

Relation between flash rate and wind speed

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Outline

- ❖ Goals
- ❖ Instruments used for analyze
- ❖ First results
- ❖ Conclusion

Goals

Many experiments have been done to find connections between lightning activity and severity of weather.

Relationship between meteo parameters and flash rate and electric field are using

- ✓ To classify storms
- ✓ To understand electrification processes in thundercloud
- ✓ To predict violence of the storm

etc.

Instrumentation



Papers

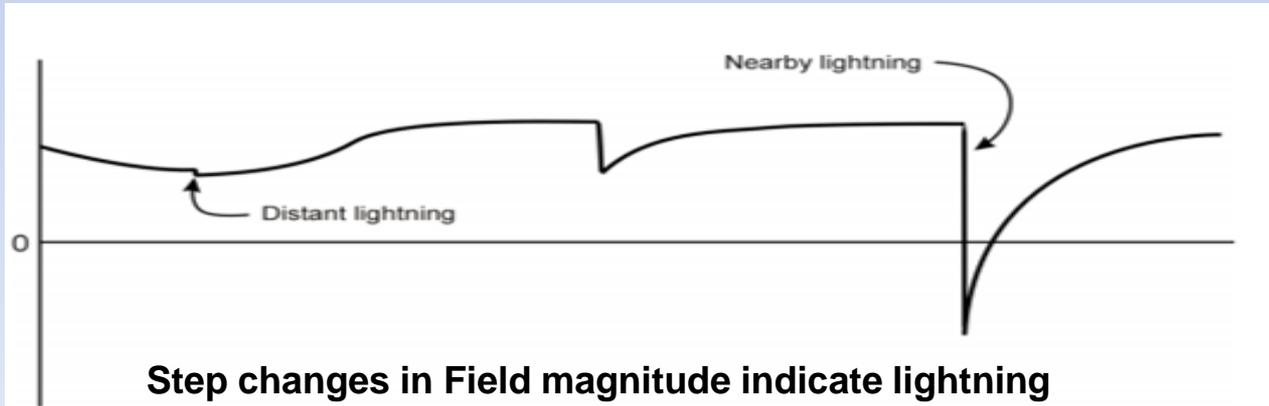
- **Williams et al 1999:** The behavior of total lightning activity in severe Florida thunderstorms
- **Lang et al 2002:** Relationships between Convective Storm Kinematics, Precipitation, and Lightning
- **Schultz et al 2009:** Preliminary Development and Evaluation of Lightning Jump Algorithms for the Real-Time Detection of Severe Weather
- **Pawar et al 2010:** Anomalous electric field changes and high flash rate beneath a thunderstorm in northeast India
- **Schultz et al 2011:** Lightning and Severe Weather: A Comparison between Total and Cloud-to-Ground Lightning Trends

Boltek EFM-100

Boltek EFM-100 Electric Field Monitor measures the static electric field generated by thunderclouds electric field in Volts per meter. Lightning is detected as a sudden change in the static electric field.

EFM-100 can

- Log date, time and distance of nearby lightning.
- Monitor lightning up to 38 km away (accuracy 5 -10 km)
- Detect the high electric field conditions which precede lightning.
- Short-range detector is optimized for close lightning to provide the best distance accuracy while ignoring far away lightning.
- Monitor up to four separate locations per PC.
- Review archived data from previous storms.



Lightning Detector (Boltek)



StormTracker's

Detects if lightning is near.

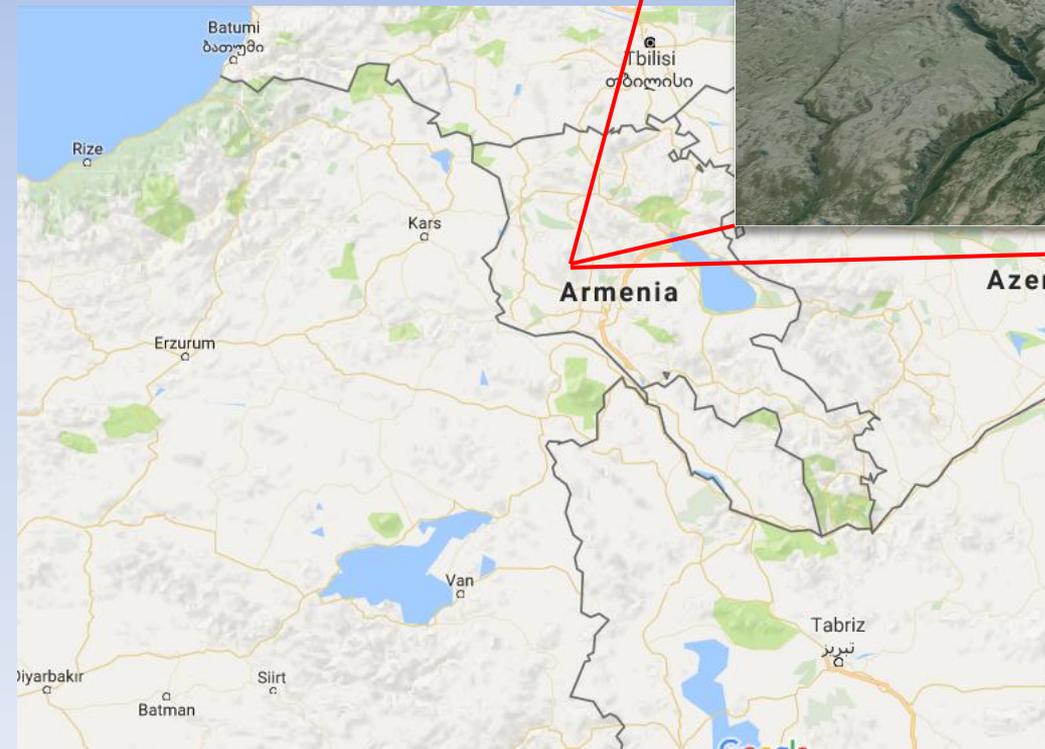
1. Receives early warning.
2. Determines from which direction the storm is coming.
3. Follows developing and decaying storms from the first strike to the last.
4. Saves all data for future analysis.

Vantage Pro2

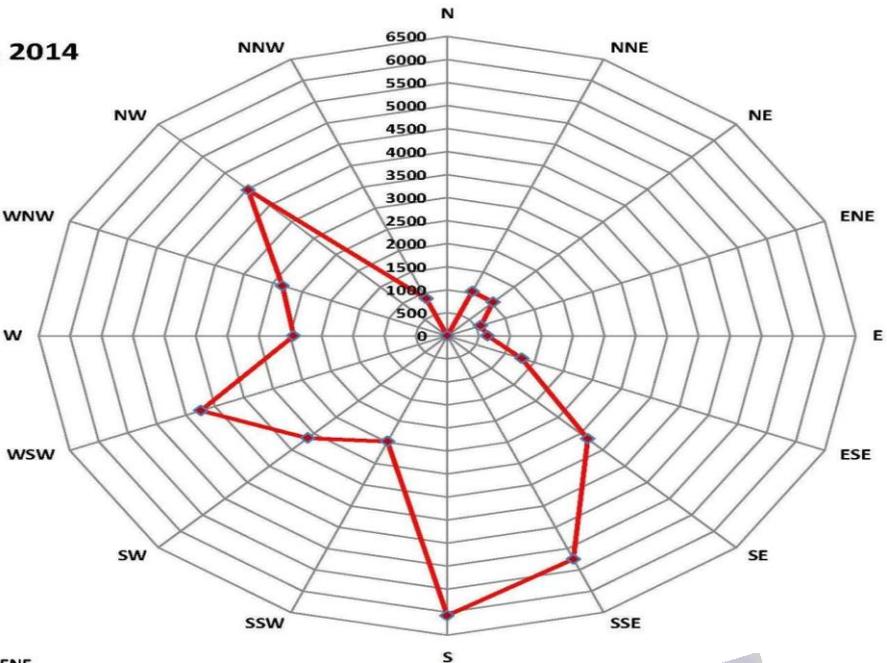


It has the following integrated Sensors:

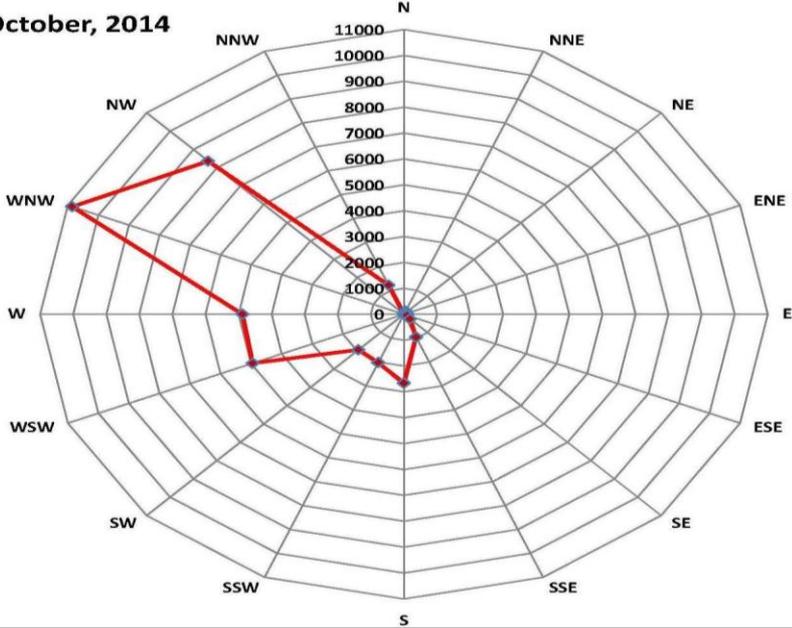
- Rain collector
- Temperature and humidity sensors
- Anemometer
- Solar radiation sensor
- UV sensor
- Solar panel



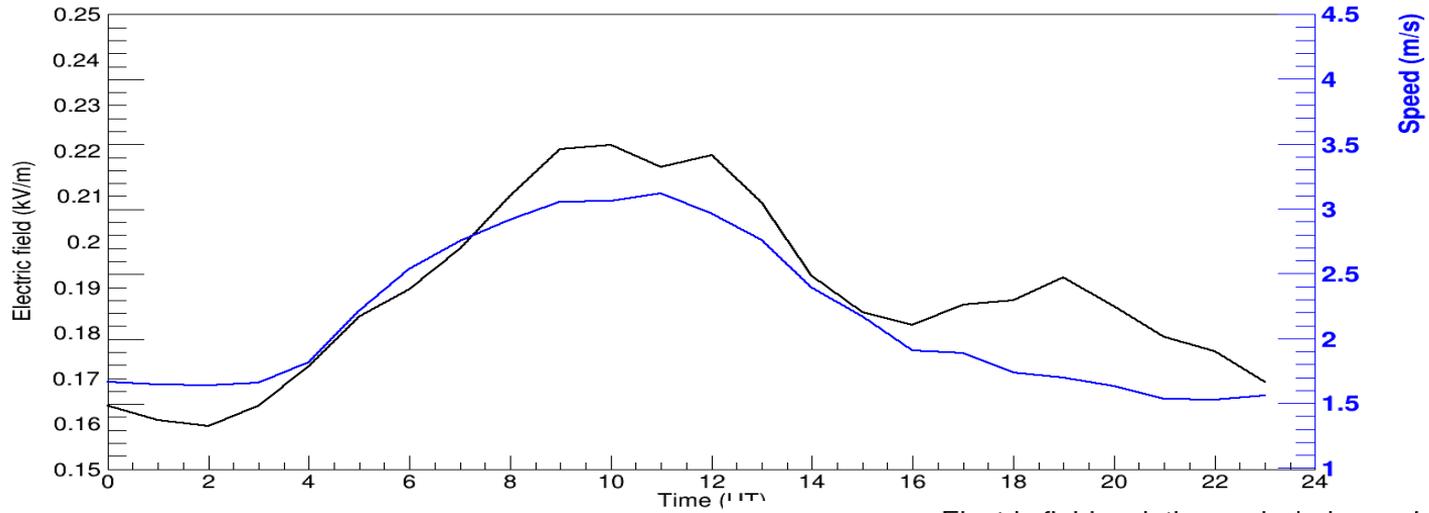
Wind direction in May, 2014



Wind direction in October, 2014

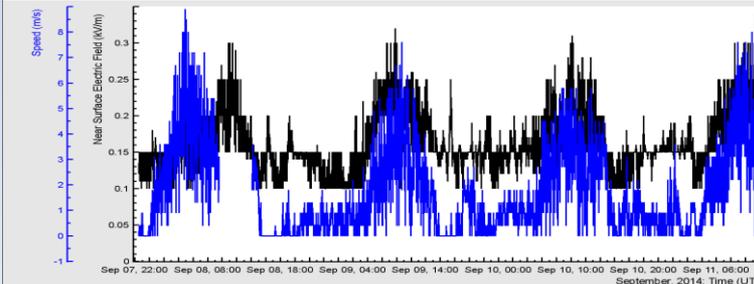
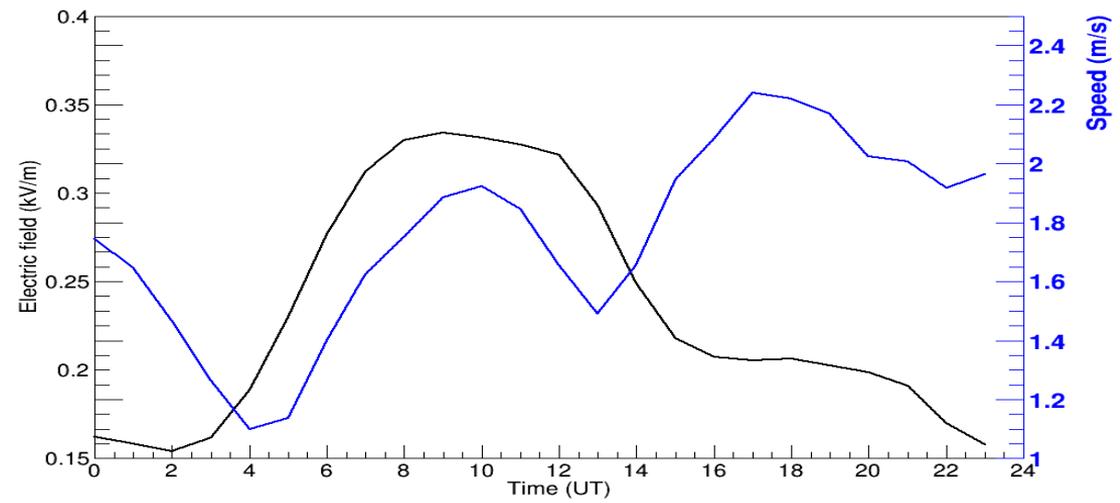


Electric field variation and wind speed during fair weather

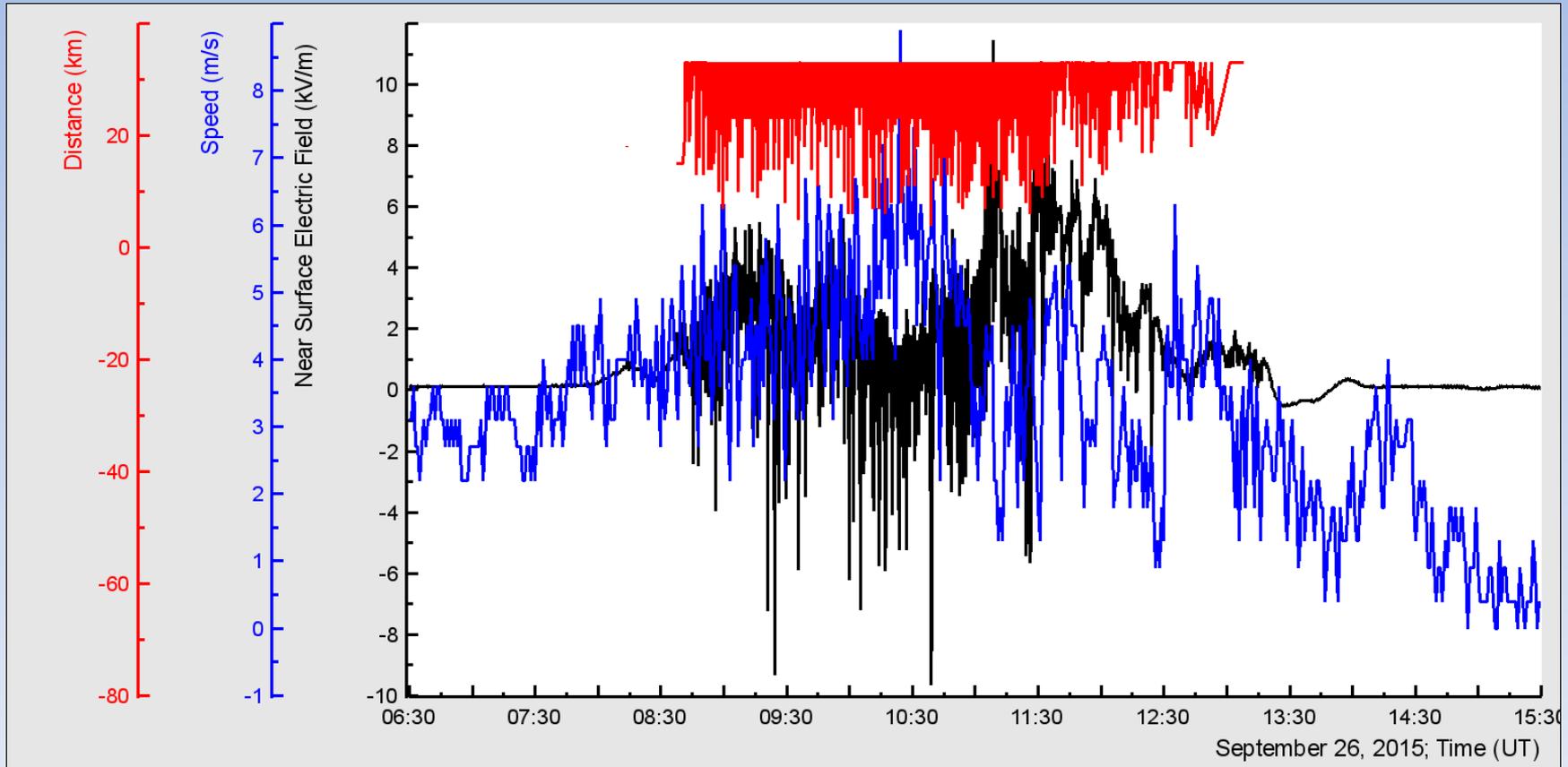


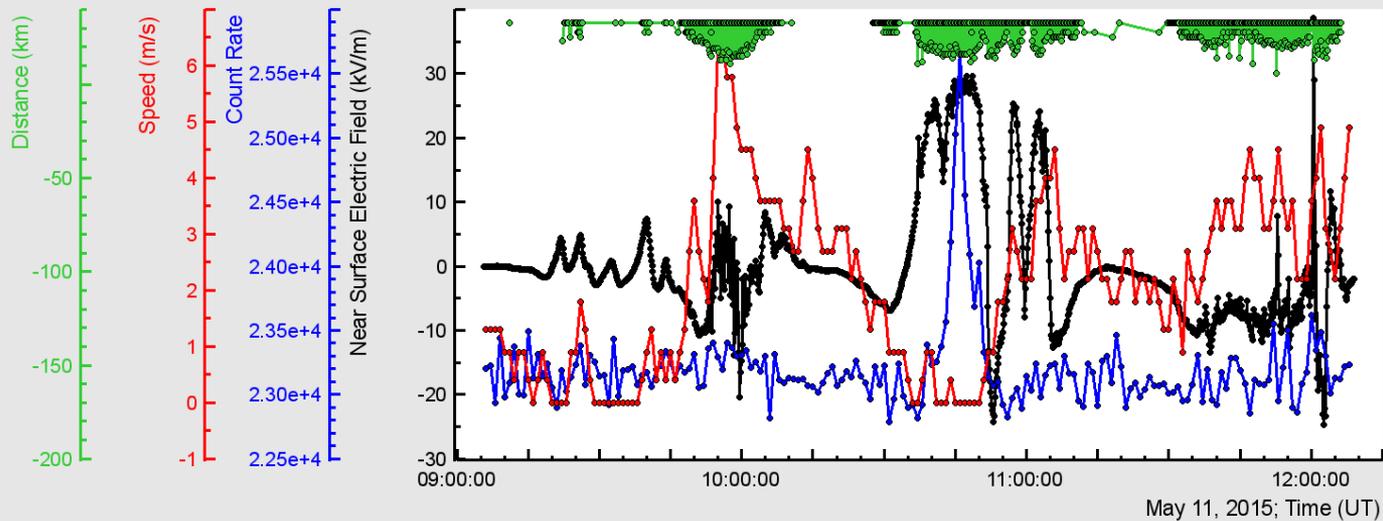
**~400 days
from 2011
June to 2015
December**

Electric field variation and wind speed during fair weather

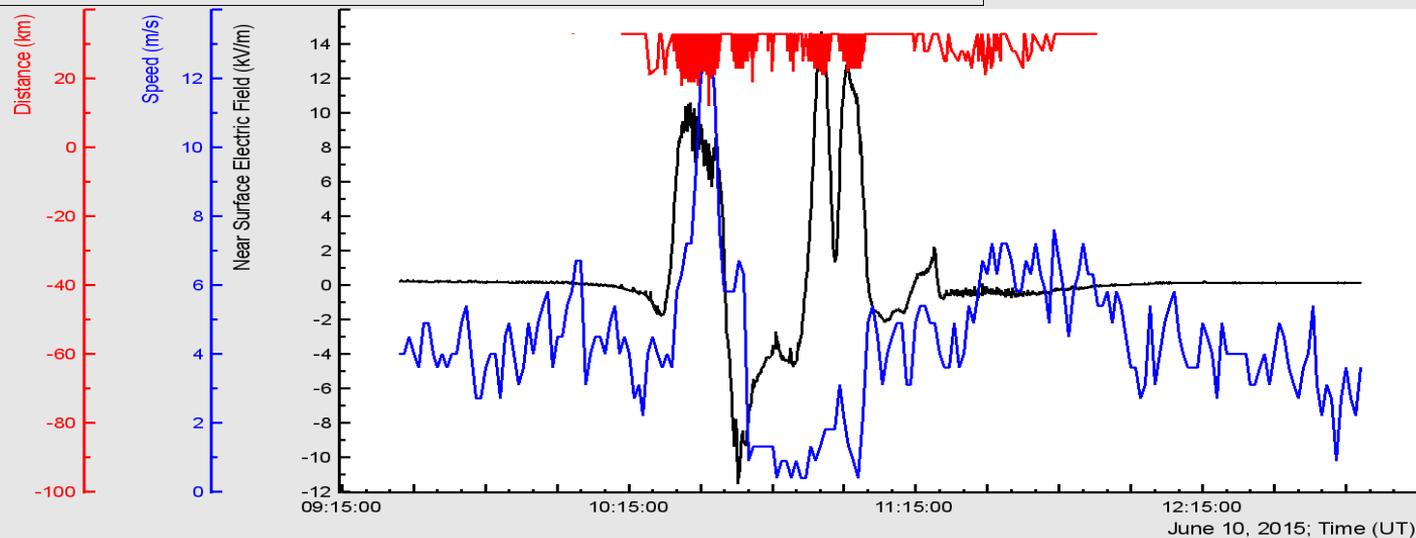


Storm example

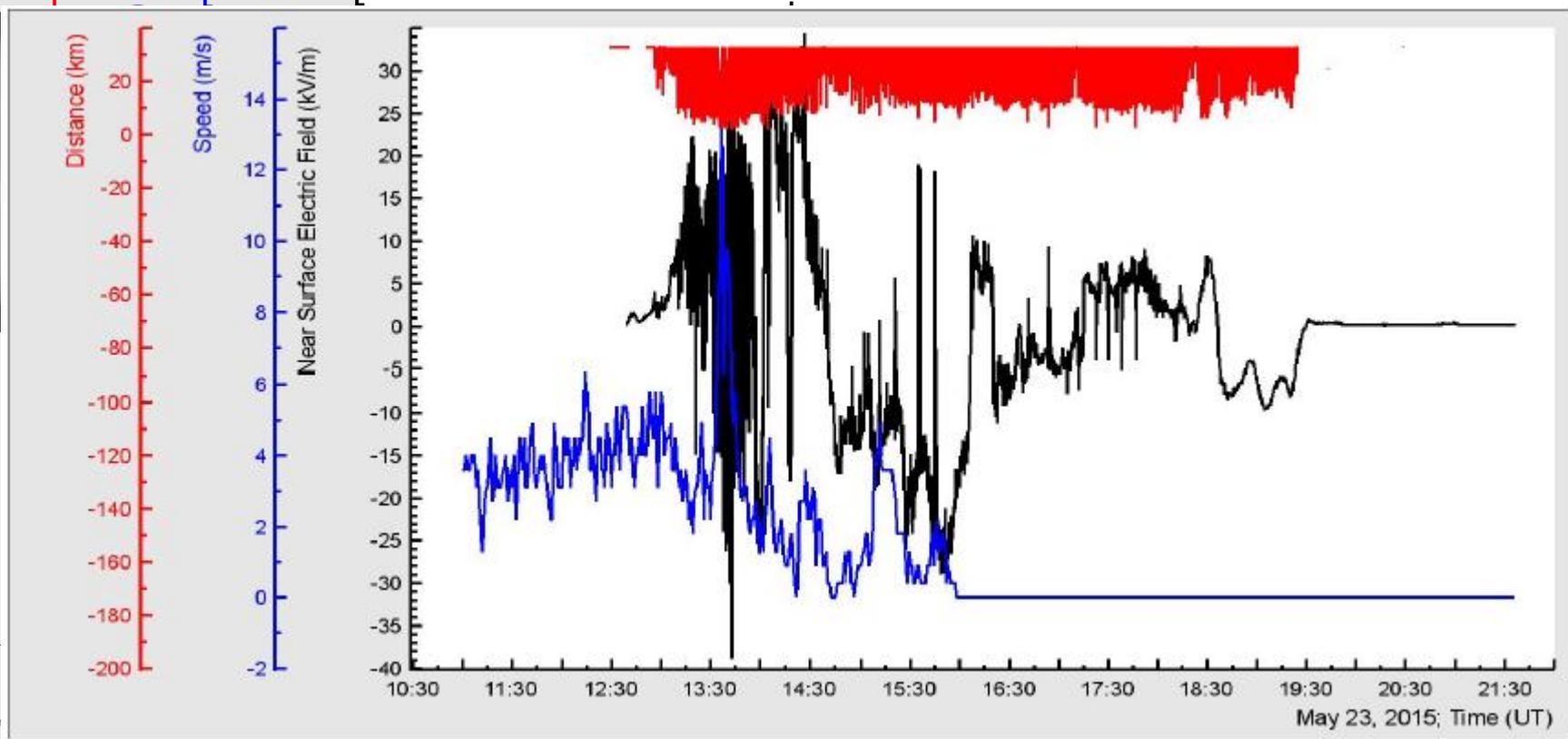




Wind speed increased in the first stage of storm

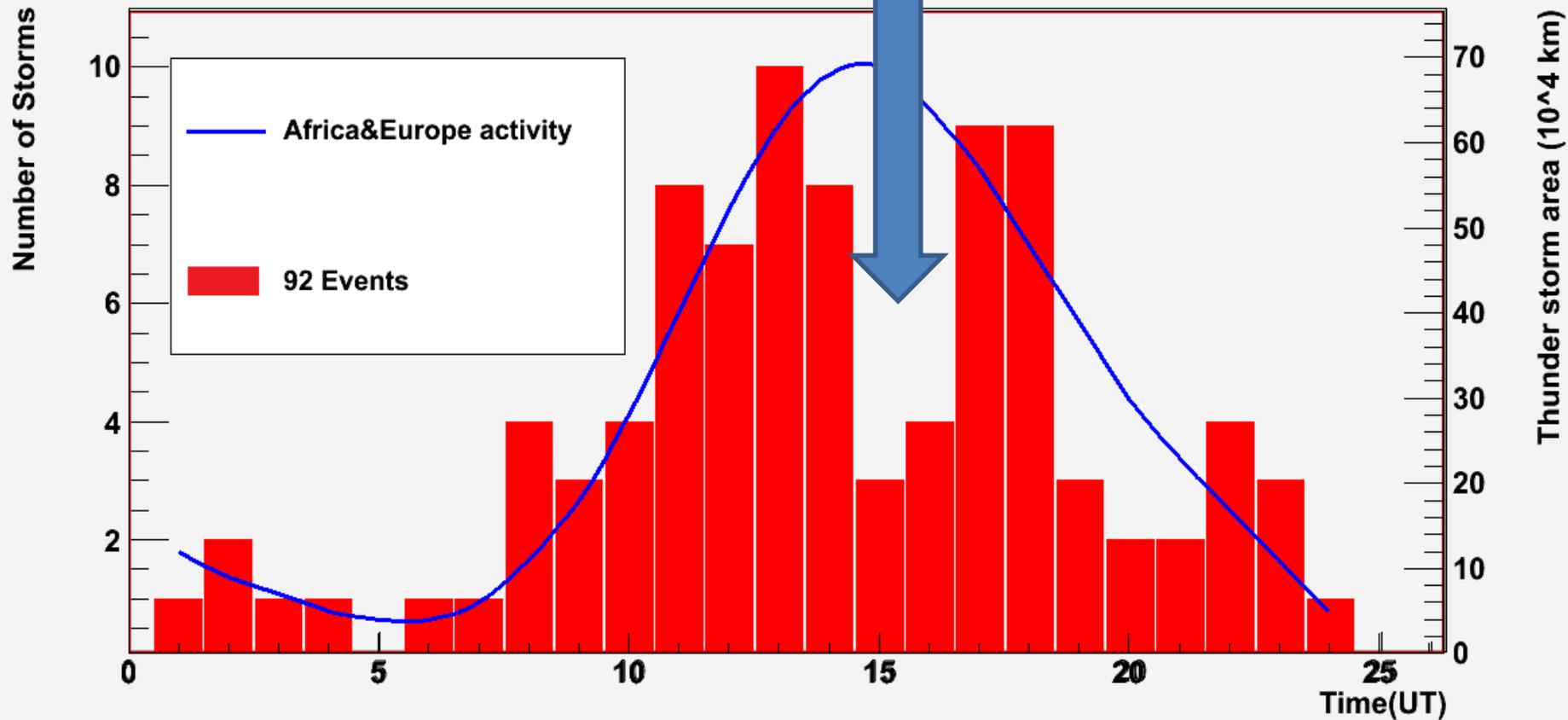


Joint measurements on May 23

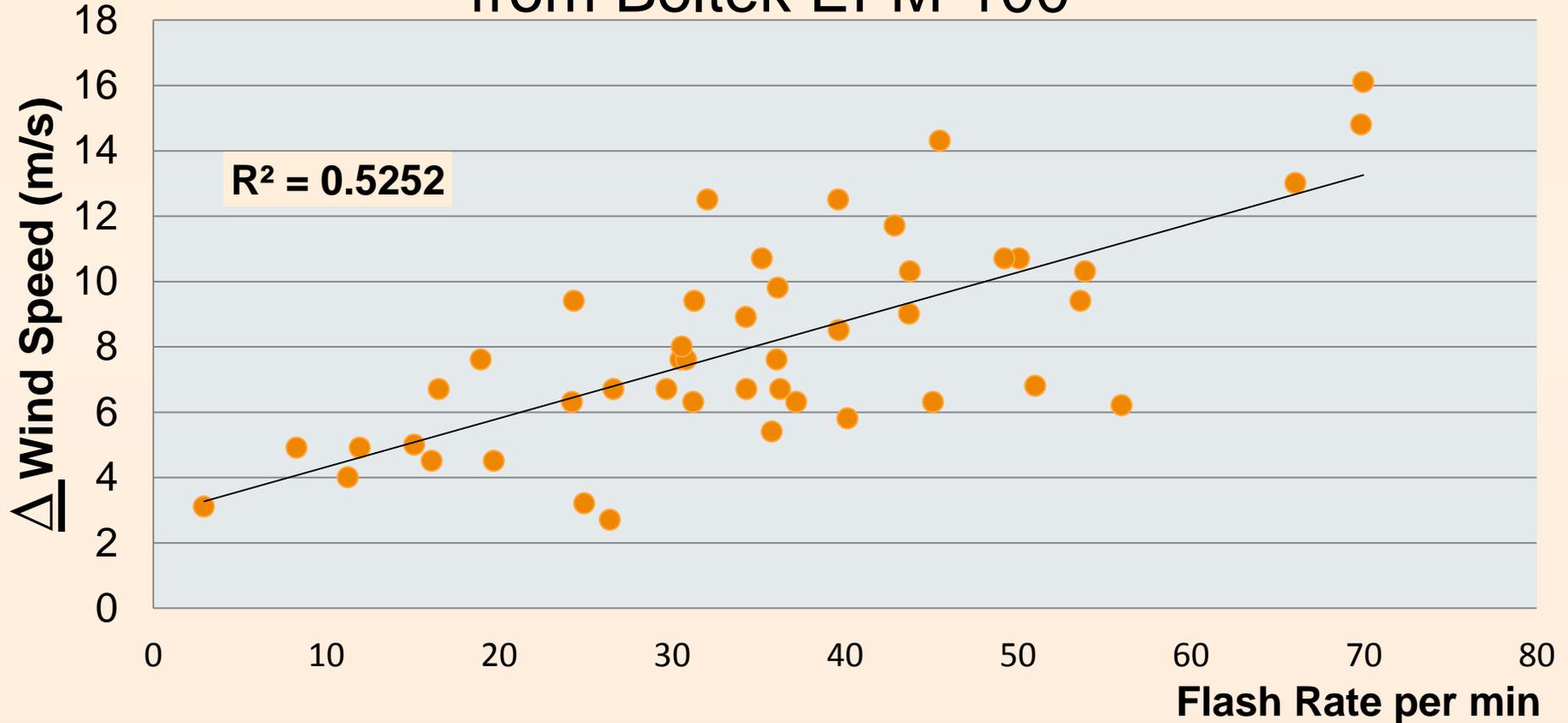


Mor

Events distribution



Correlation between wind speed and Flash Rate from Boltek EFM-100



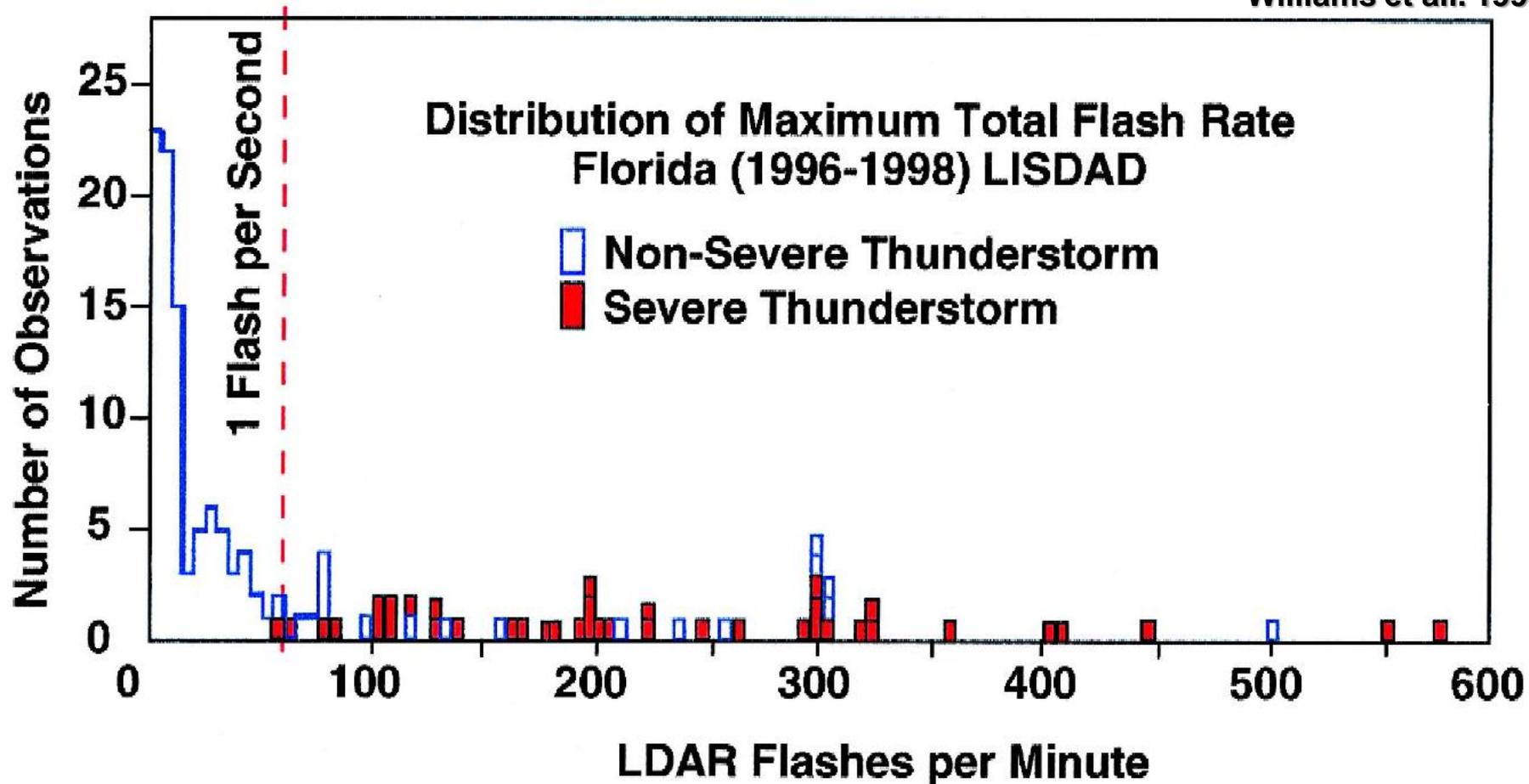
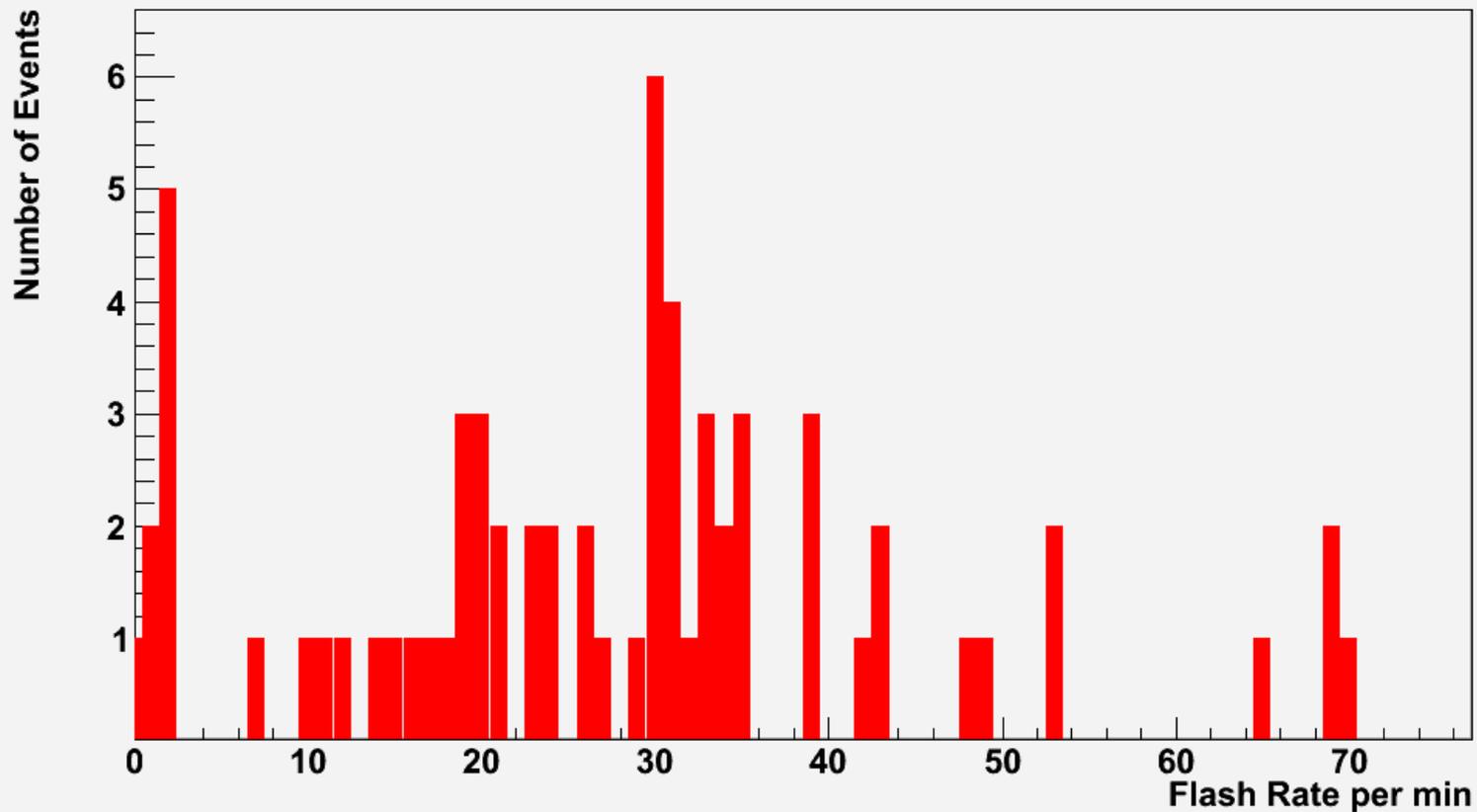


Fig. 3. Peak flash rates for Florida thunderstorms based on LDAR observations.

Distribution of average flash rate per min



Conclusion

- Results were presented for April-October months of 2014 & 2015 years.
- There is positive correlation between wind speed and electric field during fair weather
- Thunderstorm occurred 11:00-14:00 & 16:00-19:00
- Violence of storm directly coupled with lightning activity.
Positive correlation between wind speed and flash rate 😊 ?

Thank you for questions



