

This file contains a supplementary Table listing the imagery used to map landslides and 10 supplementary figures

Fig S1 contains the size distribution of landslide for the three different mapping techniques for the Brazil 2011 event.

Fig S2 contains the landslide density map for the eight inventories.

5 **Fig S3** contains the rainfall estimated from satellite during the 2015 Colombia landslide events.

Fig S4 shows correlations between storm total rainfall, duration and peak intensity.

Fig S5 contains results validating the landslide width estimation based on polygon geometry.

Fig S6 shows the length/width ratio distribution and their relation to landslide area for the eight inventories.

10 **Fig S7** contains the correlation between the parameter of an Inverse Gamma distribution or a Log-Normal distribution fit for the landslide scar area.

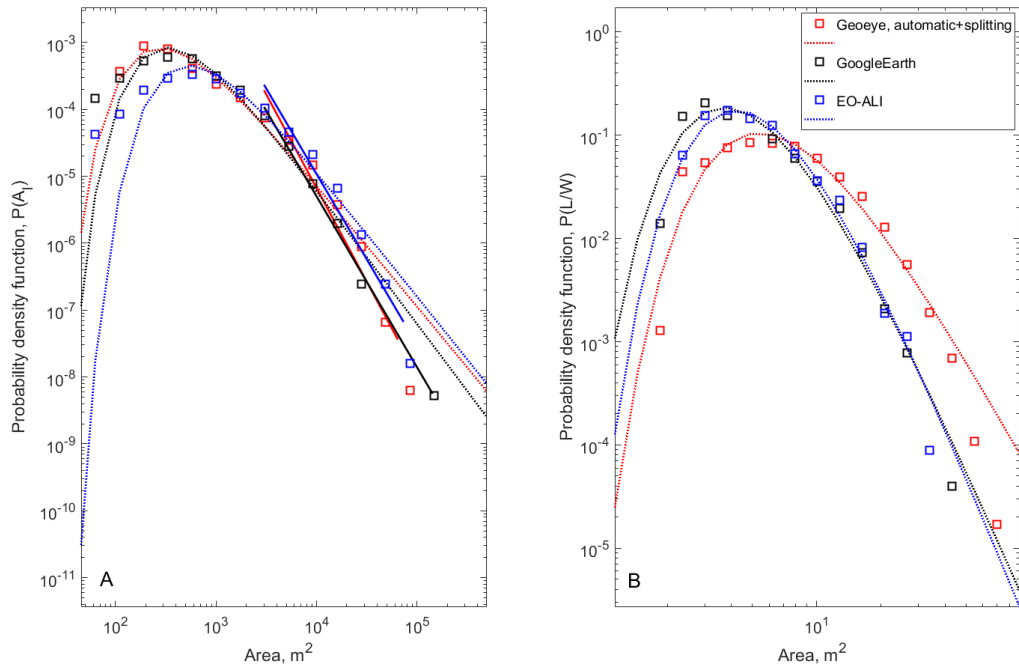
Fig S8 shows the relation between landslide density and normalized total rainfall.

Fig S9 shows the landslide distribution of the landslide caused by Typhoon Talas in Japan 2011, and its relation to lithological units.

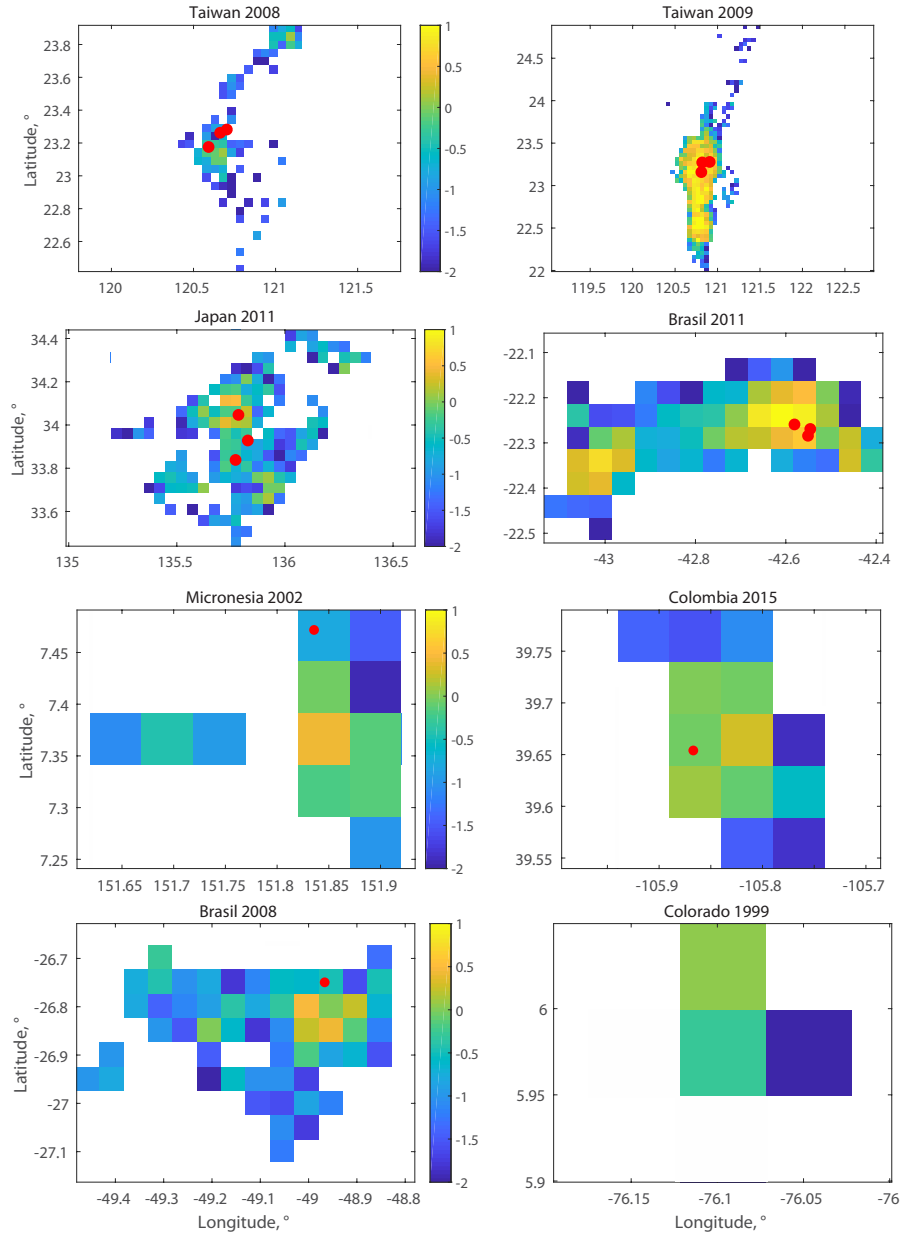
Fig S10 shows the relation between maximum landslide size and total rainfall.

Table 1. Summary of the publicly available imagery accessed to map the rainfall-inudced landslides. The format is as follow: Year[Type-Date]. Year is the same as the event when not specified. Image type are abbreviated as L5/8, EO, S2 and GE for Landsat 5/8, EO-ALI, Sentinel-2 and Google Earth. ** For Taiwan 2009, Brazil 2011 and Japan 2011, we also accessed Formosat-2, Geoeeye-1 and aerial photographs, as described in the main text.

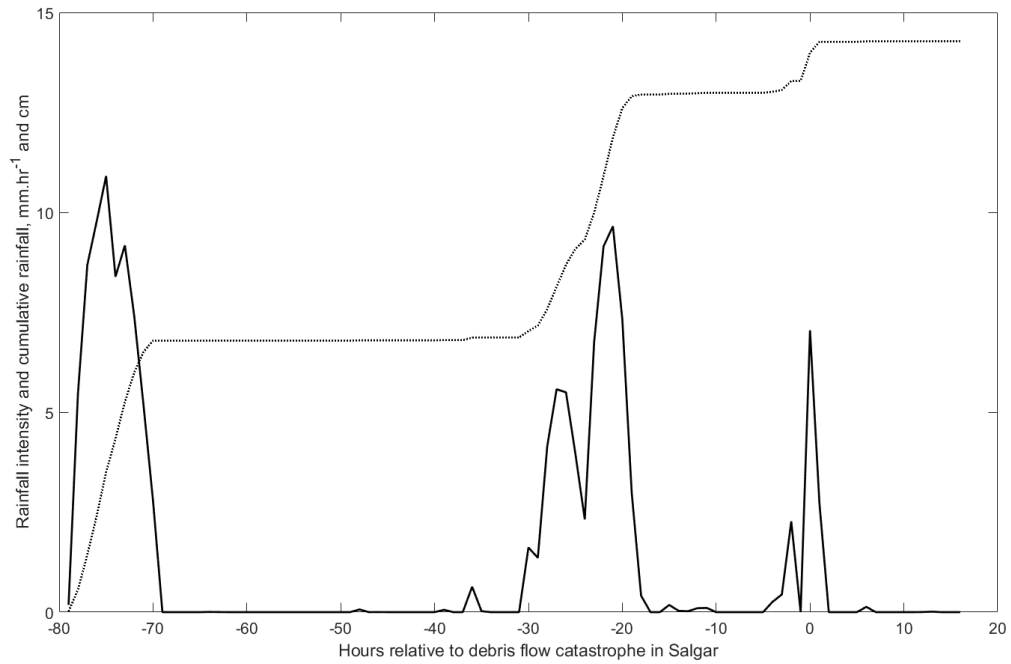
Event	Brazil 2008	Taiwan 2008	Taiwan 2009**	Brazil 2011**	Japan 2011**	Colombia 2015
Pre-event	L5-062	L5-173/196	L5-175	2010[EO-083]; GE	2010[L5-122/154]; L5-196;	2014:[L8-200/361]
Post-event	2009[L5-032]; GE	L5-205	L5-255	EO-033; GE	L5-285/308; GE; 2015[S2-272]	2016[L8-142; S2-203];GE



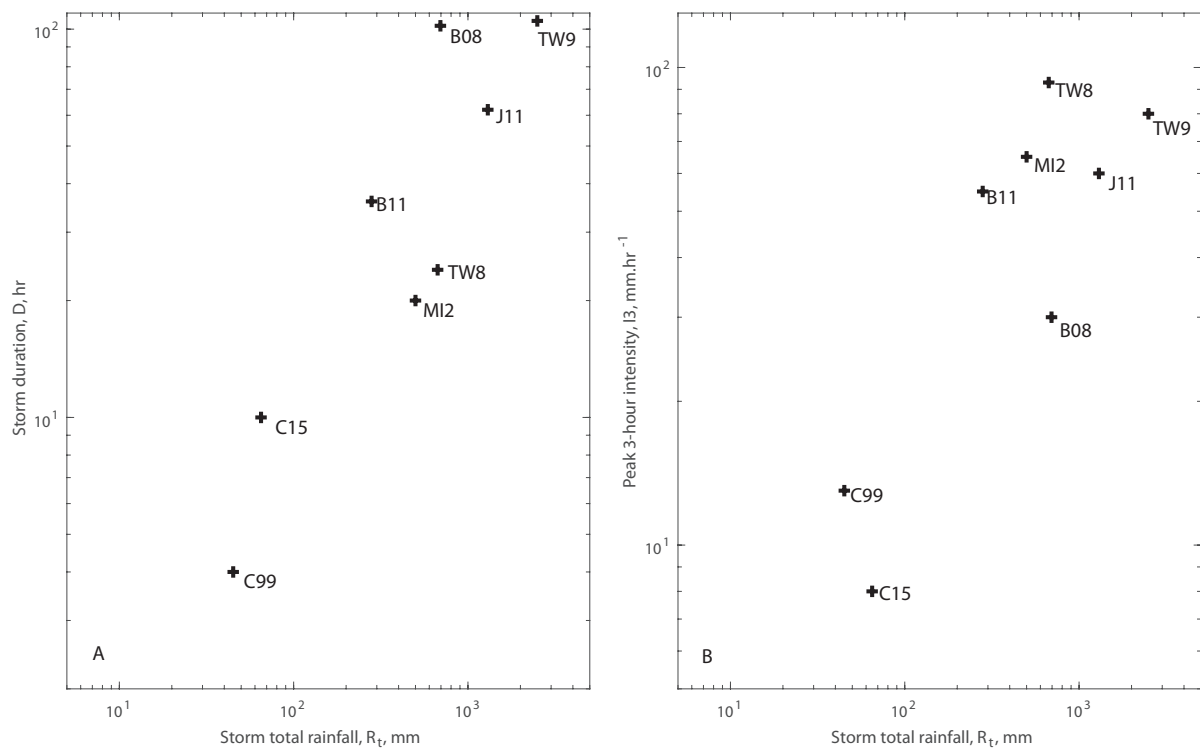
Supplementary Figure 1. Probability density functions of landslide area (A) and length/width equivalent ratio (B) for three subareas of the Brazil 2011 event, mapped with different methods: Manually from Google Earth, manually from EO-ALI and with an automatic supervised classification of a very high resolution Geoeeye image, followed by manual splitting and corrections. Dashed lines are maximum likelihood estimation of an Inverse Gamma Distribution associated with each catalog, while solid lines are least square fit of the power-law tails.



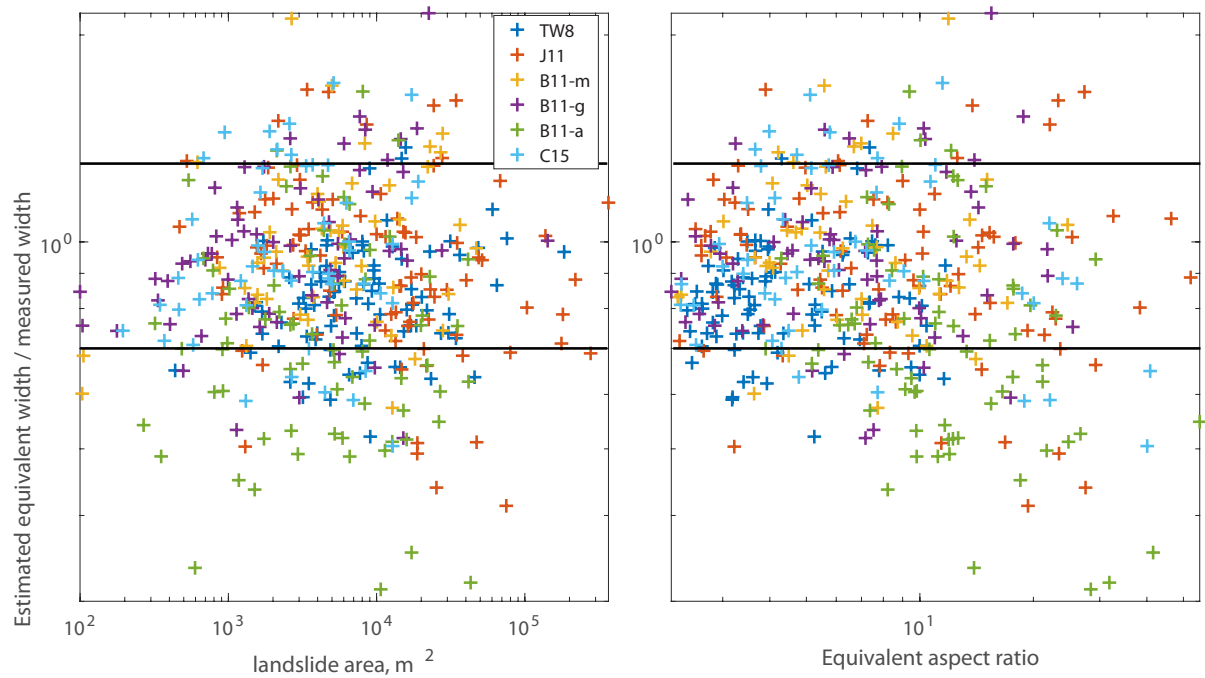
Supplementary Figure 2. Map of landslide density (in %) in the affected area of the eight events. Density is computed as the total area of landsliding in a $0.05 \times 0.05^\circ$ cell divided by the area of the cell. The colorbar indicate the \log_{10} transformed density. Red dots represent rain gages accessed in this study.



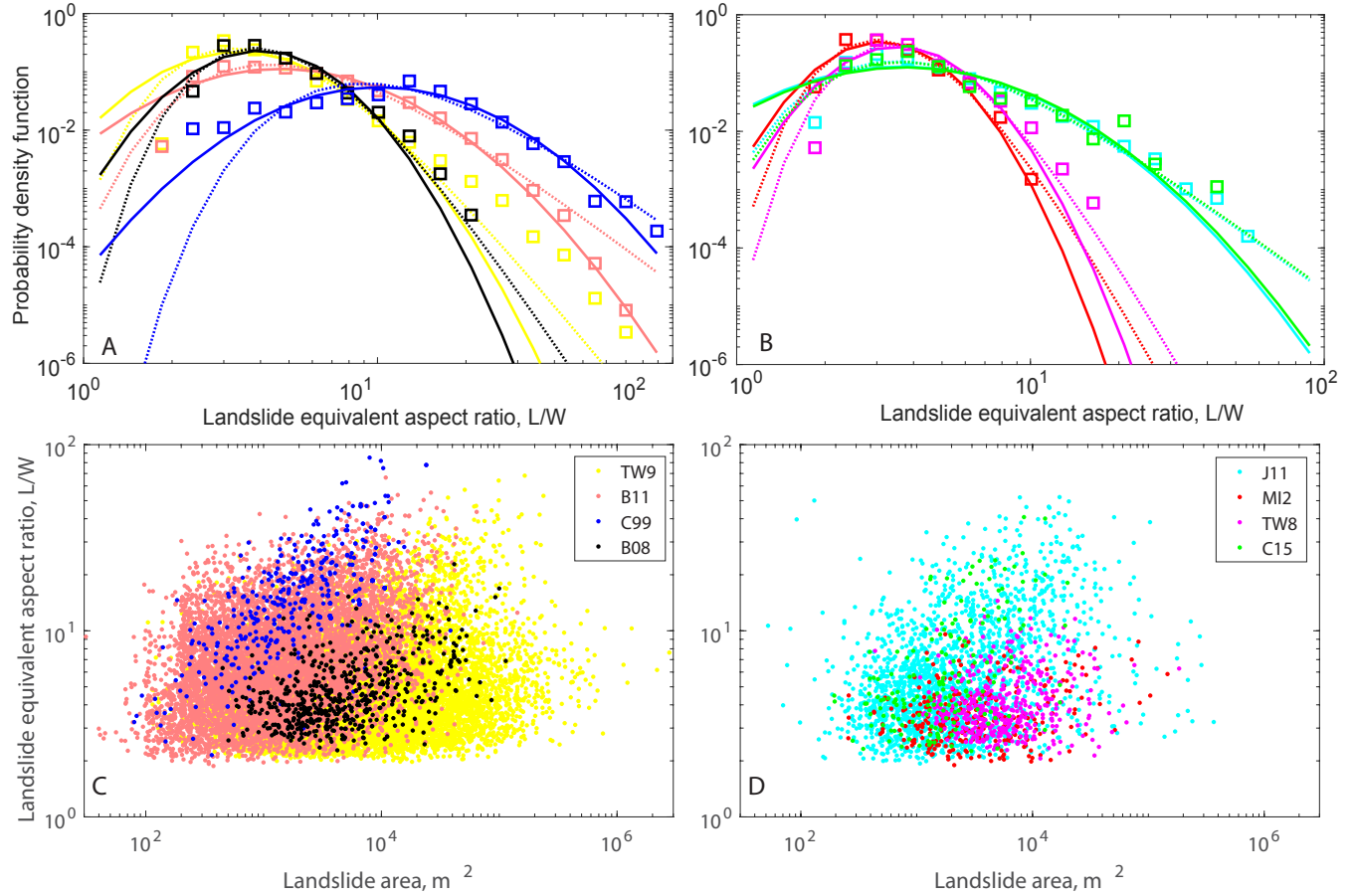
Supplementary Figure 3. Rainfall intensity (solid) and cumulative rainfall (dashed) estimates from GSMaP version 7 ungaged products. These estimates are based on the average of the four $0.1 \times 0.1^\circ$ pixel covering the area containing the landslides from the Colombia 2015 event near Salgar.



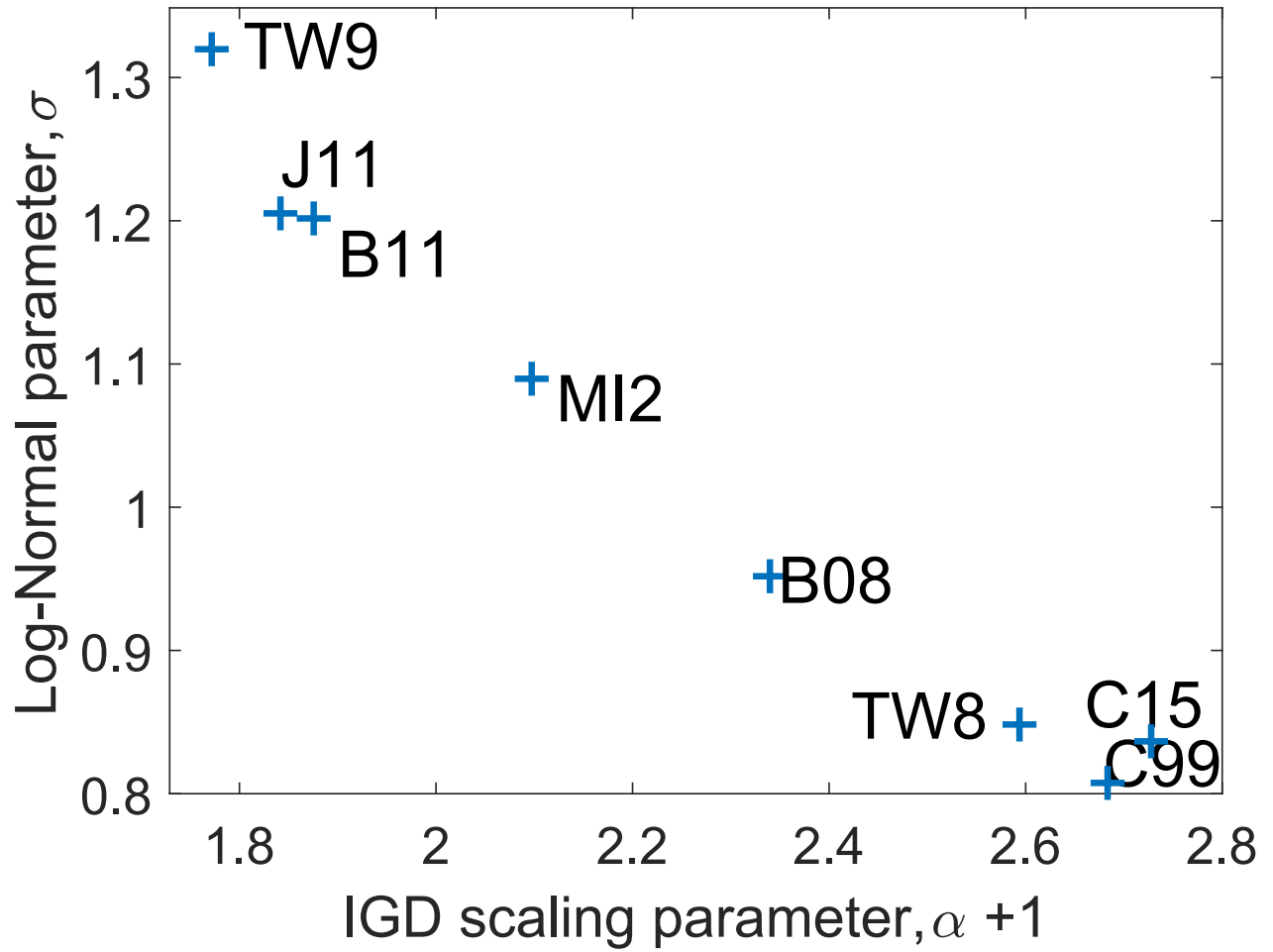
Supplementary Figure 4. Correlations between storm total rainfall and storm duration (A) and peak rainfall intensity (B).



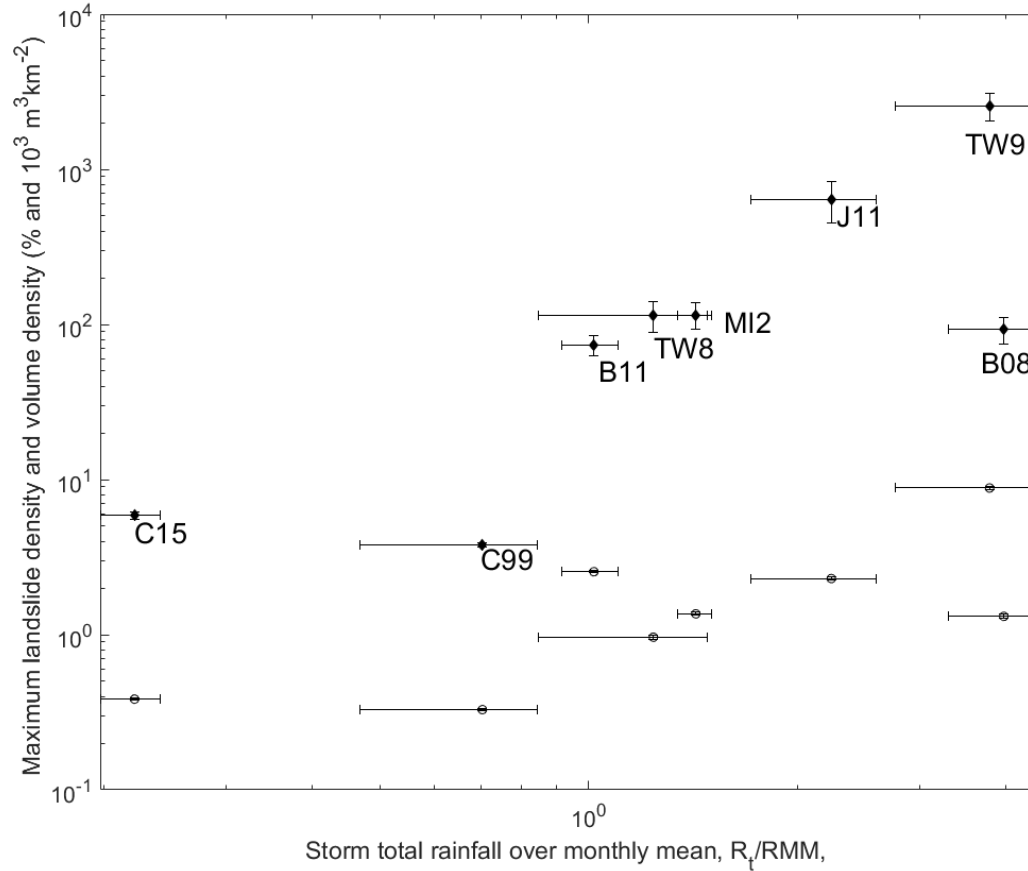
Supplementary Figure 5. Ratio between the estimated landslide polygon widths (based on perimeter and area measures) and the measured scar width perpendicular to downslope direction, against (A) polygon area, and (B) polygon equivalent aspect ratio, for 418 landslides out of 4 inventories. The horizontal black lines delimit the range of 30% above or below a ratio of 1.



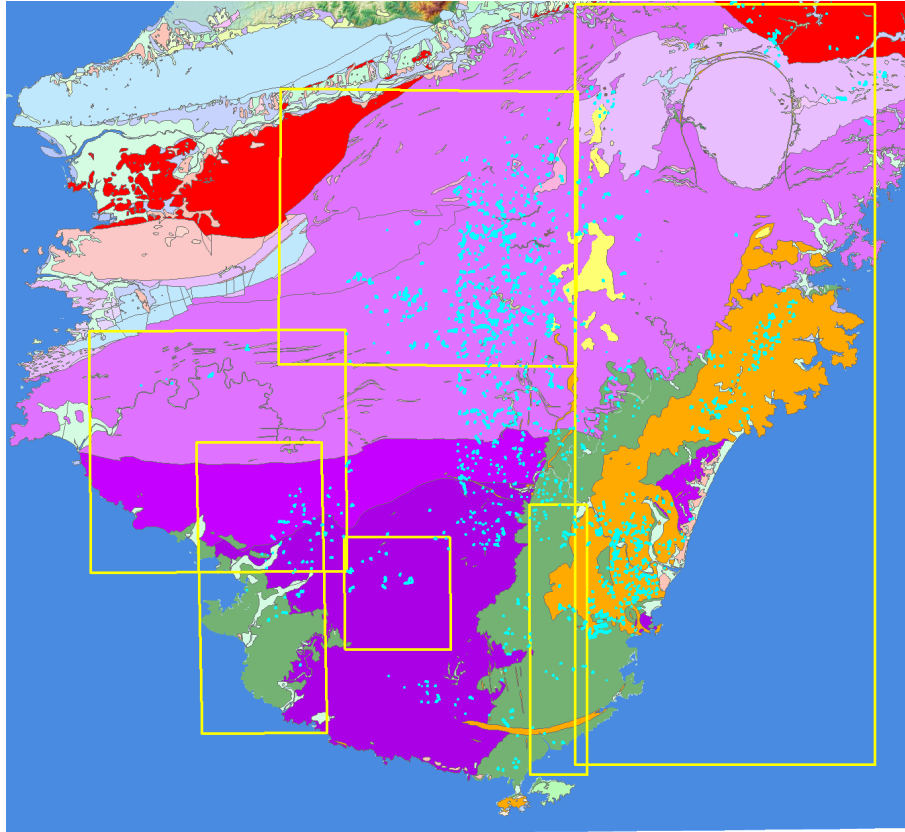
Supplementary Figure 6. Probability density functions of length/width equivalent ratio (A,B) and scatter plot of length/width equivalent ratio against landslide area (C,D) for the 8 landslide inventories. All inventories have a modal L/W of 2-4, except C99 where multiple debris flow were merged and that has a mode beyond 10. Then inventories can be divided in two groups, one where long runout (> 10) landslides are rare (MI2,B08,TW8,C15) while for the others events long runout are much more frequent, including for small landslides.



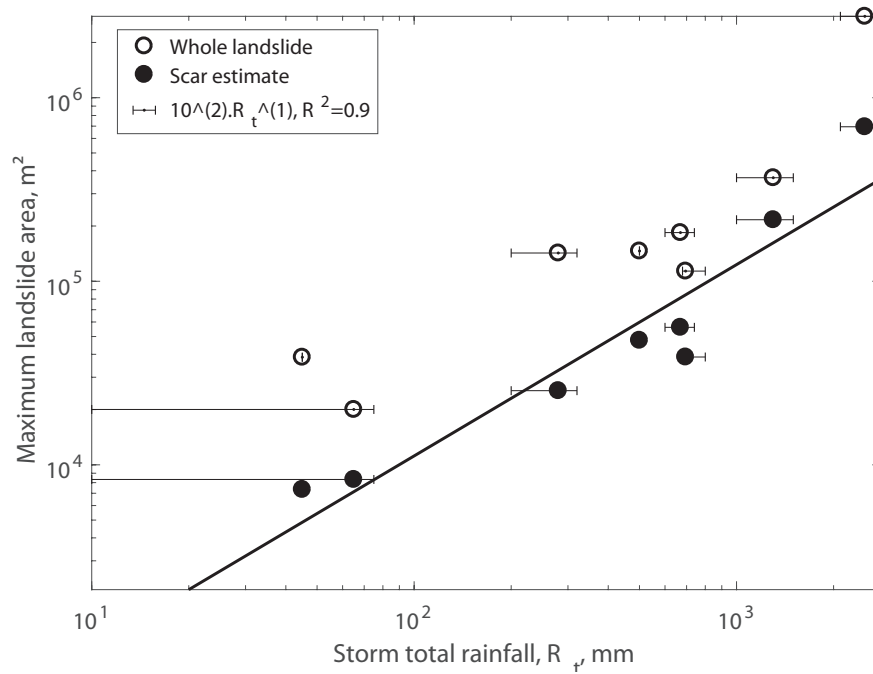
Supplementary Figure 7. Correlation between the decay exponent obtained for an Inverse Gamma distribution fit of the landslide scar size distribution and the parameter (σ) of a log-normal best fit of the same data. Data and fit are displayed in main text figure 3 C and 3D



Supplementary Figure 8. Peak landslide density in a 0.05° sliding window, against storm total rainfall normalized by the 30 year mean monthly rainfall for the month of occurrence of the storm. We averaged records (1981-2010) from Alishan and Yushan station for TW9, and a third station for TW8, available at <https://www.cwb.gov.tw/V7e/climate/monthlyMean/Precipitation.htm>. We used Owase station record (1981-2010) for J11 available at <http://www.data.jma.go.jp/obd/stats/data/en/smp/index.html>. For B08 and B11 we used maps of mean monthly rainfall (1961-1990) from <http://clima1.cptec.inpe.br/monitoramentobrasil/pt>. For C99 we averaged mean monthly values reported in Vail and Idaho springs by <https://www.usclimatedata.com/climate/colorado/united-states/3175>. For C15 and M02 we had to use CRU model results available for 1961-1990 from <http://sdwebx.worldbank.org/climateportal/index.cfm>.



Supplementary Figure 9. Landslide triggered by Typhoon Talas superposed on a simplified geological map. Main lithological units are an Accretionary Melange (4 shades of purple) from Jurassic age (North, light purple), to Miocene age (South, dark purple), Schist (red), Marine Sedimentary rocks (green), volcanic rock (orange) and plutonic intrusion (yellow). Others units North and West are irrelevant to landsliding. Although the relative abundance of landslide in the volcanic zone compared to the neighboring sedimentary zone may relate to rock properties (strength, weatherability), lithology clearly cannot explain the specific landslide pattern within the melange zone.



Supplementary Figure 10. Maximum landslide area from the whole landslide or the estimated scar against the total rainfall from the eight inventories.