

Study of salt water and fresh water boundary fluctuation by using the high density electrical resistivity method

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The fluctuation of the salt water / fresh water boundary in the seashore groundwater with the tidal change has been studied to understand the structure of the salt water and fresh water boundary by the 2-dimensional vertical measurement based on the high density electrical resistivity method.

100m-length resistivity measurement line was set up to across the coastline in Nijinomatubara seashore, Karatsu city, Japan. The Wenner arrangement electrical resistivity method by 1m interval with 100-point electrode was executed to observe the resistivity change along the measurement line during the tidal cycle between 15:30 on July 30th~9:10 on 31st, 2001. The measurement was performed a total of ten times for the same 2-dimensional section during the observed tidal cycle.

The obtained apparent resistivity on the quasi-sectional view shows clear change with the tidal cycle. The obtained apparent resistivity distribution was converted into the electric conductivity distribution of groundwater using the experimental result of the soil resistivity character against the salt concentration in the studied seashore sand. As a result, three typical domains have been confirmed in the studied coastal area during the investigated tidal period; a sea water domain, an interfering water domain, and a fresh water domain. In the sea water domain, it was narrowly distributed below the coastline when a tide level was low and it has expanded toward the inland side when a tide level became high. In the interfering water domain, it shows little delay against the tidal change. In the fresh water domain, there is no evidence of the influence of salt water with the tidal change.

The present study was based on the apparent resistivity distribution. The inverse analysis of the resistivity result will be considered in the future.