



Integrated Drought Index (IDI) to monitor drought severity in Western India

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Rainfall variability during the monsoon and increasing global mean temperature resulted in a significant change in water availability in Western India. Groundwater depletion is one of the most vital issues related to food and water security in India. Droughts (meteorological, hydrological, and agricultural) pose enormous challenges for drinking and irrigation water supply. However, understanding of various types of droughts remains a complex issue due to spatial-temporal variability of precipitation, runoff, soil moisture, and groundwater. In this study, we used the Variable Infiltration Curve (VIC) with SIMple Groundwater Model (VIC-SIMGM) to simulate groundwater table depth, groundwater recharge, and aquifer storage in addition with water budget components (runoff and evapotranspiration) in the Sabarmati River Basin (SRB). We compared the simulated groundwater table depth anomaly with observed well data and groundwater storage change anomaly from Gravity Recovery and Climate Experiments (GRACE). We develop an integrated drought index (IDI) that captures the response of meteorological (precipitation), hydrological (streamflow and groundwater), and agricultural (soil moisture) droughts. The drought severity from IDI was successfully compared with drought severity index (DSI) based on Moderate Resolution Imaging Spectroradiometer (MODIS) data. The major droughts in SRB under retrospective scenario (1950-2017) were reconstructed to examine the inter-relationship among different drought types.