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-
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.


Keegan, K.M., and others PNAS, Climate change and forest fires synergistically drive widespread melt events of the Greenland Ice Sheet, http://www.pnas.org/content/111/22/7964.abstract


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