Groundwater Analysis of Atoll Islands in the Federated States of Micronesia: Observations, Modeling, and Training

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Abstract. Atolls are ring-shaped reefs surrounding or partly surrounding a lagoon and usually having one or more small, low-lying coral islands. There are over 400 atolls throughout the oceans of the world, with 294 located in the Pacific Ocean. Despite their extreme distance from other land masses, many atolls are inhabited. The water resources of these islands, and the local island communities that depend upon them, however, are under continual threat due to El Niño-induced drought events, potential sea-level rise, and geographic isolation from other population centers. Fresh groundwater, residing in a thin freshwater body floating atop the underlying seawater in the subsurface sediments and termed the "freshwater lens", requires particular attention since small land surface area and highly porous soils preclude the development of natural surface water bodies. Island residents typically complement the use of groundwater with man-made rain catchment systems, although during drought events they have only groundwater to fulfill all domestic water needs. In this report we provide a summary of work conducted during the last few years regarding the availability and threat of groundwater resources on atoll islands in the Federated States of Micronesia, an insular nation spread across more than 2 million km^2 of the western Pacific Ocean and containing some 32 atolls. Research activities include groundwater observations, groundwater modeling, the development of a groundwater prediction tool using modeling results, and a commitment to train local water resources managers on atoll island hydrology and the use of the groundwater prediction tool.