Geophysical Research Abstracts, Vol. 8, 00193, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00193

Estimation of old earthquakes magnitudes in Gorny Altai region (Russia) on the basis of landslides analysis

R. Nepop, A. Agatova

Institute of Geology SB RAS, Novosibirsk, Russia (agatr@mail.ru , rnk@online.nsk.su)

At present time on the basis of statistical analysis of the landslide distribution in seismic areas worldwide different analytical and empirical dependences were obtained. These dependences connected earthquake magnitude and various physical quantities which characterize the relief deformations caused by the earthquake [Malamud, Keefer, Hovius].

The relationship (1) between earthquake momentum magnitude () and the volume of the largest triggered landslide (V_{Lmax}) [Malamud 2004] is the most interesting for Altai mountain region (Russia). That is because of three reasons. First of all, the largest landslide retains in relief for a long period of time. Then, every earthquake causes a lot of small landslides and only one the largest. And finally, just the largest landslide can be diagnosed by remote sensing which is very important in out-of-the-way mountain places.

$\log V_{L\max} = 1,36M - 11,58 \pm \sigma, \quad \sigma = \quad 0,49 \quad -$ standard deviation. (1)

There are a lot of paleoearthquake traces (rock-falls, landslides, faults etc.) within SE Altai and directly in the epicentral zone of September 2003 Chuya earthquake. Their seismic genesis is determined by the concentration of this forms, their coincidence with boundaries of morphostuctures and by the size of accumulative bodies. Tectonic activity of SE Altai (Russia) in Holocene was confirmed by 27 September 2003 Chuya earthquake (M=7.5), occurred along the boundary between North- and South-Chuya ranges and systems of Kurai and Chuya intermontane depressions [Agatova 2005]. The parameter of giant landslide (aria - 0,66 km^2, volume – 0,027 km^3) caused by this earthquake confirms relationship (1) for Altai mountain region. It allows us to estimate the lower-bound magnitude of paleoearthquakes. To estimate a higher-bound magnitude we suggest using the simple linear relationship between momentum earthquake

magnitude and the length of main scarp of the largest landslide. Permissibility of using the simple linear dependence is justified by closeness magnitudes of old earthquakes and the modern one.

This analysis gives adequate accuracy for paleoseismogeological method [Nikonov 1988]. Large landslides and rock-falls, which were mapped on the southern border of Kurai and Chuya intermontane depressions, traces seismically active NW dextral fault zones. Paleoearthquake magnitudes (6.9 – to max. available), which were obtained by analysing these seismodislocations, show larger than considered earlier seismicity of the Altai mountain region, its similarity to Mongolian Altai and give a method of seismicity evaluation for the whole Altai region.