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Dynamic of Saltwater Intrusion in a Coastal Aquifer: Examination of Field Performance

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The dynamic of saltwater intrusion in an unconfined coastal aquifer is investigated via intensive field measurements, with the purpose to increase understanding of coastal hydrologic system, especially for the study site. The observation site selected is on Taniyagi Beach, a nourished and constructed beach in the Toban coast.

An idea about layered nature of the beach soil is obtainable from Fig. 1, where the result of surface-wave survey is plotted together with boring log and N-value of recently conducted SPT test. The observation wells (indicated by vertical arrows) are located along the straight lines at the right angles to the coastline.

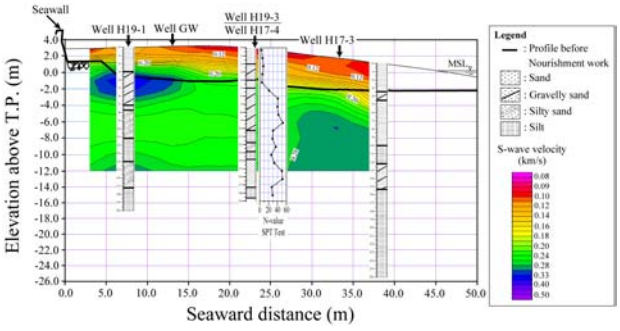

Figure 1. The geological structure along the cross-sectional profile of studied site.

The beach groundwater level, groundwater electric conductivity (EC) and groundwater temperature up to well depth, together with the tidal fluctuation are continuously observed. The seawater-freshwater interface is evaluated in two ways:

1. By continuous EC measurement.

This measurement is conducted by installing continuous EC meter in well H19-3, at the position of TP=-2.44m. The sensor is also equipped with automatic water pressure sensor, so it is become possible to monitor groundwater level at the well for the same time. This monitoring method is aimed to observe the long-term variation of the seawater-freshwater interface.

2. By direct logging.

In addition to long-term variation, we also examine short-term variations of the seawater-freshwater interface by direct logging. This observation is focused on the effect of daily tidal fluctuation on beach groundwater salinity. For this purpose, the electrical conductivity and temperature of groundwater in all of the five observation wells are measured at high tide and low tide stage. This measurement is conducted by inserting portable EC meter in the observation wells. The groundwater EC and temperature then be recorded for every 0.5m depth.

The measured performance of groundwater EC shows some interesting characteristics:

- There are strong correlation between tidal fluctuations and groundwater EC fluctuations. Peaks and troughs appear at time series of tidal fluctuation, also become visible at time series of beach groundwater electrical conductivity at the well H19-3.
- The seawater-freshwater interface of studied site is found to have dispersion zone rather than a sharp interface.
- The effect of daily tidal fluctuation on EC variation become visible. Clearly, the tidal fluctuation from low tide stage to high tide stage, forces the seawater to intrude further inland.