LI Gen and A. Joshua WEST, 2013. Landslides Associated with the 2008 Wenchuan Earthquake and Implications for the Mass Balance of Large Earthquakes. *Acta Geologica Sinica* (English Edition), 87(supp.): 364-364

Landslides Associated with the 2008 Wenchuan Earthquake and Implications for the Mass Balance of Large Earthquakes

LI Gen and A. Joshua WEST

University of Southern California, Los Angeles, CA 90089, USA

Earthquakes influence Earth's surface topography as a result of both deformation along faults, and seismically-induced landslides in the region of strong ground motion. The balance between mass increase from rock uplift and mass wasting from landslides and landsliding-facilitated erosion plays a critical role in mountain building and landscape evolution. A recent study of the 2008 Mw 8.0 Wenchuan earthquake provocatively suggested that the mass wasting from landsliding (5-15 km3) was significantly larger than the mass growth from coseismic uplift (2.6±1.2 km3) [Parker et al., 2011]. The mass addition was reasonably well constrained by Synthetic Aperture Radar (SAR) analysis, but the mass deficit in this study was estimated by mapping landslide areas from high-resolution satellite images using a semi-automated algorithm and empirical topographical masks.This may be problematic because the semi-automated routine does not rigorously distinguish individual landslides that can significantly influence volumes calculated based on non-linear power-law scaling relationships between landslide area and volume. We remapped the landslides in the Longmenshan area using the semi-automated algorithm, and refined the dataset by manually excluding false areas (e.g. terraces and buildings) and cutting large-area landslides into their constituent parts. The remapped dataset returns a significant lower cumulative landslide volume that is consistent with the global scaling relationship between landslide volume and magnitude [Malamud et al., 2004] and is comparable to the mass addition associated with co-seismic deformation during the Wenchuan earthquake. Statistical parameters are proposed to explain the contrasting results; the difference between the datasets is mainly caused by the segmentation of large-area landslides. On the global scale, we use this case study as the basis for a novel geometric model incorporating the scaling relationships between rapture area, fault displacement, and magnitude, together with global landslide scaling relationship, to calculate orogenic growth associated with earthquake events of varying magnitude. This suggests that it is earthquakes of moderate magnitude that contribute most to topographic growth.

Key words: Wenchuan earthquake, landslide mapping, earthquake mass balance

References

Malamud, B. D., D. L. Turcotte, F. Guzzetti, and P. Reichenbach (2004), Landslides, earthquakes, and erosion, *Earth and Planetary Science Letters*, 229(1–2): 45-59.

Parker, R. N., A. L. Densmore, N. J. Rosser, M. de Michele, Y. Li, R. Q. Huang, S. Whadcoat, and D. N. Petley (2011), Mass wasting triggered by the 2008 Wenchuan earthquake is greater than orogenic growth, *Nat Geosci*, 4(7): 449-452.

* Corresponding author. E-mail: genli@usc.edu