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# How do climate controls influence groundwater recharge in Africa?

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Understanding the relationship between climate forcing data and recharge rates in arid and semi-arid regions is crucial for sustainable management of groundwater resources, especially in a vulnerable continent like Africa. This study investigates the relationship between climate drivers and potential groundwater recharge (PGR) patterns across Africa for a long-term record (1960-2010). Water-balance components were simulated by using the PCR-GLOBWB model and were reproduced in both gridded maps and latitudinal trends that vary in space with minima on the Tropics and maxima around the Equator. Statistical correlations between temperature, storm occurrences, drought, and PGR were examined in six climatic regions of Africa. Temporal trends observed in the Northern Hemisphere of Africa reveal that the increase in temperature is significantly correlated to the decline of PGR, especially in the Northern Equatorial Africa. Nonetheless the climate indicators were unable to explain the alarming negative trend of PGR observed in the Sahelian region, even though the Standardized Precipitation-Evapotranspiration Index (SPEI) values report a 15% drought stress. Conversely, increases in temperature have not been detected in the Southern Hemisphere of Africa, where increasing frequency of storm occurrences determine a rise of PGR, particularly in southern Africa. Time analysis highlights a strong seasonality effect while PGR is in-phase with rainfall patterns in the summer (Northern Hemisphere) and winter (Southern Hemisphere) and out-of-phase during the fall season. This study helps elucidate the mechanism of the processes influencing groundwater resources in six climatic zones of Africa, even though modeling results need to be validated more extensively with direct measurements in future studies.