

# A comparison of the hail size in front of the electrical and other radar features of thunderstorms: the use of lightning jump as severe weather forecaster.

Farnell C., Rigo T., Pineda N.  
 Servei Meteorològic de Catalunya (SMC).  
 cfarnell@meteo.cat



## Characteristics of study

Period of study: 2006-2013

Number of cases: 139 episodes

## Objective

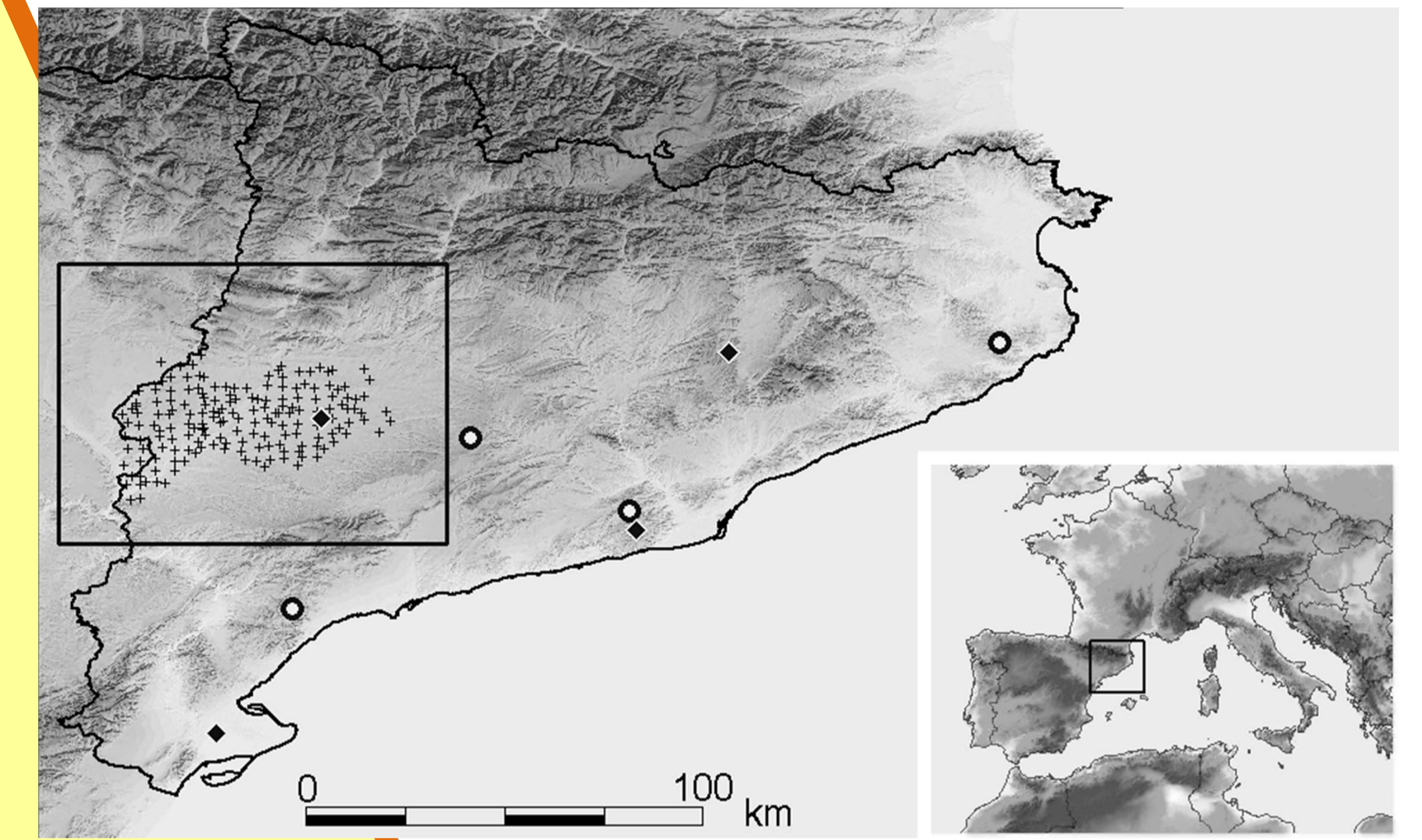
The aim of this work is determine if it is possible to forecast the diameter of hail through the characteristics of thunderstorms like the total lightning and the vertical profile of reflectivity.

This poster shows **lightning characteristics** and **radar parameters** related to thunderstorms that produced LJ warnings.

A **LJ alert** is triggered when is produced a sudden increase of total lightning activity associated with a thunderstorm

The thunderstorms dataset has been divided in **three groups**, according to the diameter of the hail fall .

## Area of study



+ Hailpads ● XRAD: Radar Network ○ LLS: Lightning Location System (LLS)  
 C-band radars LS 8000 VAISALA  
 Single Pol Total lightning

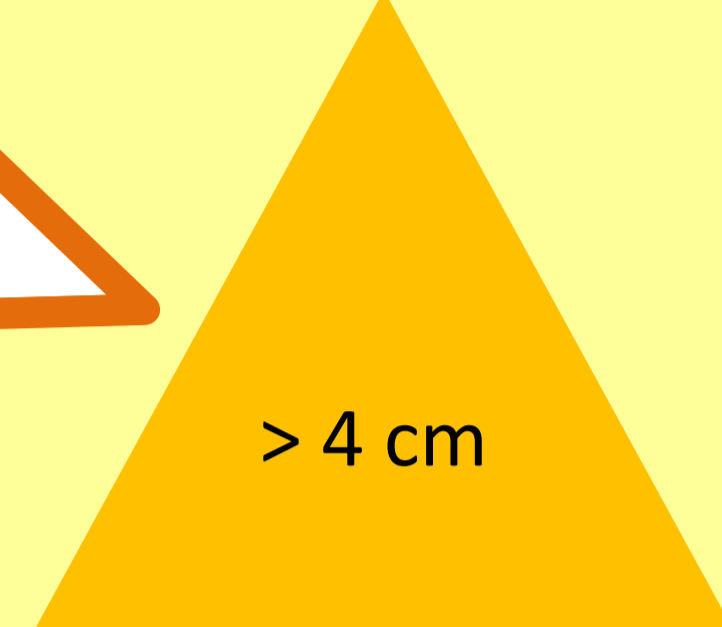
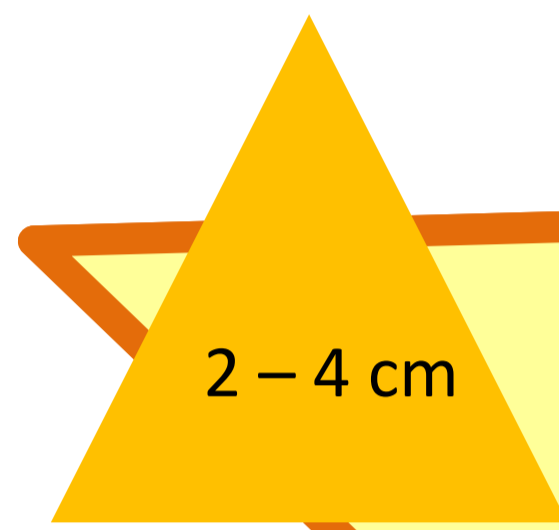
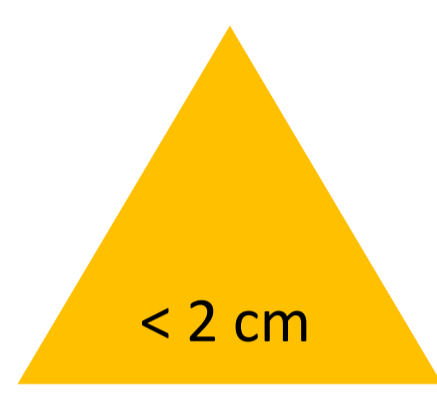
## Distribution according to the size of hail

Number of episodes by group

**G1**  
77

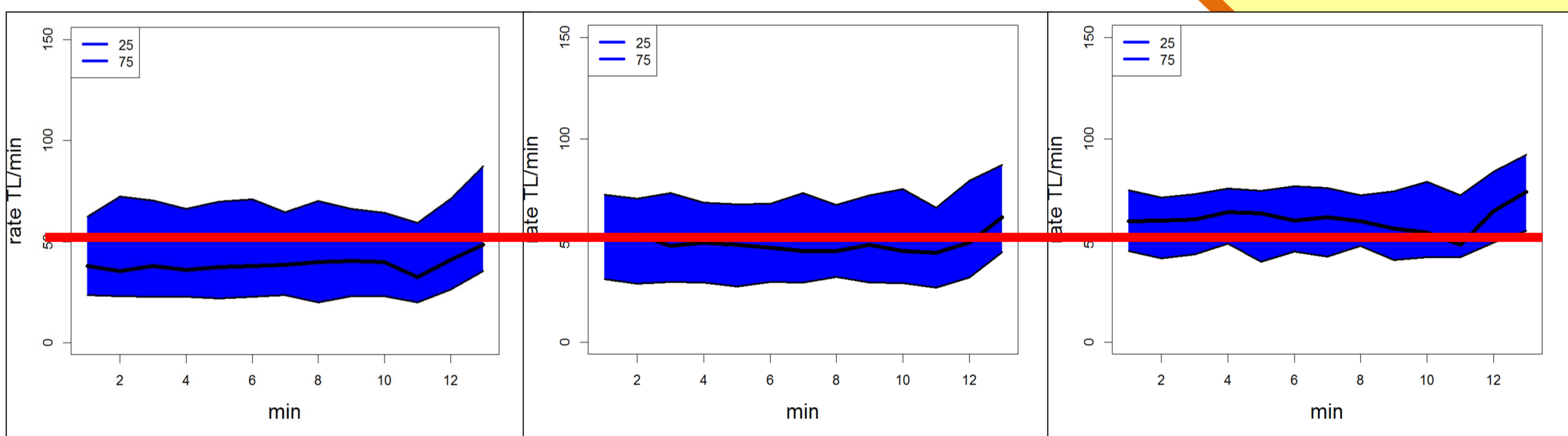
**G2**  
51

**G3**  
11



## Evolution of lightning and area parameters

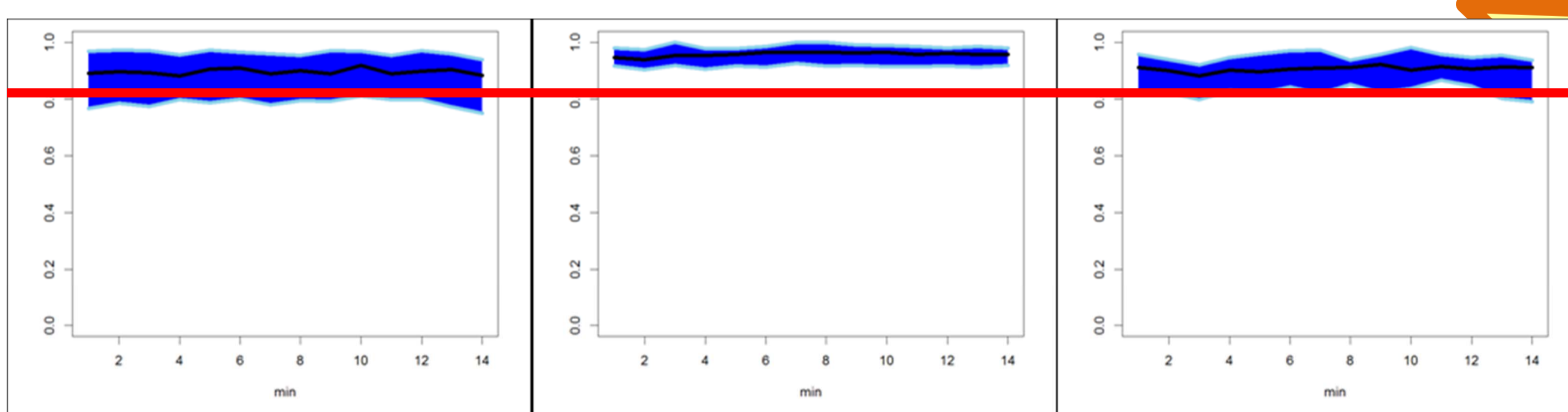
Rate of Total Lightning / minute



Although all groups show abrupt increase at the last minute, G3 shows the highest differences on respect the previous minutes.

## Which type of lightning is the dominating ?

IC / Total Lightning



IC flashes dominate in total lightning in the 3 groups  
 CG flashes only are 20 % in G1 and G3. In G2, they represent 10 %.

### G1

-CG dominate during all period, especially in the last minute.

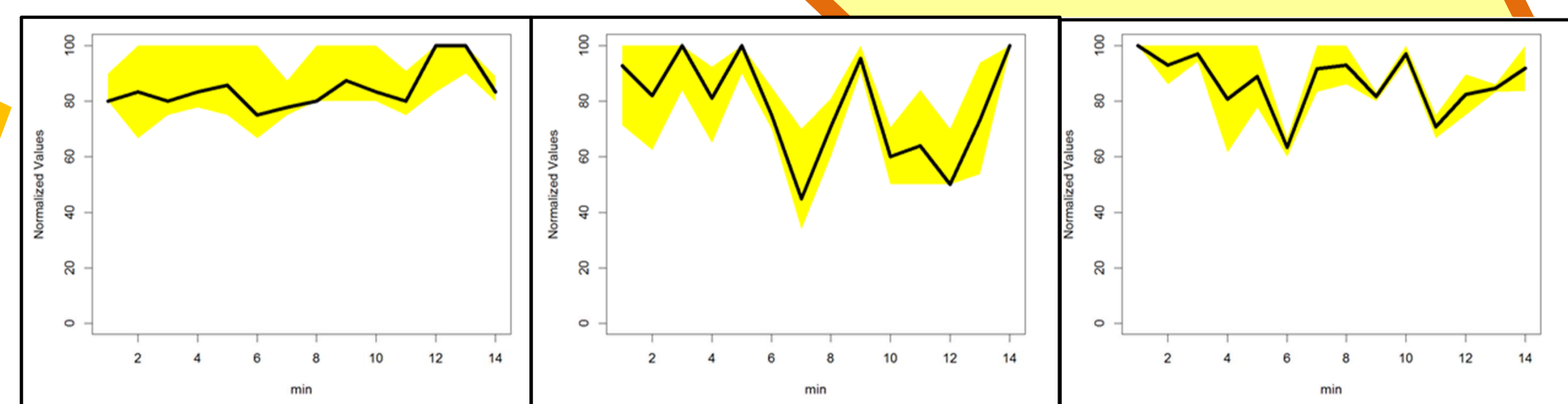
### G2 & G3

-CG dominate during the first minutes. From minute 4, there is an increase of +CG.

## How is the behavior of CG flashes ?

Are there positive anomalies?

CG - / CG



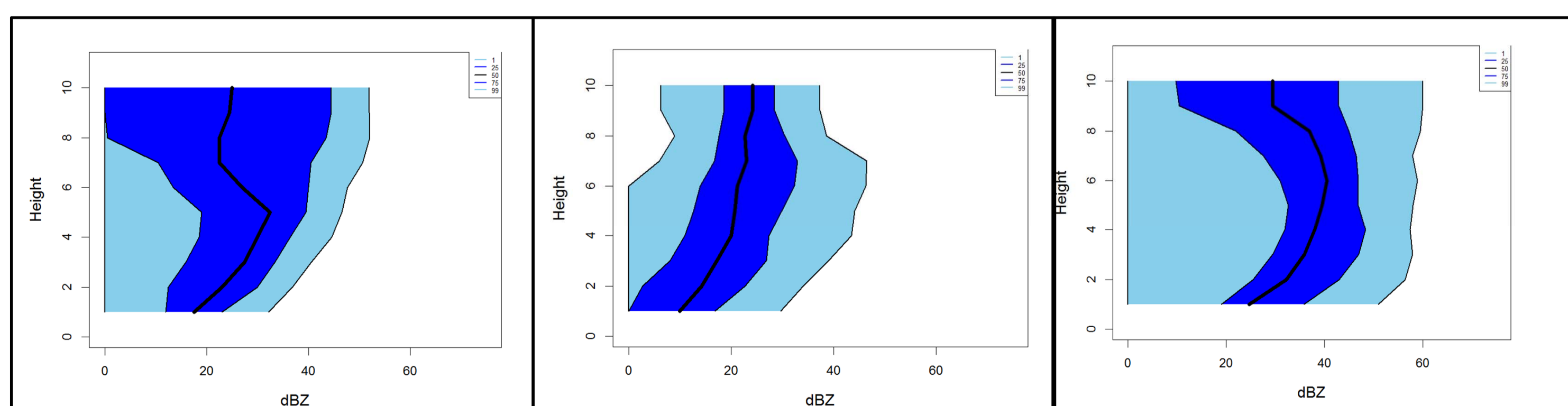
## Radar parameters

Profile of reflectivity

### FUNNEL shape

### TILTED shape

### BOWED shape

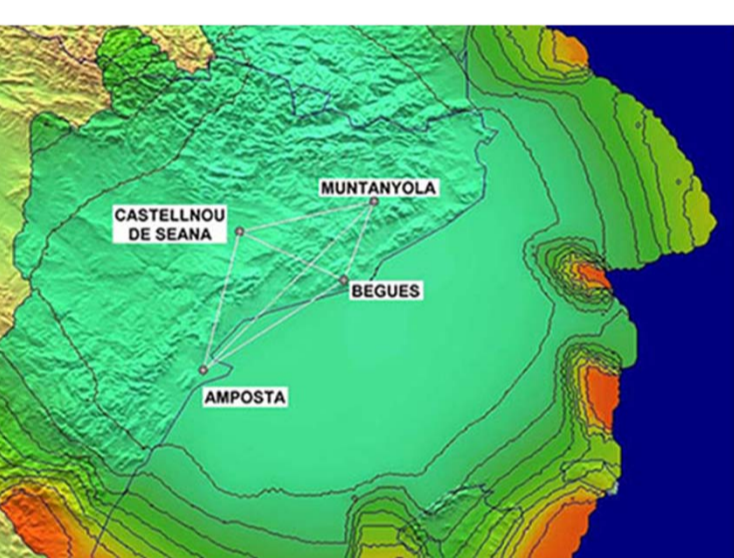


The evolution of reflectivity / height shows variation according to different group.

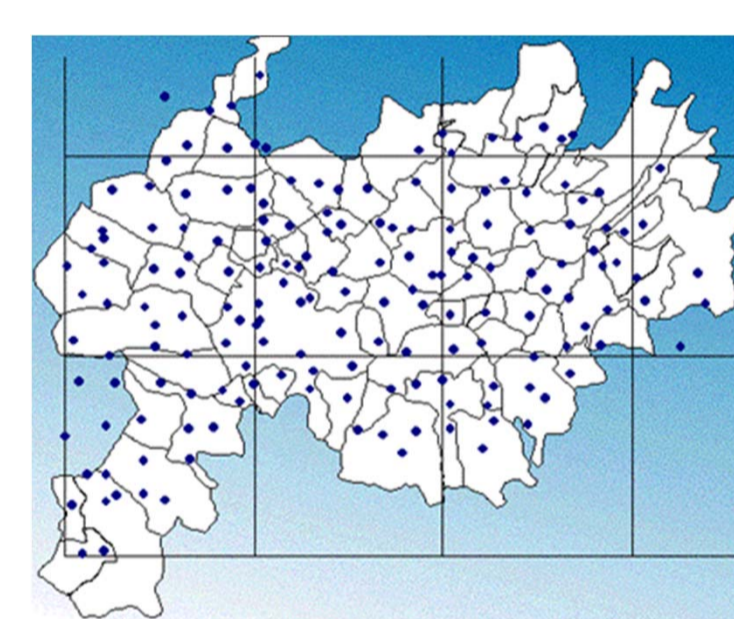
## RADAR



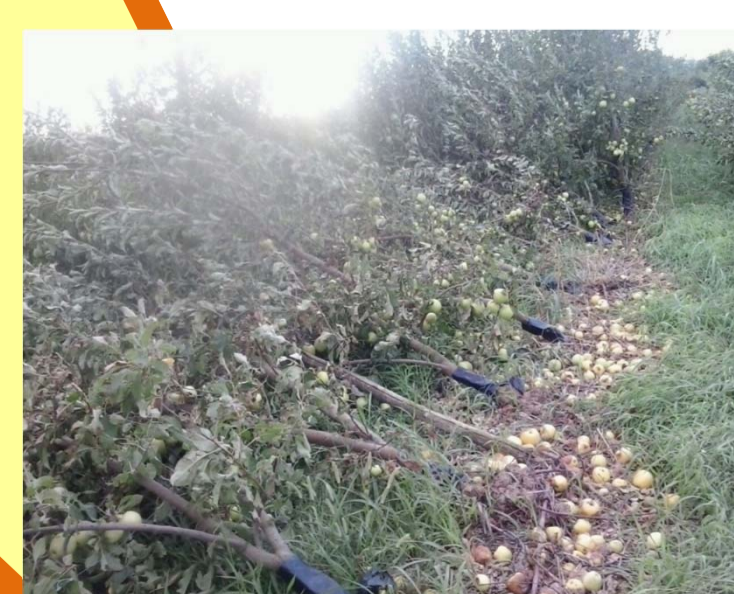
## LLS



## HAILPADS



## DAMAGES



## Acknowledgements

We want to thank to the Grupo de Física Atmosférica de la Universidad de León, to the Associació de Defensa Forestal (ADV-Terres de Ponent) and the Research Area of the SMC.

## References

Farnell, C., Rigo, T., & Pineda, N. (2017). Lightning jump as a nowcast predictor: Application to severe weather events in Catalonia. *Atmospheric Research*, 183, 130-141.