

## ***Interactive comment on “Revisiting the statistical analysis of pyroclast density and porosity data” by B. Bernard et al.***

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Review of “Revisiting the statistical analysis of pyroclast density and porosity data” by Bernard B. and co-authors

This methodological manuscript deals with density and porosity data obtained on volcanic pyroclasts. It aims at providing a more robust methodology to calculate and plot average and dispersion of the two aforementioned physical parameters, for datasets consisting of tens to hundreds of pyroclasts. The study is based on published density and porosity data from two different types of deposits at Unzen and Chachimbiro. As it is actually presented, it is my understanding that the authors do not intend to interpret the obtained data and what they mean in terms of volcanic processes, but rather describe their methodology to get density/porosity data and how it differs from

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the classical method.

I find this study interesting even if I have some comments that are mostly related to the manner the method, data, and results are explained and illustrated in the paper.

- The manuscript would definitely benefit from a short table gathering the symbols and definitions used in the study, probably detailing which parameters are measured directly, indirectly, obtained graphically, etc. Notably, the difference between sample, sample set, dataset should be clarified, or at least listed in the table. What is  $n$  exactly? Is  $n$  the number of pyroclasts in a “sample”? So then  $n$  varies from 15-103 for Chachimbiro and 24-33 for Unzen according to Section 2.1? If so, then give also a symbol for the number of “sample sets” in the “dataset” (i.e., 32 for Chachimbiro and 31 for Unzen).

- The difference between “ $i$ ” and “ $j$ ” in Equations (4)-(7) should be explained. Also, why is it  $R_p$  and not  $R_{p_i}$  in Equation (4)? It is the representativeness ( $R_{p_i}$ ) of pyroclast ( $p_i$ ), with  $1 < i < n$  where  $n$  is the number of samples in the sample set (i.e., the sample size), no? - It remains unclear to me what is done exactly as part of the stability analysis (Section 2.4) and what Figure 4 actually represents. I think this part should be better explained or rephrased, as it seems to be the most important part of the study, or alternatively illustrated with a simple cartoon. I guess  $n$  should be call here the “sample set size” and not the “sample size” if, as I understand, it refers to the number of samples in the sample set.

- Figure 5: I don’t see, personally, why B and D do a better job than A and B, respectively, in distinguishing the datasets. The authors would have to better explain how/why the Folk and Ward parameters do a better job than Inman.

- How does the 10% fluctuation in porosity mode compare with the error/uncertainty associated with the measurement of porosity and density itself (i.e., propagating errors on mass, volume and solid density to calculate porosity and density)?

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I therefore recommend accepting this manuscript for publication in solid Earth Discussions after moderate revisions that would address the main comments outlined above. I have also other comments that I highlighted on the attached annotated version of the manuscript.

Best regards and good luck, Thomas Giachetti

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/7/C318/2015/sed-7-C318-2015-supplement.pdf>

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Interactive comment on Solid Earth Discuss., 7, 1077, 2015.