Geophysical Research Abstracts
Vol. 12, EGU2010-6800, 2010
EGU General Assembly 2010

Repeat rainfall simulation experiments for assessing the evolution of overland flow generation and inter-rill erosion following wildfire

Jan Jacob Keizer, Maruxa Malvar, Sergio Prats, and João Pedro Nunes
CESAM, University of Aveiro, Environment&Planning, Aveiro, Portugal (jjkeizer@ua.pt)

The EROSFIRE project selected field rainfall simulation experiments (RSE's) as a time-and cost-effective approach to gather runoff and soil loss data under the rapidly changing conditions typical for commercial eucalypt plantations in Portugal following wildfires. These RSE data were first and foremost envisaged for initial parameterization and calibration of a physically-based model like MEFIDIS. Subsequent model assessment at larger spatial scales would then be based on slope-scale erosion plot data collected at a small number of selected sites. The present work, however, will in principle be confined to an analysis of the measurement results of the RSE's in two recently burnt eucalypt plantations.
Repeat RSE's were carried out in two adjacent but contrasting eucalypt stands on steep hillslopes in north-central Portugal. This involved six occasions ranging from 3 to 24 months after a moderate severity fire in July 2005. A paired-plot experimental design was employed that comprised two pairs of RSE's at each site and occasion. From a grand total of 46 RSE's: (i) 24 and 22 RSE's involved application rates of 45-50 and 80-85 mm h-1, respectively; (ii) 22 took place in a stand that had been ploughed in downslope direction several years before the wildfire and 24 in an unploughed stand.
The results showed a clear tendency for extreme-intensity RSE's to produce higher runoff amounts and greater soil and organic matter losses than the simultaneous high-intensity RSE's on the neighbouring plots. Nonetheless, there were marked exceptions, both in space (for one of the plot pairs) and time (under intermediate soil water repellency conditions). Also, overland flow generation and erosion varied significantly along the various field campaigns. This temporal pattern noticeably differed from a straightforward decline with time-after-fire, rather suggesting a seasonal component that reflected broad variations in topsoil water repellency.
The ploughed site produced less runoff and erosion than the unploughed site, contrary to what would be expected if the downslope ploughing had occurred after the wildfire instead of several years before it.
Finally, sediment losses at both study sites were noticeably lower than those reported by the other studies involving repeat RSE's, i.e. in Australia and western Spain. This possibly reflects a history of intensive land use in the study region, including in more recent times after the widespread introduction of eucalypt plantations.