Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01448, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01448
EGU General Assembly 2008

The influence of stone content on water movement in water-repellent soil

E. Urbanek and R.A. Shakesby

Department of Geography, School of the Environment and Society, Swansea University, UK (e.urbanek@swansea.ac.uk/Fax: +44 1792 295955)

Considerable effort has been made in recent years with trying to understand how water can penetrate a contiguous, near-surface layer of water-repellent soil. Zones of preferential water flow, spatial heterogeneity of water repellency, and the presence of root holes, faunal burrows and cracks have all been suggested in explaining how the layer may be bypassed by water. Such interpretations acknowledge that soil texture may have an influence on water repellency, but the stone content is invariably ignored. Many Mediterranean soils, particularly in fire-prone forest and woodland environments, are both water-repellent and extremely stony. Although the stoniness of wettable Mediterranean soils has previously been investigated with respect to overland flow, its possible influence on water flow behaviour through water-repellent soil has received no previous attention to the authors' knowledge. This study uses a series of laboratory experiments to explore how variation in stone concentration, variation in stone size and water-repellent characteristics of the stone surfaces can affect the permeability of a uniform, highly water-repellent, artificial soil matrix. Using various measures to monitor different aspects of soil water movement, the results indicate that there is a minimum stone concentration threshold below which no water penetration occurs and above which water is able to move through even a highly water-repellent matrix. A large rather than restricted range of stone sizes is shown not to lead to a marked improvement in soil water penetration as might be expected, and water-repellent rather than wettable stone surfaces delay rather than prevent water penetration with increasing stone content. It is concluded that a high stone content, as is typical of many Mediterranean soils, can be an important factor in allowing water

to bypass even the most extremely water-repellent soil matrix. The implications for understanding hillslope overland flow and catchment runoff characteristics in stony water-repellent soils are explored.