Geophysical Research Abstracts
Vol. 13, EGU2011-9615, 2011
EGU General Assembly 2011

Characterizing the Hydrological Properties of Laboratory and Wildfire Ash from North America

Victoria Balfour and Scott Woods

University of Montana, Department of Ecosystem and Conservation Sciences, Missoula, MT, 59812, United States (victoria.balfour@umconnect.umt.edu) (scott.woods@cfc.umt.edu)

Vegetative ash formed during forest wildfires has varying effects on post-fire runoff and erosion. In some cases the ash layer reduces runoff and erosion by storing rainfall and by protecting the underlying soil surface from surface sealing and rainsplash detachment. In other cases, the ash layer increases runoff and erosion by forming a surface crust, clogging soil pores, and providing a ready source of highly erodible fine material. Variability in the hydro-geomorphic response to rainfall may reflect differences in the hydrologic properties of ash caused by differences in fire severity or fuel type. We are investigating and quantifying the hydrologic properties of ash produced in the laboratory at varying combustion temperatures and collected after wildfires in North America. Wherever possible we use conventional laboratory techniques from soil hydrology but in some cases have adapted techniques to account for the distinct physical and chemical properties of ash, such as variability in the particle density and the partial solubility.

Preliminary results indicate that some of the hydrologic properties of ash, such as the hydraulic conductivity, are similar to those of a mineral soil with a comparable particle size distribution. For example, ash with a silty loam texture had a hydraulic conductivity of 7 x 10-4 cm s-1, which is within the range reported for mineral soils with the same texture. However, other properties, such as the porosity are entirely different from mineral soil; total porosity estimates for ash (obtained using the field bulk density method) ranged from 85 to 95 percent, which is more than twice the typical range for mineral soils. Scanning electron microscopy indicates that the contrasting hydrologic properties of ash and soil are due to differences in the particle shape, particle packing and pore structure. In ongoing research we are relating the hydrologic properties of ash to easily measured physical and chemical properties that can be used to predict the ash hydrological response.