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Hydrology and Earth System Sciences Discussions

Interactive comment on "The relationship between the open fractures and mineralized fractures in Oligocene sandstones of Leghorn coast (Tuscany, Italy) – the hydrogeological relapses" *by* A. Cerrina Feroni and P. Martinelli

Anonymous Referee #2

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General comments

The manuscript presents a brief conceptual model which aims to describe local variations of field observations of open vs sealed (mineralised) fractures from the Tuscany region in Italy. Specifically, it is proposed that an "existence of a virtual surface separating an upper (external) zone with open diffuse fracturing from an under (internal) zone with mineralised fracturing" may explain the various localised observations of open/closed fracturing and weathering caused by erosion and land-seawater interac-

tions etc.

The manuscript under review does, in a general context, present a relevant scientific issue within the scope of HESS, and combined with some field observations proposes a qualitative heuristic explanatory model of certain aspects of these observations.

For example, a very important and ongoing topic of investigation in the hydrogeological flow and transport modelling community is the flow channeling phenomena observed in fractures (such as in the listed reference to Moreno et al., 1988). Fracture in-fill (mineralisation) is generally regarded as the main cause of fracture heterogeneity and hence flow heterogeneity (channelling), and as such, the current study under review could in principle be of interest for the hydrogeological community.

However, the underlying field data used in the current study under review is meek and resulting conclusions are significantly lacking scientific substance, as the main result is a qualitative and heuristic conceptual model (or rather, simply an explanation) based on qualitative, and to some extent subjective, interpretations of a very limited number of field observations.

There is little qualitative and no quantitative basis to make a rigorous scientific judgement of whether the proposed conceptual model / explanation is indeed a plausible conclusion. For example, it would be very interesting to see actual data from outcrop mappings, such as spatial variations of statistics of fracture observations, eg fracture frequencies, lengths, orientations, apertures, lithologies, types of mineralisation and in-fill materials, etc, but unfortunately no such data is presented. Also, there is no hydrological or hydrogeological data or investigations presented. In other words, it seems that hard data supporting this study is entirely lacking.

There is little reference to previous work, and also alternative models, explanations, or additional perspectives seem to be lacking. The manuscript only contains four citations, which to me seems very sparse. The reference list however contains a list of 13 references, ie nine (!) of these are not even quoted in the manuscript text. Surely it

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cannot be acceptable practice to include non-cited references. The only citations which seem to be used in the text are to (i) Elter (1975), (ii) Ricci Lucchi (1986), (iii) Scesi and Gattinoni (2007), and (iv) Weinberger et al (2010).

Further, in the Introduction section, there is no general background or motivation for the current study. As just mentioned, very few previous studies are cited (only one citation is provided in the Introduction). Thus significant efforts would be needed in order to place the current study in context; ie no serious efforts seem to have been made to include a literature review, or even citing some of their existing listed references and other relevant studies.

Also, I seem to lack a "Results" section. My initial interpretation is that Sections 2 and 2.1 constitute an analysis of field observations, and Section 3 ("Conclusions") actually represents an interpretation of these observations, ie constitute the main results. Conclusions should include possible effects of the proposed results, which is somewhat existing in the current Conclusions section. However, the manuscript in general and the Conclusions section in particular would require a discussion on how their conceptual model may be further investigated, including suggestions on how additional field studies may be applied to confirm/disprove their current interpretation.

Furthermore, even though the title and the manuscript text mention that effects of fracturing (open vs closed) would impact the subsurface hydrology of the region (the local aquifer), there is no actual investigations of the subsurface hydrology or citations to such investigations. As such, I do not see how the current study can be placed in the context of a study related to hydrogeological assessment. In particular, the subtitle "hydrogeological relapses" is misleading.

In summary therefore, I do not see how the current manuscript can be considered for publication in HESS. Perhaps after substantial review, incorporating the suggestions mentioned above, as well as further elaborating on the proposed model with quantitative support from data, and significantly re-writing and improving the presentation,

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could the manuscript be considered.

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