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Coseismic generated slope conditions related to the Mw 7.6 Kashmir earthquake of October 2005

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The Mw 7.6 earthquake that affected the middle Jhelum valley in Azar Jammu and Kashmir, Pakistan in October 2005 generated numerous coseismic landslides, concentrated along the hangingwall of the Muzaffarabad-Tanda Fault. In this mountainous area, slopes which did not fail in the vicinity of this activated fault were also seriously affected by the formation of complex arrays of tension cracks that are found on many hillslopes in association with small graben structures. Many of the cracks which occur both in bedrock and colluvium can be traced over considerable distances along slopes in the vicinity of the fault trace. In other situations, the cracks form arcuate patterns upslope of many coseismically triggered landslides. These crack arrays are due to two main mechanisms. Firstly they have been formed as a slope response to perturbations of the tensional stress regime associated with peak ground accelerations generated by the earthquake. Secondly, tensional cracks have occurred due to gravitational response on slopes associated with coseismic slope failures. Both sets of tensional fissures indicate areas of future slope failure as slopes respond to the new stress regimes in the post-seismic situation and through the monsoonal triggering cycle. On-going hazard in the area is associated with slopes at threshold stability associated with progressive failure of translational and deep seated failures and debris flows.

Disaggregation of hillslopes by ground shaking has also increased the amount of sediment available for future transportation and debris flow generation associated with rainfall, spring snowmelt and summer monsoon events. Continuous monitoring of slopes which have been affected by these tension cracks has been instigated at four sites to determine post-seismic slope response to slope stability in association with rainfall events. Measurements of both horizontal extension and vertical displacement will allow assessment of slope stability and future landslide hazard in this badly af-

fected area where more than 2.5 million people are still displaced from their land.