

Spatiotemporal analysis of lightning flash clusters and fatalities between 2000 and 2020 over West Bengal, India

Publons ID	(not set)
Wos ID	WOS:001117511000001
Doi	10.1007/s11069-023-06347-6
Title	Spatiotemporal analysis of lightning flash clusters and fatalities between 2000 and 2020 over West Bengal, India
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Publish Date	MAR 2024
Journal Name	NATURAL HAZARDS
Citation	4
Abstract	<p>Lightning strikes present a significant risk in India, particularly in densely populated and agrarian states like West Bengal. However, there has been limited research on the patterns and trend of these hazards. The present study investigated the spatiotemporal changes in lightning flashes and their fatalities in West Bengal using high-resolution Tropical Rainfall Measuring Mission Lightning Imaging Sensor (TRMM LIS) data and statistical data for the period between 2000 and 2020. The Mann-Kendall and Sen tests and cluster analysis approach were employed to estimate district- and physiographic division-wise variations in lightning occurrence and trends. Additionally, lightning fatality data for the study area spanning from 2000 to 2020 were analyzed using Mann-Kendall and Sen tests, supplemented by cluster analysis. The geospatial results indicate that districts in the south have a lower frequency of lightning flashes, while districts in the north have a higher frequency. Furthermore, the number of flashes in the region increased from 2000 to 2012 and has since displayed a downward trend since 2018. The study also revealed a steady rise in the average number of flashes from March to July. Two prominent peaks were observed: one in May and another in September. Additionally, afternoon and evening peaks in lightning activity were noted. Significant decreasing trends in lightning activity were observed in the Jalpaiguri and Murshidabad districts between 2000 and 2020. The seasonal lightning flash rate density pattern showed that the peak values are recorded during the pre-monsoon months (March-May). The temporal analysis of lightning deaths showed an upward trend from 2000 to 2020. The study concludes that lightning-induced fatalities are a significant concern in West Bengal and suggests mitigative actions.</p>
Publish Type	Journal
Publish Year	2024
Page Begin	3533
Page End	3564
Issn	0921-030X
Eissn	1573-0840
Url	https://www.webofscience.com/wos/woscc/full-record/WOS:001117511000001
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