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電気探査による環礁島における帯水層の塩水化評価

Evaluation of aquifer Salinization in the atoll islands by using Electrical Resistivity

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The freshwater in aquifers of coral atolls whose average of elevation are a few meters occur mainly as lenses floating on salt water underneath the islands. However, the freshwater aquifer is possibly salinized by the sea-level rise, the decrease of rainfall recharge rate reflected by the climate change, the increase of storm overwash, extractions due to the overpopulation. There is high possibility that the aquifer salinization can damage the important natural ambience for the people living habitat such as crops field and vegetation. In this study, the aquifer salinization is evaluated by using electrical resistivity, hydrological and long-term meteorological data in two low-lying coral atolls, Laura islet, Majuro Atoll, Marshall islands and Fongafale islet, Funafuti atoll, Tuvalu. The hydrological surveys conducted in Laura islet indicated that the interface between seawater and freshwater is shallowed in August 2009 as possibly a result of the recent decrease of the decadal rainfall and/or the sea-level rise. The detailed structure of the freshwater lens based on the electrical resistivity surveys showed patches of brackish water caused by the intrusion of seawater and over-pumping. The clear intrusion of the saline water was observed near the lagoon coast, which might be influenced by the recirculation of the seawater in the margin of the freshwater lens. The recirculation was confirmed based on the analysis of seepage meters to detect the submarine groundwater discharge (SGD). On the other hand, in Fongafale islet, the geoelectric and hydrological surveys conducted in March 2009 showed that the soil and groundwater salinization was mainly caused by the tidal forcing during spring tides. The vadose zone is not expected to retain the pore freshwater any more. The decrease of the resistivity during the flood tide indicates the coastal aquifer beneath the islet is intruded by the saline or brackish pore water in phase with the semi-diurnal tide. The aquifer allowing the intrusion can be formed by gravel retaining high porosity due to the past reclamation resulting from the airfield construction.

キーワード:帯水層塩水化,環礁,ツバル,電気探査,気候変動,淡水レンズ

Keywords: aquifer salinization, atoll, Tuvalu, electrical resistivity, climate change, freshwater lens