RE: NHESS 2016 251 Deng et al. Meteorological factors driven glacial till changing and the associated periglacial debris flows in Tianmo Valley, southeast Tibetan Plateau

Overview

This paper tries to find a correspondence between physically based triggering factors and three occurred debris flows. The english form of the paper is very poor (e.g. at line 32 "located in downstream") and is not acceptable for publication. Moreover, authors should find a better characterization for the peri-glacial debris flows. In other words they could start the differences between runoff generated debris flows and the peri-glacial debris flows. The last issue is that the text is confused: a more synthetic and schematic approach would help the readers. The following are the detailed comments and specifications.

1. The acronyms as TM, DF1, DF2, DF3, SPOT should be defined before their use. Moreover, their use in the abstract should be avoided as much as possible.
2. As runoff generated debris flows, periglacial debris flows are triggered by a water stream that entrain sediments and forms a solid-liquid wave. Water stream is the result of one or a combination of three factors: runoff due to rainfall, melting ice and outburst floods. Due to this similarity between runoff generated debris flow, authors should introduce something more about runoff generated debris flows: the runoff generated debris flows initiate when a peaked runoff hydrograph (Kean et al., 2012; Rengers et al., 2016 and Gregoretti et al., 2016) flow over or impact debris deposits entraining solid material forming the so called debris flow (Berti and Simoni, 2005; Cannon et al., 2008; Coe et al., 2008; Gregoretti and Dalla Fontana, 2008, Theule et al. 2012, Hurlimann et al., 2014, Degetto et al., 2015, Hu et al., 2016).
3. The use of rainfall threshold for explaining the effect of the air temperature should better addressed by explaining that first air temperature increase causes melting and as consequence an abundance of stream water. Therefore, respect to runoff generated debris flows, the rainfall needed for providing the exact critical discharge for debris flow triggering is much minus.
4. Upstream noise (line 116) could be due to slides or rock fall triggered by previous rainfall?
5. Lines 156-163: debris flow are usually triggered by abundant runoff. Abundant runoff is usually provided by convective rainfalls of high intensity and short duration rainfall (Berti

and Simoni, 2005; Gregoretti and Dalla Fontana, 2008). This type of rainfall is characterized by an high spatial variability (Gregoretti et al., 2016). The same authors at line 291 state that a convective storm occurred before DF1 while at the Bomi station no precipitation was recorded. Therefore, please justify in another way the use of the Bomi station. (i.e. data from this station can be used for long-period analysis of cumulative annual rainfall).

6. Lines 186: DF2 and DF3 should defined before their use.
7. Line 208: what is SPOT? Is it the acronym of?
8. Line 228: the writer does not understand the unit measurements for the relative glacial retreat provided by equation (1): what is the duration of year n? According to equation (1) D should be 1/n as dimensions (Area/Area = 1).
9. Lines 300-301: the writer does not understand the meaning of this sentence.
10. Lines 330-340: the sentences seem not clear.
11. Line 421: this statement (no debris flow occurred) contradicts line 128 (debris flows were triggered).
12. There is a clear dependence of debris flow occurrence on the air temperature, while that on rainfall is minus evident (also because direct rainfall measurements are missing in the triggering areas of examined debris flows). This could be explained by the following consideration: debris flow is generated by runoff and runoff is due to the rainfall precipitated upstream the triggering area. This is the mean reason because two debris flows occurred in September. In that month the areas not covered by snow should have reached the largest extension of the year and therefore, runoff in the downstream area should increase. About rainfalls, these could be subjected to an high spatial variability.

Berti, M., and A. Simoni (2005), Experimental evidences and numerical modelling of debris flow initiated by channel runoff, *Landslide*, 2, 171--182.

Cannon, S., Gartner J.E., Wilson, R.C., Bowers, J.C., Laber, J.L. 2008. Storm rainfall conditions for floods and debris flows from recently burned areas in Southwestern Colorado and Southern California. *Geomorphology*, 96, 250-269.

Coe, J.A., Kinner D.A., Godt, J.W., 2008. Initiation conditions for debris flows generated by runoff at Chalk Cliffs, central Colorado. *Geomorphology*, 96, 270-297.

Degetto, M., Gregoretti, C., and Bernard M. 2015. Comparative analysis of the differences between using LiDAR contour-based DEMs for hydrological modeling of runoff generating debris flows in the Dolomites. Frontier in Earth Sciences. 3:21, doi:10.3389/feart.2015.00021

Gregoretti, C., Dalla Fontana G., 2008. The triggering of debris flow due to channel-bed failure debris flow in some alpine headwater basins of the Dolomites: analyses of critical runoff. *Hydrological Processes*. 22, 2248-2263.

Gregoretti C., Degetto M., Bernard M., Crucil, G., Pimazzoni A., De Vido G., Berti M., Simoni A. Lanzoni S. Runoff of small rocky headwater catchments: Field observations and hydrological modeling. *Water Resources Research*. 52(8) doi: 10.1002/2016WR018675

Hu, W., Dong, X.J., Wang, G.H., van Asch T.W.J. and Hicher P.Y. 2016. Initiation processes for run-off generated debris flows in the Wenchuan earthquake area of China, Geomorphology. 253, 468-477. http://dx.doi.org/10.1016/j.geomorph.2015.10.024

Hurlimann M., Abanco C., Moya, J., Vilajosana I. (2014). Results and experiences gathered at the Rebaixader debris-flow monitoring site, Central Pyrenees, Spain. *Landslides*. doi:10.1007/s10346-013-0452-y 161-175

Kean J.W., Staley D.M., Leeper R.J., Schmidt K.M., Gartner J.E. (2012). A low-cost method to measure the timing of postfire flash floods and debris flows relative to rainfall. *Water Resources Research*, 48, W05516, doi:10.1029/2011WR011460

Rengers, F.K., L.A. McGuire, J.W. Kean and D.E. Hobley (2016), Model simnulations of flood and debris flow timing in steep cachments after wildfire, *Water Resources Research*, 52, doi:10.1029/2015WR018176.

Theule, J.I., Liebault, F., Loye, A., Laigle, D., and Jaboyedoff, M., 2012. Sediment budget monitoring of debris flow and bedload transport in the Manival Torrent, SE France. *Natural Hazard Earth Sciences*, 12, 731-749.

.

.