Development of techniques to investigate deep geological enviornment through the Mizunami Underground Research Laboratory project

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As a basis for research and development of geological disposal on high level radioactive waste, development of appropriate techniques to investigate deep geological environment has been studied through the Mizunami Underground Research Laboratory project by JNC since 1996. The following results have been obtained: -geological structures inferred from ground geophysical surveys and fracture analysis in boreholes, -measurement techniques of identification of water conducting features, and -interrelation between rock mechanical ,hydrochemical and hydrogeological characteristics.An overview of the knowledge and results are presented.

1.IntroductionAs a basis for research and development for geological disposal of high level radioactive waste, investigation techniques and methods to understand deep underground environment have been studied through the Mizunami Underground Research Laboratory project by JNC since 1996.2.InvestigationsGround geophysical surveys, and subsequent geological, hydrogeological, hydrochemical, and rock mechanical investigations in deep boreholes from surface have been carried out. Geological/structural modeling and groundwater simulation have also been performed using the results.3.ResultsThe following results have been obtained;1) Geological structures inferred from ground geophysical surveys and fracture analysis in boreholesFrom the combination of the geophysical surveys (seismic reflection survey and electromagnetic surveys) and the fracture analysis using cores, fractured zone that is distributed from the unconformity to approximately 350mbgl is defined in the Toki granite.2) Measurement techniques of identification of water conducting featuresFrom the combination of the monitoring of drilling fluid, geophysical loggings and fluid loggings, water conducting features are determined. Among of all techniques, detailed monitoring of drilling fluid, flow-meter logging and temperature logging are of use in identifying hydrogeologically conductive fractures (ca. 10-6 m/sec).3) Interrelation between rock mechanical,hydrochemical and hydrogeological characteristicsRock mechanical survey (stress measurement using hydraulic fracturing) reveals that the Toki granite is divided into three domains. The most upper domain accords with not only the fractured zone but also the oxidized zone that is defined by the results of Fe2+/Fe3+. This fracture zone has a great influence on the geological environments (ex. groundwater flow, rock mechanical stability). It is supposed that the geological processes of the Toki granite shed some lights on the quantification of such influences.4.Future plansA shaft and drifts will be excavated for further investigations in drift scale. A systematic investigation techniques and methods to understand deep underground environment should be constructed through the investigation process.