Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10654, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10654
EGU General Assembly 2008

Toreva blocks - peculiar deposits of large-scale landslides on volcanoes: examples from Kamchatka (Russia).

M.Belousova, A.Belousov
Institute of Volcanology and Seismology, Petropavlovsk, Russia (belousovsasha@yahoo.com)

In some cases last sliding blocks of large-scale volcanic landslides do not transform in long-runout debris avalanches. Instead they come to rest not far from the source, forming large mounds in breaches of horseshoe-shaped landslide scars - so called “toreva blocks”. Well-known examples are torevas of Socompa (Chile) and Jocotitlan (Mexico) volcanoes. We present new data on 4 cases of volcanic landslides with toreva blocks on volcanoes in Kamchatka (Avachinsky, Taunshits (2 landslides) and Shiveluch). Toreva blocks of each of the studied landslides form 1-3 steep step-like cliffs in breaches of the horseshoe-shaped craters. The cliffs (up to several hundreds meters high) are facing in the direction of the landslides; they outline rather flat upper surfaces of the toreva blocks. Well-preserved parallel sequence of lava flows and pyrocastic layers gently inclined toward the source region is visible in the cliffs. The sequence is dissected by multiple faults; lavas are strongly fractured, but overall original geological structures are much better preserved than in the corresponding debris avalanche deposited further downslope. The main question is why toreva blocks come to rest so close to the source and do not transform in the debris avalanche. Apparent coefficient of basal friction of toreva blocks (H/L about 0.3) is much higher than that common for volcanic landslides (about 0.1). Our data about basal contacts of debris avalanches have shown that lowest basal friction exists in the leading frontal part of a traveling debris avalanche (expressed in the outcrops as no erosion of the substrate surface). The farther from the frontal part (closer to the avalanche tail), the stronger is drag force in the base (stronger erosion of the substrate). We hypothesize that in frontal parts of a traveling debris avalanche some kind of natural lubricant is forming

(possibly in the form of dust cloud of strongly agitated particles). Being drugged under the traveling avalanche the lubricant reduces basal friction of the avalanche allowing it to travel unusually far from the source. With distance from the avalanche head efficiency of the lubricant becomes progressively lower and thus tail of the avalanche experiences much stronger basal friction than the avalanche head. This can explain why last sliding blocks have rather large coefficient of basal friction - they stop not far from the source and form torevas.