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Freshwater Lens Observation: Case Study of Laura Island, Majuro Atoll, Republic of the Marshall Islands

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Abstract : Atolls are low-lying small islands with highly permeable ground that does not allow rivers and lakes to develop. As the water resources on these atolls basically rely on precipitation, groundwater becomes a very important water resource during droughts. Freshwater lenses develop as groundwater on relatively large atoll islands and play a key role in the stable water supply. Atoll islands in the Pacific Ocean sometimes suffer from drought due to El Nino. The global warming effects are noticeable, particularly on atoll islands. The Republic of the Marshall Islands in Oceania is burdened with the problems common to atoll islands. About half of its population lives in the capital, Majuro, and securing water resources for these people is a crucial issue. There is a freshwater lens on the largest, Laura Island, which serves as a water source for the downtown area. A serious drought that occurred in 1998 resulted in excessive water intake from the freshwater lens on Laura Island causing up-coning. Up-coning mixes saltwater into groundwater pumped from water-intake wells. Because up-coning makes the freshwater lens unusable, there was a need to investigate the freshwater lens on Laura Island. In this study, we observed the electrical conductivities of the groundwater at different depths in existing monitoring wells to determine the total storage volume of the freshwater lens on Laura Island from 2010 to 2013. Our results indicated that most of the groundwater that seeped into the freshwater lens had flowed out into the sea.

Keywords : Atoll islands, drought, El-Nino, freshwater lens, groundwater observation
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