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Application of EM-ACROSS to the monitoring of geological environment at Horonobe, Hokkaido

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Japan Atomic Energy Agency (JAEA) is carrying out Horonobe Underground Research Laboratory (URL) Project to enhance the reliability of relevant geological disposal technology through investigation of deep geological environment within the host sedimentary rock. Development of remote monitoring technologies for geological environment is one of the subjects of this project. ACROSS (Accurately Controlled Routinely Operated Signal System) which has been developed in JAEA was selected to confirm applicability as the monitoring tool to observe any changes in the geological environment due to construct underground facility. EM-ACROSS uses electromagnetic waves, and is advantageous to the monitoring of groundwater content.

We settled two current dipole sources and three receiver stations which measure electromagnetic fields around the Horonobe URL. These receivers are about 1-2km away from the transmitter. We carried out a trial observation in the frequency range 2.5-140Hz for more than one year. We observed the EM-ACROSS signal at all stations, and obtained a set of reliable components of the tensor transfer function. From the analysis of the averaged transfer functions it was estimated that the conductivity decreased with depth. We also investigated temporal variations of the transfer function. The correlation between the temporal variations and seasonal environmental influence were observed. The experience and results of this observation are providing us with the development plans towards the routine methodology for the active monitoring of the geological environment.

Keywords: ACROSS, electromagnetic field, electrical conductivity, monitoring