Influence of voxel size settings in X-Ray CT Imagery of soil in scaling properties

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Fundamental to the interpretation and comparison of X-ray CT imagery of soil is recognition of the objectivity and consistency of procedures used to generate the 3D models. Notably, there has been a lack of consistency in the size of voxels used for diverse interpretations of soils features and processes; in part, this is due to the ongoing evolution of instrumentation and computerized image processing capacity. Moreover, there is still need for discussion on whether standard voxels sizes should be recommended, and what those would be.

Regardless of any eventual adoption of such standards, there is a need to also consider the manner in which voxel size is set in the 3D imagery. In the typical approaches to X-ray CT imaging, voxel size may be set at three stages: image acquisition (involving the position of the sample relative to the tube and detector), image reconstruction (where binning of pixels in the acquired images may occur), as well as post-reconstruction re-sampling (which may involve algorithms such as tri-cubic convolution).

This research evaluates and compares the spatial distribution of intra-aggregate voids in 3D imagery as well as their scaling properties, of equivalent voxel size, generated using various combinations of the afore-mentioned approaches.