Spatial Precipitation Trends and Effects of Climate Change on the Hawai'ian Hualalai Aquifer

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Abstract. Global climate has been drastically changing, with unprecedented changes observed in the last half-century. Temperatures have significantly warmed, with the rate of warming continuing to increase even more in recent decades. However, changes in precipitation are more varied and while precipitation plays a strong role in water resource availability, the impact of precipitation changes is uncertain. Kaloko-Honokohau National Historical Park (KAHO) sits at the base of the Hualalai Aquifer. The park is a semi-arid region, but precipitation increases dramatically as elevation increases from the coast to approximately 1500 meters and then decreases again to the top of Hualalai Volcano. KAHO is dependent upon water from this aquifer that has experienced changes in freshwater recharge due to significant changes in precipitation, as well as further stresses from urban development surrounding the park. Data from the Giambelluca *et al*. Hawai'i Rainfall Atlas were used to determine the spatial distribution of this change in precipitation over a 30-year period from 1978-2007. This approach created a spatial time series of precipitation maps by adjusting the climate normal spatial map for each year using the difference in station annual average precipitation and locally adjusting precipitation amounts using yearly precipitation residuals at individual stations. The time series was used to assess the significance of change from the Mann-Kendall test, and the rate of change using the Sen's slope estimate for west Hawai'i. The spatial analysis was then compared to the point changes computed from each station. It is shown that precipitation is changing most at the high intensity mid-elevation range along the west side of the Hualalai aquifer, and that the spatial trend analysis was more continuous and informative than the point trend estimates.