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Ground cover retrieval with Hyper- and Multi- spectral data fusion for post-fire soil erosion modelling - The Castanheira de Pêra study site.

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The identification of the type and extent of the area damaged by natural hazards such as wildfires using Earth Observation data can contribute to a better understanding of the processes affecting the Man-Nature system and, thereby, Man's capability for sustainable land management. Fire effects are not limited to vegetation and litter cover and composition but include topsoil properties, both of which contribute to the enhanced hydrological and geomorphological activity typically observed in recently burnt areas. The present study focusses on fire-induced changes in topsoil properties, vegetation and ground cover and how this latter parameter can be acquired via satellite multi- and hyperspectral analysis for the determination of soil erosion model ground cover inputs. This objective has been achieved via the comparison of field ground cover data with multi and hyperspectral satellite derived data. Hence, we applied both types of ground cover data – i.e. field and satellite-based to the same erosion model to assess how the different model input values affected the differences between predicted and observed soil erosion rates.
To this end, the present study applied the modified Morgan-Morgan-Finney (MMF) erosion model to a pine plantation that had recently been burnt by the dramatic, June-2017 Pedrógão wildfire in Central Portugal. The MMF model was calibrated against the observed plot-scale erosion rates and the seasonal patterns therein, operating on the effective hydrological depth, fire severity impact and ground cover. Furthermore, we tested satellite and field based burn severity assessments and compared both model predictions with the field erosion measurements at plot scale. Additionally, the MMF input parameters linked to vegetation cover were estimated from field observations as well as various remotely-sensed indexes derived from Sentinel-2 MSI (MultiSensing Instrument) and PRISMA (HyperSpectral Precursor of the Applicative Mission) hyperspectral data. The results showed that remote sensing data can provide valuable estimates of post-fire vegetation recovery for parameterization of the MMF model for the first post-fire year. An important condition, however, is that the spatio-temporal resolution of the satellite-based data match the spatial patterns in fire severity on the one hand, and, on the other, the changes in soil erosion processes with time-since-fire. Therefore, factors such as pre-fire fuel load, vegetation composition and

topsoil properties will require careful consideration when extrapolating the current results to other burnt areas.