Root-Soil kinematics SRXCT data

The data for this entry are collected into compressed folders. The description and metadata for each set of files is detailed below.

Samples have a naming convention describing the sample condition and where the image sits in the 4D acquisition sequence:

<file-ID-stub>\_<step-number>\_<x-extent>\_ <y-extent >\_ <z-extent >\_<bit-depth>.raw

The **file-ID-stub** lists the sample type:

DVC\_<plant-status>\_<compaction-status>\_<water-status>\_<replicate-ID>

**plant-status:** DEC refers to a decapped plant specimen, WR refers to an intact plant specimen.

**compaction-status**: COM refers to compacted soil, UNCOMP refers to uncompacted soil.

**water-status:** DRY refers to dry soil, WET refers to wet soil.

**replicate-ID:** R1, R2 and R3 refer to the three replicates of each condition.

The **step-number** (001,…,008) denotes the position of the scan in the imaged sequence, separated by 6 minutes between each step.

The **x-extent**, **y-extent** and **z-extent** are the voxel dimensions of the volume in the x, y and z orientations.

The **bit-depth** is the bit depth of the data (8-bit unsigned or 32-bit real).

i.e., **DVC\_DEC\_COM\_DRY\_R1\_1280\_1280\_960\_8bit.raw** is the first replicate of a de-capped root in compacted, dry soil, with dimensions 1280x1280x960, and 8-bit filesize.

# SRXCT volumes

## Raw SRXCT data

Folder name*: Raw\_SRXCT\_Data.zip*

Description: *These tomographic data were acquired at the TOMCAT beamline of the Swiss Light Source (Villigen, Switzerland), under 19 keV monochromatic beam conditions. For each tomogram, 750 projections were continuously acquired at 75 ms exposure, with 30 dark- and 50 flat-field images acquired for radiograph correction. Each acquisition took ~60 s in total. The attenuated beam was scintillated by a LuAG:Ce film of 20 µm thickness, and resultant images digitised using a PCO Edge 5.5 camera, following 4x optical magnification. A sample-to-detector distance of 98 mm provided an intermediate degree of propagation phase contrast. A tomographic acquisition was automatically triggered every 6 minutes, with a sequence of 8 tomograms collected for each sample over a total time of 48 minutes. Volumes have been spatially down-sampled by 2x and converted to an 8-bit range. They are the inputs to the DaVis DVC software (in this form), and to grain kinematic quantification approaches (following filtering and segmentation).*

Number of files: *144*

Individual file size: *1,536,000 kb*

Individual file bit depth: *8-bit unsigned*

Individual file dimensions: *1280x1280x960 voxels*

## Separated grain data

Folder name*: Separated\_Grains.zip*

Description: *These volumes are the files found in (Raw\_SRXCT\_Data.zip), with the primary mineral grains segmented and separated using a 3D watershed method in ImageJ.*

Number of files: *144*

Individual file size: *1,536,000 kb*

Individual file bit depth: *8-bit unsigned*

Individual file dimensions: *1280x1280x960 voxels*

## Root EDT data

Folder name*: Root EDTs*

Description: *These volumes are the files found in (Raw\_SRXCT\_Data.zip), with the roots segmented and a Euclidean distance transform (EDT) computed. To return the original root geometry, these files can be globally thresholded at a grey-level value of zero (in ImageJ for instance).*

Number of files: *135*

Individual file size: *6,144,000 kb*

Individual file bit depth: *32-bit real (big-endian)*

Individual file dimensions: *1280x1280x960 voxels*