Towards the use of lightning for tropical cyclone intensity prediction

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Abstract

Lightning in tropical cyclones and its relationship with intensity change has been a hot topic in recent years. Advancements in ground- and space-based lightning detection have greatly improved our ability to observe lightning over the oceans. As a result, there have been significant strides in understanding spatial lightning patterns in tropical cyclones, unraveling the relationship with intensity change, and incorporating lightning into intensity prediction models.

This paper will use both Vaisala's Global Lightning Dataset (GLD360) and the GOES-16/-17 Geostationary Lightning Mapper (GLM) to analyze lightning frequency and physical characteristics across the spectrum of tropical cyclone intensity changes in the North Atlantic and eastern North Pacific basins. Inner-core and rainband lightning predictors have recently been added to a statistically-based rapid intensification index (RII) for both the GLD360 and GLM. Initial results on the skill of such indices in the prediction of rapid intensification will be presented for the 2019 hurricane season.

Hurricane Dorian (2019), an Atlantic storm that rapidly intensified prior to landfall in the Bahamas, highlighted a phenomenon in GLM previously documented by Vaisala with their GLD360 network: a ring of eyewall lightning in strong tropical cyclones. Since tropical cyclone structure undoubtedly plays an important role in diagnosing the implications of lightning outbreaks on intensity change, an in-depth analysis of some recent high-impact, major Atlantic hurricanes using airborne Doppler radar will be discussed in relation to the presence or absence of lightning in the eyewall region to facilitate a better understanding of its origin and any forecasting applications it may provide.

Topic Areas

Lightning and Weather

Submission Format

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