Hydraulic diffusivity around the Kamioka mine estimated from barometric response of pore pressure

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The frequency response of monitoring of pore pressure inside rock mass is significantly improved by closing the well. Pore pressure of the rock mass is successfully measured at higher frequencies (0.1 Hz ˜2 Hz) using closed borehole well in contrast to using open wells that may have a high-cut response by wellbore storage effect. We closed the wellhead of the four artesian borehole wells that was drilled at the Kamioka mine, central Japan, and carried out the pressure measurement. We obtained that the pore pressure response both to barometric pressure change and to earth tides, which is in agreement with theoretical model derived from the linear poroelasticity. The amplitude of tidal response of the wells is consistent with those of response to seismic waves. We determined local shear modulus and loading efficiency, which correlates to the Skempton coefficient, from the observed data. The result suggested that the local shear modulus corresponding to borehole well tapped near fault zone is smaller than that corresponding to borehole well tapped into host rock that is away from the Mozumi-Sukenobu fault. We also estimated hydraulic diffusivity from the low-cut frequency of the barometric response of pore pressure. For the wells drilled near the Mozumi-Sukenobu fault, the in situ value of hydraulic diffusivity is 0.1 m^2/s, which is consistent with that determined by core measurement. At the site near the Atotsugawa fault, hydraulic diffusivity is estimated to be 0.1 m2/s in one well. Pore pressure in the other well responds to barometric pressure in period range above 1 day, which implies that the aquifer is unconfined.