A feasibility study for detecting a cavity as a groundwater flow path using DC resistivity and TDIP surveys in Shikawada cold springs area, Miyako Island, Japan.

*Shogo Komori[1], Shinichi Takakura[1], Tishiyuki Yokota[1], Yoshiyuki Nagaura[2], Yoshiaki Iguchi[2]

1. National Institute of Advanced Industrial Science and Technology, 2. Eight-Japan Engineering Consultants Inc.

Induced Polarization (IP) survey is one of effective tools to reveal an underground structure associated with ore deposits and diffusion of pollutants from a landfill, because their components (i.e., sulfides) exhibits a high polarizability in response to applied voltage. Recent studies have found that the IP is caused by constricted pores due to clay minerals and/or partial water saturation, which could allow us to use the IP for discriminating strata and for exploring water flow paths (Titov et al., 2004; Gazoty et al., 2012). In the present study, we examined a feasibility of detecting groundwater flow paths beneath the Shirakawada cold spring area in Miyako Island, Japan, by means of the IP effect. DC resistivity and TDIP surveys were conducted by using the Iris instruments' syscal pro and switch pro 48ch, under the dipole-dipole configuration comprising dipole lengths of 3 m, 6 m, 12 m, and 24 m with a length of 141 m, and n factors between 1 and 6. Steel electrodes galvanized by cupper, and non-polarizing electrodes were used for current injections (approximately 1 A per injection) and potential measurements, respectively. Another DC resistivity survey was also performed in the Tanahara cave, adjacent to the cold spring area, to confirm that the survey is applicable to the cavity detection on the above survey scale. In the present study, we will show the observed data and resistivity and chargeability structures inverted by the Res2Dinv program (Geotomo software), and examine the groundwater flow path beneath the Shirakawada site.

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