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Discussions

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Interactive comment on "Granite micro-porosity changes due to fracturing and alteration: secondary mineral phases as proxies for porosity and permeability estimation" *by* Martin Staněk and Yves Géraud

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Dear anonymous referee, thanks for your constructive and helpful comments! Below I post the responses to the key comments following the structure (1) comments from Referees (RC), (2) author's response (AR), (3) author's changes in manuscript (AChM). For indication of page and line of the AChM, I refer to the revised version of the manuscript (pdf supplement). The modified figures are in the revised manuscript.

RC:... In fact the permeability of the various samples was never measured....

AR: It is true that the submission didn't contain any results of permeability measurements. We believe we provided no reason to think it did, c.f. abstract l. 14: "Based on a simple model to calculate permeability from the measured porosities and throat size distributions..." In fact this study is focused on one section of a large set of experimental and observational data on the Lipnice granite or in a broader sense on the Melechov pluton. The presented section describes the key aspect of the material affecting many of its physical properties: the rock structure or more specifically the rock void space structure. The potential of experimental methods to directly measure permeability is highly constrained as compared to MIP given the prerequisities for the sample shape and size. In this way, the MIP can shed much more light (including permeability, though calculated) on very detailed features of the rock structure, since the MIP specimens have less limitations than e.g. plugs for permeametry. In our opinion, it is extremely difficult (if possible at all) to conduct permeability measurements representative of materials as specific as are the MIP specimens in our study. In this way, the MIP data provide permeability insight that cannot be obtained by direct measurements.

AChM: -

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RC: . . .Instead the authors use the Katz & Thompson model to infer an estimate of the permeability based on the MIP data. Whereas this model predicts permeabilities that are quite consistent with values measured on various sandstones or limestones with standard "spherical" or tube-like porosity, this consistency is more questionable for fractured rocks like the granite samples tested in the present study. . ..

AR: To support the consistency of our calculated permeability values, we provide summarized results of direct permeability measurements in the revised submission, c.f. Fig. 11c. Our initial intention was not to publish them at all in this study since, as explained above, here we wanted to focus on the rock porosity structure and the chemical / optical properties characterization, which is a matter of volume large enough for

one paper. The focus and the fundamental character of the porosity structure are also reasons why we give somewhat detailed descriptions in the present paper. We intend to publish the results of permeability measurements in a developed form and accompanied by results of other petrophysical methods based on oriented measurements in a separate study logically following the present one.

AChM: Permeability method: p 7, l 22-27

Fig. 11 and its caption: p 39, l 1, 6, 8-9

Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2018-107/se-2018-107-AC2-supplement.pdf

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Interactive comment on Solid Earth Discuss., https://doi.org/10.5194/se-2018-107, 2018.