

ABSTRACT

An Investigation of Lightning Strikes over Jamaica

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A lightning strike may be defined as a flow of electric charge between positive and negative regions in the atmosphere. Seventy-eight percent (78%) of global lightning production occurs in the $30^{\circ}\text{S} - 30^{\circ}\text{N}$ band, which includes Jamaica, located between $17.35^{\circ}\text{N} - 18.35^{\circ}\text{N}$. While lightning events are widely studied throughout the world, there is very little documented work done in the Caribbean. This investigation of lightning strikes over Jamaica examined (i) the temporal and geographical variations of lightning over the island and (ii) predictive models for daytime lightning occurrence for a lead time of up to 2.25 days. Twenty-three (23) months of data were used between the years 1998 and 2005.

Spectral analysis revealed a significant 24hour period over land. There was a peak in the average number of lightning strikes per hour between 1900UTC and 2100UTC and a minimum from 1300UTC to 1600UTC. More than 90% of all the strikes recorded occurred in the months May to October with the total number of strikes peaking in August. Spatial analysis revealed the predominance of lightning activity on the eastern section of the island where convection is aided by prevailing winds and topographic lift. The three sea sections

investigated revealed the dynamic nature of the land-ocean convection. The sea to the south behaved most like open ocean while the influence of the land was more evident in the northern and eastern sections.

The stability indices found to be most significant for lightning occurrence in Jamaica were the Lifted Index and K Index. These indices, combined with daytime persistence and nighttime persistence, produced the prediction equation with the best Critical Success Index at a 6 hour lead time. Other equations were developed for lead times of 1.25 days and 2.25 days with lower, but still significant, Critical Success Indices.

Keywords: Cherri-Ann Camoya Scarlett; Jamaica; lightning; lightning intensity; stability indices; stepwise logistic regression; prediction equation; Lifted Index; K-Index; Daytime Persistence; Nighttime Persistence.