



Vertical velocity in semi-confining layers in Chianan coastal plain, southern Taiwan

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The Chianan coastal plain in southern Taiwan consist of horizontal sand and mud layers over hundred meters thick. Those fine-grained aquifers have been exploited for decades and cause large hydraulic gradient between shallow and deeper aquifers. In theory, a vertical flow may occur in the semi-confining layers. However, there is no research on the vertical flow in Taiwan's coastal fine-grained layers. We represent a study of borehole temperatures by monitoring wells from 2013 to 2016. We discover that there is a vertical downward flow in 60-120m with a Darcy velocity of $1.6-3.2 \times 10^{-9}$ m/s by the Bredehoeft and Papadopulos (1965) curve matching method which assume a steady state boundary condition. However, a warming trend in the shallow aquifer and a cooling trend in the deeper aquifer during our studied period that may change the curve shape of borehole temperature and cause some errors. Therefore, we simulate 1D heat transfer for those data and find a vertical velocity of 2.45×10^{-8} m/s, one order larger than the curve matching method, while the thermal diffusivity is 1.2×10^{-6} m²/s and porosity assumed as 0.35.