

## ***Interactive comment on “Reply to “Basal buoyancy and fast-moving glaciers: in defense of analytic force balance” by C. J. van der Veen (2016)” by Terence J. Hughes***

**Anonymous Referee #2**

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This has been a troublesome review to prepare - refereeing a dispute between a pair of senior scientists.

Hughes has developed what he calls the geometrical force balance, by his account a novel and simplified way of understanding the controls on glacial flow. van der Veen carefully pointed out the flaws in this approach, which neglects fundamental aspects of the balance of forces at play in glacial ice. Both the geometric force balance and van der Veen's criticisms of it have been published for reference. Now, I gather Hughes would like to criticize the criticisms of the validity.

van der Veen reasons about the mechanics of flow using well established, mathematical constructs; e.g. from Stoke's flow, it follows that...Having read Hughes' criticisms, I

C1

still can not find fault with van der Veen's approach, his reasoning, or his conclusions. Hughes, on the other hand, appears to be reasoning more intuitively system while offering a defense of it. In many cases he reveals his own misconceptions, or misplaced antagonism about superficial issues, like van der Veen's equation formatting.

In a way, maybe the review should come down to this: I have not been persuaded by Hughes' rebuttal. I find van der Veen's criticisms and rebuttal to the rebuttal very persuasive.

However, Hughes has achieved too much and demonstrated unique insight too often to be ignored. His intuitive approach animates the community and helps set the scientific agenda - often through provocative catch phrases or articulation of very high level processes. van der Veen, has also been very influential in glaciology. His approach is methodical and builds upon centuries of mathematical analysis. He writes the textbooks we all study in order to better understand the controls on glacial flow. Much of his work carefully isolates components of the mechanical controls on flow and makes quantitative comparisons of their importance.

Given that sketch of the two parties involved, it's not surprising they are at odds over Hughes' geometrical force balance. But, given that it is published, the subsequent debates over its validity provide and interesting context for how ideas are generated and debated in science. I'm favor of 'publishing' (electronically) the entire exchange in hopes that subsequent generations of scientists can see what a messy affair this whole business can be.

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C2