Lightning Impacts on Sporting Event Operations

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Introduction

Lightning poses a danger to anyone who is outside. At an outdoor athletic event, that hazard exists to on-field competitors, field protection staff and spectators. Athletes involved need as much real-time protection as possible to be safe, but not so much as to degrade the quality of the product (e.g., sitting around waiting for the storm to arrive). We consider a study of the course of the game, with slightly higher convection. Thus, it came as no surprise the data largely followed the thunderstorms patterns of the United States. All months contained a similar number of games (495-485), although due to increased sample size, we combined the September and October data.

What is Total Lightning?

Timing of the initial lightning strikes (Fig. 2) proved to be an interesting part of the study. Many games commenced around 7 p.m., local time, immediately following the climatological daily peak for afternoon convection. Thus, it came as no surprise that, by far, the initial strikes occurred during the “pre-game” period. Delays were defined as the period within one hour of the scheduled game time. Impacts occurring during this period also produced a delay in 10% of the games (Fig. 3).

The research found that once the games were underway, the initial lightning strikes were somewhat evenly spread across the course of the game, with slight higher totals in the early part of the game and lower totals later in the game.

Delays

A total of 1,846 games were analyzed as part of this study. Of these, 103 games saw a lightning strike within 10 miles (“impacts”), representing 5.5% of all games. However, only 57 of the 100 lightning-impacted games were delayed. This became a topic of discussion as part of the research (Fig. 1).

First Strike Distance

Numerous researchers have found that thunder can be heard as far as 20 miles from a thunderhead. (e.g., in a large stadium, this much audibility is not expected. Studies (NOAA) also indicate that lightning can strike 10, and sometimes as much as 25 miles from the stadium, when the storms approach the stadium. The Earth Networks Total Lightning Network (ENTLN) was used to determine the occurrence of these 100 lightning strikes (Fig. 2). Data followed summertime thunderstorm climatology. However, a marked decrease was noted across the Plains. There are some possible explanations for this, including diurnal thunderstorm patterns across the region and the presence of a season-long trend in the central U.S. during the research period.

Geography

The data is also presented in terms of geographic regions of the United States and southeastern Canada (Fig. 4-5). Data followed summertime thunderstorm climatology. However, a marked decrease was noted across the Plains. There are some possible explanations for this, including diurnal thunderstorm patterns across the region and the presence of a season-long trend in the central U.S. during the research period.

Graphs

1. Graph 1: First hour occurrence of lightning within 10 miles of stadium.
2. Graph 2: Timings of lightning strikes within and after 10 miles of stadium.
3. Graph 3: First strike distance within 10 miles of stadium.
4. Graph 4: First strike distance from stadium.

Conclusion

• The data showed that the chances of a standardized policy for event delays due to lightning was problematic. By not having a standard, the decision (simply to delay) was left to the individual, or in some cases, a potential change in weather conditions.

• Timing of the initial lightning strikes occurred during the pre-game period, which could give the perception that events are unsafe during severe or changing weather conditions.

• The delay in starting the event was usually a result of the decision to delay, rather than a result of the weather conditions.

• The results of the study (Fig. 2) indicate that the majority of initial lightning strikes occur at a distance of 6.5 to 10 miles from the stadium. However, it was found that these strikes caused a delay with far less frequency than those storms which developed near the stadium. When the storms occurred 5.5 to 10 miles from the stadium, it led to a delay in only 47% (26 of 53) of the cases in any part of the U.S. By comparison, a 75% delay tendency was noted when the first flash was within 5 miles, and 100% of games were delayed when the initial flash was within 2 miles of a stadium.

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