APPLICATION OF GROUND PENETRATING RADAR TO THE IDENTIFICATION OF NATURAL PIPING IN BLANKET PEAT CATCHMENTS

J. Holden (1) and M. Vilas (2)
(1) School of Geography, University of Leeds, UK. (2) Dpt. Geoquímica, Petrologia i Prospecció Geològica, Universitat de Barcelona, Spain.

Natural soil pipes are common in upland wetlands yet there are major problems in finding and defining the subsurface pipe networks. This is particularly important because pipeflow can contribute a large proportion of runoff to the river systems in these wetland environments and may significantly influence catchment sediment and solute yields. Traditional methods such as digging soil pits are time consuming (particularly in deep peat) and only provide single point sources of information. This poster presents results from an experiment to assess the use of Ground Penetrating Radar (GPR) to remotely sense pipes in blanket peat. The technique is shown to be successful in identifying most of the pipes tested in the pilot catchment. Comparison of data on pipes identified by the GPR and data verified by manual measurement suggest that pipe depth can be located in the soil profile with an accuracy of 20 to 30 cm. In agreement with ground survey, pipes were identified throughout the soil profile although those within 10 – 20 cm of the surface could not be identified using the 100 or 200 MHz antennae due to multiple surface reflections. Generally pipes smaller than 10 cm in diameter could not be identified using the technique although modifications are suggested that will allow enhanced resolution. Future work would benefit from the development of dual frequency antennae that would allow the combination of high-resolution data with the depth of penetration required in a wetland environment. The GPR experiment shows that pipe network densities were much greater than could be detected from surface fieldwork alone. Thus a non-destructive fast technique which can produce continuous profiles of peat depth, and pipe locations across survey transects is advocated which provides important information for our understanding of wetland hydrology, hydrochemistry and geomorphology. The GPR technique used cannot, however, prove hydrological connectivity between the pipes found along each survey transect. A radar system with an array of portable transmitters and receivers that can be placed across the hillslope may prove too expensive to develop. Suggestions are made for the development of the technique using mesh transects with 0.1 m step in two directions (parallel and perpendicular to the slope). Improved software in combination with global positioning system technology will allow a three-dimensional model of the soil profile and connectivity and sources of pipe networks across blanket peat hillslopes to be developed.