Application of ACROSS to the monitoring of geological environment; Development of remote monitoring system in Horonobe, Hokkaido

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Monitoring has been discussed as part of the institutional control of a high-level radioactive waste (HLW) repository. Geological disposal is essentially a passive system and, in principle, does not require post-closure management to ensure long-term safety. However, in order to confirm the safety of the repository, it is important to ensure that, even if conditions such as groundwater flow, geochemical characteristics and mechanical properties determined by the preliminary site characterization vary due to perturbations induced by the construction and operation of the repository or by natural events, the range of variation would be within the predetermined design-based margin. In addition, post-closure monitoring may be required in some cases due to societal demand. R&D on the Accurately Controlled Routinely Operated Signal System (ACROSS) has been pursued to develop a remote monitoring system that allows determination of underground structures and assessment of the evolution of rock properties and hydrological conditions with a resolution higher than that of conventional geophysical surveying techniques. The electromagnetic (EM) and the seismic ACROSS have been installed around the Horonobe Underground Research Laboratory (URL) and experimental monitoring prior to the construction of the underground facilities was started. The EM and seismic ACROSS are consisted a transmitter and 3 receiver stations. These receivers are about 1-2 km away from the transmitter. The observed spectra by operating ACROSS show that the amplitude of frequencies correspond to the transmitted signal are higher than that of other frequencies. It is indicated that the transmitted signal was certainly received.