

Formation mechanism of redox boundary in sedimentary rocks

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This study integrates hydrogeological and geochemical investigations to characterize the redox boundary in sedimentary rocks using boreholes MSB-2 and MSB-4 in the Mizunami Underground Research Laboratory (MIU) Construction Site. Distributions of hydraulic head show large downward gradients and low fluid pressures. These are caused by the low vertical-permeability strata as a hydraulic boundary at approximately 160 to 130masl. Groundwater chemistry shows that the concentration of redox-sensitive species and Eh values are different across the hydraulic boundary. The hydraulic boundary probably plays a role as a barrier against the penetration of oxidizing groundwater from ground surface into a deep reducing zone, and corresponding to the redox boundary. Such a system, where the reducing zone is protected by a hydraulic barrier would provide an important insight into the long-term stability of hydrochemical conditions deep underground.