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Interactive comment on “Unravelling the enigmatic origin of calcitic nanofibres in soils and caves: purely physicochemical or biogenic processes?” by S. Bindschedler et al.

Anonymous Referee #3

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This is an excellent article on the origin of calcitic nanofibers : small-scale (nm to μm) organic/carbonate mineral objects which are abundant in the vadose environments of soils and caves. It provides both an in-depth and up-to-date review of the current hypotheses regarding the origin of calcitic nanofibers, as well as new experiments supporting a partially novel hypothesis of the nanofibers originating from the mineralization of enzymatically-degraded fungal cell wall elements.

A very nice synthesis of the literature descriptions of calcitic nanofibers and Needle Cacite Fabric (NFC), a similar, but morphologically distinct, form of organo-calcitic precipitate, is given in Table 1.

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The authors propose an additional hypothesis on the origin of at least some of the calcitic nan-fibers that may result from the mineralization of organic material derived from the cell wall of fungi. Based on the evidence provided, I think this hypothesis is plausible. Of course the alternative origin proposed by the authors fits in well with the existing hypothesis (number three) described by the authors: that of the involvement of an organic template as a nucleation site. The authors then add to this idea that the organic template in question might originate from the fungal cell wall - this is well explained in the conclusion.

I have only one criticism regarding the importance of this model of calcification to global cycles of Ca and C. In the abstract it is stated that the formation of calcite nanofibers may be relevant to global Ca and C biogeochemical cycles. The authors do not provide evidence for this statement. What is needed to support this statement is an estimate of the global rate of Ca and C sequestration in organic nano-fibers, and then a comparison with the global rate of formation of carbonate minerals by other mechanisms. The manuscript is easy to read and the figures support the text nicely.

In summary, this is an excellent article for a broad spectrum of scientists approaching the world of small-scale organo-carbonate mineral objects in the vadose environment.

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