



Lake Waiau and Pu [U+02BB] upōhaku - two unusual lakes on Maunakea volcano, Hawaii

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High mountain lakes are often a valuable buffer for water availability throughout the year. This is especially the case in alpine deserts like the high alpine areas of the Hawaiian Volcanoes above 3000 m altitude, since the porous and coarse cinder material and basalt boulders do not favor water storage.

Pu [U+02BB] upōhaku (~4,000m asl), a cinder cone near the summit of Maunakea volcano, Hawaii, has a sporadic pond of water and also nearby Lake Waiau is perched within a cinder cone known as Pu [U+02BB] uwaiau (~3600 m asl) which makes it the highest lake on the Hawaiian Islands. With only ~210 mm annual precipitation mostly caused by single storm events, and a potential evaporation of up to 5mm/d, permanent water sources are extremely rare in this environment.

Several hypotheses were discussed as a possible cause for perching the water in this environment such as an impermeable permafrost base, a massive block of lava or clay layers. We applied geomorphic mappings and electric resistivity tomography to portray the shallow subsurface in the vicinity of the two water bodies. We also used current and unpublished older temperature loggings to evaluate the thermal regime around the lakes. Based on our results, specific electric resistivity values are too low and ground temperatures are too high to be interpreted either as ice rich permafrost or basaltic massive rock. Much more, fine grained material such as ash and its clay-rich weathering products likely cause the perched water table at both study sites. At Lake Waiau we discovered a layer of high electric conductivity that may constitute a significant water reservoir outside of the lake and further be responsible for perching the water towards the lake. Understanding the nature of the two permanent water bodies will help to manage the sensitive alpine environment which includes several endemic species.