SLU

Agroscope

An introduction in processing and evaluation of X-ray images with SoilJ

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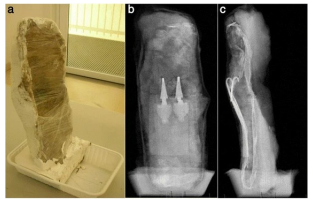
X-ray imaging

- X-ray Computed Tomography (CT) is a non-invasive technique that allows 3 and 4-dimensional, non-destructive imaging of heterogeneous materials (Heeraman et al. 1997)

- Originally being used for medical purposes, e.g. for identifying bone fractures

https://www.disnola.com/x-ray/

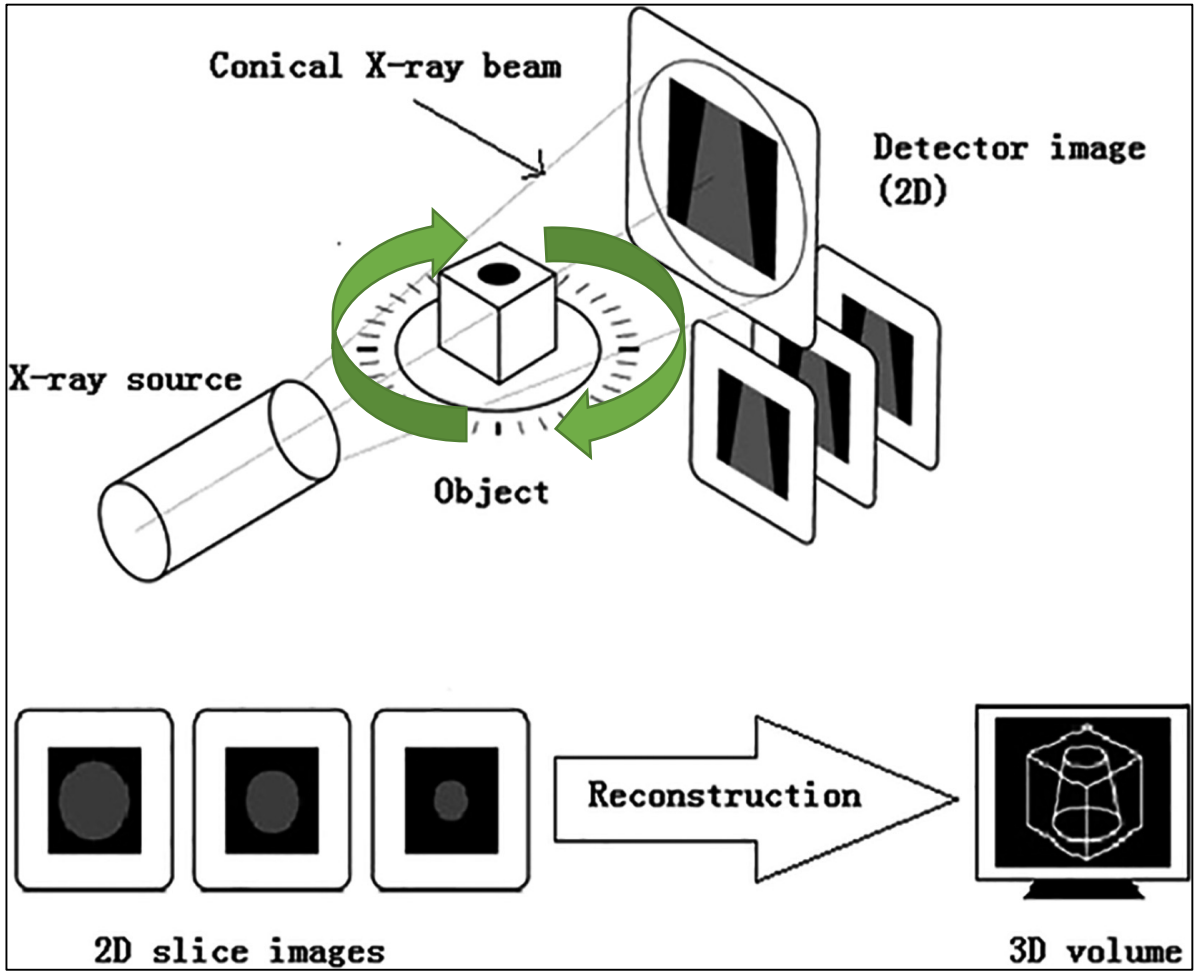
- Archeological research (e.g. Re et al. 2015)



- Valuable tool in vadose zone research (Binley et al. 2015; Werth et al. 2010)

→ Large potential to quantify dynamic processes within soil, such as root development, soil structure evolution, water flow, and solute transport (Capowiez et al. 2014; Koestel & Larsbo 2014; Sammartino et al. 2015; Tracy et al. 2015)

Working principle of X-ray CT technology



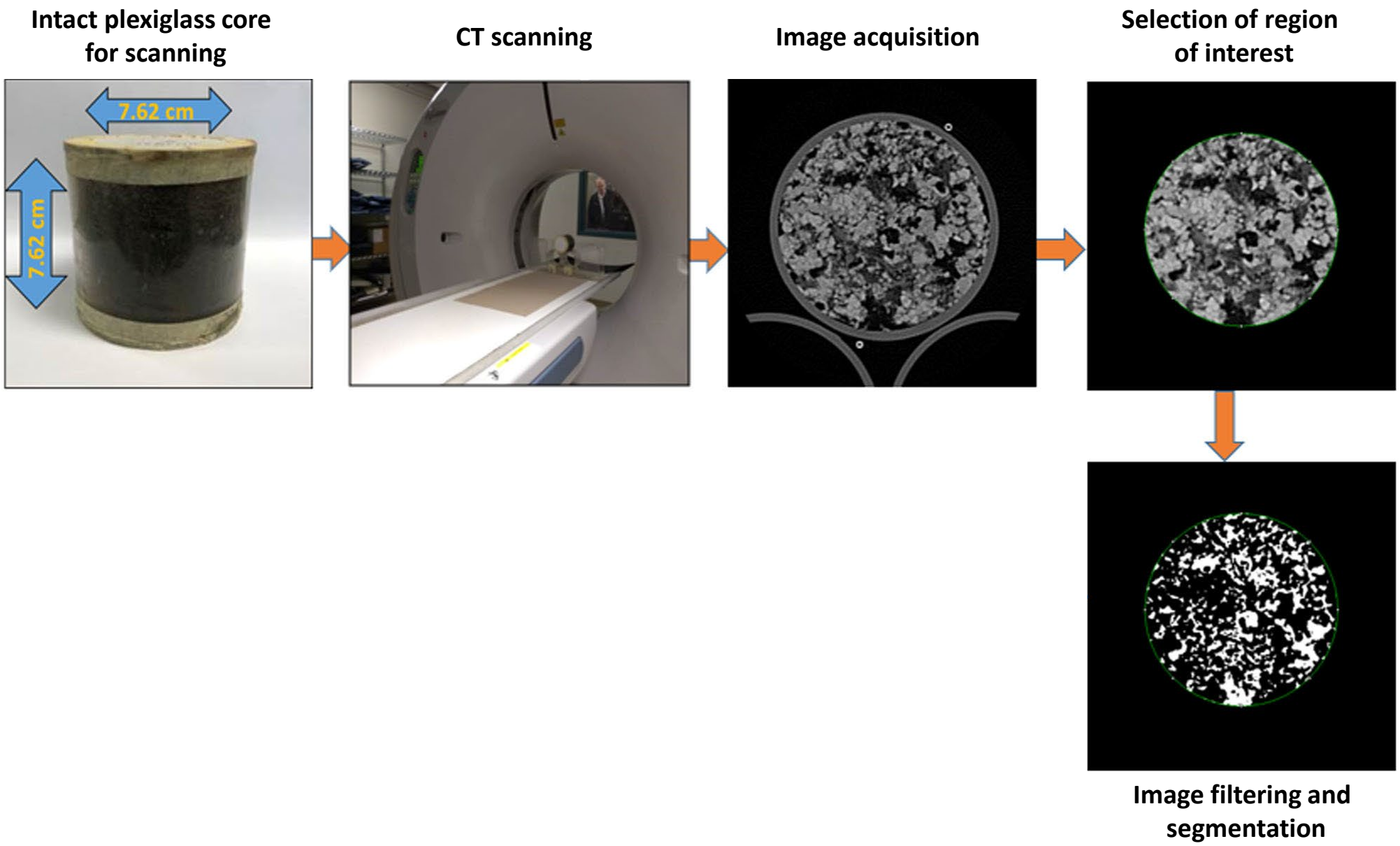
Du et al. (2019)

Different materials within the object

Different mass attenuation and decay characteristics

Obtain radiation attenuation information when X-ray passes through the sample at different directions

Attenuation is recorded on a detector

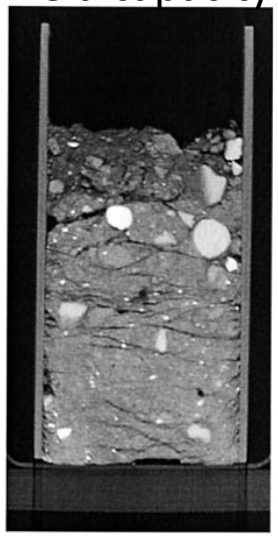


Adapted from Singh et al. (2020)

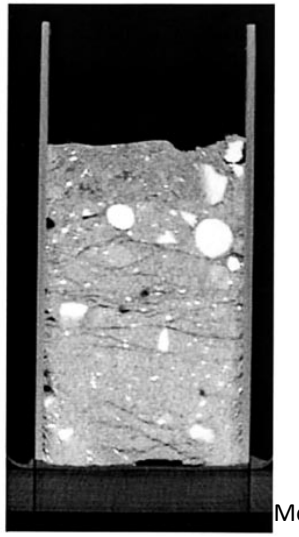
Characterisation of **pore space geometry** in soil with respect to…

permeability

field capacity

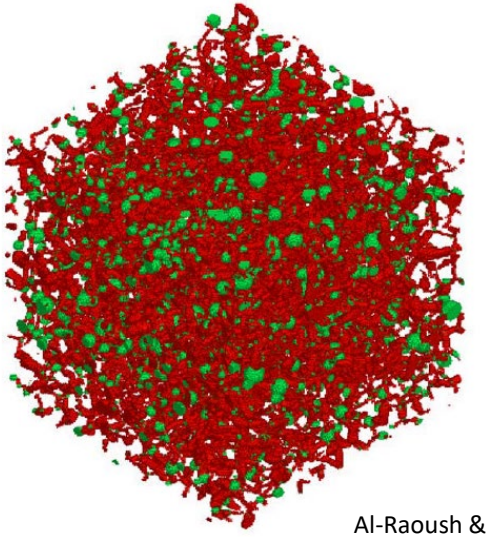


infiltration



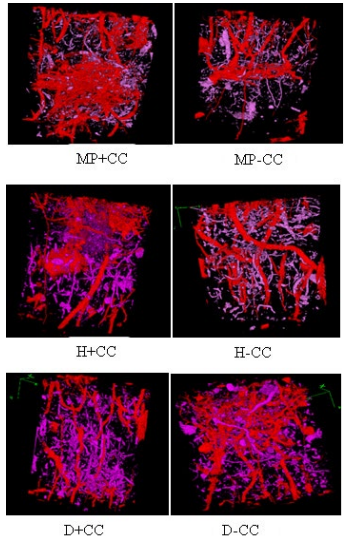
Mooney (2002)

pore network structures



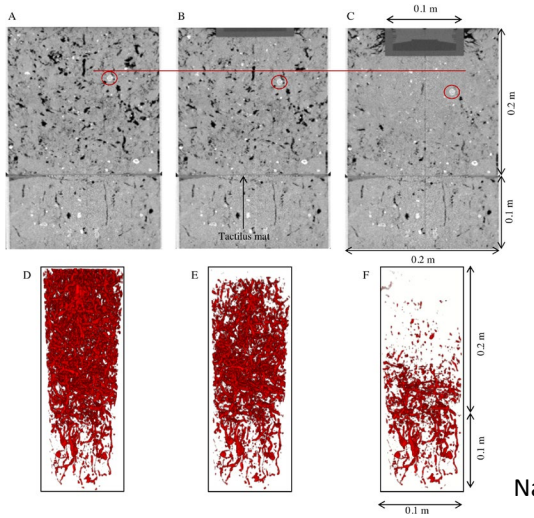
Al-Raoush & Willson (2005)

soil management



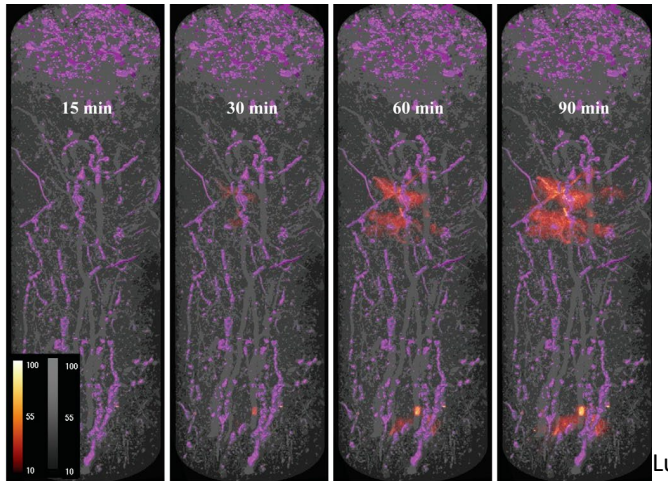
Abdollahi et al. (2013)

soil compaction



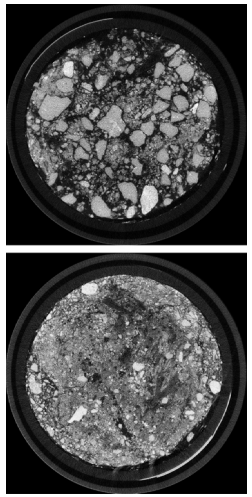
Naveed et al. (2016)

preferential flow



Luo et al. (2008)

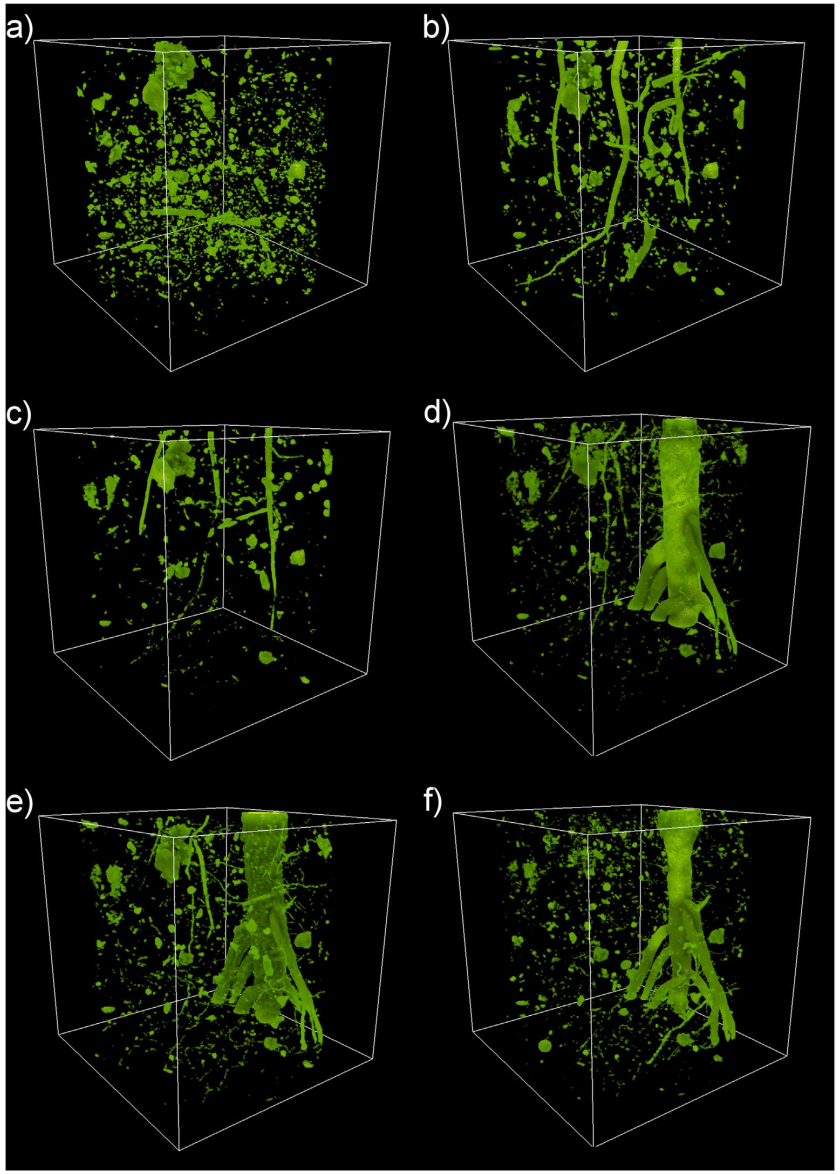
slash-pile burn



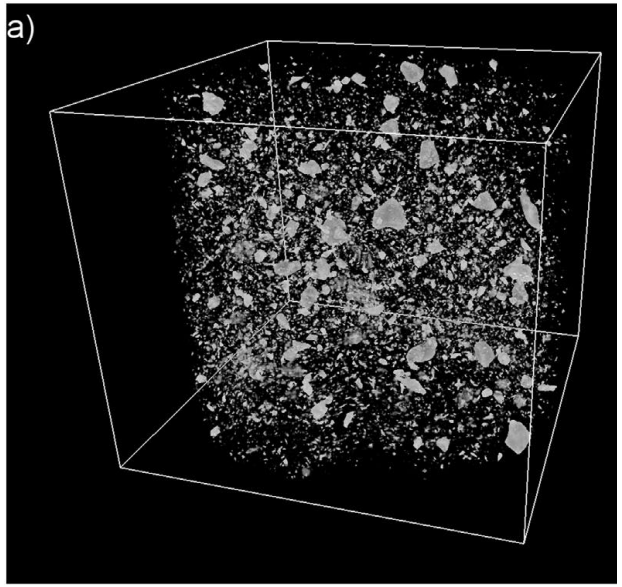
Massman et al. (2010)

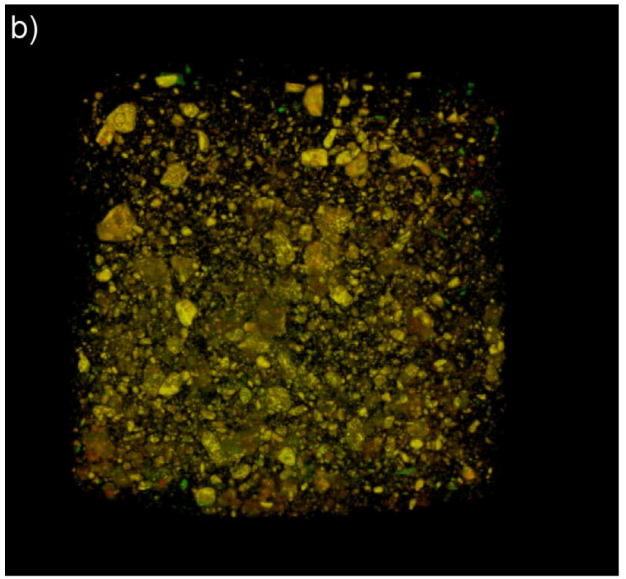
More than just pore space

POM and Root development over two years
(Koestel & Schlueter 2019)



Sand grains and gravel
(Koestel & Schlueter 2019)





Biopores
(Lucas et al. 2019)