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Interactive comment on "Measuring hydraulic fracture apertures: a comparison of methods" *by* Chaojie Cheng et al.

Miller Zambrano (Referee)

miller.zambrano@unicam.it

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Measuring hydraulic fracture apertures: a comparison of methods: This is my first time reviewing this manuscript. The topic is of remarkable interest, and it has been widely investigated from different points of views implementing several techniques and approaches. Therefore, the expectations from this manuscript are quite high.

In general, the manuscript describes a series of methods for estimating the hydraulic aperture and makes a comparison among them. I have just some considerations that can improve the quality of the manuscript:

1) Revised some missing literature (classic and recent) that could impact on the motivation (lines 58-60) and the general definition of the state of the art (lines 28-60). A

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short list is offered but I suggest expanding it considering the related literature.

2) Consider revising the grammar and the composition of some sentences that are difficult to understand (e.g. line 23-24).

3) Concerning the use of the portable permeameter, the discussion and methodological considerations could be improved considering for instance the work of Filomena et al. (2014). These authors found differences of 37% of the permeability measurements between confined and plug samples.

4) This work could take benefits of including other approaches for describing roughness and aperture. For instance, evaluating the roughness in terms of wavelength and asperity height distribution can better describe the surfaces (or profiles) of the fractures (see Brown, 1995). In addition, a description of the mismatch of the fracture walls can be also of interest due to their impact of permeability (see Zambrano et al., 2019). Similar to your work, these authors considered open fractures with normal (similar to FF3) and parallel displacement (similar to FOF1 and FF2).

5) Concerning the description and the discussion of the results, I consider some statistical validation should accompany some expression like “well-matched”, “excellent agreement”, “better agreement”, “better matching”. Also, a better description of the graphs is needed.

6) After all the data exposed, it is difficult to understand the conclusion 3.

Recommended literature:

Please consider the following classic literature dealing with fracture roughness and hydraulic aperture:

- Y. W. Tsang, “Usage of “equivalent apertures” for rock fractures as derived from hydraulic and tracer tests,” Water Resources Research, vol. 28, no. 5, pp. 1451–1455, 1992.

- G. M. Lomize, Flow in Fractured Rocks, Gosenergoizdat, Moscow, 1951.

- C. Louis, “A study of ground water flow in jointed rock and its influence on the stability of rock masses,” in Rock Mechanics Research Report, Imperial College, London, 1969, Rock Mechanics Research Report 10.

- E. F. de Quadros, Determinação das características do fluxo de água em fraturas de rochas, Department of Civil Construction Engineering, Polytechnic School, University of Sao Paulo, 1982.

- S. R. Brown, “Simple mathematical model of a rough fracture,” Journal of Geophysical Research: Solid Earth, vol. 100, no. B4, pp. 5941–5952, 1995.

- S. R. Ogilvie, E. Isakov, and P. W. Glover, “Fluid flow through rough fractures in rocks. II: a new matching model for rough rock fractures,” Earth and Planetary Science Letters, vol. 241, no. 3-4, pp. 454–465, 2006.

- E. Isakov, S. R. Ogilvie, C. W. Taylor, and P. W. Glover, “Fluid flow through rough fractures in rocks I: high resolution aperture determinations,” Earth and Planetary Science Letters, vol. 191, no. 3-4, pp. 267–282, 2001.

- S. R. Ogilvie, E. Isakov, C. W. Taylor, and P. W. J. Glover, “Characterization of rough-walled fractures in crystalline rocks,” Geological Society, London, Special Publications, vol. 214, no. 1, pp. 125–141, 2003.

Please also add some literature about roughness assessment using SfM photogrammetry and hydraulic aperture estimation using computer fluid dynamics (i.e. Zambrano et al., 2019). The following literature should be considered in paragraph 55:

- Zambrano, M., Pitts, A. D., Salama, A., Volatili, T., Giorgioni, M., & Tondi, E. (2019). Analysis of Fracture Roughness Control on Permeability Using SfM and Fluid Flow Simulations: Implications for Carbonate Reservoir Characterization. Geofluids.

- Corradetti, A., McCaffrey, K., De Paola, N., & Tavani, S. (2017). Evaluating roughness

scaling properties of natural active fault surfaces by means of multi-view photogrammetry. Tectonophysics, 717, 599-606.

Check the classic of Barton et al. (1985) that relate mechanical aperture, hydraulic aperture, and joint roughness coefficient.

- Barton, N., Bandis, S., & Bakhtar, K. (1985, June). Strength, deformation and conductivity coupling of rock joints. In International journal of rock mechanics and mining sciences & geomechanics abstracts (Vol. 22, No. 3, pp. 121-140). Pergamon.

Please check carefully the following article related to the use of the miniperm device

- Filomena, C. M., Hornung, J., & Stollhofen, H. (2014). Assessing accuracy of gas-driven permeability measurements: a comparative study of diverse Hassler-cell and probe permeameter devices. Solid Earth, 5(1), 1.

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