

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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This is a superb study yet, the statement pg. 2094 lines 1-2: “rapid nonlinear growth of ice melt is not likely.” should be rephrased and expanded to consider in the likely continued warming scenario:

a.) how surface melting became the dominant ice mass loss mechanism 2007-2012 [Enderlin et al. 2014], 6 summers in a row, driven by persistent atmospheric circulation anomalies that coarse GCMs don't capture [Fettweis et al. 2013] yet that Arctic am-

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plification warming may perpetuate increased Rossby wave amplification [Francis and Vavrus 2012] and increased wave numbers [Coumou et al. 2014].

b.) even as some (not all) ice sheet glacier outlets would retreat out of water, a variety of factors not yet encoded in ice sheet models, suggest possible increasing surface melting processes: 1.) increasing bare ice area and increasing depressed albedo wet snow area as snowline altitude increases non-linearly, a hypsometric amplifier with snowline migration to increasing ice sheet surface elevation. 2.) possible increasing black carbon deposition from increasing wildfire [e.g., Flannigan et al. 2013; Jolly et al. 2015] yielding earlier melt onset [Yasunari et al. 2015] and more intense summer melting [Keegan et al. 2014].

3.) increasing biological albedo darkening [Benning et al. 2014].

c.) ice dynamical feedbacks with increasing surface meltwater infiltration contribute to: 1. enhanced marine terminating glacier front undercutting and hence calving not yet encoded in models [Rignot et al. 2008]. 2. elevation feedback [Colgan et al. 2015]

ps. this comment submitted in some haste between flights in Greenland. I could add more citations to support c.) and others. [a related informal case is made here http://www.huffingtonpost.com/jason-e-box/ice-melt-fast_b_7927186.html] Again, really great to read the whole article, look forward to read it again.

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