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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming is highly dangerous" *by* J. Hansen et al.

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In Section 7.3, "Ice sheet mass loss and sea level rise", the authors state: "The IPCC (2013) report increased estimates of sea level rise compared to prior IPCC reports, but scenarios they discuss are close to linear responses to the assumed rising climate forcing." (Page 20114, Line 21). While this is entirely correct, I would note that IPCC AR5 did qualitatively acknowledge potential ice sheet mechanisms for non-linear sea level rise that had not been acknowledged in previous IPCC reports.

Specifically, IPCC AR5 Section 4.4.4.2.2 ("Cryo-hydrologic warming") introduced cryo-hydrologic warming as a process causing ice sheet change. This is one of five processes highlighted in 4.4.4.2 ("Ice Sheet Processes"). Cryo-hydrologic warming is the relatively rapid warming of glacier ice temperatures due to the latent heat released by refreezing meltwater, whereby this warming of the ice modifies temperature-dependent ice rheology, with relatively small increases in ice temperature resulting in relatively large increases in ice deformation and flow.

While the majority of research on the possible influence of cryo-hydrologic warming on ice dynamics has been undertaken in the context of the Greenland ice sheet (Phillips et al., 2010; van der Veen et al., 2011; Phillips et al., 2013; Colgan et al., 2015; Luthi et al., 2015), where specific surface meltwater production is relatively high in comparison to the Antarctic ice sheet, perhaps this discussion of an upper limit scenario for the ice sheet sea level rise contribution would benefit from mentioning that IPCC AR5 scenarios are acknowledged not to contain cryo-hydrologic warming, and other mechanisms, of rapid ice sheet response. Presumably if such mechanisms were included in AR5 scenarios, then AR5 projections would appear less linear.

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