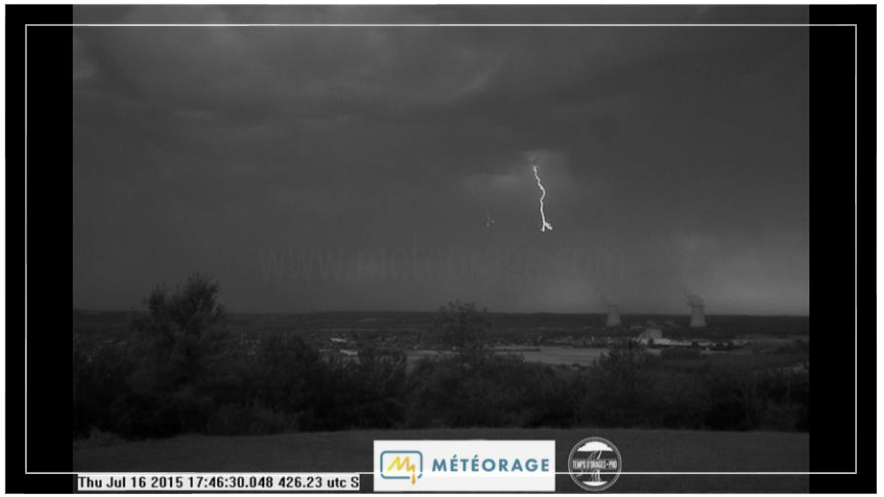
The risk of lightning strikes in stadiums : the example of football

Stéphane SCHMITT
International Expert alongside standardisation committees (AFNOR / IEC) and World Meteorological Organization (WMO)
Specialist in Thunderstorm warning systems.

MÉTÉORAGE

ECSS
European Conference on Severe Storms

11th Conference - May 2023
Bucharest – Romania

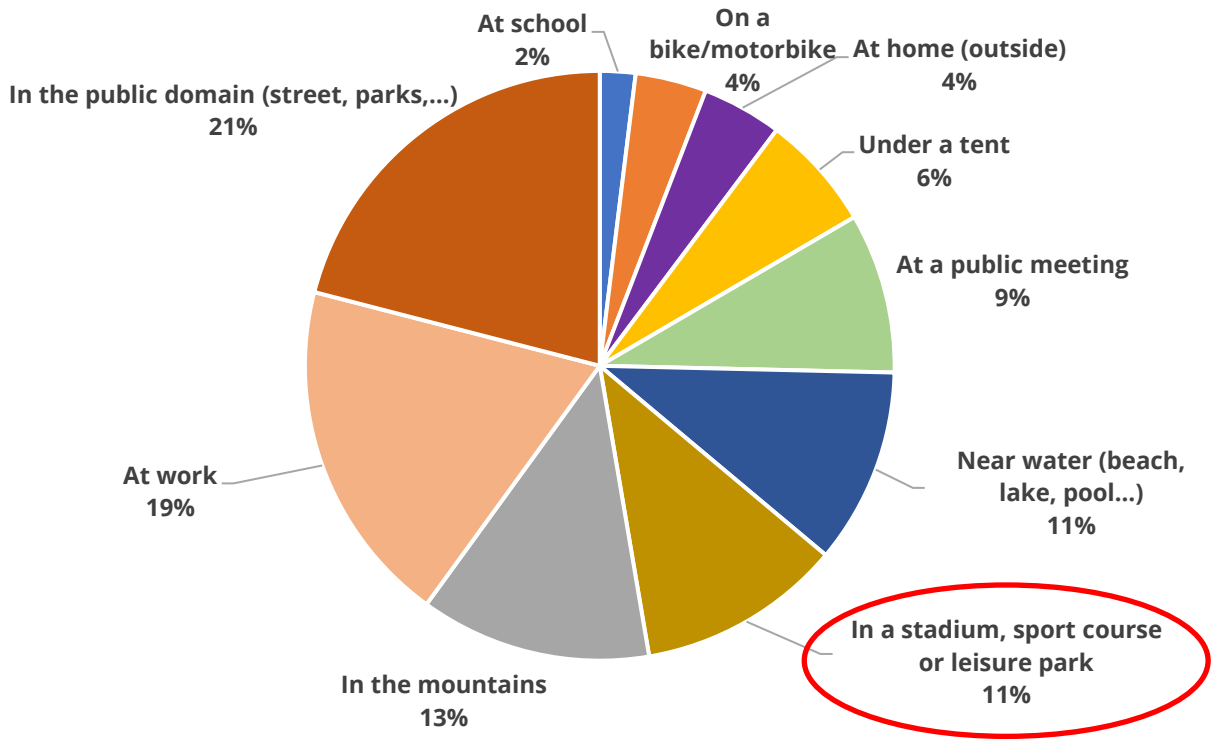


Content

- Introduction
- Too sudden thunderstorm to shelter ?
- A severe event or a strong discharge ?
- Individual fault or collective failure ?
- Conclusion

Introduction

- Our previous study, presented during ESSL 2019, revealed that ~10% of the victims were struck by lightning in a stadium…3 on 4 during football games.
- The victims were children in 5 out of 10 cases.
- We sought to analyze these events in detail to try to answer to the following “natural questions”…

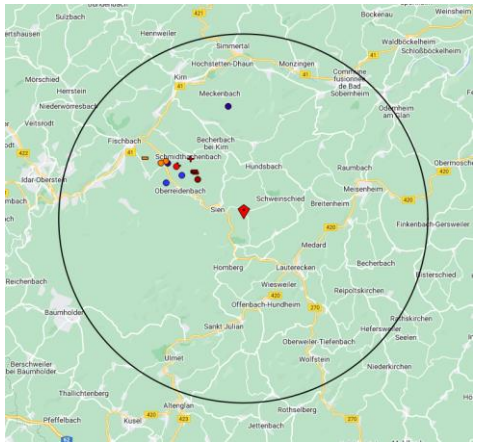


Schmitt S., Kreitz M., 2019. Learning lessons from deaths and injuries due to lightning in Western Europe. 10th European Conference on Severe Storms, Krakow, Poland, 4-8 November 2019, doi: 10.13140/RG.2.2.17824.53763.

Results based on **215 cases throughout Europe** during the **2010-2019** period, obtained both via press alerts and the European Severe Weather Database (https://www.eswd.eu/).

Too sudden thunderstorm to shelter ?

- Our previous study had revealed that ~75% of these thunderstorms were visible or audible at least 30 minutes before the event. An additional study also revealed that in 85% of the French cases, the speed of propagation was slow or moderate.
- Nevertheless, the victims were sometimes deprived of shelter (eg : Mountains, forests,...) and we cannot conclude to a systematic underestimation of risk under the thunderstorm.
- In 3 « football cases » out of 4, we can suspect a clear lack of consideration of the danger, assuming to consider that :
  - These thunderstorms were visible or audible within a 15 km distance (a distance notably admitted by the NWS : https://www.weather.gov/safety/lightning-science-thunder)
  - It was certainly possible to shelter within 20 minutes after seen or heard the thunder.



Example of approaching thunderstorm occurred in Germany during a Tournament where 35 people including 30 children were injured.

15 flashes were detected and 3 cloud-to-ground occurred within 6 km to the stadium 20 minutes before the accident

A severe event or an intense discharge ?

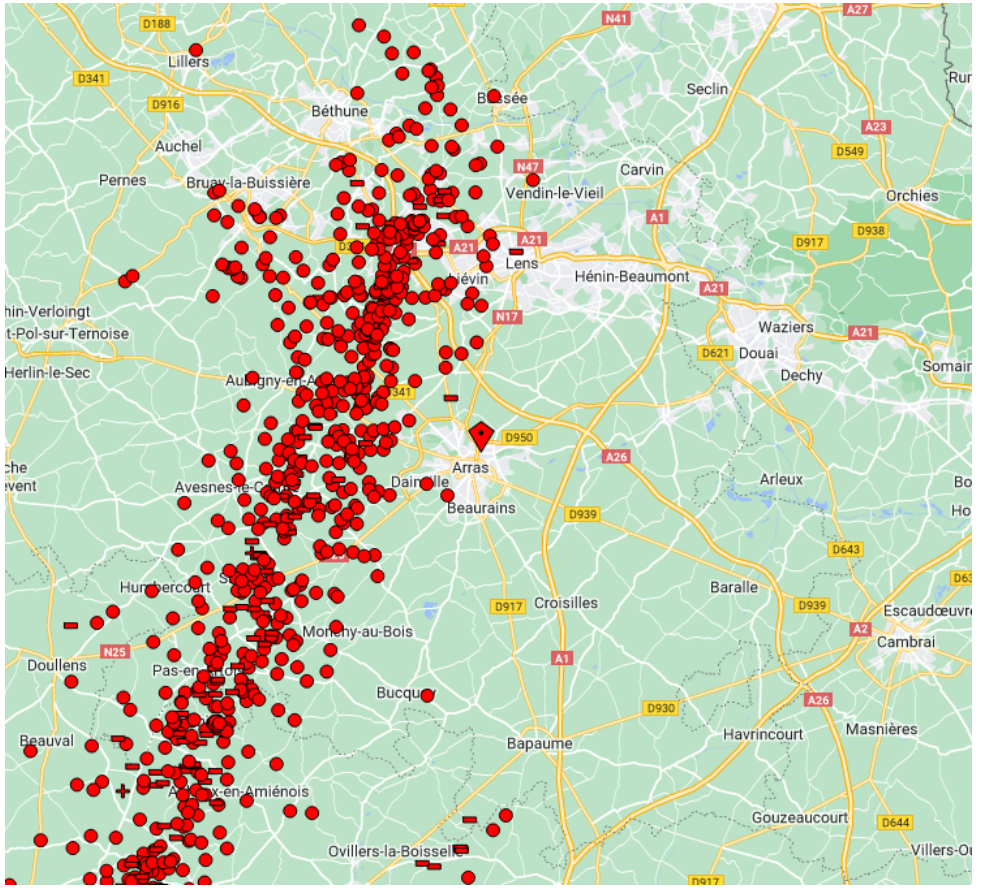
- Our previous study had revealed that, in France, 82% of the all the incidents had occurred during a predicted thunderstorm of level 1 (phenomena locally dangerous) and 18% during a predicted thunderstorm of level 2 (dangerous phenomena expected).

- Our post-analysis on these events confirmed that lightning activity was moderate in 63% of the cases and strong in 37%.

- If we analyse in detail all the “football cases”, these results are in phase with the consideration of “classical” (even weak) thunderstorms and discharges:
  - 6 out on 10 with less than 10 CG within a 10km radius area around the location
  - 6 out on 10 with CG do not exhibit current peak over 20kA.

An individual fault or a collective failure ?

- Our previous study had revealed individual behavioural shortcomings (eg: victims under trees in 30% of the total cases)
- While collective decisions could compensate for these individual errors of judgement, we also have to consider that they can increase them.
- One case exhibits a collective failure: a meteorological vigilance of level 2 was issued but neither the parents of the victims or the other children, the activity supervisors, the municipality that owns the sports facilities, nor anyone else intervened to cancel a football training session.
- Children played while a thunderstorm was clearly present and several of them were injured.
- Even after the event, most of the post-accident statements, considering a “sudden” event or an atypical discharge, raise question about collective responsibilities…



Saint-Nicolas-les Arras (France) – 4th of June 2019

Lightning activity between 4 and 6 PM
while the incident occurred at 6:30

Conclusion

- The analysis of several cases of lightning related incidents during soccer practice has shattered a few preconceived ideas:

1. Thunderstorms rarely occur suddenly and without forerunner: 75% were detectable 30 minutes before and in 9 cases out of 10 at least 15 minutes before the fatal strike, leaving enough time, in this activity, to shelter.
2. Deadly thunderstorms are not particularly severe or atypical, or causing intense current peak…it is even often the opposite.

- This kind of study also points out the shortcomings in terms of individual behavior, just like other outdoor activities, but also exhibits some forms of collective failure that question the effectiveness of sole individual awareness campaigns.

Thanks for your attention

Follow us on :

communication@meteorage.com
www.meteorage.com