Visualization of snowmelt infiltration water by resistivity monitoring

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It is important to understand the flowpath of groundwater that influences the stability of the landslide for efficient landslide measures. Nakazato et al.(2005) monitored the ground resistivity changes in the landslide area in the Kobe Group distribution region. And, they clarified that the ground resistivity in the upper part from 8m in depth showed the annual variation which caused mainly by the ground temperature change. In this research, we tried to make the snowmelt infiltration water visible as a tracer by the resistivity monitoring by using such the temperature dependence of the ground resistivity.

The investigation site is the upper part of the landslide block of 250m in length and 120 in width and the maximum thickness about 20m located in the landslide prevention area, Goudo Daini in the IIyama city, Nagano Prefecture. The survey lines of electrode spacing 2m were arranged in a direction of the slope and a slope transverse direction as the length of 118m and 98m respectively. The resistivity monitoring was carried out from September, 2001 to November, 2002 almost every other day by the automated observation system (Nakazato et al., 2003) that consisted of McOHM-21. The electrode arrangement adopted the dipole-dipole method. At the same time as monitoring, measurements of soil moisture, ground temperature and groundwater conductivity along the survey line were executed as a reference data of the resistivity change.

The survey results were arranged on apparent resistivity pseudosections as a apparent resistivity change rate to the initial (the data in September, 2001). As a result, we recognized the tendency which the high resistivity part expanded most in the middle of April when melting of snow ended in the landslide colluvium under the main scarp in this investigation site. Because the soil moisture meter of 2 and 3m in depth did not show a big change at the melting of snow period, it is concluded that this resistivity change caused by the flow of the snowmelt infiltration water of the low temperature and the high resistivity.

References

Nakazato et al. (2003) Technical Report of the National Institute for Rural Engineering, No.201,173-182.
Nakazato et al. (2005) Journal of the Japan Landslide Society, Vol.42, 303-311.