

Coastal Groundwater Dynamics in Sandy Beach

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Tidal motions of the water table height inside a nourished sloping beach are investigated via intensive field measurements and theoretical considerations, with the purpose to facilitate better understanding of groundwater environments in sandy beach. Taniyagi Beach on Toban coast, a nourished and constructed beach in Akashi City was chosen as a field observation site. This selection was motivated by its geological setting. The beach is characterized by a long stretch of sea cliff of Pleistocene soil and the associated gently sloping shore platform. With a such geological setting, the beach is expose to erosion by wave action (Woodroffe 2003).

An intensive field observation has been starting since April 2005. First-phase field instrumentation included an beach groundwater observation well (designed GW), two column of three-sensored tensiometers for measuring soil suctions, four soil moisture probes, a rainfall gauge and an atmospheric pressure gauge. A tide gauge was also installed at the nearby Fujie fishing port. Azuma et. al., (2005), give detail instrumentation layout and observation results, which included discussions on beach environmental responses due to typhoon even in 2005.

The data set presented here mainly derives from second-phase of observation period, in which we installed additional instrumentation including three beach groundwater observation wells (designed as H17-1, H17-3 and H17-4). Note that wells H17-3, H17-4 and GW, together form an array that is approximately perpendicular to the shoreline, with distances 12.1 m, 23.1 m and 34.1 m, respectively

from the shoreline. The idea of this wells configuration is to obtain a comprehensive description of beach groundwater table changes over time for particular points along beach profiles.

Analysis of ten minutes interval data of tidal and beach groundwater fluctuation records collected during the second-phase shows some interesting characteristics:

- There are strong correlation between tidal and beach groundwater fluctuation at the observation wells. Peaks and troughs appear at time series of tidal fluctuation, also become visible at time series of beach groundwater fluctuation at the observation wells (H17-3, H17-4 and GW).
- Even in the period of no significant rainfall (magnitude or duration), the time averaged beach groundwater table from the observation wells stand considerably above the mean sea water level (T.P=0.0 m).
- Comparing the tidal record with the beach groundwater fluctuations record obtained from the observation wells, shows the tidal amplitudes slowly attenuate as they propagate in the landward direction.

References

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- Woodroffe, C.D., (2003). *Coast*, Cambridge University Press, pp.143-188.