Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

ACC021-03 Room: Exibition hall 7 subroom 3 Time: May 27 11:15-11:30

Verification of 50cm-ground-temperature method for permafrost detection by idealized numerical experiments

Tetsuo Sueyoshi[1*], Atsushi Ikeda[2], Go Iwahana[3]

[1]JAMSTEC, [2]Inst. of Mountain Sci., Shinshu Univ., [3]Grad School of Env. Sci., Hokkaido Univ.

"50cm-ground-temperature method", or GT50 method is one of the technique for detecting the lower boundary of permafrost distribution in a mountainous terrain, which is based on the change in ground-temperature lapse rates at 50-cm depth during summer. The basic idea behind this method is that the 50-cm depth ground temperature is generally controlled by the balance of mean daily air temperature and ground heat flux, and this balance is affected by latent heat from permafrost as well within permafrost zone. This effect from permafrost causes the bend in lapse-rate plot along the slope, which can be interpreted as a lower boundary of permafrost zone. The method is suitable for the field work which has difficulties in logistics, especially for remote region or steep mountain (Fukui et al., 2006; Fujii et al., 1999; Fujii and Higuchi, 1972).

Although useful, the method should have certain limits of application, because it depends on the variation of ground heat flux, the amount of latent heat, etc. The aim of this study is to verify this GT50 method quantitatively, to investigate necessary conditions and rooms for improvements. The distributed 1-D ground temperature calculation was made in a idealized semi-infinite slope, assuming uniform atmosphere-land energy exchange.

For the first step, temperature profile of equilibrium state was calculated, 50-cm ground temperature was plotted against the altitude. As a preliminary results, the plot shows the dependence to the grand water content, and the method cannot detect the boundary if the permafrost is very dry (volumetric water content < 1%). Other results for different ground water content, diurnal variation, thermal conductivities will be shown in the presentation.

Keywords: permafrost, ground temperature, observational method, numerical experiment, mountain area