Geophysical Research Abstracts, Vol. 9, 10901, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10901


# Soil microtomography - Pores quantification by X-ray and serial sectioning

**G. Mele** (1), A. Kaestner (2) and F. Terribile (3)

(1) CNR ISAFOM, Ercolano NA, Italy (g.mele@isafom.cnr.it) (2) VARIAN, Baden, Switzerland (3) DISSPA University of Naples, Portici NA, Italy

Chemical, physical and biological processes occurring in the soil are essential for the life on the earth and show, generally, complex behaviours. These latter depend, largely, to the complexity of the soil structure. Quantification of pore geometries has then become a well-established field of research since the seventies when the earliest image analysis systems were applied to 2D images of soil thin sections. Many tomographic techniques are now available which can provide 3D images of the soil pore space (e.g. X and g-ray CT from different radiation sources, NMR imaging, PET, acoustic microscopy, ERT, etcĚ). Due to the different physical principles involved, each technique allow to better address different applicative problems. Usually better resolution comes with lower size of the sample and vice versa. Aiming at studying the relationships between pore size distribution and flow properties we focussed on soil sample sizes at REV scale for such macroscopic properties. Two resin impregnated cylinder shaped samples of 6 cm in diameter and 6 cm in height having very different pore structure (sandstone and alluvial vertisol), have been first scanned using a SkyScan 1172 desktop micro-CT system in order to test the best achievable resolution, then have been sliced using a completely automatic serial sectioning system in order to compare the quality of the reconstructed images. Fragments of the samples 1 mmˆ3 large were also scanned with the SkyScan-2011 X-Ray Nano-Tomograph in order to visualise the pore structure at the lower scale not represented for the whole samples. Pore size distribution was quantified using a successive “opening” algorithm and connectivity analyses were also performed using the “percolation curve” approach. Best reconstruction results were obtained at 19mm and 17mm resolution for the first and second sample respectively. The very large amount of data needed to represent the whole samples at those resolutions required the sub-sampling of the whole image vol-

umes in order to can be analysed on a workstation having 8Gb RAM. Variability of the porosity results among the sub-samples suggested that the REV of the studied sandstone were less than 1 cmˆ3 wide while the whole sample of the vertisol was needed to representatively quantify its pore network.