



# SEVERE STORM THREATS AND LARGE EVENT VENUES

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# *DEFINITIONS*

**LARGE EVENT VENUES:** Stadiums, speedways, festivals, carnivals, fairs,, arenas, even freeways ...  
*Wherever large crowds gather.*



# DEFINITIONS

**THREATS:** Tornadoes, severe thunderstorm wind (e.g., microbursts and derechos), giant hail, heavy/flooding rains, CG lightning, extreme heat or cold, Tropical Storms



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NSSL Photo



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# *Cloud-to-Ground Lightning*



# *Extreme Wind*



# *Very Large Hail*



*Roanoke, IL Tornado ~ 19:41*



*Roanoke, IL Tornado ~ 19:42*



# *Roanoke, IL Parsons Plant*



# *Roanoke, IL Parsons Plant*



# *Roanoke, IL Parsons Plant*



# *Consider Potential Damage from these Missiles*



# *Large Tornado May 24, 2005*

TU9 SP875 KM47  
05/05/24 TU 17:30:55

oaks



# *Large Storm June 23, 2007*



# *Large Tornado June 23, 2007*



*Large Tornado June 23, 2007*



# ***DEFINITIONS***

**BACKGROUND:** Little in the meteorological literature but more in news media – several close calls and near-catastrophes





# *CHALLENGES*

Acknowledging the threat exists

Illustrating the threat (harder before disaster)

Developing a **plan to minimize** the threat

Gathering resources: human and \$\$\$

Implementing the **plan** using those resources

*Close calls, actual events and “if full...”*



22 Aug 2003

Boston MA

Fenway Park

Capacity 33,871

Red Sox game, rain delay, fans still outside  
exposed to frequent lightning!

*Close calls, actual events and “if full...”*



26 Aug 2000  
Blacksburg VA

**Lane Stadium**

2000 Capacity: 52,500

2006 Capacity: 66,233

Football game postponed seconds before kickoff.  
Stands full of spectators amidst frequent lightning  
strikes.

Lee Corso's (ESPN) car struck.

*Close calls, actual events and "if full..."*



31 Aug 2003

Lexington KY

Commonwealth  
Stadium

Capacity 67,706

Game delayed...but as always fans  
exposed and in danger!

*Close calls, actual events and "if full..."*



6 Jul 2005  
Hampton GA

Atlanta Motor  
Speedway

Capacity 125,000  
+ camping + lodging

F2 tornado (from Cindy) formed *onsite*, \$40 mil damage

# *Close calls, actual events and “if full...”*



## 1989, **Red Rocks Amphitheatre, Denver CO**

- 8,000 children exposed to golf ball hail, strong wind, heavy rain, lightning
- No shelter available.
- Inadequate emergency vehicle access.
- Numerous injuries, many suffered hypothermia



# *Close calls, actual events and "if full..."*

## **Tornadoes rip through heart of Nashville**

**Governor:** Low casualty toll 'miracle'

**Latest developments:**

- [Storms came at 3:45 p.m.](#)
- [Building, church collapse](#)



(Courtesy WISN)

**F3, 1 killed (not at stadium)**



**16 Apr 1998**  
**Nashville TN**  
**Adelphia Stadium**



**Capacity 68,798**

*Close calls, actual events and "if full..."*

11 Aug 1999  
Salt Lake City UT

Delta Center,  
Salt Palace

1 killed at convention tent



*"Nah, that couldn't be a  
tornado. We don't get those  
here."*

- Hospital spokesman upon sighting

# *Close calls, actual events and “if full...”*

Woman dies in Kennywood collapse as fierce storms tear through region

High winds devastate park, 54 people hurt



31 May 2002

W. Mifflin PA

Kennywood  
Amusement Park

“Straight line”  
thunderstorm winds

Collapsed ride, *ad-hoc* “shelter”

*Close calls, actual events and "if full..."*

13 Jun 1998  
Oklahoma City  
Frontier City  
Amusement Park



F2 Tornado  
17 injuries



*Close calls, actual events and "if full..."*

19 Jul 2006  
St. Louis  
Busch Stadium



Bow Echo

Est. 60-80

mph, field covered but  
what about the fans?

Wind-borne objects  
injure 30 people



*Close calls, actual events and "if full..."*

6 Nov 2005  
Evansville IN  
Ellis Park Horse  
Racing Facility



F3 Tornado

23 killed,  
~200 inj. away  
from track



# *Close calls, actual events and "if full..."*

16 June 2007

Imola (Venice), Italy

“Freak tornado hit, uprooting trees, overturning cars, knocking over sound towers and girders at the festival venue. 25 people injured by the falling towers, although none fatally”

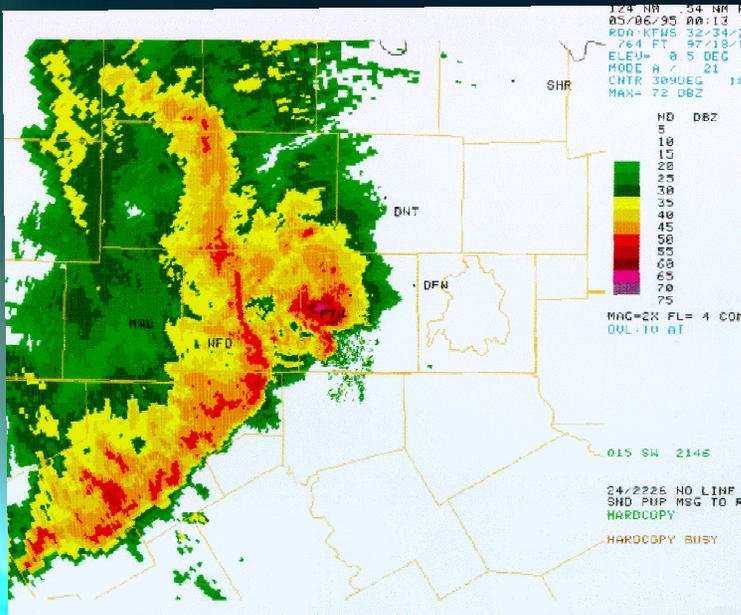


*"We are saddened by the events that happened in Venice today and our hearts are with the injured fans and their families."*

# *Close calls, actual events and "if full..."*

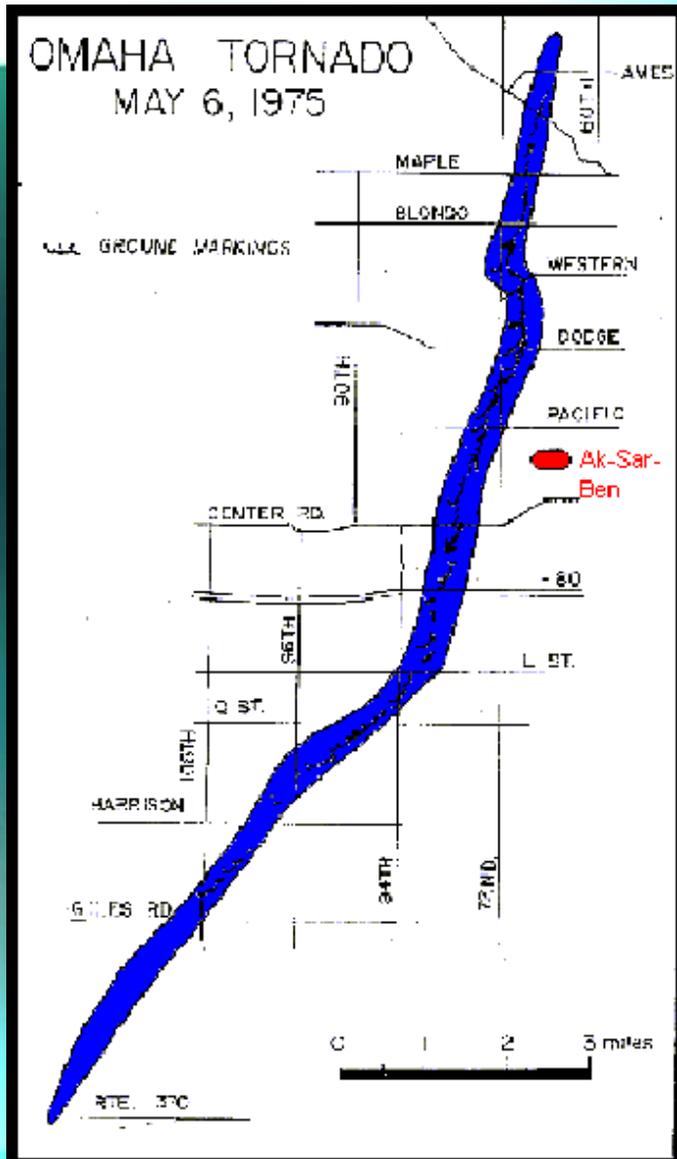
5 May 1995  
Fort Worth TX  
Mayfest

Attendance ~10,000



Monster supercell w/ 80  
mph winds, softball size hail,  
flooding rains

# *Close calls, actual events and "if full..."*



6 May 1975 Omaha NE  
**Ak-Sar-Ben horse track**  
½ mile wide violent (F4) tornado  
passed within ½ mile of track

*Close calls, actual events and "if full..."*



14 Dec 1987

West Memphis AR

Southland Greyhound Park

F3 tornado passed  $\frac{1}{4}$  mile away  
*from 7,000 unaware spectators !*

*When are fans warned?*

*What should they do?*

***MORE SPRAWL  
MORE TARGETS  
100+ death tornado again?***



**Rae & Stefkovich (2000)**

# *SUCCESS STORIES in Venue Preparedness*



12 Nov 2005

Ames IA

**Jack Trice Stadium**

Capacity 45,814

F2 across NW Edge of Ames,  
Forward speed 53 mph,  
Sirens sounded, in warning,  
>3 hours into tornado watch,  
Evacuation inside & out,  
good advance planning

# *SUCCESS STORIES in Venue Preparedness*



10 Nov 2002  
Van Wert OH  
Movie theater

F4 tornado, in warning,  
theater with alarm unit  
activated by county EM,  
evacuation to interior safe  
areas, many kids' lives saved



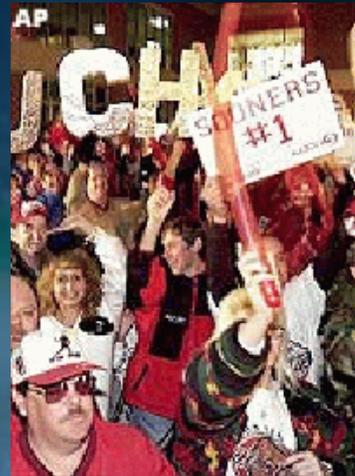
Repeating text at the bottom of the slide.

*Who is responsible for  
mitigating this danger?  
Venue operators, Venue  
Managers, Security Managers,  
and...*

# The Entire Integrated Warning System



**EMERGENCY MANAGEMENT**



Every individual

# *Who MUST act to mitigate this danger...*

## ★ **EMERGENCY MANAGERS**

Help venues develop, publicize and execute site plans

## ★ **STORM SPOTTERS**

Superior COMMS capabilities and weather eyes can be put to use near and generally west from venues

## ★ **NATIONAL WEATHER SERVICE**

Reliable outlooks, watches and warnings...WCM liaison to venues, EMs, police and other public officials

## ★ **VENUE ARCHITECTS and OPERATORS**

Acknowledge risks, design facilities accordingly

Customized safety plans (develop with EMs)

Publicize – not withhold – severe weather plan

## ★ **Insurance Industry** Insure only venues that have a *plan*.

# *Who MUST act to mitigate this danger...*

## ***PRIVATE SECTOR METEOROLOGY***

- ★ Event-specific and Venue forecasting, consulting and alerting services

## ***LOCAL and NATIONAL NEWS MEDIA***

- Investigate and inform audience of safety plans at venues
- Inform audience of forecasts (outlooks, watches, warnings)

## ***EVERY INDIVIDUAL SPECTATOR***

***\*\*\*AWARENESS!!!\*\*\****

***Severe weather forecast***

***Weather safety plan of venue***

***Personal safety options at facility (plan or not)***

***Demand for storm-ready gathering places***

What else is needed?

# *EDUCATION*



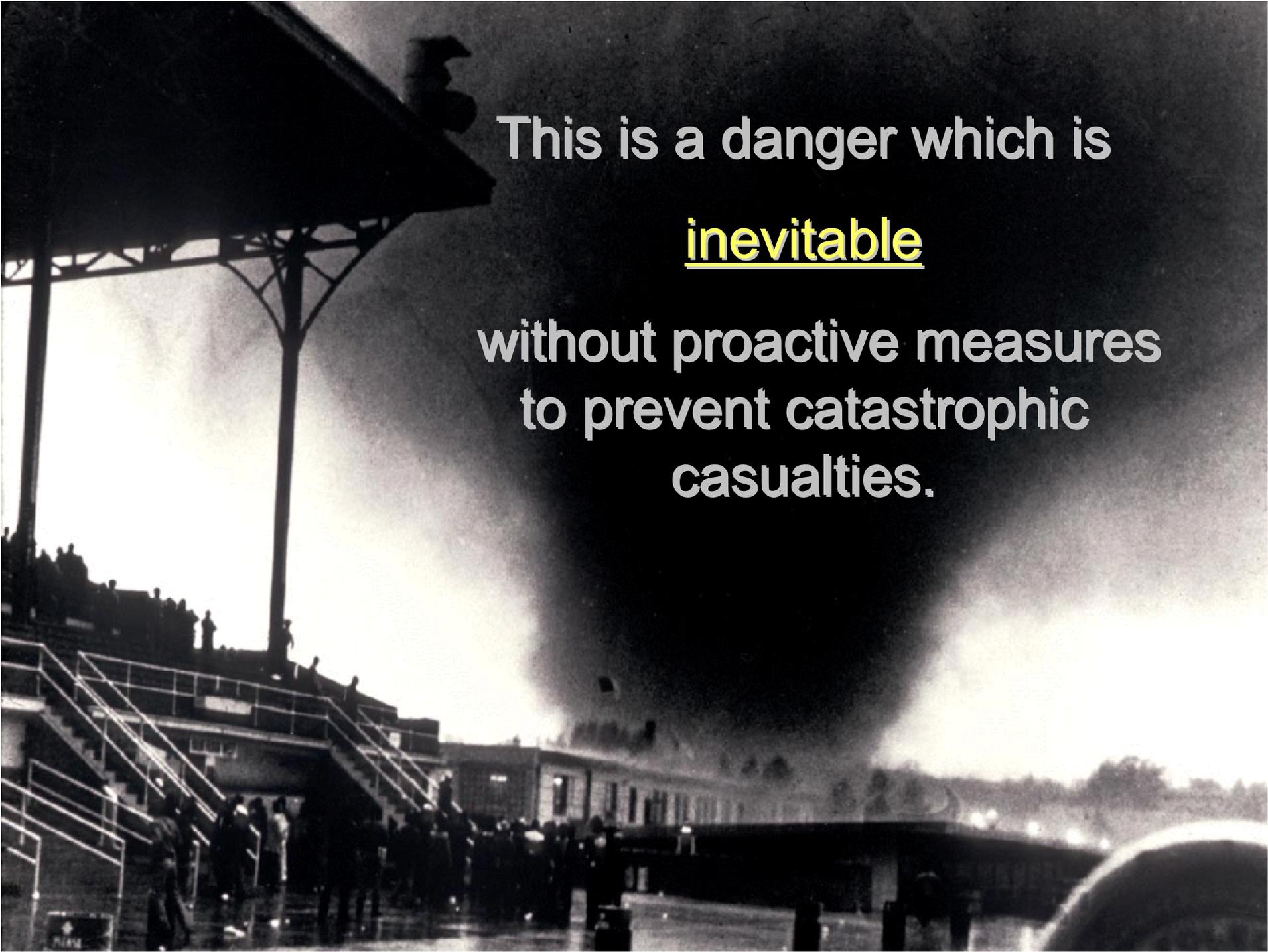
...about severe weather safety in public places



# HEED THIS WARNING

A direct strike on a crowded large venue is *only a matter of time* -- if not here, somewhere.





This is a danger which is

inevitable

without proactive measures  
to prevent catastrophic  
casualties.

Considering the potential  
catastrophic loss of life & legal  
exposure...

**The only true liability is the  
negligence of doing nothing.**

# *What are we doing?*

- A national meeting involving the entire warning system and insurance industry.
- Experts to address detailed threat characteristics.
- Breakout sessions to discuss individual threats & develop recommendations.
- Result: Templates to mitigate each threat that venue operators must face.
- Venue operators use these templates to formulate **A PLAN!** for each threat & their specific venue.

## *Until then some suggestions: Lightning*

- Often relatively long lead time – minutes up to ~2 hours
- Shelter away from metal, wiring, plumbing, and other conductors
- Shelter in automobiles

## *Until then some suggestions: Flash Flood*

- Variable lead time – minutes to hours
- Seek high ground, avoid most underground locations
- High risk – considering canceling event

## *Until then some suggestions: Hail\**

- Short lead time – minutes
- Shelter under well constructed roof and walls and well away from windows & doors
- Avoid automobiles & other forms of transportation

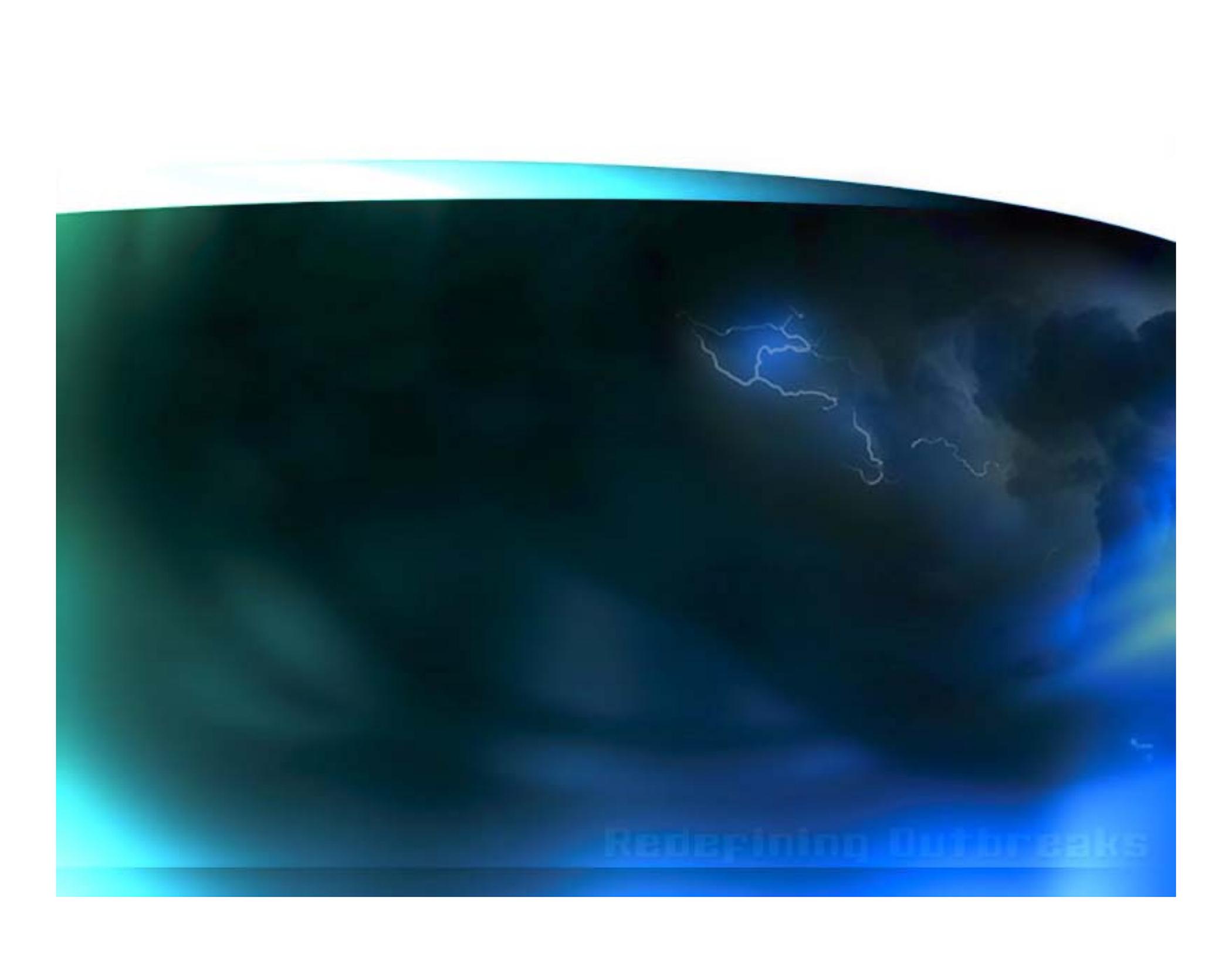
\* Often accompanied by high winds

## *Until then some suggestions: Wind*

- Variable lead time – Seconds up to ~ 1 hour
- Shelter within reinforced structure
- SPC Moderate to High Risk – consider canceling event

## *Until then some suggestions: Tornadoes*

- Short lead time – minutes
- Shelter underground
- SPC Moderate to High Risk – consider canceling event

A dramatic, dark blue and black sky with a bright, jagged lightning bolt striking down from the upper right. The overall mood is intense and powerful.

Redefining Outbreaks

# *Image & Graphics Credits*

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*Questions? Comments?*

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