



## **A database on post-fire erosion rates and debris flows in Mediterranean-Basin watersheds**

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Wildfires can affect many Mediterranean countries on a yearly bases, producing damage and economic losses, both as direct effect of the fires and as consequent events, including erosion and sedimentation in the recently burned areas. Even though most of the wildfires occur in Spain, Portugal, southern France, Italy and Greece, it can be stated that no one of the Mediterranean countries is completely immune by such hazards. In addition to destruction of the vegetation, and in addition to direct losses to the built-up environment, further effects may also be registered as a consequence of the fire, even weeks or months after its occurrence. Wildfire can have, in fact, profound effects on the hydrologic response of watersheds, and debris-flow activity is among the most destructive consequences of these effects, often causing extensive damage to human infrastructure.

Wildfires are today continuously monitored by several European institutions, and forecasting of the conditions (weather, temperature, wind, etc.) more likely conducive to their occurrence is often available in real time. On the other hand, not much is known about the processes that occur as a consequence of the fire, including erosion and debris flows. These are often underestimated, and become object of study only after some catastrophic event has occurred. This is in strong contrast with all the established techniques of risk mitigation; as a result, no prevention action is generally considered, and the society relies only on the emergency phase following a disaster. Aimed at contributing to gather information about the occurrence of erosional and debris-flow activity in recently burned Mediterranean areas, and at making available these information to land planners and scientists, a specific database has been compiled and presented in this contribution. To date, scientific literature on the topic in Europe has never been catalogued, and was dispersed in a number of different journals and in conference proceedings. The database derives from critical analysis of the existing literature, integrated by case studies directly studied by the authors.

Studies on recently burned areas in the Mediterranean basin are most frequently carried out on small experimental plots, often with simulated rainfall. A problem of scale therefore exists when trying to extrapolate the erosion rates (also reported as sediment yields or as sediment losses) from these studies to a watershed scale. Very few articles, on the other hand, were found that document the watershed-scale response of basins to rainfall-induced erosion and debris flows following wildfires. The few reported cases of debris flows in the Mediterranean Basin describe erosion of sediment from the hillslopes and the channels (sometimes down to bedrock), and, for a limited number of sites, failure of discrete landslides. This information indicates that debris-flow generation from recently burned areas in the Mediterranean basin appears to occur primarily through sediment bulking processes. Nevertheless, the database so far compiled shows a distribution of post-fire erosion and debris flows in the western Mediterranean basin (Spain, essentially, but also Portugal), followed by the eastern Mediterranean area (Israel), and then by France, Italy and Greece. Even though still in a preliminary version, that needs to be integrated and updated from further sources, our data compilation allows for the unique opportunity to examine issues related to the generation of post-wildfire debris flows across a variety of environments and under a variety of conditions, and to move from a qualitative conception of the controls on post-fire debris-flow generation to the definition of specific conditions that result in their occurrence. Future activities of the project will include: i) updating and integration of the preliminary version of the database; ii) development of models that can be used to identify the probability of debris-flow occurrence and the magnitude of the event for pre- and post-fire hazard assessment in Mediterranean climates; iii) definition of rainfall thresholds for post-fire debris-flow events in Mediterranean climates, as a tool to provide guidance for preliminary warning systems.