Empirical constrains of changes in sea level during the current interglacial

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One of the main concerns during the current ongoing global warming is the rise in sea-levels due to the melting of mountain glaciers and over the rest of the century the likely accelerated melting of either or both of the Greenland ice sheet and the Antarctic ice sheet. In particular, the West Antarctic Ice sheet (WAIS) which is currently held in place by grounded ice may be disrupted due to increased buoyancy as sea levels rise from the melting of northern hemisphere ice sheets. The Intergovernmental Panel for Climate Changes (IPCC) predicts a sea-level rise of as much as one meter during the next century (IPCC AR4, 2007). The current estimates of sea-level rise are within the upper end of the uncertainties in the IPCC projections. The uncertainties in the sea-level projections are large as ice sheet dynamics are poorly understood and have not been included explicitly in the IPCC reports. Empirical approaches using paleo sea-level records such as coral reefs as proxy bench marks can provide better constraints. This is so because previous interglacials include examples of higher sea-levels as well as warmer temperatures than the present. In particular, examples of sea-level at times when global ice sheet configurations were similar to today would be useful. Study of previous interglacial sea-levels may reveal the degree of sensitivity to temperature variations whereas the timing of glacial sea-level changes can constrain the phase relationship between temperature changes and ice sheet response (eg. Yokoyama et al., 2000; Kawamura et al., 2007).

I will show examples of new developments in past sea-level studies that will help to constrain predictions for future sea levels during this and the next century. I will refer to ongoing discussions on the predicted low and high rates of sea-level rise. Global mean surface temperatures during the last interglacial (LIG) were 2 degree C warmer. This is comparable to the future predictions of IPCC. Sea-level changes during the LIG are estimated to be as much as 1.6m per century (Rohling et al., 2008). A sophisticated computational climate model, of coupled general atmosphere-ocean circulation (AOGCM), predicts fast rates of sea-level rise leading to the melting of portions of the Greenland ice sheet and WAIS (Overpeck et al., 2006). Changes in solid earth deformation due to surface mass re-distributions need to be taken into account when the satellite data (eg., GRACE data) and tide gage data are calibrated to assess the mass balance of the ice sheets and that will also be discussed.

References
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