



Post-fire rainfall events influence on debris-flows trigger mechanisms, evolution and sedimentary processes: the Rio Casella case study in the North-western Italian Alps

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A brief and localized rainfall event of moderate intensity, involving the Verbania province (Northern Piemonte, N-W Italy) on 18th July 2005, caused a debris-flow event along the Rio Casella torrent. This phenomenon occurred after that a large portion of the Rio Casella basin was affected by a wide ground-fire (0.7 km² of the total 1.6 km² basin area) in March 2005. The bedrock of the Rio Casella torrent catchment consists of massive metamorphic rocks. According to a recent study conducted on several alluvial fans in the alpine region (Moscariello et al, 2002), this lithological characteristic would make the Rio Casella basin primarily characterized by non-cohesive sediment gravity flow processes. However, debris-flow deposits accumulated during the 18th July event show an unusually large amount of fine grained particles which are characteristic of cohesive sedimentary gravity flows. In addition, dark-brown mud-rich deposits associated with old post-fire rainfall events have also been observed. Rainfall analysis related to the period between the fire and flood event, using both raingauges and meteorological radar data, pointed out that the debris flow triggered on 18th July 2005 had greater magnitude, but less precipitation intensity rates, compared to previous recent mud flows. These particular processes can be explained by considering the presence of burned organic material and fine-grained sediment deriving from soil thermal reworking that formed a thick layer of some centimeters covering about 44% of the basin drained by the Rio Casella torrent. The majority of this layer was winnowed

by the rainfall events during the March-June period, thus leaving a hydrophobic soil surface. In such conditions, run-off increased, corrivation time shortened and consequently discharge along the Rio Casella torrent increased as well. As a consequence, the rainfall action associated with the 18th July 2005 became more effective in mobilizing coarse sediments present in the Rio Casella channel.