

## ***Interactive comment on “Synchrotron microtomographic quantification of geometrical soil pore characteristics affected by compaction” by R. P. Udawatta et al.***

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Synchrotron microtomographic quantification of geometrical soil pore characteristics affected by compaction

Referee comments:

The discussion paper is nicely written. Introduction is not comprehensive. It definitely overshadows some of the recent studies that investigated the effect of compaction on soil pore characteristics using X-ray CT. For example:

Schäffer, B., Stauber, M., Müller, R., Schulin, R., 2007. Changes in the macropore  
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structure of restored soil caused by compaction beneath heavy agricultural machinery: A morphometric study. *Eur. J. Soil Sci.*, 58, 1062-1073.

Lamandé, M., Wildenschild, D., Berisso, F.E., Garbout, A., Marsh, M., Moldrup, P., Keller, T., Hansen, S.B., de Jonge, L.W., Schjønning, P., 2013. X-ray CT and laboratory measurements on glacial till subsoil cores: Assessment of inherent and compaction-affected soil structure characteristics. *Soil Science*, 178, 359-368

Kim, H., Anderson, S.H., Motavalli, P.P., Gantzer, C.J., 2010. Compaction effects on soil macropore geometry and related parameters for an arable field. *Geoderma*, 160, 244-251

Further I have some comments on the technicality of the paper as follow

1. Table 1; why there is a large standard deviation in case of mean pore radius, total pore volume, largest pore volume etc. as the used experimental system is very clean. Is there something wrong with the segmentation method or packing/pressing of the soil cores created some artifacts? You can evaluate porosity distribution along the height of soil column (porosity at each slice) to confirm the method of packing.
2. It is really hard to see any difference between the treatments in all of the figures presented. Can you find other ways to plot the data?
3. If the X-ray CT porosity decreased from 10.9 to 4.9% under compaction then why not the different morphological indices showed the proportional affect particularly coordination number and tortuosity. Is it possible for you to evaluate the Euler number, which is good measure of the pore connectivity?
4. Why mean pore radius is same for the both aggregate size classes? Is something wrong with the packing of soil or segmentation method?
5. I am suggesting here two parameters that need to be investigated in such studies i. pore shape evolution under compaction and ii. Degree of anisotropy of the pore space.
6. Further it is good exercise to compare results using multiple segmentation methods. Locally adaptive segmentation methods may perform better here.