

Hydroclimatic variability, trend analysis and change point detection in the Lobo River basin, Côte d'Ivoire (1975–2014)

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ABSTRACT

West Africa has experienced significant hydroclimatic variability since the 1970s, characterized by prolonged drought periods followed by a partial recovery of rainfall, with major implications for water availability and management. The Lobo River Basin (12,722 km²), located in central-western Côte d'Ivoire and a major left-bank tributary of the Sassandra River, represents a key water resource for the region, supplying several urban centers including Daloa. Despite its socio-economic importance, the long-term hydroclimatic dynamics of this basin remain insufficiently documented. This study aims to analyse the temporal variability of hydroclimatic parameters in the Lobo River Basin over the period 1975–2014, to detect statistically significant trends and breakpoints in rainfall, temperature, and streamflow series, and to characterize their seasonal behaviour. The analysis is based on monthly precipitation data from five stations, mean air temperature from two stations, and streamflow observations from two hydrometric stations. A quality control procedure, including outlier detection and spatial consistency checks, was applied to all datasets. Annual and seasonal aggregates were computed by distinguishing the dry season (November–April) and the rainy season (May–October). A standardized hydrological index was used to identify wet and dry periods. Trends were assessed using the non-parametric Mann–Kendall test, and their magnitude estimated using Sen's slope estimator. Breakpoints were detected using the Pettitt test. All analyses were performed at annual and seasonal scales, with a significance level of 5%. The results are expected to reveal contrasting hydroclimatic dynamics, with a probable decrease in rainfall and streamflow during the 1970s–1990s, consistent with the West African drought, followed by a partial recovery. Temperature series are expected to show an increasing trend. Seasonal differences in trend magnitude and breakpoint timing are also anticipated. This study provides new insights into hydroclimatic variability in the Lobo River Basin and supports improved water resource management in a tropical context.

Keywords: Hydroclimatic variability; Mann-Kendall test; Change point detection; Lobo River basin.