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The different response by various natural stimuli and processes (tidal force, barometric loading, ground shaking and crustal strain) were used as the elements of the hydraulic information in the earthquake induced groundwater level changes. Using the ocean tidal force to act as naturally recurring stimuli to provide a sufficiently varied distribution of excitations in time and space, and represented the hydro-geological changes responses to the earthquake processes. The purposes of this study are to analyze the recently observation results of the earthquake induced tidal deviation of groundwater level in observation wells around Hualien city, eastern Taiwan. The analysis of the tidal responses and the atmospheric pressure responses also will be used to estimate the mechanical properties of the aquifer. Comparison the observation between the sea level and the groundwater level changes in the each event, offers the opportunity to discussion the possible mechanism of the hydrologic response to earthquake. Curiously pre-seismic groundwater level changes in the pattern of tidal deviation occurred repeatedly in several local seismic events nearby the Hualien City. Poroelastic model been used to act as the simulation tool to fit to the pre-seismic groundwater level changes. The results shows groundwater preseismic change could be simulated by a recharge or discharge at a fault zone with poroelastic model. The numerical results could support our conceptual model with a permeable fault zone between sea loading and groundwater responses. Our numerical model provides some information for the preseismic mechanism but more investigations are required.

キーワード: Groundwater, Permeability Structure, Pre-seismic
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