Reply to referee#1

Minor comments :

(1) The orientation of the cleft. We now give the orientation of the cleft that is subvertical but perpendicula to the main foliation. It is also indicated in the legend of the figure 2b.

This cleft is subvertical and oriented perpendicular to the main host-rock foliation (N110; Grand'Homme et al., 2016).

(2) Page 9, Line 13 : We rewrite the sentence to show that the fluid origin could have two sources either meteoritic water (where the driving force is hydraulic gradient and are topography-driven circulation) or metamorphic fluids produced by dehydration reactions in depth. We also add two references showing that circulations of fluids at mid-crustal depth, in ductile regime is still ambiguous.

Based on the mid-crustal depth required for the fluid circulations, it is unclear whether the fluids could be originated from topography-driven circulations of meteoritic water (Diamond et al., 2018; Hofmann et al., 2004; Raimondo et al., 2013), or rather liberated by underthrust rock dehydration due to metamorphic reactions.

(3) Page 9, Line 16 : since the possibility of circulations of meteoritic water remains unclear, dehydration reactions appear as good candidates for explaining this unusually hot fluid circulation in the cleft. This is still very speculative, but we added now a short sentence in that sense

Dehydration reactions, with a likely origin in the underthrust metasediments, could be a good candidate to account for the episodic, short-duration monazite precipitation observed in Alpine Clefts in the ECM (Grand'Homme et al., 2016).

(4) Page 9, Line 26 : this paragraph was rewritten in order to take into account the comments of the two reviewers. We agree that we dont know the thermal regime before, and it is clear that the fluid impact will depend on the fluid flux, volume, the difference of temperature between fluid and surrounding host-rock.

The impact of the hot fluid circulation on estimating cooling rates from thermochronological data in areas affected by hydrothermal fluid flow may be twofold: (1) by causing locally a transient thermal regime and (2) by fully or partially resetting the ZFT thermochronometer. Nonetheless, this effect may possibly only be of importance in the direct vicinity of the areas affected by fluid flow, depending on the size of the fluid conduit, the duration of the fluid flow event and the temperature difference between the hydrothermal fluids and the ambient temperature of the country rock.

(5) Page 10, Line 31: Cenki Tok et al. Reference was modified

(6) We now make reference to the study of Tagami and Murakami (2007) who found a modification of ZFT length in the Nojima fault

This result is similar to previous conclusions reached in the the Nojima fault, where modification of the zircon fission track lengths are interpreted as consequences of ancient thermal overprints by heat transfer or dispersion via fluids in the fault zone (Tagami and Murakami, 2007). As in our study, the effect appears extremely local since it is not seen in samples taken at the vicinity of the fault, especially in the footwall (<0.1 m).

(7) Changes directly proposed in the manuscript were all taken into account

Reply to anonymous referee#2

A General comments :
The main comment of referee#2 concerns the interpretation of the ZFT. To answer this comment, we extended the section of the fission track results to show the difficulty of dating the material such as :

(1) Normally the objective is to date at least about 20 grains per sample, which was not possible because of poor sample quality with few zircons available, and many grains with strong U-zoning and inclusions. Therefore only rather limited number of grains could be analysed per sample, resulting in all samples showing a relatively high dispersion in the grain age distributions and low $\chi 2$ values.
(2) Because of all these limitations the ZFT ages given here should be viewed with caution. Particularly the two samples collected further away from the cleft may have been affected by partial annealing only. Nonetheless, the observed single grain ages and central ages indicate that these zircons experience cooling since the mid-Miocene.

B Specific comments :

(1) Introduction : as demanded, it is now divided in four paragraphs. The third paragraph was completly rewritten to clarify the different hypotheses that can account for the ovelap between monazite and ZFT ages in different areas of the ECM. It must be noted that these ages are different depending of the massif considered, for example the ages in the Argentera massif (around 20 Ma) are much older than those in the Belledone massif (7-8 and 10-12 Ma). In the fourth paragraph, we now explain that microthermometric studies are obtained to determine the temperature of the cleft mineral precipitation. We precise now that monazite age was previously obtained by Grand'Homme et al. (2016) and that this age was used to reveal for the unusually hot fluids.
(2) ZFT data : results section was extended (see general comment) . Concerning the duration, we are now much more cautious. Duration of the advective heating was removed of the abstract. In the discussion, it is mentionned that « The difference between these two ages constrains the time range between the infiltration of the hot fluid and cooling down of the cleft wall to temperatures similar to the host-rock, i.e. it limits the duration of advective heating to around 1-3 Myr (Fig. 8), but given the uncertainty of the ZFT age, the heating interval may have been even shorter ».
(3) Sample coordinates were added at the beginning of the presentation of the geological settings
(4) We have been rewritting the abstract, introduction, and discussion such as to show that fluids have no impact on exhumation rate but may impact the temperature and reset partially the ZFT data. We emphasis that in our study, the impact of the fluid circulation is however local and not seen at 30 m of the cleft. However, the role of the fluid may vary depending on the fluid flux, the volume, the temperature difference between the fluid and the host-rock and the duration of the circulation

C Line Comments
All line comments were taken into account. Only major changes are discussed below
Title : we modify with « Evidence of adevctive heating…

Page 1, Line 30-31 : the duration is now more mentioned in the abstract

Page 2, Line 26-27 : we didnt specify the ages because they differ depending on the massif and tectonic position

Page 3, Line 10 : The ECM consist of blocks of Variscan basement of the European margin They correspond to the westernmost paleogeographic units and are distinguished from the Internal domains, consisting of more distal paleogeographic units that underwent higher metamorphic grade during the Alpine subduction-collision cycle. The ECM were thrusted under the internal domains….

Page 3, Line 25 : tectonic accident was replaced by fault

Page 3, Line 30-31 : we rephrase and remove whilte mica and mention the mylonite instead : « is evidenced by the pervasive retrogression in the mylonite »

Page 4, Line 1 : we now mention that the cleft has metric dimension but is variable in height and width

Page 4, Line 17-23 : we deplace the paragraph and made small changes in the next one.

Page 8, Line 7-12 ; 26-27 ; 32: here we did a significant extension of the text to better explain the concept of closure temperature and how to apply it for ZFT data :

Lauzière granite had cooled below the zircon fission-track closure temperature of about 240-280°C during the mid-Miocene (Fig. 8). The closure temperature is considered as the temperature at which the fission-track system closes to the loss of fission tracks by annealing and is applicable in case of monotonic cooling (Dodson, 1973). The idea is that no fission-tracks are preserved in the zircon crystals at elevated ambient temperatures, but start to be retained as soon as the crystal cools below the effective closure temperature. The actual value of the closure temperature for the zircon fission-track systems depends on the rate of cooling and the amount of accumulated radiation damage (Bernet, 2009; Brandon et al., 1998 Rahn et al., 2004; Reiners and Brandon, 2006; Tagami, et al., 1998). For natural radiation damaged zircons and common alpine cooling rates on the order of 10-20°C/Myr the closure temperature is about 240±5°C, whereas for zircons with no or very low amounts of radiation damage the closure temperature is about 340±10°C for the same cooling rates (Reiners and Brandon, 2006). The closure temperature should not be confused with the partial annealing zone, which is the temperature range over which fission-tracks are partially but not fully annealed, either during reheating or during very slow cooling through this temaprture range (e.g. Reiners and Brandon, 2006). If heating during the hydrothermal event was sufficiently high to anneal fission tracks completely in the zircons analysed in this study, then the ZFT cooling ages will reflect post-hydrothermal event cooling mainly related to exhumation, given that the hydrothermal heating event as relatively short-lived and with limited thermal impact of the surrounding country rock on a regional scale. Assuming a general regional geothermal gradient of ~25°C/km and a surface temperature of ~10°C the rocks of the Lauzière granite may have been exhumed from crustal depths of <10 km since 14-16 Ma, (Fig. 8).

Figure 1 : Box were made larger that they dont overlay on the monazite and ZFT ages. We replace polygons by rectangles of the monazite age to make the lecture easier. We now mention in the legend that all monazite ages correspond to cleft monazite Th-Pb ages. The typo in the legend was corrected

Figure 2 : White background was placed behind the text of panel A. We corrected the typo of Mesozoic. We add the orientations of the veins and foliations in the legend. Foliation can not be represented because it is subvertical and parrallel to the orientation of the picture (N-S).

Figure 4 : the number of analyzed fluid inclusions appears now in the figure

Table 2 : All rows have the same Na value estimated independantly from the average salinity determined from the microthermometric data (Table 1) on QzP2. This is this value that is used as internal standards for the other elements. It is now mention in the result sections, such as :

The average T_m ice obtained for the QzP_2 fluid inclusions (-7.3°C) was used to calculate the Na concentration of 43300 ppm. This value of 43300 ppm Na was used as an internal standard for the calculation of Li, K and Sr concentrations (Table 2).

D Editorial comments

All corrections were taken into account