

HIGH SUMMER RAINFALL DURING THE WARM EARLY PLEISTOCENE IN THE SOUTHERN HEMISPHERE: ANALOGUE FOR FUTURE GREENHOUSE CLIMATES?

Kale Sniderman^{1*} and Nicholas Porch²

¹ School of Geography and Environmental Science, Monash University, Victoria, 3800, AUSTRALIA
+61 3 9905 4622 email: kale.sniderman@arts.monash.edu.au

² Department of Archaeology and Natural History, Australian National University, Canberra, ACT , 0200, AUSTRALIA

ABSTRACT

CSIRO projections for the late 21st century (CSIRO, 2007) predict warmer temperatures for Australia, but predictions of precipitation changes are variable, and straddle zero change. Nevertheless, the majority of models predict moderately reduced rainfall in the southern half of the continent, both annually and seasonally. However, these predictions have not been compared with climate reconstructions for times in the geological past when climate was 2-3°C warmer than the 20th century. Here, we present new palaeoclimate reconstructions from subfossil beetle assemblages at Stony Creek Basin, a palaeolake record showing that diverse 'subtropical' rainforest persisted in southern Australia for at least several 100 kyr into the Early Pleistocene. Our reconstructions indicate that, between 1.8-1.5 Ma, southeastern Australian temperatures were c. 2°C warmer than present. This evidence for an unexpectedly

warm southern hemisphere during the Early Pleistocene is consistent with Raymo et. al's (2006) hypothesis that the East Antarctic ice sheet may have maintained a terrestrial, rather than marine, melting margin up until perhaps c. 1 Ma. Our reconstructions also indicate that annual rainfall was similar to, or up to c. 2× modern values, and that summer rainfall was c. 2.4× higher than today in this region now dominated by cool season rainfall and summer drought. This contrasts both with CSIRO projections for a ≥2°C warmer world, and hypotheses that past warmer worlds were 'El Niño-like' (Fedorov et al., 2006). These reconstructions imply that, once 'slow' feedbacks such as ice sheets equilibrate with the radiative forcing of a +2°C warmer world, the sign of moisture changes in southern Australia may be strongly positive, rather than negative, as currently projected in response to warming over the coming decades.

References:

- Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2007). *Climate Change in Australia. Technical Report 2007*.
- Fedorov, A.V., Dekens, P.S., McCarthy, M., deMenocal, P.B., Barreiro, M., Pacanowski, R.C., Philander, S.G. 2006, *Science* **312**, 1485-1489.
- Raymo M.E., Lisiecki L.E., Nisancioglu K.H. *Science* 2006, **313**:492-495..

*Corresponding author address: Kale Sniderman, School of Geography and Environmental Science, Monash University, 3800, Victoria, Australia. Email: kale.sniderman@arts.monash.edu.au