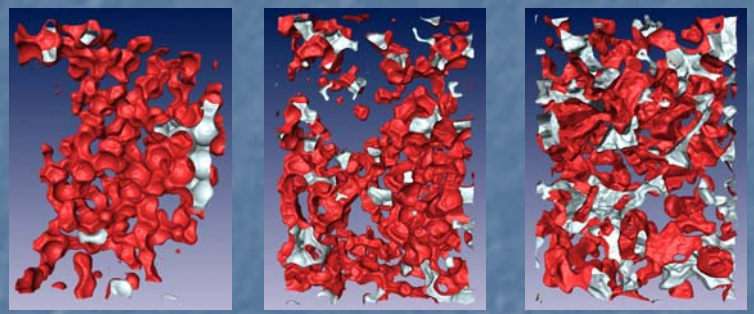
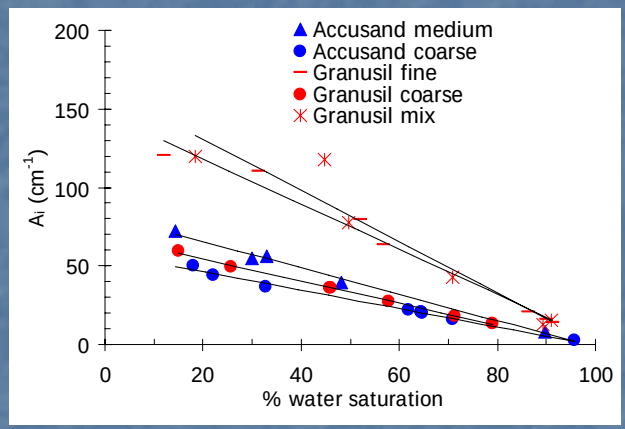
Microtomographic Imaging of the Air-Water Interface in Unsaturated Porous Media

Molly S. Costanza-Robinson, Middlebury College, VT

The air-water interface in porous media serves as a two-dimensional retention domain for solutes and colloids and also governs the dynamics of interphase mass- and energy transfer. Advances in synchrotron X-ray microtomography (μCT) provide direct visualization of the air-water interfacial area, from which quantitative porescale information is extracted.



μCT visualization of the air-water interface for glass beads (left) and two natural sands (Accusand and Granusil). Total imaged volumes are 4×4×6-mm cuboids.



Measured air-water interfacial areas for various size fractions of two natural media as a function of water saturation. A_i varies linearly with S_w for all media examined.

Acknowledgements

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Measured air-water interfacial areas depend on the size of the imaged region. The small samples typically imaged by μCT may not always satisfy representative elementary volume (REV) requirements with regard to air-water interfacial areas (e.g., yellow and blue lines).