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## The characteristics and drivers of climatological precipitation over the Serengeti-Mara region

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The Serengeti National Park is famous for the biological phenomenon of the annual wildebeest migration. This migration is reliant on unique local precipitation conditions: a rainfall gradient stretching across the park, the strength and inclination of which alters from month to month. Given the ecological significance and the complexity of the regional precipitation, a detailed study of the region's climatology is essential for understanding why these precipitation patterns exist, and whether they are likely to change.

Using multiple observational datasets, we studied the spatial distribution of annual and monthly climatological precipitation. We carried out harmonic analysis and cluster analysis to identify areas with similar annual cycles. We then examined regional wind, moisture and precipitation patterns on seasonal, monthly and diurnal timescales.

We found that the large-scale wind circulation patterns dictate the basic structure of the annual cycle over the region. However the shape of the annual cycle was distinctly different in 5 parts of the region, with varying peak rainfall months and dry season rainfall totals. Analysis of the diurnal wind patterns showed that the regional seasonality is strongly augmented by the lake and land breeze from Lake Victoria, and the interactions between this local source of moisture and the complex topography of the East African rift. This leads to a low-level convergence zone between the prevailing large-scale easterlies, and westerlies from Lake Victoria over the Serengeti in the afternoon. This in turn results in the rainfall gradient across the region, the orientation of which changes depending on the mid-tropospheric wind direction.