



The topographic signature of a Major Typhoon

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In August 2009, Typhoon Morakot, characterized by a cumulative rainfall up to 3000 mm in about three days, triggered thousands of landslides and debris flows in Taiwan. The availability of detailed LiDAR surveys before and after the event offers a great opportunity to deeply investigate the topographic signatures of a major Typhoon, thus providing a way to better understand the Earth Surface Processes and the landscape evolution in a region affected by these phenomena and where the uplift rate is significant. We considered six small catchments, located in the Central Taiwan, affected during the Typhoon Morakot by a different degree of slope failures (totally affected by shallow and deep-seated landslides, and not affected by any erosion). For each of these catchment high resolution Digital Terrain Model (DTM) was derived by LiDAR data, before and after the Typhoon. The scaling regimes of local slope (S) versus drainage area (A) in a loglog diagram served as the basis upon which recognize topographic signatures. The results suggested that for the catchments affected by landslides it is possible to recognize in the third SA scaling regime a characteristic signature of the SA relation: the topographic gradient of the relation tends to vary a little (or slightly increase) increasing the drainage areas. According to literature (Stock and Dietrich, 2003; Tarolli et al., 2009) this behavior of the relation is due to channels incised by landslides and debris flows. Differently, for the catchments without slope failures this signature is not present. These results are interesting because they offer a real example of landscape evolution under rainfall forcing, demonstrating that a Major Typhoon may significantly affect, in a short time, the SA scaling regimes. The possibility to obtain these information, immediately after an intense event, really represent a strategic tool for a first quantification of the processes that affected and significantly changed the earth surface, and provide a quick preliminary view on which part of the investigated landscape is more affected by these processes.

References

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