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Tools for monitoring and assessing the stability of landslide dams

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Landslides that dam river valleys pose at least two types of threats: on one hand, as they are generally extremely rapid events, the occurrence of the landslide itself can produce loss of life and destroy property and infrastructure, on the other hand the damming of the river valley can produce extensive damage both upstream and downstream from the dam location. Upstream from the blockage, rapidly rising waters may cause floods that can reach significant distances and inundate communities along the river, mainly producing damage due to interruption of human activities and lifelines. Downstream the hazard can be even greater as a catastrophic failure of the dam can produce an outburst flood that can strike areas located along the river even at significant distances. The higher the peak discharge originated by the dam failure, the more devastating are its effects. In cases in which landslides threaten to dam river valleys two main issues exist: 1) will the landslide be large and fast enough to dam the river? and; 2) if a landslide dam forms, what will the most likely post-formation scenario be? Within the present study this topic has been extensively investigated leading to the production of an inventory of case histories from Italy (Alps, Apennines, Sicily), containing over 100 landslide dams, which are mostly quite well known (Casagli & Ermini,1999), and from around the world, updated from the original work of Costa & Schuster (1991). The study has produced interesting results consisting in a set of geomorphological tools that can represent useful instruments for civil protection authorities in the decision making processes associated with the management of emergencies deriving from landslide dam formation. Interesting new opportunities are also offered by the application of new monitoring techniques such as radar interferometry. Satel-

lite and ground-based radar systems can be used for real-time monitoring of landslides before failure and, once the failure has occurred and a landslide dam has formed, to constantly control deformations of the blockage. This information can be invaluable for the public authorities in charge of emergency management.