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# Reconciling Dry Valleys' Stability with East Antarctic Dynamism

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Landscape stability in the Dry Valleys sector of the Transantarctic Mountains provides evidence of extremely low rates of denudation and hence apparent climatic stability on Antarctica over the last 10 to 15 million years. This evidence has been widely used to support the premise that the East Antarctic Ice Sheet (EAIS) has been stable and of similar size to the modern ice sheet over this time interval. However, mid-Pliocene ($\sim$3 million years ago) sea level highstands of approximately 25m above modern suggest that Pliocene warm periods were characterised by ice volume reductions in East Antarctica.

Predicted climatologies produced by the Hadley Centre General Circulation Model (GCM), using a prescribed EAIS configuration, are inconsistent with the palaeoclimatic evidence from the Dry Valleys. The GCM predicts local Pliocene precipitation rates five times greater than modern. This increase is due to the removal of the physical barrier of the ice sheet in Victoria Land and changes in katabatic winds. However, this inconsistency between the models and data can be resolved by utilising new ice sheet predictions derived from offline British Antarctic Survey Ice Sheet Model experiments as a boundary condition within the Hadley Centre GCM.

In contrast to previous predictions, the new EAIS predictions reintroduce the Victoria Land glaciation and Dry Valleys' katabatic winds in the GCM, which translates into a modelled increase of only 30% in Dry Valleys' precipitation compared to modern. This limited increase in precipitation amount occurs even though the ice sheet model predicts a significant retreat of the EAIS over the Wilkes and Aurora sub-glacial Basins. Although this new, modelled Pliocene EAIS increases the ice sheet extent compared to previous EAIS reconstructions, the total ice volumes predicted are not vastly different. If we combine model predictions of the EAIS with predictions of Greenland Ice Sheet volumes and the assumption of no ice in West Antarctica, the resulting sea-level rise is similar to that reconstructed for warm intervals of the Pliocene based on palaeoshoreline data and oxygen isotope and Mg/Ca based proxy data.

These new ice sheet model reconstructions seem to reconcile Dry Valleys' landscape stability and sea-level records that require significant EAIS deglaciation. This study also shows the dangers of extrapolating limited palaeo-data over large areas and emphasises how models can help the interpretation of point-based geological data.