

Investigations of macro-porous altered highly porous zones in Toki granite near the Tsukiyoshi fault near Mizunami, Japan

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The permeability and porosity of granitic rocks along tectonic faults, and at regional scale, has been a topic of interest in hydrogeology and in earthquake-related sciences. Although the effects of faulting on granite are widely documented, the effects of porosity enhancement by hydrothermal alteration and earlier metasomatism near and away from fault zones in granites have not been widely studied. Here we present the preliminary results and observations of an investigation of drill cores from the Shobasama area JAEA drill site near Mizunami, Gifu prefecture. Previous work by JAEA also indicated the presence of intensely leached rock volumes, of large extent (10's meters wide). Although the granite is normally a low porosity rock here (<1%), porosity in parts of altered granite is high (> 10%), and this is not caused by fracturing (e.g. fault damage zone), but by metasomatic and hydrothermal processes of fluid and rock interaction. Some leached granite domains were categorized as episyenite due to quartz dissolution and vuggy character (porosity up to 30%). Based on data from downhole thermal Neutron porosity-density logs, and digital photos of drill core, we inspected many drill core boxes at JAEA core storage and selected about 150 drill core samples for analysis. Permeability will be measured with N₂ gas permeameter probe developed at Kyoto University, and porosity will be measure. The drill core porosity along several transects can be compared to the Neutron log porosity, and it can be used in calibration of such logs. The porosity structure and connectivity of macro-pore channels is assessed by recording videos and images of gas bubble discharge patterns from porous granite, in addition to mineralogical, XRD, and microscopic analyses along these zones that are planned. Mapping the spatial distribution to 1km depth, and clarifying the origin of these porous granites in relation to tectonic and hydrothermal activity, will improve the knowledge of local and regional hydrogeology and of the water-rock interaction processes.

Keywords: Probe permeameter, Fault zone, Mizunami