

Appendix

Determination of Wet Season Onset, Cessation, and Rainfall Intensity

For each zone, the climatological daily mean rainfall was calculated as the mean of the daily rainfall across all years. The annual mean was obtained by averaging these daily means for each year. The climatological cumulative anomaly, $C(D)$, was computed as:

$$C(D) = \sum_{d=1}^D (P_d - \bar{P})$$

where D is the day of the year and $\bar{P}$ is the annual mean daily rainfall. The minimum of $C(D)$ defines the climatological onset of the wet season, and the maximum defines cessation, providing a representative seasonal profile for each zone.

Interannual variability was assessed by calculating the annual cumulative anomaly for each year using daily rainfall, R_d :

$$A(D) = \sum_{d=1}^D (R_d - \bar{P})$$

The minimum of $A(D)$ indicates the wet season onset, while the maximum indicates cessation, with season length defined as the number of days between these points. The Precipitation Concentration Index (PCI) was used to evaluate rainfall intensity and temporal distribution (Botai et al., 2025; Oliver, 1980).

$$\text{PCI}_{\text{wet season}} = \frac{\sum_{i=d_{\text{onset}}}^{d_{\text{cessation}}} P_i^2}{\left(\sum_{i=d_{\text{onset}}}^{d_{\text{cessation}}} P_i\right)^2} \times 100$$

where P_i is the daily precipitation. Higher PCI values indicate more concentrated rainfall, while lower values indicate a more uniform distribution. According to Oliver, (1980), PCI <10 indicates uniform rainfall, 10–15 moderate concentration, 16–20 irregular concentration, and >20 strongly irregular precipitation.