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Interactive
Comment

Interactive comment on "Discrete-Element bonded particle Sea Ice model DESIgn, version 1.3 – model description and implementation" *by* A. Herman

Anonymous Referee #2

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Review of "Discrete-Element boned particle Sea Ice model DESIgn, version 1.3 - model description and implementation" by A. Herman

This paper describes the 1.3 version of the DESIgn discrete element sea-ice model. In general the paper is well written and gives a good introduction to the field in general and the model in particular. The model description is somewhat light in places especially concerning the numerics. I recommend publication after adding more description to various parts (see general comments).

General comments: ——————

1) section 4 should describe in more detail the origin of the grain-grain contact forces. They may be described in lots of detail in one of the other papers, but a brief description

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of the physical origin of the forces should be given. For instance no mention is given of pressure ridge formation during convergence - is this process the origin of one of the contact forces? How is ridging handled?

2) A more detailed description of the numerics should be given. Are the equations of motion solved implicitly or explicitly? With a velocity Verlet solver? What are the timestep constraints? How do they scale with floe size? How computationally intensive is the model?

3) The floe size distribution seems non-uniform from the diagrams but I didn't see a description of how it is initialized?

4) The model is described as able to achieve compact ice cover. How is this possible with circular floes that with hexagonal close packing you would expect a maximum % ice coverage? What is the maximum coverage achievable with circular floes?

Specific comments: —————

p5483: l5-7: Implies observations have no use in the study of sea ice dynamics.

p5483: l23: I'm a bit confused my the name of model. I think its DESIgn, but the way the capital letters are written implies is DESI-DESIgn. I think it would be clearer to say Discrete-Element, bonded particle Sea-Ice model design (DESIgn).

p5484: l3: "as described in last section" -> "as described in the last section"

p5484: l10: "but it enables to take into": Not correct English

p5486: l9: "dilatation" - explain what this is

p5486: l14: "allows to obtain": Not correct English

p5487: l4: "more suitable for MIZ" -> "more suitable for the MIZ"

p5488: l29: "ice cover Herman (2013)." -> "ice cover (Herman 2013)"

p5489: l1: "polydispersity": define

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p5491: l8: "ice grains with a constant density \rho" maybe change to "ice grains each with a constant ice density \rho". On first read I thought density referred to the number density of grains rather than a material density of the individual grains.

p5491: l18: "are still equal zero" -> "are still equal to zero"

p5492: l21: "net momentum" surely this should be torque or moment rather than momentum.

p5495: l16: "not included in calculation" -> "not included in the calculation"

p5496: l9: "damping coefficient" Explain what this is for.

p5497: l17: "enables to specify": Not correct English

p5499: l5-10: How are the C constants determined?

p5499: l9: "The torque of Fai equal zero." This is an assumption. Clarify.

p5499: l15: "In MIZ" -> "In the MIZ"

p5505: l26: "amounts to a sudden hit into the modeled sample" rephrase

p5505: l27: "with wide": with wide what?

p5505: l27: Figure 10d doesn't seem to exist.

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Interactive comment on Geosci. Model Dev. Discuss., 8, 5481, 2015.

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