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Variability and trends of lightning flashes in future climate change scenarios

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Abstract

Recent studies worldwide show a 2-fold increase in the number of severe weather events in the last 25 years. Losses estimates overpass \$ 140 billion in several years. On the other hand, although the overall number of deaths caused by natural disaster decreased, the number of fatalities caused by storms remained almost constant since 1920's, thus becoming relatively high nowadays. All these data are supported by the IPCC Climate Change Report of 2014, which stated that changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including, among others, the number of heavy precipitation events in a number of regions. Impacts of such climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, human morbidity and mortality. Direct and insured losses from weather-related disasters have increased substantially in recent decades, both globally and regionally. More severe and/or frequent extreme weather events and/or hazard types are projected to increase losses and loss variability in various regions.

In the last 10 years, Brazil has been integrating adaptation methods and policies into the national climate change agenda by identifying impacts, mapping vulnerabilities, and building a natural disaster monitoring and warning system. Lightning flashes are highly destructive, causing considerable damage to man-made structures. Particularly, electrical power faults, telecommunications tower breakdowns, damages to buildings among others, have been occurring more frequently national-wide in recent years. Thus, a better understanding of how lightning flash trends and frequencies behave in distinct climate change scenarios can help in planning future infrastructure as well as in decision-making processes to adapt existing infrastructures. The present work intends to study the occurrence of lightning flashes in State of Santa Catarina (South of Brazil) and provide future projections of the lightning activity in different climate change scenarios, under the hypothesis that the lightning is modulated by climate-dynamic mechanisms. The three main relevant expected products are: (i) the spatial-temporal variability of the lightning incidence in the present climate scenario; (ii) the climate modulations associated with the lightning frequency; (iii) the projections of the lightning activity for two distinct IPCC AR5 future climate scenarios: RCP4.5 and RCP8.5. In a general way, the results suggest that the State of Santa Catarina is likely to experience an increased in the lightning frequency in the next 100 years.

Topic Areas

Applications of Lightning Data: Insurance Claims, Fire Risk, Mining, Wind Farms, etc.,
Lightning Climatology

Submission Format

Oral