



Mountain permafrost in areas of modern volcanic activity: Kluchevskaya volcano group (Kamchatka)

A. Abramov (1), D. Gilichinsky (1), R. Motenko (2), E. Tikhonova (2)

(1) Soil Cryology Laboratory, Institute of Physicochemical and Biological Problems in Soil Science, Pushchino, Russia, (2) Dept. of Geocryology, Lomonosov Moscow State University, Moscow, Russia (pro-forest@mail.ru / Fax: +7 496 7330595)

The permafrost conditions of Kluchevskaya volcano group have been studied as a starting point for investigations of formation and dynamics of permafrost in areas with modern volcanic activity.

There are several geocryological zones in this area (according to altitude zonation): non frozen zone (from 0 to 900 m asl), where friezing is seasonal, some rare islands of frozen ground can be found higher than 450 m asl. At upper levels in mountains, permafrost have island, discontinuous and continuous distribution. The mean annual ground temperatures are decreasing with altitude: from 5 °C at 20 m asl to 0 °C at low boundary of permafrost, and down to -7...-8 °C at 2500 m and -16 °C at 4000 m. The maximum permafrost thickness is about 450 m, the active layer thickness decreases with altitude from 2.5 m at 900 m to practically 0 m at 4000 m asl.

We drilled dozen of boreholes (from 5 to 25 m deep) at different altitudes between 800 and 3075 m asl, in different landscape conditions. The hourly surface and subsurface temperature data from loggers and temperature measurements in boreholes are presented. We have CALM sites at different altitudes in this area (at 1330 and 1630 m asl). From 2003 to 2006 the active layer thickness was 67-78 sm and 49-54 sm respectively.

Glaciers here are distributed higher then 1400-1500 m asl with average thickness 30-40 m. The most of them probably are cold type. Basal melting is possible in caldera areas where the ice has maximum thickness more than 200 m.

The thermal-physical properties of volcanic tefra have been estimated in

field and in laboratory. These deposits have very low ability to heat transfer (due to high porosity): scoria $\lambda_t=0.17$ (Moisture content=0%)- 0.27 (10%)- 0.44 (45%)W/m*K, $\lambda_f=0.16$ (0%)- 0.34 (10%)- 0.66 (45%)W/m*K; ash $\lambda_t=0.18$ (0%)- 0.30 (21%)- 0.58 (43%)W/m*K, $\lambda_f=0.16$ (0%)- 0.42 (21%)- 0.65 (43%)W/m*K. Due to this, it can preserve permafrost and buried ice from melting or sublimation. The unfrozen water content in these deposits is about 0.2-0.4% (from -10 to -3 C).

The next step – modeling the permafrost distribution and temperature fields for this area using all available data.

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