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Using Total Lightning Data in Severe Storm Prediction: Global Case Study Analysis from North America, Brazil and Australia

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Intracloud (IC) lightning is better correlated to storm severity than cloud [U+2010] to [U+2010] ground (CG) lightning, providing early indicators of the development of severe thunderstorms that may produce damaging hail, high wind or tornados. The detection of total lightning flashes, especially the IC flashes, enables improvements in the lead time of severe weather prediction and alerting. The WeatherBug Total Lightning Network™ (WTLN), created specifically for total lightning detection, can detect both IC and CG flashes efficiently. The total lightning data from WTLN in different regions around the world is used in this study.

The properties of lightning cells preceding numerous severe storms in various locations have been studied and certain predictive patterns in the lightning cells have been identified. The time evolution of the lightning flash rate and the IC/CG ratio of individual cells are used to identify severe thunderstorms with significant lead time before they occur. Studies have shown that early detections in the sudden rise of the rate of IC discharges and subsequent peak of total flash rate can serve as an indicator for severe storm conditions. Using WTLN lightning data, a real [U+2010] time lightning cell tracking and the WeatherBug Dangerous Thunderstorm Alert program has been developed. The results of several storm studies using WTLN lightning data from the US, Brazil and Australia will be presented.