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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.

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We would like to thank this referee for his/her thorough review of our manuscript. Please find thereafter our answers as well as where modifications have been to the original manuscript.

P979 (5), L10 and L14 / P4, L110 and L114: "in controlled" changed to "under controlled" at both occurrences.

P979 (5), L17 / P4, L119: "Calcite" changed to "calcite".

P982 (8), L19-20 / P7, L201, 205, 206: In line 203, we define the term genetic as



"related to the origin of something" in order to avoid confusion with genetic heredity (this is mostly for biologist readers). What we are trying to highlight by using the terms "genetic" and "non-genetic" is the fact that one feature does not originate from the other (genetic link between NFC and nanofibres), but, most likely, originate from similar conditions and settings, i.e. nanofibres do not contribute to form NFC (non-genetic link between NFC and nanofibres).

P984 (10), L26 / P9, L265-266: Thank you very much for the input, references suggested (Schieber and Arnott, 2003; Martel and Young, 2008) and two additional ones (Kirkland et al., 1999; Young et al., 2009) have been added. Likewise, references P19, L605-607 have also been updated.

P985 (11), L4 / P9, L271: Reference suggested (Benzerara et al. 2005) has been added.

P985 (11), L8 / P9, L275-276: sentence and reference modified as suggested by the referee. Trichet and Défarge (1995) removed from reference list.

P986 (12), L10 / P10, L305: "the" has been added before "conclusion".

P993 (19), L16-25 / P16, L496-503: This is an interesting point. Indeed, it seems rational that microbes are able to produce enzymes that are adapted to the physicochemical parameters of their environments. Turner (2010), in a study comparing enzymes activities in soils with different pH showed that both beta-glucosidase and chitinase had their optimal activity at low pH. However, they observed that the pH of optimal activity varied with soil pH: the higher the soil pH, the higher the pH of optimal activity. Nevertheless, the pH of optimal activity always remained in an acidic range (<6). The same trend is observed in Sinsabaugh et al. (2008). Regarding beta-glucanase, the enzyme hydrolysing beta-glucans, only scarce information exists on the topic. Laboratory assays have shown an optimal activity around 5. However, we were not able to find any further study comparing its activity in soils under various pH. It is also important to consider that not only one but several enzymes (likely coming from a guild of microbes) are re-

quired to lead to the complete decay in soil of branched and cross-linked polymers such as chitin and beta-glucans from fungal cell walls. Therefore, further studies are probably needed to better understand the fate of cell wall polymers in complex environments such as soils.

P995 (21), L21-22 / P18, L552: This is indeed a very good comment, and we did not think of adding it to the discussion. The fact that Benzerara et al. (2005) observed carboxylic groups associated with their nanofibres (rod-like nanocrystals) is very intriguing, as carboxylic groups are well known for their ability to bind cations such as Ca2+ for instance (Dupraz and Visscher, 2005). Those groups could influence both CaCO3 nucleation and stabilization in the case of calcitic nanofibres. We have added a sentence to specify this fact in P18, L553-556.

P996 (22), L27 / P19, L587: “through” has been replaced by “by”.

P998 (24), L2-4 / P20, L621-622: This is an interesting point, as it questions the dynamics of the system. If observed nanofibres are old, then it seems likely that all previous organic features are entirely mineralized. If the system is young (i.e. the mineralization process is still on-going), then organic templates (whether they are microbes or organic polymers) can remain. This is why we were able to detect organic meshes of nanofibres using Osmium labelling. However, the main argument to discard the origin of nanofibres as microbial cells is that oligotrophic environments, such as caves or mineral deep soils, cannot sustain (in term of trophic status) an intense microbial growth able to generate such large nanofibres accumulations.

P998 (24), L25 / P20, L643: “To note that” has been removed.

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