

Estimation of vertical hydraulic conductivity from pore pressure response to barometric pressure fluctuation

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Pore pressure is measured primarily for estimation of groundwater flow. Multi-depth pore pressure measuring devices have been developed and much time series data have been accumulated. These data show fluctuation due to barometric pressure change. The purpose of this study is to propose a method for estimation of vertical hydraulic conductivity from barometric response of multi-depth pore pressure data.

Based on poroelasticity, pore pressure measured in deep section responds undrained to barometric change and pore pressure measured in shallow section responds drained. Therefore, analyzing the difference of measured response between deep sections and shallow sections, we can estimate vertical hydraulic conductivity. We developed estimating procedure using multi-depth time series. Multi-depth measurements also remove an annoyance of barometric attenuation in unsaturated layer, because the shallowest section below the water table is used as a reference section for estimation of properties in saturated zone.

We adopted this method to the time series of 5 sections measured in one borehole. In this result, we can estimate vertical hydraulic conductivity macroscopically up to 120m depth.

This study proposed a new method for estimation of vertical hydraulic conductivity using pore pressure response to barometric pressure change. These passive measurements and an analyzing method seems to be useful for estimating vertical hydraulic conductivity macroscopically, which is difficult to be shown in other ways.