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Monitoring groundwater recharge and hydrological fluxes in urban South Australia using a geological weighing lysimeter

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South Australia is an area of increasing population, mining and infrastructure. As South Australia is the driest state on the driest continent, the demand for and strategic importance of groundwater is high. Natural and managed hydrological changes, especially in urban areas, are always taking place and are traditionally measured as individual processes. In this research we focus on methods for measuring total change in storage over an area, which can then be split up into various components. 'Geological weighing lysimeter' is a relatively new and unused method for measuring in situ surface and groundwater storage changes. Pore water pressure in deep confined aquifers increases and decreases as natural and managed hydrological loads change above. On the other hand, time series analysis and wavelet techniques applied to time series of pore water pressures can provide partitioning of storage changes at different frequencies. The combination of techniques is used to quantify groundwater recharge along with other surface and subsurface water storage changes. Numerous bore holes that penetrate confined aquifers around urban Adelaide and South Australia were monitored to see how efficiently they functioned as 'Geological weighing lysimeters' and find out how they could contribute to understanding recharge and other hydrological processes in the area. The monitored sites show good correlations between confined aquifer pore pressure changes and hydrological loading and unloading, and assist in further understanding the magnitude of different hydrological processes in parts of Adelaide and South Australia.