

## Replies to referee #2:

Thanks for your detailed and helpful comments and suggestions. Please find below point-by-point replies (in blue) to your comments and questions (which are reprinted in black).

In this article, authors present the application of a phase-field model, based upon the Griffith fracturation process, developed by B. Bourdin. The fracturation concerns only one square floe fixed on an edge and uniformly tracked on the other. The goal of this study is to develop a tool for the enhancement of simulation performances via a statistical analysis reinforced by observations campaigns.

The phase-field method description is interesting and simulations are performed using the FEniCS library but it is not really an original study. The other key point, random generation of ice scares, is interesting in the context of this article, even if the stochastic model has been adapted from other works. This is the most original part of the article; thanks to these stochastic generation and an efficient crack generation algorithm, other perform a study of the solidity of floes with specific shape and load. This article article is not very rich in comparisons with experiments, nevertheless, it gives a methodology to generate pertinent simulations. Authors evoked two possible applications, one on DEM, not with direct computation but via a dictionary of behaviors (very pertinent) or via a detection facilitation of the configurations where the phase field computation are needed (I think less pertinent). A remark concerning the simulations, I am quite astonished by the closed line of fracture in Fig. 2, second computation.

As a conclusion, this article is interesting for the good exploitation of complex objects (phase-field for Griffith modelling of fracturation, stochastic generation of scares) and tracks to exploit the resulting algorithm with a good numerical illustration. I think that this article would be useful for community and deserve to be published.

Thank you for your comments. Your evaluation of our work has been helpful in understanding its value.