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

M. Montagnat

maurine.montagnat@univ-grenoble-alpes.fr

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Dear Authors

As already discussed with one of the authors, I think the values of the Young modulus and stress exponent taken for ice in this manuscript can be questioned.

Schulson and Duval 2009 (Creep and Fracture of Ice, chapter 4, part 4.2.2) give a clear explanation about the difficulties arising when trying to estimate the Young modulus from a "classical" mechanical test, since plasticity is activated very soon. They mention the work done by Gammon et al (1983 for instance), based on acoustic wave propagation as being the only one to give "robust" data of Young modulus for ice. In the

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"ice community", it is now accepted that the value of the Young modulus, from Gammon et al work, is 9.33 GPa, very far from the 325 MPa taken here...

This value of about 9 GPa is also the one taken by Theile et al. 2011 (Acta Mat) for instance in order to estimate the Young modulus of snow with FE simulations from microCT images of natural snow.

Another question concerns the value of the stress exponent. The stress exponent at secondary creep in ice is known to be 3, based on a strong experimental work (well summarized in Schulson and Duval 2009). Values close to 5 (or 4.5) were found from experiments that were pushed up to the tertiary creep, when dynamic recrystallization (or micro fracturation) comes into play. I guess that this type of behavior is not relevant for the conditions mentioned here?

Maybe these values do not play a significant role in the main results of the paper.... nevertheless, to use well documented values could maybe enhance the quality of this work?

Sincerely

Maurine Montagnat

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