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Evaluation of NASA POWER and CRU Precipitation and Temperature Datasets over a Desert-prone Yobe River Basin: An Investigation of the Impact of Drought in the North-East Arid Zone of Nigeria

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Abstract : The most dependable and precise source of climate data is often gauge observation. However, long-term records of gauge observations, on the other hand, are unavailable in many regions around the world. In recent years, a number of gridded climate datasets with high spatial and temporal resolutions have emerged as viable alternatives to gauge-based measurements. However, it is crucial to thoroughly evaluate their performance prior to utilising them in hydroclimatic applications. Therefore, this study aims to assess the effectiveness of NASA Prediction of Worldwide Energy Resources (NASA POWER) and Climate Research Unit (CRU) datasets in accurately estimating precipitation and temperature patterns within the dry region of Nigeria from 1990 to 2020. The study employs widely used statistical metrics and the Standardised Precipitation Index (SPI) to effectively capture the monthly variability of precipitation and temperature and inter-annual anomalies in rainfall. The findings suggest that CRU exhibited superior performance compared to NASA POWER in terms of monthly precipitation and minimum and maximum temperatures, demonstrating a high correlation and much lower error values for both RMSE and MAE. Nevertheless, NASA POWER has exhibited a moderate agreement with gauge observations in accurately replicating monthly precipitation. The analysis of the SPI reveals that the CRU product exhibits superior performance compared to NASA POWER in accurately reflecting inter-annual variations in rainfall anomalies. The findings of this study indicate that the CRU gridded product is often regarded as the most favourable gridded precipitation product.

Keywords : CRU, climate change, precipitation, SPI, temperature
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