

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2022-22

Anonymous Referee #2

Referee comment on "DFN Generator v2.0: A new tool to model the growth of large-scale natural fracture networks using fundamental geomechanics" by Michael John Welch et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-22-RC2>, 2022

The aim of the paper is to present the implementation of a previously published algorithm. The presentation of the underlying physical and mathematical model is very brief. This severely obscures underlying simplifications and assumptions. For instance, it is not clear to me whether/how the model accounts for interaction between closely spaced and coalescing fractures. I suggest a much clearer demarcation of the model's domain of applicability as well as impacts of assumptions on the simulated fracture networks. This should be specified for the *model*, as opposed to at the algorithm or implementation level.

Commendably, the numerical simulations include verification studies. Unfortunately, these seem to be of limited value for the following two reasons: Firstly, the comparisons between implicit and explicit simulations only corroborate equivalence of the two versions of the code. Secondly, the metric used to compare to the "realistic" networks in Sections 4.2 are unclear. Furthermore, I am doubtful as to the relevance of the sensitivity study in that section to the paper's aim.

While the manuscript is generally clearly written, some minor typos should be corrected. I have included some indicative examples below, but the list is far from exhaustive.

10: Examples of typos: modesl -> models, and -> or

360: How does this account for stress interaction between gridblocks?

Coordinate systems: The description of conventions for coordinate systems in geomodels seems out of place. Please simply describe the systems used in this work. That description can also be made more succinct – it should not be necessary to explain that the value 0.5 is halfway between 0 and 1, nor to repeat the same description for all three dimensions.

643: The link seems broken.

677: What does “this” refer to?

695: This figure provides a good overview!

699: I am more accustomed to the pair verification and *validation*.

707: I can think of other ways, such as performing self-convergence studies with decreasing temporal and spatial discretization sizes.

714: I would think “A verification exercise” would be more accurate in this “verification” section.

725: This discussion of limitations should be extended and given greater prominence.

Section 4.2 sorely needs a description of the metrics used for comparison. Without this, phrases such as “accurately reproduce” and “good match” are meaningless.

This section contains descriptions of sensitivity between input parameters and fracture geometry. While this is an interesting topic, I do not see the relevance to the presentation of the implementation, which is the stated aim of the current manuscript. I suggest removing these descriptions in favour of more elaboration on the comparison.

860: It is not entirely clear whether the authors propose to extend the DFN Generator for some of the “proposed developments” or if the suggestion is to combine it with existing packages for these purposes, using fracture networks from the DFN Generator as input. Where applicable, I would suggest the latter approach.