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# Influence of soil and climate on root zone storage capacity

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The catchment representative root zone storage capacity ($S_r$), i.e. the plant available soil water, is an important parameter of hydrological systems. It does not only influence the runoff from catchments, by controlling the partitioning of water fluxes but it also influences the local climate, by providing the source for transpiration. $S_r$ is difficult to observe at catchment scale, due to heterogeneities in vegetation and soils. $S_r$ estimates are traditionally derived from soil characteristics and estimates of root depths. In contrast, a recently suggested method allows the determination of $S_r$ based on climate data, i.e. precipitation and evaporation, alone (Gao et al., 2014). By doing so, the time-variable size of $S_r$, is explicitly accounted for, which is not the case for traditional soil based methods. The time-variable size of $S_r$ reflects root growth and thus the vegetation's adaption to medium-term fluctuations in the climate. Thus, we tested and compared $S_r$ estimates from this 'climate based method' with estimates from soil data for 32 catchments in New Zealand. The results show a larger range in climate derived $S_r$ than in soil derived $S_r$. Using a model experiment, we show that a model using the climate derived $S_r$ is more accurately able to reproduce a set of hydrological regime signatures, in particular for humid catchments. For more arid catchments, the two methods provide similar model results. This implies that, although soil database information has some predictive power for model soil storage capacity, climate has a similar or greater control on $S_r$, as climate affects the evolving hydrological functioning of the root zone at the time scale of hydrological interest. In addition, $S_r$ represents the plant available water and thus root surface, volume and density, and is therefore a more complete descriptor of vegetation influence on water fluxes than mere root depth. On balance, the results indicate that climate has a higher explanatory power than soils for catchment representative root zone storage capacity.