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Modelling interrill erosion in recently burnt forest areas

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Major disturbances like wildfires can have important impacts in terms of soil erosion hazard. Quantitative assessment of soil erosion and its modelling are needed to better understanding of the changes in the underlying hydrological and erosion processes at the various spatial and temporal scales. In this study, two physically-based models - WEPP and MEFIDIS - were applied to small-scale erosion data from recently burnt forest areas that were obtained by means of rainfall simulation experiments in the framework of the EROSFIRE project (http://www2.dao.ua.pt/RECNATUR/EROSFIRE/pages/index_english.htm). The main aim of this work was to address the uncertainties in the model input parameters and, in particular, the models' sensitivity with respect to the possible ranges in model input data, mainly due to small-scale variability in the parameters measured in the field and laboratory. The rainfall simulation experiments were carried out in commercial eucalypt in north-central Portugal sites, starting about 2 months after the wildfire in early July 2005. The rainfall simulations involved field data collection concerning a wide range of variables, including soil moisture and soil water repellency, and the gathering of runoff and soil samples for laboratory analysis of e.g soil texture and soil organic matter. The data from the rainfall simulations were compared with model results, and were found to provide a satisfactory basis for erosion modelling at small-plot scale and, through upscaling, for predicting erosion rates at the slope scale. In the case of both models, calibration with respect to runoff mainly focused on saturated hydraulic conductivity (Ksat) and calibrated Ksat values were significantly lower than the average measured values. A likely explanation is that the two models use the Green-Ampt method to calculate infiltration rate, Chow et al. (1988) having referred that the Ksat parameter used in this method is a "field parameter" that is generally, significantly lower than the hydraulic conductivity for saturated soil. With the

calibrated Ksat values, both models produced satisfactory runoff results for various plots on four slopes differencing in terms of slope steepness, land management practices and initial soil moisture conditions. Soil erosion was calibrated by changing soil texture parameters, in particular the critical shear stress in MEFIDIS and the interrill soil erodibility in WEPP. Comparison of the models' results has shown a certain degree of uncertainty in numeric erosion prediction, which can be attributed to the non-linearity of the interrill erosion processes and to the strong soil hydrophobicity, something neither of the models take into account.