

Limited East Antarctica ice volumes during most of the last glacial cycle – links between ice sheet models and paleoenvironmental records

Duanne White¹, Sonja Berg², Nicholas Golledge^{3,4}

¹*University of Canberra*

²*University of Cologne*

³*Victoria University of Wellington*

⁴*GNS Science*

Ice sheet models require former ice histories for model validation and sensitivity analysis. Most existing models have been assessed relative to the present day and the the Last Glacial Maximum (LGM, circa 21 thousand years before present). This focus has effectively tied ice models to two distinct, but highly divergent climate states. As models have several key internal parameters (e.g. basal sliding coefficients) required for tuning, the two periods are insufficient for resolving the relative importance of the key forcing parameters. Thus, investigating ice sheet histories during other climate states are important.

Resolving paleoenvironmental records prior to the LGM has traditionally been difficult due to the influence of ice that subsequently advanced over key sites. However, lake sediment records and other proxies are increasingly being resolved near the glacial margin during Marine Isotope State 3, particularly between 30-40 ka.

In this paper, we review the evidence for ice sheet geometry during the 30-40 ka time slice. These sites indicate the footprint of the pre-LGM ice sheet was no greater than present. Further, diatoms in marine inlets document seasonally open water conditions, similar to today. Using conceptual and numerical ice sheet models, we investigate some of the likely drivers for a small East Antarctic ice sheet during a period that was much closer to ‘full glacial’ conditions in many of the key paleoclimate records.