

# ***Interactive comment on “Mineral physical protection and carbon stabilization in-situ evidence revealed by nano scale 3-D tomography” by Yi-Tse Weng et al.***

**Anonymous Referee #1**

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In this paper, Weng et al study the 3D distribution of organic carbon and mineral particle using synchrotron-based transmission X-ray microscopy. The approach was applied to a lab-made mixture of black carbon and nano mineral (TiO<sub>2</sub>) and to a natural soils rich Fe oxyhydroxides. By observing criss-cross of mineral particles and organic matter they conclude on the importance of mineral physical protection (for example through ligand exchanges) for long-term persistence of OC. They also conclude that mineral physical protection for OC stabilization may be more important than previously thought. I have the feeling that this study uses a Jack Hammer to open nuts. We already know that minerals play key role in the persistence of organic matter in soils. The specific role of reactive minerals such as Al and Fe oxyhydroxides, allophane is known since

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several decades. Therefore, I do not see what progress in our knowledge is made here. Moreover, the observation of criss-cross of mineral particles and organic matter in one soil layer does not inform on the role of minerals on OM persistence and does not permit any generalization. We do not know whether the OM is really retained by minerals, with what forces and what consequences for its fate in soils. From my modest knowledge, I think that what we need now is to determine whether the capacity of minerals to fix carbon is limited; If this capacity is limited, how much carbon can still be stored in soils (by considering the whole soil profile). Understanding how some organic compounds free of minerals can persist over centuries (An example among many others: Derenne et al. 1991) could be another original and exciting research avenue.

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