REVIEW OF 'EXPERIMENTAL EVIDENCE FOR A UNIVERSAL THRESHOLD CHARACTERIZING WAVE-INDUCED SEA ICE BREAK-UP'

VOERMANS ET AL

1. General comments

This is a very nice collection of observations and the main result of figure 8 is surprising, but convincing with quite a few events included that represent many different scales and seem to have been careful with uncertainties. I recommend publication with minor revisions. I have a small suggestion about the definition of the I_{br} threshold to make it more intuitive.

2. Specific comments

(1) p3: section about I_{br} could be improved - I have never heard the term "similitude" or of the "Pi-theorem" before - can you think of a better name? Using ka (steepness) and kh instead of converting k to λ would get rid of many factors of 2π, and I_{br} could become a stress relative to the flexural strength or a strain relative to the breaking strain for a beam. (The critical value would be about $4\pi^2 \times 0.014 = .55$ I guess). Since the relationship looks like it could have some universality it is worth presenting it somewhat more intuitively.

(2) "sheet as an elastice plate" — "sheet as a thin elastic plate" (or maybe simply an elastic beam, since you are using the $\sigma = Y\varepsilon$ relation below).

(3) p16: "infinitely thin ice sheet becomes numerically unbreakable" — the opposite problem is that the strain as $kh \to \infty$ (shorter waves/thicker ice) also becomes infinite. In that case including reflection by ice edges is one way to reduce the strain inside the ice [1, 2]. Using the ice wavelength instead of the open water one could also make a difference here too. For both points the ice sheet example of Cathles et al jumps to mind.

References

[1] Guillaume Boutin, Fabrice Ardhuin, Dany Dumont, Caroline Sévigny, Fanny Girard-Ardhuin, and Mickael Accensi. Floe size effect on wave-ice interactions: Possible effects, implementation in wave model, and evaluation. *Journal of Geophysical Research: Oceans*, 123(7):4779–4805, 2018.

[2] T. D. Williams, L. G. Bennetts, V. A. Squire, D. Dumont, and L. Bertino. Wave-ice interactions in the marginal ice zone. Part 1: Theoretical foundations. *Ocean Modelling*, 71:81–91, 2013.