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Interactive comment on "SCARLET-1.0: SpheriCal Approximation for viRtuaL aggrEgaTes" *by* Eduardo Rossi and Costanza Bonadonna

Mattia de' Michieli Vitturi (Referee)

mattia.demichielivitturi@ingv.it

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This paper presents a Matlab package designed to provide a 3D virtual reconstruction of aggregates. The manuscript is well written. figures for the most part are clear, and I have found the work interesting and very useful in the volcanological context, where particle aggregation is an important topic. As a non-expert in the field of sphere-composite algorithms, I am not in a position to judge the scientific relevance of the method introduced and the accuracy of the results presented. With that in mind, I would recommend accepting the manuscript for publication provided that the authors implement some moderate corrections that I am suggesting. Some of my most important comments are listed below, but the full list of comments can be found in the annotated manuscript, submitted as supplement to this comment.

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1) I think it would be easier to understand the procedure with very simple examples, for example with the initial volume given by an ellipsoid, a sphere or a cube. Looking at figure 3, for example, it is not clear how the conversion from STL to spheres works, also because it seems that there are isolated spheres (on the right in panel 3B). I was thinking that all the spheres should be connected/touching.

2) I have found that in some part of the paper a more quantitative analysis would be important. In particular, I think that a metric to quantify the accuracy of some steps of the procedure are needed. For example, when a given 3D shape is approximated with a set of not overlapping spheres, I think it is important to quantify how much this approximation is close to the original shape, both in terms of volume and surface. Is it possible to quantify the accuracy of the approximation?

3) The external volume of an aggregate is approximated by the convex hull outlined by the most outer points of its internal spheres. This choice is not clear to me, because the aggregate can be very far from being convex, and this would lead to a significant over-estimation of its volume. The volume of the components of the aggregate is computed in a different way, and this can lead to strange results in Eqs. 1-3. For example, when the equations are applied to one single component (i.e. without aggregation), rho_agg is different from rho_p. In addition, as the authors write, in this way the external volume of the aggregated is “approximated” by the volume of the convex hull. When using an approximation, as in my comment #2, I think that an estimation of the accuracy of the approximation is needed, otherwise it is difficult to analyze the subsequent results (porosity of aggregates).

4) Section 3.2.1 is devoted to the analysis of the porosity of the union of two ellipsoid. It is not clear to me what you mean here with porosity, because there are no internal voids in this configuration. So, I think that it is important here to give a clear definition of porosity. If porosity is simply defined by Eq. 1, does this definition coincide with that used in volcanology when measuring porosity of volcanic samples? I think this is an important point, because otherwise the analysis of results, and a comparison with

natural samples, are difficult to understand.

5) As a final point, I think that the computational time required to run the package should be discussed a little bit more. A table with the times of the simulations reported in some of the examples could be useful.

Please also note the supplement to this comment

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https://gmd.copernicus.org/preprints/gmd-2020-346/gmd-2020-346-RC1-supplement.pdf

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