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# Examining management interventions on hydrological droughts

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It is a challenge to supply water to meet increasing demands, particularly during droughts. Dependence on groundwater resources is increasing, especially when surface water availability is limited and reservoir levels are low. However, even groundwater supplies are finite, and abstracted volumes may exceed natural recharge rates in many regions resulting in depleted aquifers.
In Southern California groundwater depletion is an ongoing problem that received increased attention after the two recent multi-year droughts. Projects to enhance groundwater recharge through managed aquifer recharge (MAR) have been implemented resulting in local rising groundwater storage. Drought resilience seems to be increasing. However, the implementation of MAR schemes varies regionally. How these recharge schemes influences droughts remains unknown. Hence, the focus of this study is to quantify the effects of MAR on hydrological drought development.
The hydrological droughts are defined by a below normal groundwater level. A reference network of long term groundwater level records (managed by California State) was used to define long term variability in groundwater levels. Time series have been converted to standardized levels (SGI) and clustered based on similarity in the time series. These clusters defined the identified regional variability, which was standardized for MAR areas. The distribution of reference clusters was used to re-scale recorded groundwater levels in these areas. Deviation from reference clusters was expressed in SGI, and changes in drought development were evaluated using a drought threshold that is valid for the entire cluster. The unique transformation of measured groundwater level distribution allows a quantification of variability given the reference regional variability.
Changes in drought development are expressed in drought duration, magnitude and recovery. The ongoing work suggests that MAR systems partially alleviate hydrological droughts in some regions. on hydrological droughts are evaluated in some regions. The reference clusters indicate a local change in recharge patterns that may be related to increased drought resilience. While the water demand seems to continue to grow, it is important to learn from the potential of these MAR projects and critically examine potential drought alleviating interventions.