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Interactive comment on "Wave-ice interactions in the neXtSIM sea-ice model" *by* Timothy D. Williams et al.

Anonymous Referee #2

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1. The Coulomb-Mohr criterion can be formulated in terms of principal stresses and in terms of normal and shear stresses (sigma_n, tau) applied to infinitesimal inner surface crossing a material point. The criterion sets that material fails when the stress belongs to the failure envelope. On the plane (sigma_n, tau) the interpretation of the criterion is based on the Mohr circle conception. Material fails when Mohr circle touches the failure envelope. In case of bending deformations the stress state is uniaxial and the first/third principal directions coincides with the horizontal plane. The second principal stress is zero, and the second principal direction is vertical. Therefore the failure occurs due to the tension near the plate surface or plate bottom. Formulas (18f,g) interpret sigma_N and tau as pressure and maximal shear stress. I don't think that it is correct interpretation of the Coulomb-Mohr criterion.

2.The ice failure in continual sea ice models is not similar to ice failure in flexural

strength tests. In the last case the ice is broken by vertical crack due to the bending. It is observed in all tests. In the first case there is damage accumulation, but ice is still represented by continuum. I don't think that it is a good idea to join criterions for large and small scale failure processes even if they look similar. From the other hand in-plane stresses calculated from sea ice dynamic model may influence banding failure by waves since in-plane compression reduces tension caused by the bending. I am not sure that it is important for real application to MIZ problems because there is no strong compression.

Probably above formulated comments will not have significant influence on the results of numerical simulations. In that case I recommend minor revision with improving of the formulations for the failure criterions and correction of Fig. 1.

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