Geophysical Research Abstracts
Vol. 20, EGU2018-6535, 2018
EGU General Assembly 2018

Debris flow and slushflow phenomena in Lovozerskiye Tundry, Kola Peninsula, NW Russia

Anna Rudinskaya, Yuri Belyaev, Artem Gurinov, Ekaterina Garankina, Vladimir Belyaev, Fedor Romanenko, Maxim Ivanov, and Egor Tulyakov

Lomonosov Moscow State University, Moscow, Russian Federation (rudinskaya94@gmail.com)

Lovozerskiye Tundry is a compact plateau-like mountainous massif located in the central part of Kola Peninsula 10 km eastward from the Khibiny Mountains. In perspective of mining and tourism development, risk assessment of natural hazards is essential. Numerous erosional valleys, glacial troughs and cirques, and tectonic lineaments deeply incise the massif 28 km in diameter with relative heights up to 500 m. One of the specific processes of valley development representing important natural hazard are slushflows, specific subtype of debris flows (Perov, 1996). Unlike typical debris flows, these are essentially water-saturated snow masses with limited (commonly <12%) content of clastic material (size up to 1-2 m) occurring in low-order stream channels. Slushflows are widespread in arctic and subarctic environments (Fleishman, 1978; Nyberg, 1989; André, 1995; Hestnes, 1998; Bozhinsky et al., 2001; Laroque et al., 2001). Nearby, in the Khibiny, slushflow phenomena were thoroughly investigated over the last 50 years (Bozhinsky et al., 2001). However there is no reliable published data on their localization, dynamics and intensity in the Lovozerskiye Tundry.

Geomorphic interpretation of high-resolution satellite imagery from public services and 1:50000 topographic maps showed widespread distribution of geomorphic evidences of debris flow phenomena within the massif. Detailed field survey conducted in 2017 generally confirmed these results. Specific landforms and deposits distinguishing active slushflow origination, transit and deposition zones were observed in 22 out of 30 investigated mountain valleys longer than 3 km. Apparently, most of the slushflows in the Lovozerskiye Tundry are originated by rapid snowmelt, possibly added by rainfall, in narrow deep channels in upper reaches of larger basins. In addition, there are also gravitational slushflows localized in steep avalanche tracks starting as wet snow slab failure similar to wet snow avalanches. Typical granular debris flows – with low content of fine material (Coussot and Meunier, 1996) – are possible in, at least, four basins due to periodical occurrence of extreme water discharges from moraine-dammed lakes triggered by avalanches and/or rockfalls into lakes. It has also been found that granular debris flows in lower parts of valleys can be triggered by slushflows in their upper parts. For example, during the 2017 field campaign initial stages and consequences of such a complex event starting as slushflow and continuing as granular debris flow was observed on July 3 in the Sengisjok valley. The following field surveys have established the limits of all morphodynamic zones. For the run-out zone, a detailed lithological map was compiled. For the transit zones mean and maximum debris sizes were measured and maximum splash levels were determined by the debris traces and large plant remnants as about 2 m above the channel for the deposition zone. Additionally, large-scale aerial photography of the four key sections of the valley floor was accomplished using UAV DJI Phantom 3 for further monitoring.

The study was funded by RFBR project №17-05-00630 and GM -16-11632810089-5.