

Interactive comment on “Numerical homogenization of the viscoplastic behavior of snow based on X-ray tomography images” by Antoine Wautier et al.

Anonymous Referee #2

Received and published: 7 January 2017

I must confess that I am not sufficiently expert in theoretical continuum mechanics to be a useful referee; however, I will still accept my role as a referee for this paper. I trust the editor will understand my shortcomings and be able to use my comments in a constructive manner that will ultimately be useful for the eventual publication of the science involved.

After reading the abstract, introduction and conclusion, looking at the various figures, and skimming the somewhat "over my head" mathematical development, I am still quite confused about what this paper is about and what it is trying to do. I take it that there is an ultimate goal of providing a simple rule (or demonstration of a rule?) known as "homogenization" that, when applied to snow, allows the treatment of the tortuously

C1

complex micro-structure of the snow grain assemblage to be done as if the whole mess were a single homogeneous fluid. I struggled to see where the paper demonstrates either success or failure (and by what criteria?) in achieving this overall goal.

I also found the paper to be very loosely tied to a snow phenomena that I am familiar with. Of course, not being a specific snow scientist, but rather a generalist in glaciology, I could be simply too unaware of what is specific to the field. But usually, I get hints from reading the gist of the introduction and abstract as to what the specific phenomena to be illuminated is. I did not get such a hint in this paper.

Finally, I don't understand why viscoelasticity is being examined. Aren't the two end member rheological treatments (pure viscous for long-term creeping problems, or pure elasticity for short term shock events) good enough for practical snow problems? What is the motivation for developing a viscoelastic treatment? What problem needs it?

The demonstration is also somewhat opaque due to the fact that a black-box software tool (ABAQUS) is used for much of the computation... Some of this computation is non trivial...

The paper reads very much like a textbook; and I wonder how much of the mathematical development is simply boilerplate that is also published elsewhere.

Good luck with this paper! It is obviously written by incredibly smart scientists, and there is a lot of work there. I simply don't know if I have learned anything from reading it.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-272, 2016.

C2