

Interactive comment on “Silica diagenesis-driven fracturing in limestone: an example from the Ordovician of Central Pennsylvania” by Emily M. Hoyt and John N. Hooker

Anonymous Referee #1

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The authors provide observations on bed parallel calcite veins and link their formation to silica diagenesis. Geochemical fracturing is not well studied and of interest to readers and fits the scope of SE. This work builds on previous work by the second author, the orientation of fractures and the geologic setting is different. As presented the conclusions are not supported and are hypothesis-driven. Abstract lacks specific information and uses broad generalizations to describe the outcrop and fractures. The abstract needs an opening statement(s) that help the reader identify the topic/hypothesis/or problem being evaluated in the paper – this could be achieved with the addition of specific details on lithologies, fracture type, and distribution. Methods section requires additional information Point quantification – explains the use of a grid to count fractures

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and optical petrography was done but no explanation of what was done besides using a microscope – did point counting occur? For example: Line 199-200 claims petrographic evidence of show significant amount of detrital quartz, the slide shows 1 grain, no point count data given. XRD cannot distinguish between detrital and biogenic. This is an unsupported claim. The difference in mechanical properties between layers is dismissed because fractures are present in brittle limestone layers and absent from intervening shales — a literature review would suggest this is in fact due to mechanical difference between the shale and limestone Calculations presented are based on generalized assumptions of rock mechanical properties The manuscript lacks citations throughout – well-documented procedures exist for quantifying fractures no need to Authors claim to calculate fracture volume – a volume requires 3D all counts are done in 2D and are listed as area's elsewhere in the document The word “fracosity” is not required and authors should present background information and data that supports the creation and use of a new term and/or the reason for not using a well-established method for documenting fracture distributions within a rock mass and associated terminology. The manuscript lacks introduction to stratigraphy and, The tectonic events are eventually mentioned but both stratigraphy and geologic history/tectonic setting needs to be more detailed and happen earlier in the manuscript. A larger regional map would be helpful inset to the geologic map. The manuscript is hard to follow partway through the author's voice and word choice changes, perhaps it was written in two separate parts and joined with the latter part being more polished (from ~line 250 writing style changes). Manuscript mixes results and observations with interpretation throughout

The language used throughout the early portion of the manuscript is not precise (until ~line 250). Manuscript lacks data/quantification that supports the use of terms like "a highly stratified fracture pattern" Distracting editorial typos exist throughout Discussion refers to observations and a process never mentioned in results Introduction of methods for fracture formation should move earlier in the manuscript, they first appear in the discussion Stratigraphy is defined as Limestone, Shale, Argillaceous Limestone, Clay, and fractured layer – this is over generalized and a mix of lithology,

grain size, and deformation features. The authors should provide an explanation of lithologies and how they were determined. What type of limestone and how do limestone and argillaceous limestone differ; how does clay (a grain size or mineral group not a rock type) differ from shale -what type of types of cement are present — does the fracture layer also have a lithology? Do fractures refer to all fractures or just the calcite veins if the study is on the calcite veins refer to them as calcite veins Figure captions are lacking and do not allow the figure to stand alone; photomicrographs are poor quality and unlabeled. Table 1 – inconsistent presentation of data Fractured layers have no detail regarding rock No – paper lacks citation throughout especially in the geologic setting and methods of determining fracture distribution

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