

## ***Interactive comment on “Fault-controlled dolomitization in the Montagna dei Fiori Anticline (Central Apennines, Italy): Record of a dominantly pre-orogenic fluid migration” by Mahtab Mozafari et al.***

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This paper presents field, petrographic, isotopic, and fluid-inclusion thermometric and compositional analyses of the different dolomitization and calcite veining events that affected Lower Jurassic rocks within the Montagna dei Fiori Anticline. The authors conclude that dolomitizing fluids show evidence of interaction with underlying units and therefore infer that dolomitization was fault related and occurred in two main episodes, before and during the Apenninic orogeny. This manuscript is organized in a logical manner and the data presented appears to be of high quality. Conclusions are for the

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most part well supported by the data presented in this study. My main concerns are: 1) A proper assessment of the spatial distribution in outcrop of the different structural diagenetic products is missing. Moreover, their relationship with the anticline and faults is difficult to establish because no orientation... etc. data are provided. It seems like an opportunity was missed to use outcrop exposures to their full extent. 2) Description of cross-cutting relations of the different calcite-filled veins and dolomite cements is vague. Breccias need to be properly described and documented, probably in their own section. Fracture cements described as vein cements (CV) are presumably also present in the host rock, although no description nor documentation are provided. In that case, the use of CV to refer to these cements would be inappropriate. 3) Isotopic signatures and fluid inclusion temperature and salinity ranges of most cement types overlap, but they are used to relate them to different tectonic/fluid events. The one I am having most trouble with is: why would D3 be considered hydrothermal if the temperatures of inclusions in these cements are exactly the same as those of inclusions in D2, which are not considered hydrothermal? Also, Sr/Sr in D3 are much higher than in D4 but both are considered to have been precipitated from the same fluids? 4) The impact of this work would benefit from a discussion of the implications of fault-related dolomitization processes in general, with application for porosity/permeability evolution and fluid-flow in analogous, dolomitized, carbonate-hosted reservoirs and aquifers within similar structures. What is the main driver for fluid circulation? What changes are required in the system to go from dolomite to calcite cementation? When and why did this occur? 5) How is this study better than that of Ronchi (2003)? In which way did it advance the field?

I would recommend publication of this manuscript after the concerns raised here have been properly addressed.

Please refer to the attached PDF for further comments.

Please also note the supplement to this comment:

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<https://www.solid-earth-discuss.net/se-2018-136/se-2018-136-RC4-supplement.pdf>

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2018-136>, 2019.