

USING MICROGRAVITY TO CHARACTERISE WATER STORAGE AND USAGE AT KINGS PARK, PERTH, WA

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Kings Park in Perth is a well-known urban parkland and tourist attraction, and is one of few urban parks to preserve extensive native bushland (evergreen woody vegetation). A key question in assessing ecosystem health is water availability and use, especially in periods of drought. Since March 2015 the UWA in collaboration with the BGPA has conducted a time-lapse microgravity study of groundwater storage in Kings Park. Data collection has focused on seasonal to inter-annual change, with bi-monthly measurements extending across multiple days. Relative measurements are taken with a Scintrex CG-5 gravity meter and are referred to the Helena Valley reference station, which is located in the granite-dominated Perth Hills. Interim results (May 2017) suggest that measurement methods are sufficiently sensitive to characterize change, with measurement precision of ± 2 microgals (approximately ± 40 mm of stored water).

Two-month storage-changes are defined from the gravity data, and usage is further defined as rainfall minus storage-change. Storage-changes are positively correlated with rainfall ($r=+0.70$) and negatively-correlated with solar exposure ($r=-0.69$). Thus, a fairly strong signal is seen of increase during the winter wet season, and decrease during the summer dry season. Usage is positively correlated with solar exposure ($r=+0.312$) but also shows dry periods in late summer, where estimated usage is near-zero despite high solar exposure, and a high-usage period at the start of the wet season. Interannual change is substantial, and seems to be linked to the Indian Ocean Dipole, which was strongly positive in winter 2015 and strongly negative in winter 2016.