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Solid Earth Discussions

Interactive comment on "Advecting heating by hot fluids of an Alpine fissure in Lauzière Granite (Belledonne massif, Western Alps)" *by* Emilie Janots et al.

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The paper gives a fantastic inside in the fluid dynamics of the middle crust. Several modern studies try to model fluid flow and related heat dynamics in the upper sections (mainly for the geothermal energy business, e.g., Shaik et al. 2011) without such detail data as presented here. This paper gives data from nature in middle crustal fluid processes. The presented connection between fluids and relative timing is very convincing and therefore, the fluid inclusion studies give a good insight in physical conditions along T-t path of the fluid/rock system. Taking the T-t path of the background rocks from the literature, this gives important evidence for heat distribution in the crust.

This would allow further studies on fluid flow (see last sentences of the paper).

There are a few sentences, which can be improved (see attached pdf).

Minor comments: The cleft is subvertical (top of page 9) and perpendicular to the main foliation (page 4)? This would indicate the main foliation in the ECM is subhorizontal. This looks different in Fig. 2 and in most regions of the ECM the foliation is steep.

Page 9, Line 13: The sentence: "In the ECM, escape... (Hofmann et al. 2004)" is misleading. The sentences mix the possible fluid sources (e.g., metamorphic dehydration) with driving forces (e.g., topography) and related meteoric fluid sources (this discussion is related to the problem of infiltration, and not of the upward flow).

Page 9, Line 16ff: "Considering the position of the Lauzière granite, possible migrating fluid pathways through deeper crustal levels could localize along the contact between gneiss and metasediments (Ornon-Roselend), or other tectonic accidents located at its southern margin (Fig. 1b)." This sentence imply some major pathways occur along lithological contacts. However, the occurrence of metamorphic metasediments below the investigated cleft would give indications for a metamorphic fluid source. In case of metamorphic fluids for the development of this cleft, the fluid volume is limited (e.g., chlorite dehydration of a metasediments does only produce a certain fluid volume, => therefore fluid flow will not run a long time). => Is this the reason for the different monazite generations in the area (see monazite ages in Fig. 1b)? Are the investigated monazite related to short episodic fluid event of metamorphic fluids, whereas the younger monazites are related to long term meteoric water at lower grade conditions????

Page 9, Line 26ff: "...(1) by modifying the thermal regime transiently and (2)..." This is a simplification, because it is not clear, which "thermal regime" occur. The zone of advective heating may be short lived, hot and spatially small, which do not modify the thermal regime, but produce locally other mineral compositions, ages etc.. This would require a more regional investigation on fluid/rock interaction and the consequences

for the temperature distribution.

Page 10, Line 31: Cenki Tok et al. references is not 2011, but 2014 (the reference is related to the Mont Blanc study of Cenki Tok et al.) change also in the text.

Some possible interesting references: Tagami, T., Murakami, M., 2007. Probing fault zone heterogeneity on the Nojima fault: Constraints from zircon fission-track analysis of borehole samples. Tectonophysics 443, 139–152.

Shaik, A.R., Rhman, S., Tran, N., Tran, T., 2011. Numerical simulation of Fluid-Rock coupling heat transfer in naturally fractured geothermal system, Applied Thermal Engineering 31, 1600-1606.

Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2018-84/se-2018-84-RC1-supplement.pdf

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