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Interactive comment on "Sheet, stream, and shelf flow as progressive ice-bed uncoupling: Byrd Glacier, Antarctica, and Jakobshavn Isbrae, Greenland" *by* T. Hughes et al.

Anonymous Referee #2

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Having reviewed an earlier version of this manuscript, I am pleased to report that the current version represents a significant improvement in clarity. The manuscript remains a challenging read, as the creative "holistic" methods used here differ greatly from "standard" continuum mechanical methods, and readers who do not share the authors' intuition will need to spend a fair amount of time with Hughes' 2012 book to fully follow the calculations presented here. However, the authors do a good job starting the reader along that path with appendices explaining the basic method and several tricky calculations. In addition, a new section (5) provides clear comparisons with earlier continuum mechanical approaches. Once the methods have been established, their application to Jakobshavn and Byrd are generally clear and insightful.

My general suggestions for improvement focus on sections 2 and 3, which are the longest and most difficult sections. While individual paragraphs are generally readable, it is not easy to follow the thread of the argument through lengthy calculations and frequent tangential remarks. Introducing subsections and adding some remarks stating where you are going would be helpful. Also, given the large number of variables used, a table of definitions would be convenient. Lastly, it would be helpful if the "main" equations that will be applied later were more clearly distinguished from those which are steps in the derivation.

Specific comments: (p 4276, line 17) This is a bit much for one sentence.
(4278, 5) "let alone on different tills" doesn't fit the sentence structure.
(4279, 2) "In between, a viscoplastic yield stress. . ." This is very unclear, which is a problem given how often σ_v is used. What exactly does equation (4) look like in this case? This really should be explicitly stated.
(4279, 14) What are the limits of integration?
(4279, eqn 8) Should be written as a displayed fraction so the denominator is clear.
(4280, 20) The yield criteria need more explanation, or at least a reference to a textbook or similar source.
(4280, 23) Comparing the expression for P_W with equation (10), P_W and P_W^* appear to have the same definition, but they are discussed as being different.
(4290, 2) "his analytical flaws" Please be more specific.
(4296, 16) Gagliardini et al repeated experiments of Walker et al, GRL, 2008, which should also be cited
(4299, 10) The three effects should be described in more detail, both in terms of your parameters and what physically happens.
(4302, 1) "conversation" $\rightarrow$ "conservation"
(Figure 2 caption, line 3) $\dot{\epsilon}$ is missing the 0 subscript.
(Figure 5) Be careful that the final version of this figure comes out large enough to be easily readable.

TCD
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Interactive comment on The Cryosphere Discuss., 9, 4271, 2015.