281 Lightning Impacts on College Football Games

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VAISALA

ECU

MOTIVATION

- Lightning safety policies influence all types of sports, especially football in the United States
- The football season overlaps the latter portion of the annual lightning cycle across the country
- The economic impacts can be large – The University of Idaho received $975,000 for a game cancelled by lightning at the University of Florida on 30 August 2014
- Lightning considerations now impact all outdoor sports worldwide
- This study examines the lightning context of games that are affected
- No prior objective review of lightning effects on multiple games has been performed with lightning data

METHOD

- Composite data from the National Lightning Detection Network (NLDN) around the locations and times of college football games impacted by lightning
- Evaluate lightning activity relative to 136 football games during autumn in the United States from 2010 through 2017

DATA

- Use cloud-to-ground (CG) and in-cloud (IC) data from the NLDN
- Impacts are from media reports on university websites and other media
- Exact external clock times are determined from media reports or interpolated from other information about progress of game

AUTUMN 2018 U.S. SPORTS IMPACTED BY LIGHTNING

Football
-4 NFL games
-24 college games
-30 states with high school games affected

Soccer
-23 college games
-9 states with high school games affected

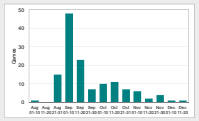
Other
-2 college field hockey games
-1 college tennis match

2018 GLOBAL LIGHTNING DEATHS DURING SPORTS

- 1 soccer player, Malaysia, October
- 1 volleyball player, India, October
- 2 soccer players, India, August
- 2 soccer players, Kenya, November
- 3 hockey players, India, June
- 4 soccer players, India, August

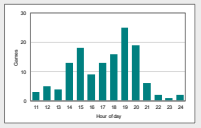
TIME OF YEAR OF DELAYS

Early September maximum
136 games, 2010-2015

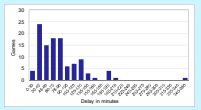


TIME OF DAY OF DELAYS

Early afternoon and early evening maxima
136 games, 2010-2015



LENGTHS OF DELAYS



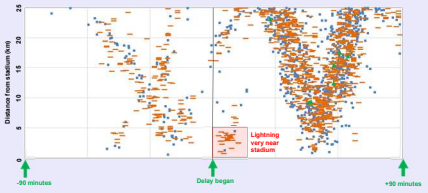
LOCATIONS OF DELAYS

EXAMPLE OF MOVING THUNDERSTORMS

University of Michigan, Ann Arbor
03 September 2011

- Vertical scale: Distance from 0 to 25 km from stadium
- Horizontal scale: 90 minutes before, to 90 minutes after delay

- V shape in this format indicates a storm that steadily approaches, reaches overhead, then leaves the stadium.
- Prior to cancellation, negative cloud-to-ground strokes and in-cloud pulses were detected by the NLDN to be 25 km away at one hour before suspension.
- 30 minutes before suspension, lightning came closer until it was nearly overhead.
- Within a few minutes after suspension, an additional cluster of negative cloud-to-ground strokes was within 5 km of the stadium, and quickly ended.
- Later, another storm moved steadily toward the stadium and was overhead at 45 minutes after suspension.



SIX GAMES THAT NEVER STARTED

Coffeyville Community College, Kansas
23 October 2013

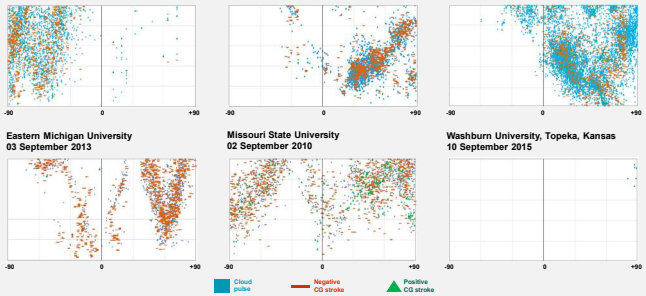
University of Florida
30 August 2013

University of Illinois
04 September 2015

Eastern Michigan University
03 September 2013

Missouri State University
02 September 2010

Washburn University, Topeka, Kansas
10 September 2015

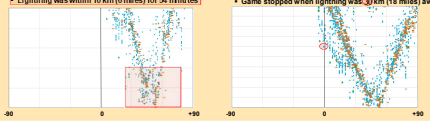


FIRST RESPONDER BOWL

26 December 2018
Dallas, Texas
Cotton Bowl Stadium

25-km plot
- Classic V-shape of moving thunderstorm
- Game stopped before lightning was within 25 km
- Lightning was within 10 km (6 miles) for 54 minutes

50-km plot
- Larger area than other 25-km range cases
- Lightning was steadily moving toward stadium for a long time
- Game stopped when lightning was 30 km (18 miles) away



SUMMARY

- Affected most often in early September
- Affected most often in midafternoon and early evening
- Mostly in Texas, Florida, and Midwest
- Delays ranged from 21 to 348 minutes
- Many games are well managed, but a large variation in responses to lightning
- Recommendation: Colleges should provide documentation of the decision process for lightning delays to understand better whether optimal approaches are being used effectively and consistently

FIVE CATEGORIES OF LIGHTNING IMPACTS

Games	Impact	College	NFL
6	Never started	6	0
34	Started late	30	4
18	Suspended and not restarted	17	1
12	Halftime delays	12	0
66	In-game delays	61	5

TYPES OF STORMS

Games	Type of storm; some in two categories
33	V shape for steadily-moving storms
22	Large amount of lightning before, during, and/or after decision times
37	Medium amount of lightning
46	Small amount of lightning
17	Very little or no lightning

Reference

Holle, R.L., and K.W. Flanagan, 2018: Lightning impacts on college football games. Preprints, 6th International Lightning Meteorology Conference, March 12-15, Fort Lauderdale, Florida, 9 pp.