

## ***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 1 for his/her comments. I do, however, disagree strongly with his/her assertion that there is no new or original insight. Therefore, I would like to briefly clarify two issues:

**1) What is the key point in this manuscript?**

The key point I wish to convey is presented in Figure 3: subtracting the ice-core  $\text{pCO}_2$  signal from the ice-core Antarctic temperature signal (after rescaling both signals with their respective standard deviations) yields a residual signal similar to the rescaled obliquity cycle. This directly implies that temperature is approximately a linear combination of  $\text{pCO}_2$  and obliquity. As far as I am aware, this has not been pointed out elsewhere.

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**2) Why is this an important finding?**

A key question with regard to the glacial cycles is the causal relationship between the variations in atmospheric  $\text{pCO}_2$  and Antarctic temperature. Any scenario in which  $\text{pCO}_2$  primarily responds to, and amplifies, Antarctic temperature can only be consistent with Antarctic temperature being a linear combination of  $\text{pCO}_2$  and obliquity, if  $\text{pCO}_2$  would somehow respond less strongly to the 41-kyr (obliquity) variations in Antarctic temperature than to the dominant 100-kyr Antarctic temperature variations. As the referee says, such a scenario ‘is a dead alley’ (point 11 of his/her specific comments). Instead, the key finding is consistent with a very different type of causal relationship: either Antarctic temperature and  $\text{CO}_2$  independently respond to a 100-kyr cycle of another variable or there exists a 100-kyr biogeochemical oscillation of  $\text{CO}_2$ , to which temperature responds; on top of that, temperature responds to obliquity variations.

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