Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06341, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06341
EGU General Assembly 2008

Quantification of biophysical processes in soil-plant systems under natural environmental conditions using X-ray microtomography

S.J. Mooney (1), D. Grinev (2) and I.M. Young (2)

(1) Environmental Sciences, University of Nottingham, University Park, Nottingham, NG7RD, U.K. (sacha.mooney@nottingham.ac.uk), (2) SIMBIOS Centre, University of Abertay Dundee, Bell Street, Dundee DD1 1HG, U.K. (d.grinev@abertay.ac.uk)

Soil is an extremely complex porous medium and it is of key importance to understand how the spatial arrangement of the physical and biological components of soil affects their interaction and consequent function (Young & Crawford 2004). Understanding of the interactions of soil physical properties and the plant root system in particular is a key research challenge in the quest to further understand rhizosphere dynamics and is vitally important for studying the biophysics of germination, establishment and plant growth (Gregory 2006). Advances in the visualisation of soil porous architecture utilizing tools such as X-ray microtomography (μCT) have enabled the assessment of soil structural properties in a quantitative manner and at a number of highly relevant scales (e.g. Nunan *et al*. 2003). However, there have been few X-ray microtomography studies of soil-plant systems under natural environmental conditions mainly because of the unavailability of controlled environment chambers integrated into μCT scanners. Here we present some of the first work to quantify the interactions of soil physical properties and the plant root system under natural conditions. Using a controlled environment chamber we have been able to visualise and subsequently quantify, using Arabidopsis as our model, the undisturbed 3-D soil-plant system architecture as it temporally evolves under specified temperature, humidity and light conditions. This capability is crucial for the visualisation and quantification of soil-plant systems *in-situ.* These results will be used for developing a mathematical model of soil-plant system dynamics, and analysis of the biomechanical aspects of the root system growth.

References

Young, I.M. & Crawford, J.W. (2004). Interactions and self-organisation in the soil-microbe complex. Science, 304, 1634-1637.

Gregory, P.J. (2006). Plant Roots: Growth, Function And Interactions With the Soil. Blackwell Publishers, 328 pp.

Nunan, N. *et al*. (2003). Spatial distribution of bacterial communities and their relationship with the micro-architecture of soil. FEMS Microbiology Ecology 1496, 1-12.