

Mechanism of changes in groundwater levels tapping unconfined aquifers during the 2000 eruption of Miyakejima Volcano

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Groundwater levels in three wells changed during the 2000 volcanic unrest at Miyakejima. The groundwater levels have been monitored by Tokyo Metropolitan Government since 1993 and are tapping unconfined aquifers on the island. Changes in rainfall patterns, boiling away of recharge, vertical displacement of the ground surface relative to sea level and volumetric strain could cause groundwater level variations. We compared tidally corrected water levels with average monthly rainfall values, seismic data, GPS data, and tilt data to determine which factors could have acted in 2000. Changes in rainfall patterns, boiling away of recharge, and changes in aquifer characteristics did not cause the detected water level changes. Groundwater at Miyakejima shows response to both vertical displacement of the ground surface relative to sea level and volumetric strain. The groundwater levels respond to vertical displacement of the ground surface because the water table equilibrates to the new apparent sea level. The volumetric strain changes are large enough to produce significant water level response in this case, although we would not generally expect to see a strain response in groundwater from an unconfined aquifer.