



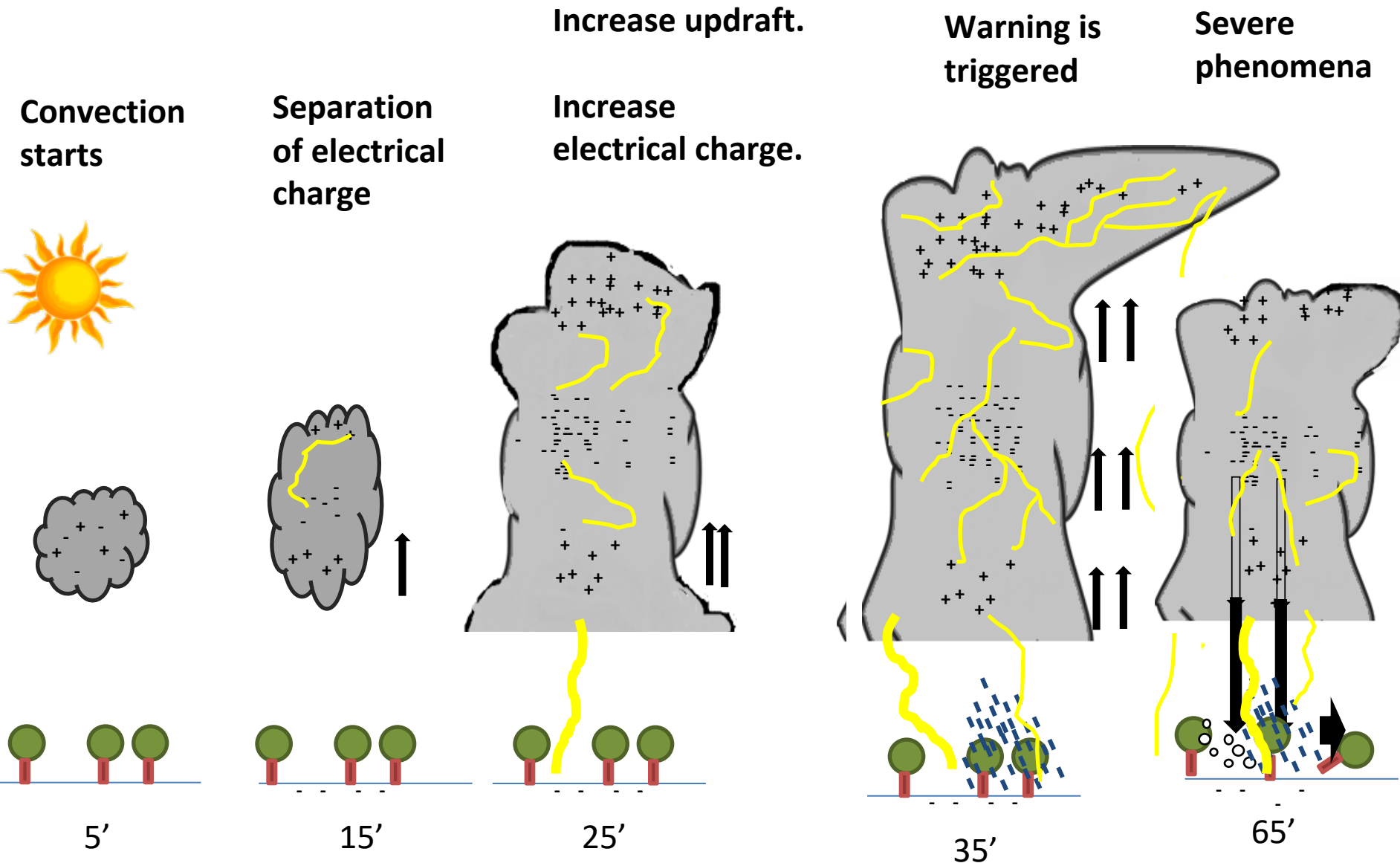
Introduction

Definition

- ☐ The LJ is a **sudden increase of the total number of lightning rate** (Williams et al. 1999).
- ☐ It is a consequence of strong updraft which favours the crash between ice particles and a higher separation of the charge (Williams, 2001).
- ☐ This tool is used for forecasting **SEVERE WEATHER**
 - Hail > 2 cm
 - Tornados / Waterspout
 - Downburst
 - Strong gust wind

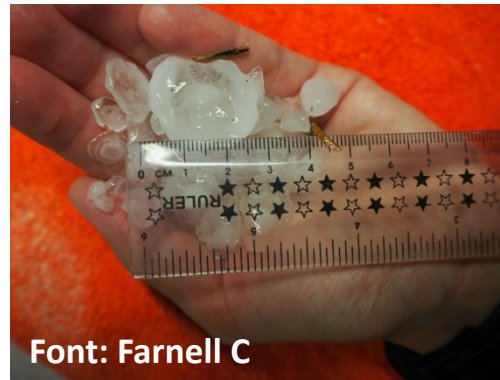


Conceptual Outline



Introduction

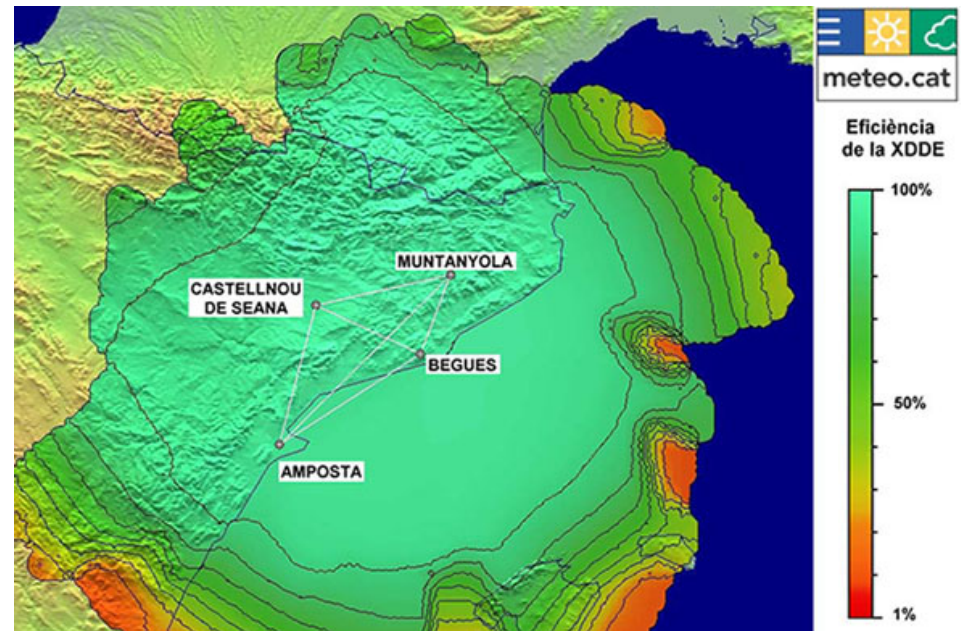
Examples of Severe Weather recorded in Catalonia



Before the algorithm ...

Lightning Location System (LLS)

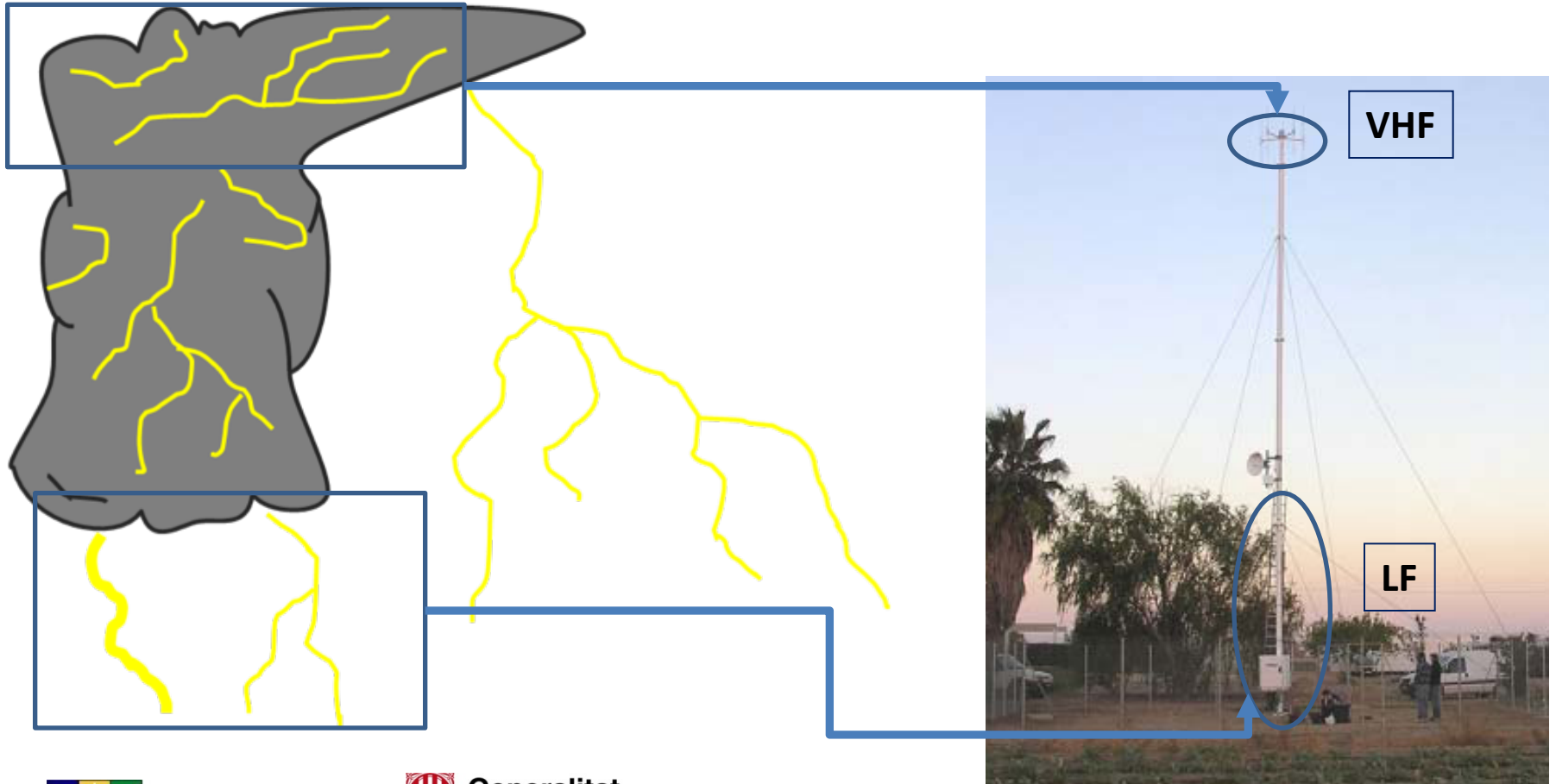
- The LLS of the SMC operates in both frequencies, LF and VHF, allowing the detection of IC and CG flashes.
- Few networks in Europe have this capability (IC detection)
- The LLS is composed by 4 detectors, with an efficiency of $> 90\%$ over the territory





Before the algorithm ...

Detecting two types of flashes: intra-cloud and cloud-to-cloud



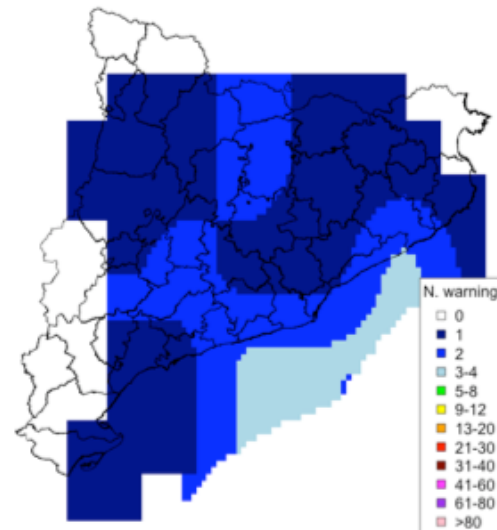


Characteristics

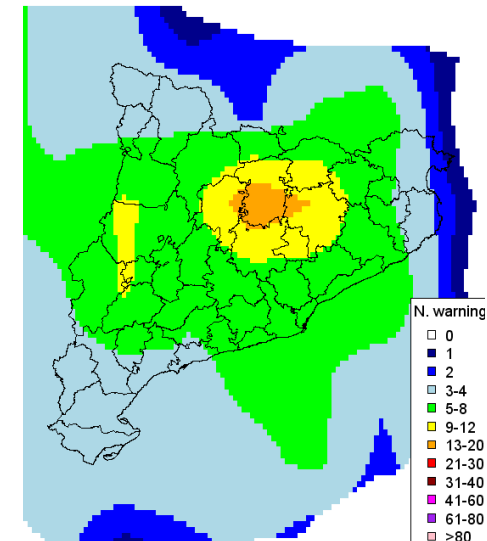
Total Lightning (TL)

□ This tool needs the TL (intra-cloud (IC) + cloud-to-ground (CG)) to work well.

Lightning	Only CG	CG+IC (TL)
Nº alerts (2006 – 2015)	69	5,262



CLOUD TO GROUND

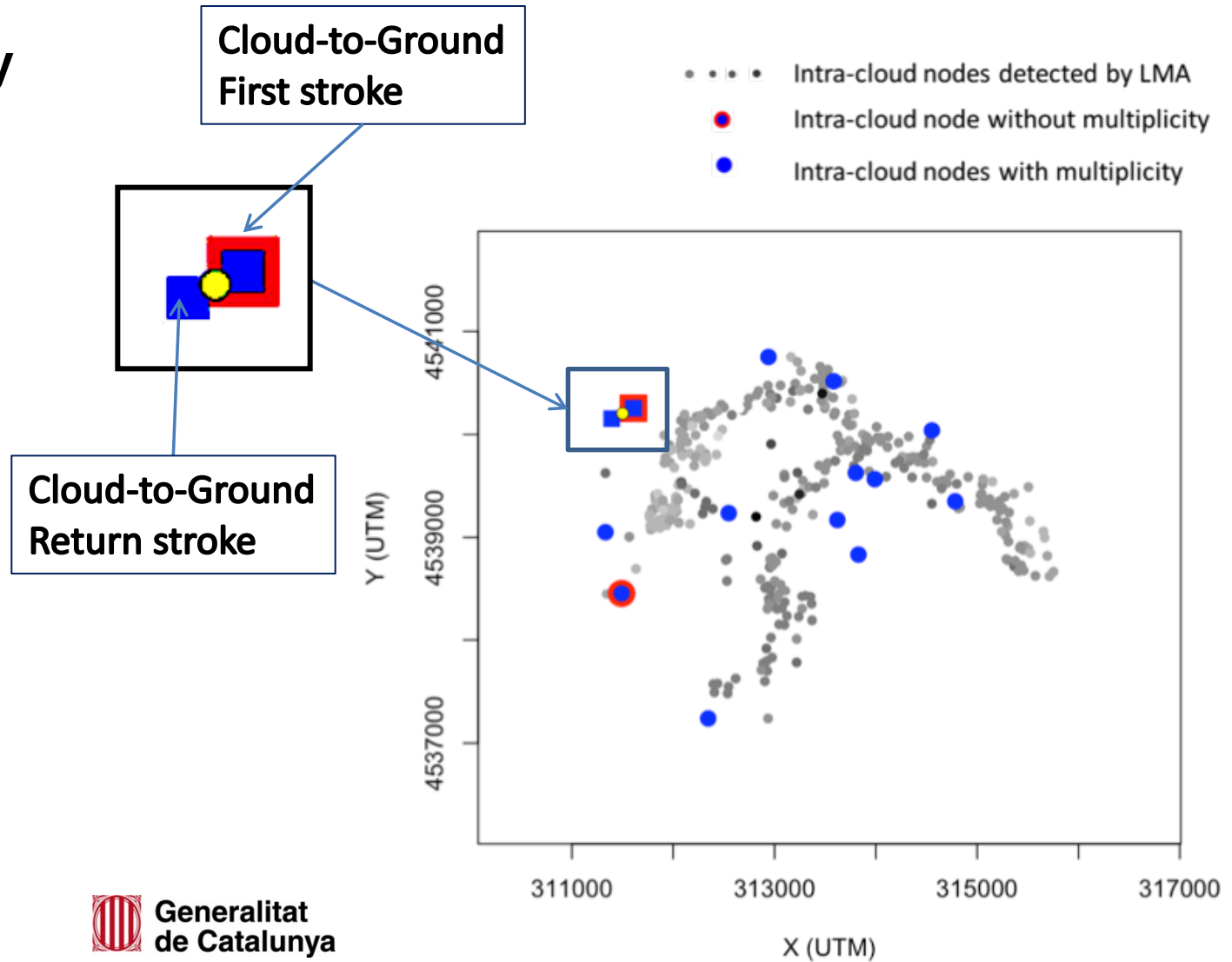


TOTAL LIGHTNING



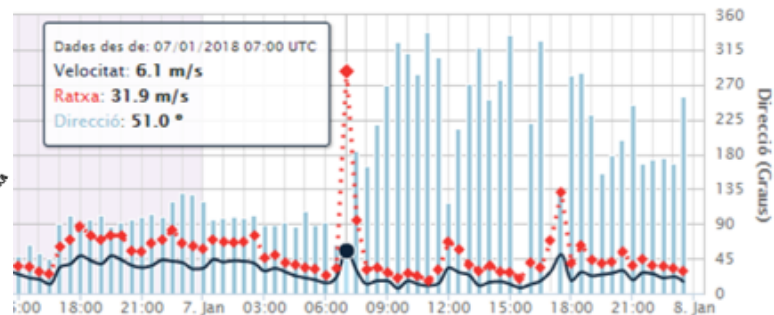
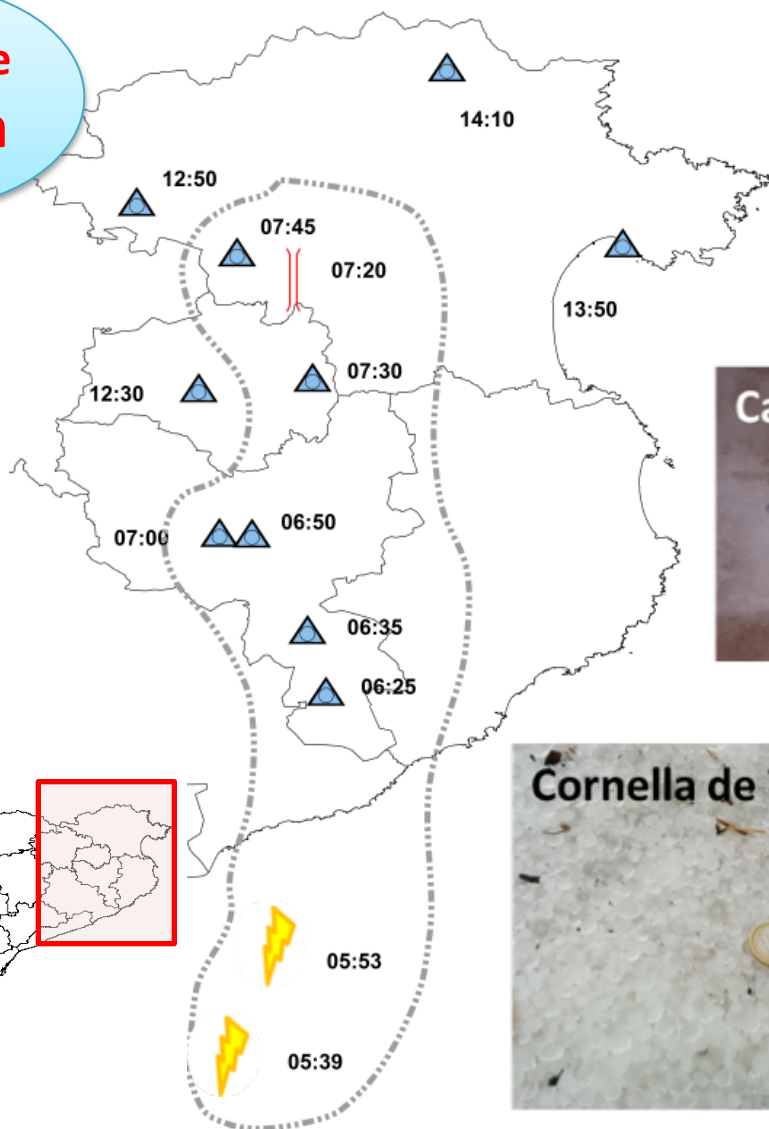
Before the algorithm ...

Multiplicity



Case studies, 07/01/2018

lead time
87 min



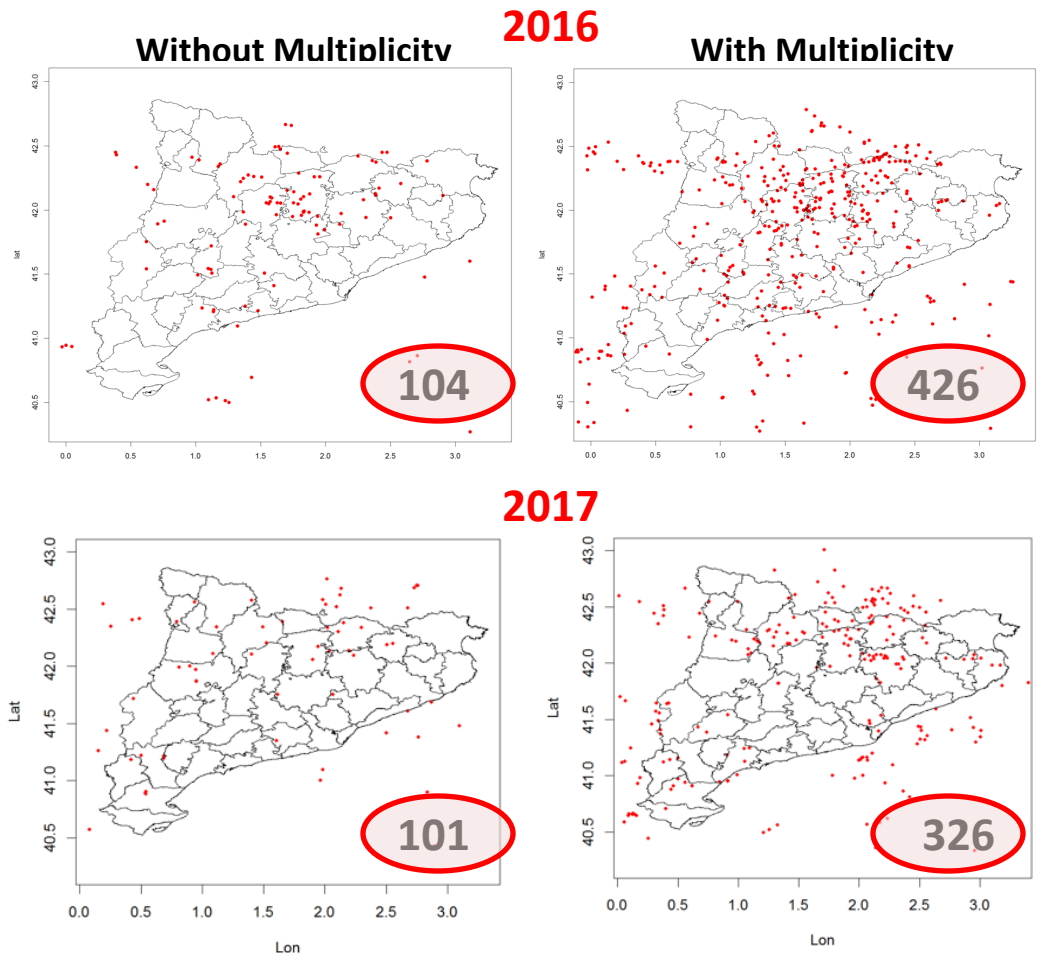


Characteristics

Multiplicity

- The number of LJ taking into account multiplicity is higher than not considering the multiplicity (only the first node of IC).

Type Of LJ	Without Multiplicity	With Multiplicity
Nº alerts (2016)	104	426
Nº alerts (2017)	101	326





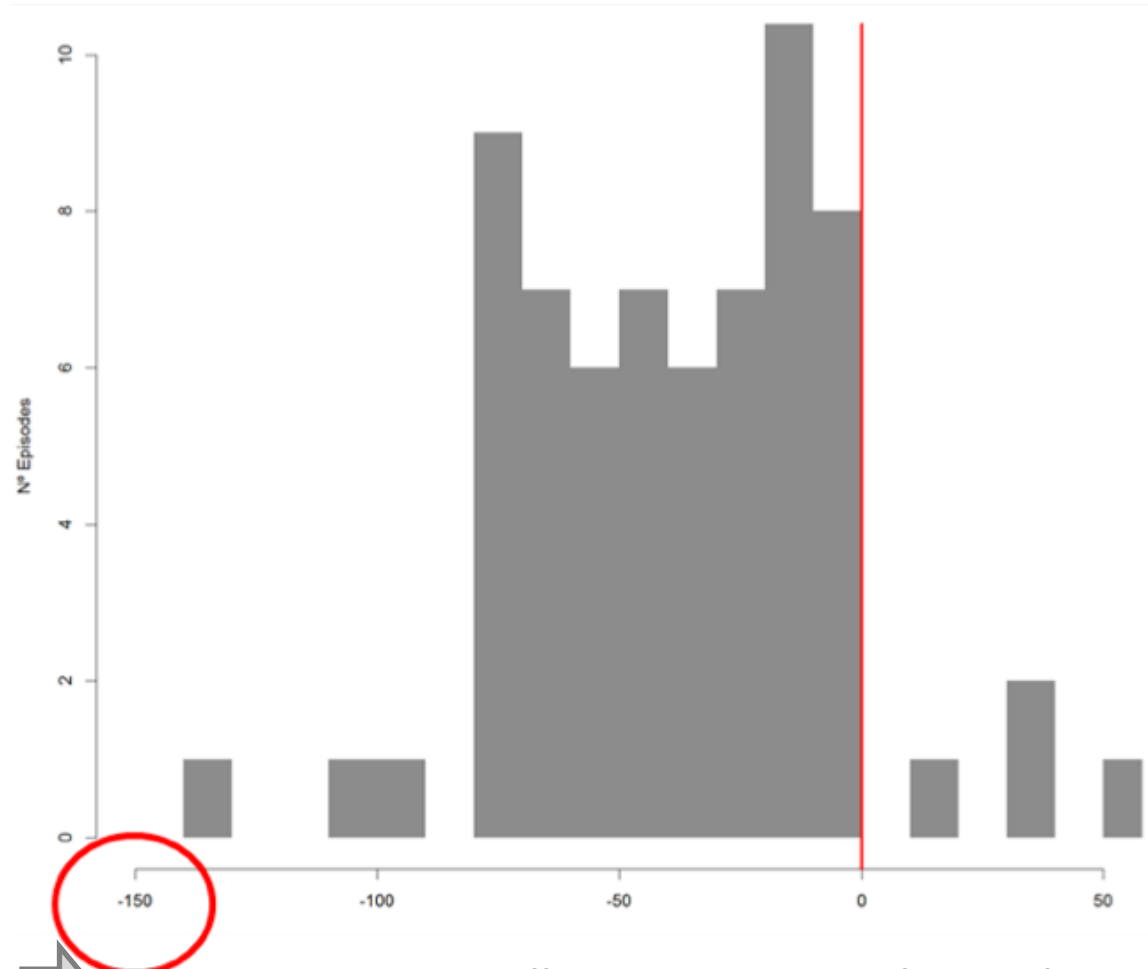
PC: Percentage of correct predictions
FAR: False Alarms

Results – Operative 2017

SKILLS SCORES

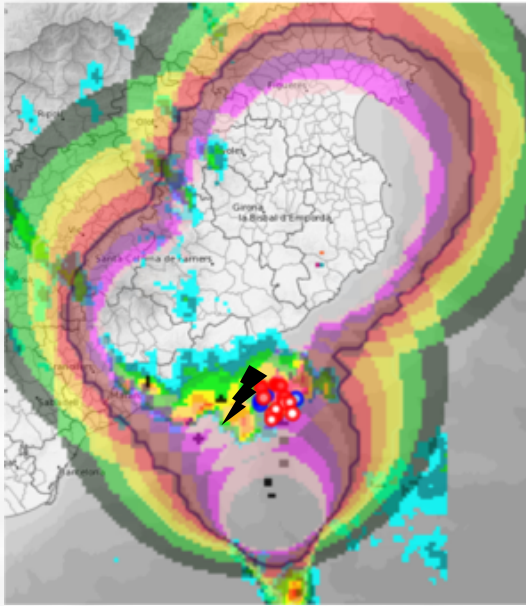
PC	81%
FAR	22%

Average of Lead Time **49 min**

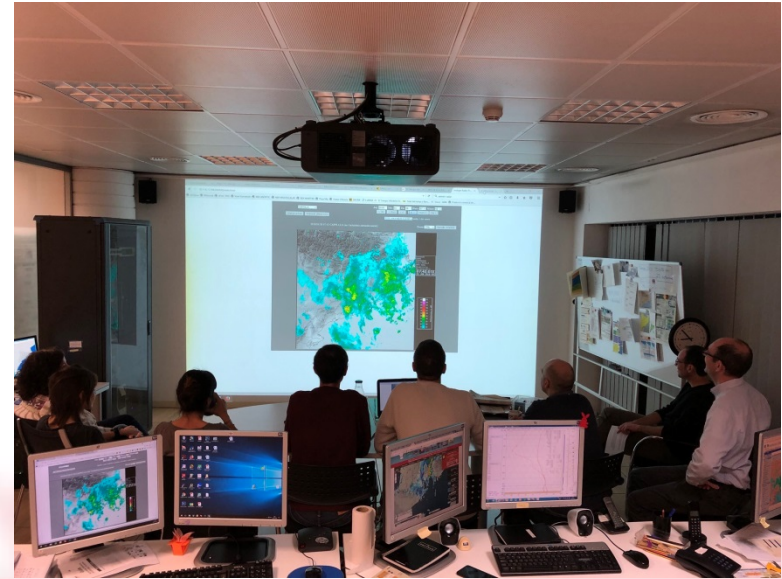


More than 2 hours of anticipation → The MULTIPLICITY allows to increase the Lead Time

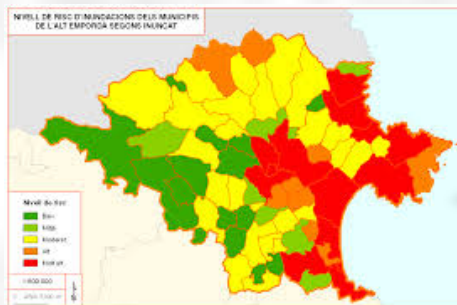
Severe weather warning project



LJ + TRACKING OF THE STORMS



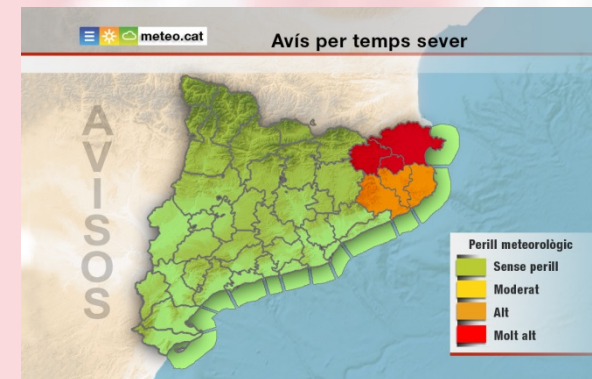
Viewer EPV



Civil Protection Warning



civil protection:Risk Analysis



Warnings