Porosity-permeability structures and a basin analysis of Miyazaki Group

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Knowing the hydraulic properties of sediments within a sedimentary basin is important to understand the underground fluid flow processes inside a basin quantitatively. In a laboratory, we can measure the hydraulic parameters of rock samples, such as porosity and permeability, at confined pressure conditions inside a pressure vessel simulating the lithostatically loaded condition of rocks underground. If the pore fluid pressure of sediments is hydrostatic throughout the whole region of a basin, we will be able to apply the experimentally determined relationships between the effective pressure (Pe) and the hydraulic parameters of rock samples to the depth condition of the basin simply assuming a constant effective

pressure gradient toward the deeper horizons. In this study, we experimentally determined hydraulic parameters (porosity and permeability) of the rock samples collected in Miyazaki Group, and constructed the hydraulic structure under ground. Miyazaki Group has several characteristics: same rock facies in the different stratigraphies, monocline structure with no big fold. This helps us to estimate the effect of time-dependent compaction. Miyazaki Group. Miyazaki Group is also known to natural gas and hot springs, so we can get the some boring cores and compare the experimental data of outcrop and that of boring cores

We measured permeability and porosity as a function of Pe up to 100 MPa using the high-pressure apparatus at Kyoto University. Permeability decreased with increasing Pe and permeability did not fully recover during decompression. Porosity also did the same. Permeability was generally higher in sandstones than in siltstones. Porosity change from 40% in upper area to 8% in lower area. From experimental data, We estimated porosity and permeability underground structure of Miyazaki Group. We also calculated specific storage using the porosity from experimental data, solved the one-dimensional fluid equation using the permeability and specific storage as a function of Pe (Bethke and Corbet, 1988).