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Medium to long-term impacts of forest fires on slope to catchment-scale processes under current and future climate

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Forest wildfires can have important impacts on hydrological and soil erosion processes in burnt areas due to a variety of changes to soil properties and vegetation cover. The relevance of these impacts varies with wildfire characteristics, post-fire rainfall regime, and pre- and post-fire land management. The complex interactions between the various factors and processes have been one of the major obstacles to assessing wildfire impacts, particularly at larger spatial scales and over medium to long-term periods.

This presentation will show ongoing research on a forested region in north-central Portugal, the Vouga river basin, aiming at: (i) quantifying medium and long-term impacts of wildfires, and (ii) estimating the impacts of climate change on wildfire regimes and assess their implications in terms of hydrological and soil erosion processes, and land degradation in general. The focus will be in the methodology and some preliminary results.

To quantify medium and long-term impacts, existing information and data on the hydrological and soil erosion impacts of forest fires at small spatial and temporal scales has been compiled and analyzed. This information is the product of various international and national projects occurring since 1992, consisting of numerous observations on hydrological and erosion processes at the plot and hillslope. Ongoing work is also focusing on collecting data at the micro-catchment scale, and remote sensing imagery is being explored as a complementary information source, especially for large-scale landcover recovery patterns.

The ultimate goal is to up-scale this information to meso and regional-scale catchments (100-250 km2) as well as to decade and longer periods. A simple modeling tool is being developed for impact assessment across spatial scales, addressing both on-site effects such as land degradation, and off-site effects such as flood risks and sediment export rates. Preliminary results for a slope-scale application of the model will be presented.

The above-mentioned modeling tool, combined with climate change scenarios, will afterwards be used to estimate changes to wildfire regimes (frequency and intensity), and to assess their implications in terms of hydrological and soil erosion processes, and land degradation in general.