have never been explored (as far as I am aware). To be honest, I was quite surprised about this state of affairs, in particular, because much insight can be gained from an analysis with relatively simple means. Most of the remarks and questions brought forward by the Referee at the last page of comments (C347) boil down to why I didn’t use more sophisticated analysis methods. The answer is that simple methods are generally more transparent and that more elaborate methods are not necessary for the analysis. Subtracting rescaled CO₂ from Antarctic temperature yields a residual signal similar to obliquity which directly implies that temperature is approximately a linear combination of CO₂ and obliquity. This effectively rules out any scenario in which CO₂ primarily responds to, and amplifies, Antarctic temperature. Instead, the key finding is consistent with a very different type of causal relationship: either Antarctic temperature and CO₂ independently respond to a 100-kyr cycle of another variable or there exists a 100-kyr biogeochemical oscillation of CO₂, to which temperature responds; on top of that, temperature responds to obliquity variations.

Interactive comment on Clim. Past Discuss., 8, 987, 2012.