

***Interactive comment on “Fluid-mediated, brittle-ductile deformation at seismogenic depth: Part I – Fluid record and deformation history of fault-veins in a nuclear waste repository (Olkiluoto Island, Finland)” by Barbara Marchesini et al.***

**Anonymous Referee #3**

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I found really interesting reading through the paper entitled “Fluid-mediated, brittle-ductile deformation at seismogenic depth: Part I - Fluid record and deformation history of fault-veins in a nuclear waste repository (Olkiluoto Island, Finland)” by Marchesini et al., submitted for publication to Solid Earth. It presents a well-integrated multi-disciplinary approach to unravel the evolution of a fault zone in south western Finland, nicely contextualizing the particular outcrop analyses in a general context of dynamic evolution of fault zones at the brittle ductile transition conditions. The paper is well organized and easy to read, well illustrated and documented by a significant amount of

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original data.

Meso- and micro-structural analyses:

The description and photographic documentation of this part is good and complete. Brittle and ductile processes and their relationships, in my opinion, can be shared. It is appreciable that, besides the line drawings, authors live some part of the original structures directly visible in the figures.

Fluid inclusions:

Unfortunately, the data available are not particularly beautiful and convincing. Only secondary bi-phase fluid inclusions allowed the acquisition of microthermometric and Raman data, but this is quite frequent in rocks that have undergone several phases of deformation and have been exhumed. In this regard I suggest, in the specific comments, to take into account also the results of the paper by Invernizzi et al., 1998. The dispersion of results for  $T_h$  is certainly linked to a slight re-equilibration of the studied inclusions. Since these are quartz crystals containing a fair percentage of fluid in the form of vapor, I believe that a re-equilibrium due to the cooling runs for the acquisition of  $T_{mice}$  can be excluded. Furthermore, the independent results obtained with geothermometers, and the arguments pointed out in the discussion, are shareable and convincing.

Detailed comments referred to line numbers:

101: Hudson and Cosgrove 2006 is not listed in references

269: please correct the wrong typing

365: van der Kerkhof is Van. ...

468-473: check the possibility to take into account also a paper by Invernizzi et al. (1998) in J. Metamorph. Geol., 16, 247-258 ( Fluid inclusions in high pressure/low temperature rocks from the Calabrian Arc (Southern Italy): the burial and exhumation

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history of the subduction-related Diamante-Terranova unit) where the authors compare natural and experimental results, also if in different metamorphic conditions. This could be an additional example of application of experimental findings to natural fluid inclusion assemblages.

Line 877: Figure 2, 'astep' is 'step'

Line 899: Figure 4, braches are missed in letter (a)

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2019-5/se-2019-5-RC4-supplement.pdf>

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-5>, 2019.