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Modelling the thermosteric contribution to global and regional sea-level rise during the last interglacial

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Global sea level during the last interglacial is likely to have been between 5.5 and 9m above present (Dutton and Lambeck, 2012). Recent calculations, taking into account latest NEEM ice core information, suggest that Greenland would probably not have contributed more than 2.2m to this (Stone et al, 2013), implying a considerable contribution from Antarctica. Previous studies have suggested a significant loss from the West Antarctic ice-sheet (e.g. Holden et al, 2010), which could be initiated following a collapse of the Atlantic Meridional Overturning Circulation (AMOC) and resultant warming in the Southern Ocean.
Here, model simulations with FAMOUS and HadCM3 have been performed of the last interglacial under various scenarios of reduced Greenland and Antarctic ice-sheet configurations, and with and without collapsed AMOC. Thermal expansion and changes in regional density structure (resulting from ocean circulation changes) can also influence sea level, in addition to ice mass effects discussed thus far. The HadCM3 and FAMOUS simulations will be used to estimate the contribution to global and regional sea level change in interglacials from the latter two factors using a similar methodology to the IPCC TAR/AR4 estimations of future sea level rise (Gregory and Lowe, 2000). The HadCM3 and FAMOUS both have a rigid lid in their ocean model, and consequently a fixed ocean volume. Thermal expansion can, however, be calculated as a volume change from in-situ density (a prognostic variable from the model). Relative sea surface topography will then be estimated from surface pressure gradients and changes in atmospheric pressure.

Dutton A., and Lambeck K., 2013. Ice Volume and Sea Level During the Last Interglacial. Science, 337, 216-219

Gregory J.M. and Lowe J.A., 2000. Predictions of global and regional sea-level using AOGCMs with and without flux adjustment. GRL, 27, 3069-3072

Holden P. et al., 2010. Interhemispheric coupling, the West Antarctic Ice Sheet and warm Antarctic interglacials. Clim. Past, 6, 431-443

Stone E.J., et al., 2013. Quantification of the Greenland ice sheet contribution to Last Interglacial sea level rise. Clim. Past, 9, 621-639