An analysis of the MTG Lightning Imager performance with the Ebro LMA and ASIM

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Outline

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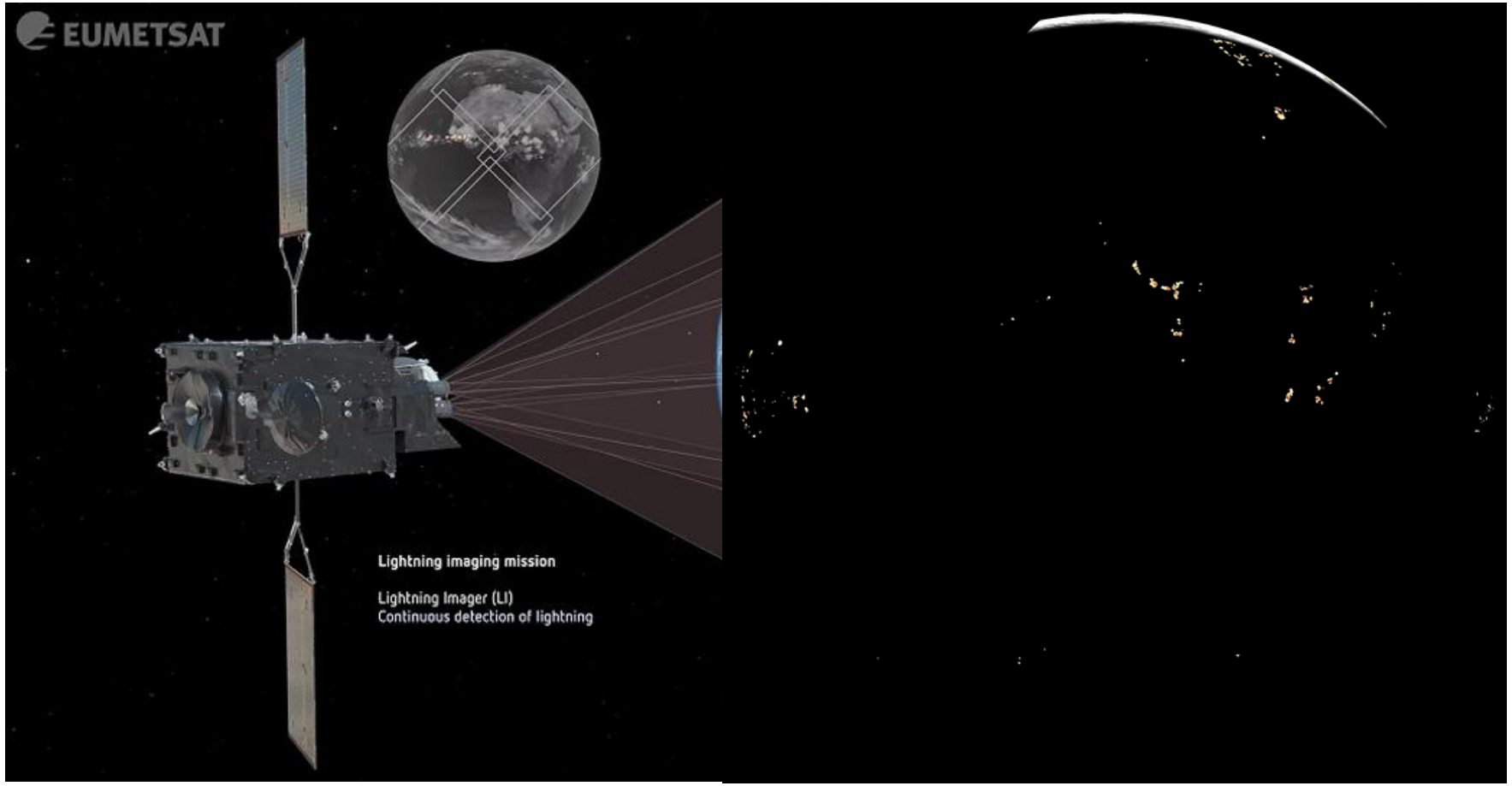
2. Examples of flashes
3. Flash detection efficiency (July-August) eLMA as reference
4. Example of ASIM-MMIA 777 nm photometer and LI flash
5. Conclusions

1. Introduction

Meteosat Third Generation Lightning Imager



https://space.leonardo.com/en/focus-detail/-/detail/lightning-imager-leonardo-mtg

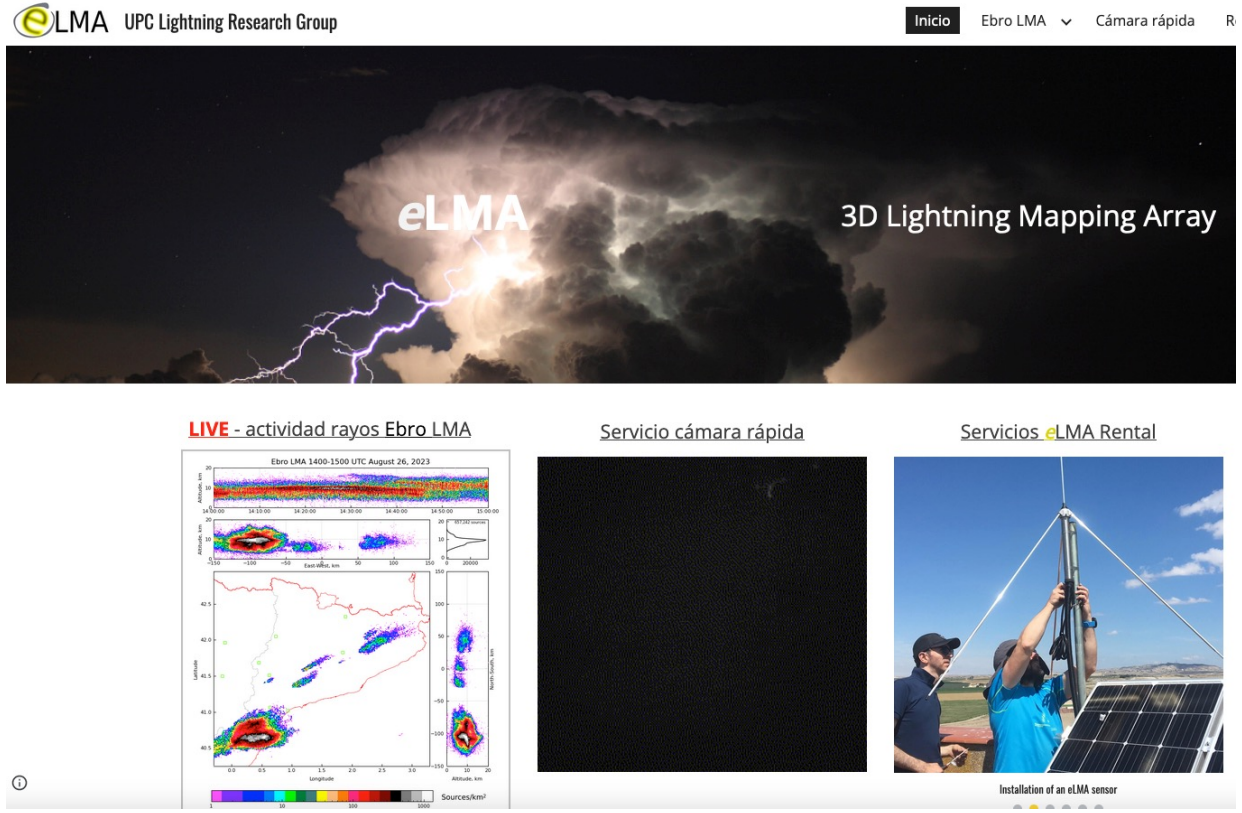
Source: EUMETSAT

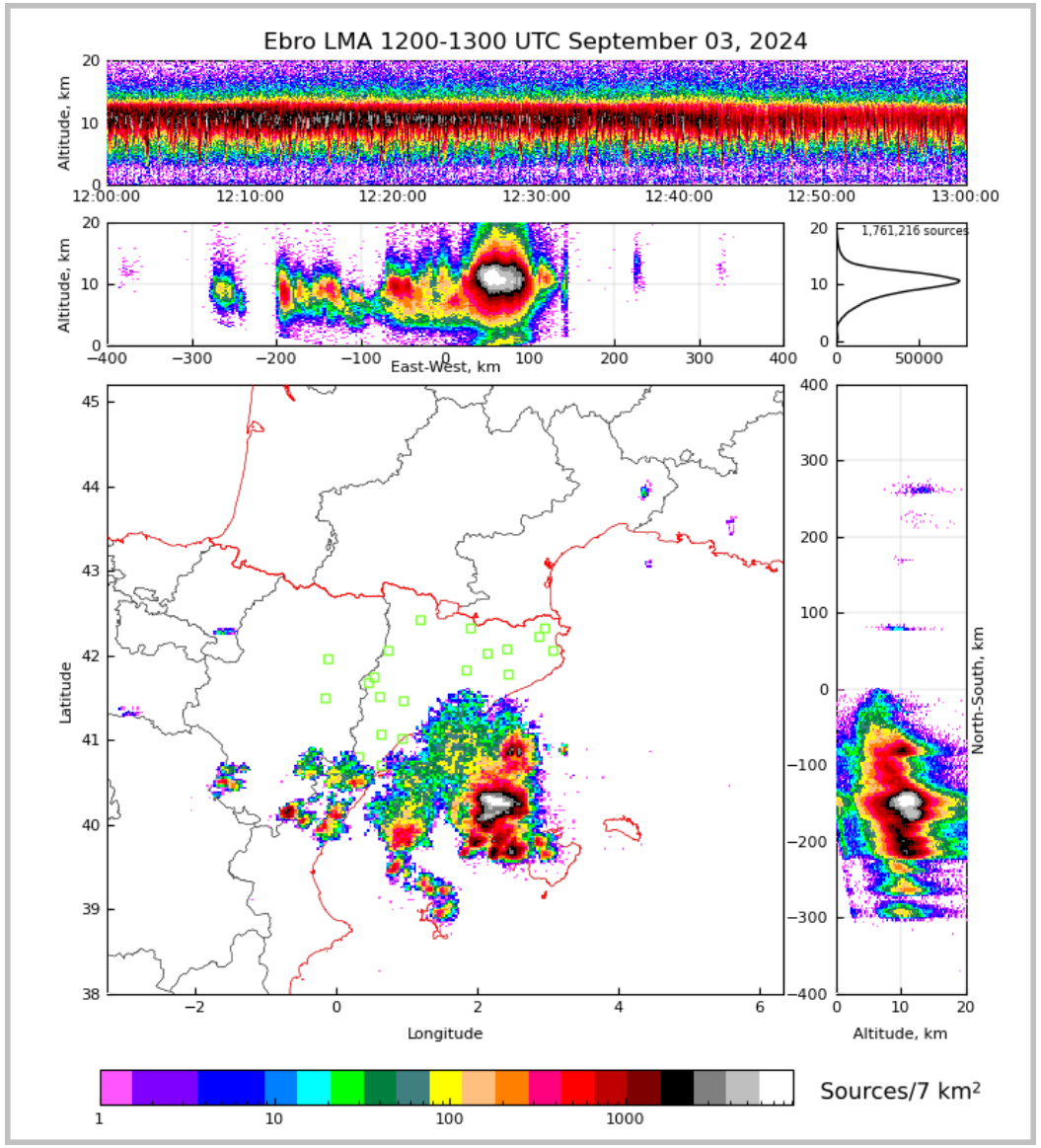
Delivering data since July 4th, 2024

1. Introduction

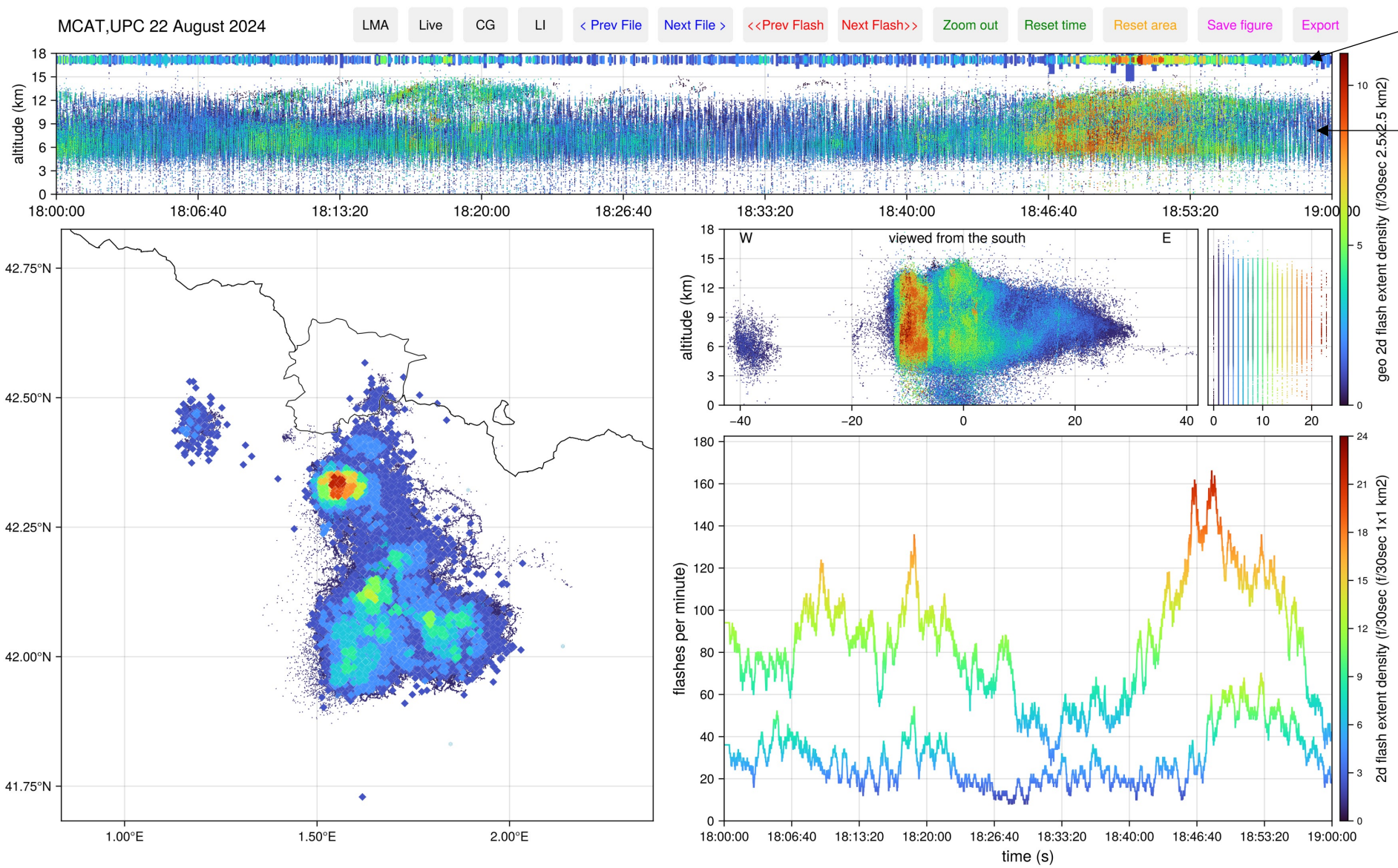
Ebro Lightning Mapping Array (eLMA)

www.elma.upc.edu





2. Example of 1 h of data



LI groups

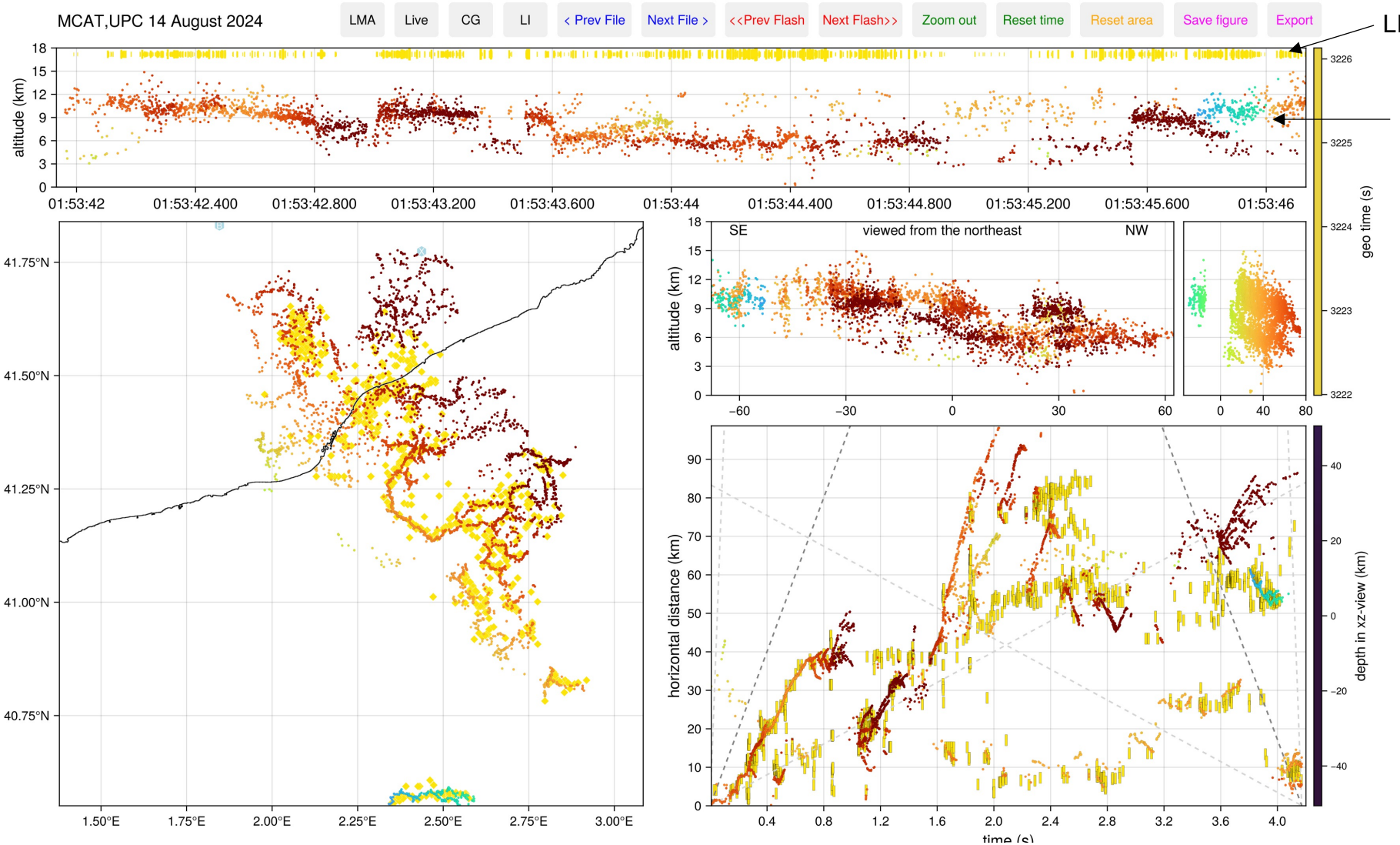
LMA sources

Example of 1h of LMA and LI data

Parallax is corrected flash by flash.

Colour is by flash extent density.

2. Example of a single flash (I)

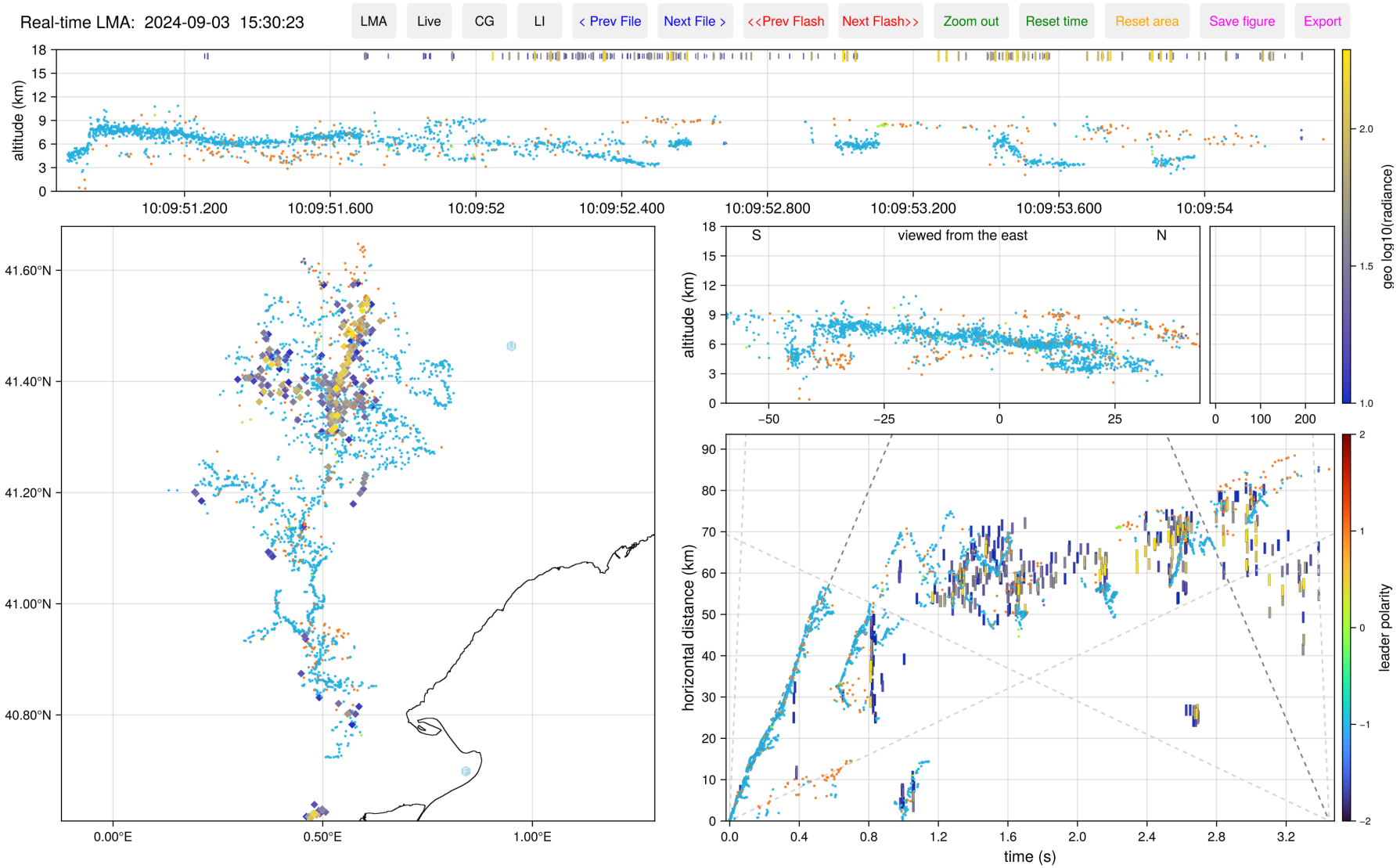


LI groups

LMA sources

Note that LI groups followed the first negative leader (0 to 0.8 s) and then most of detections are related to positive leader propagation,

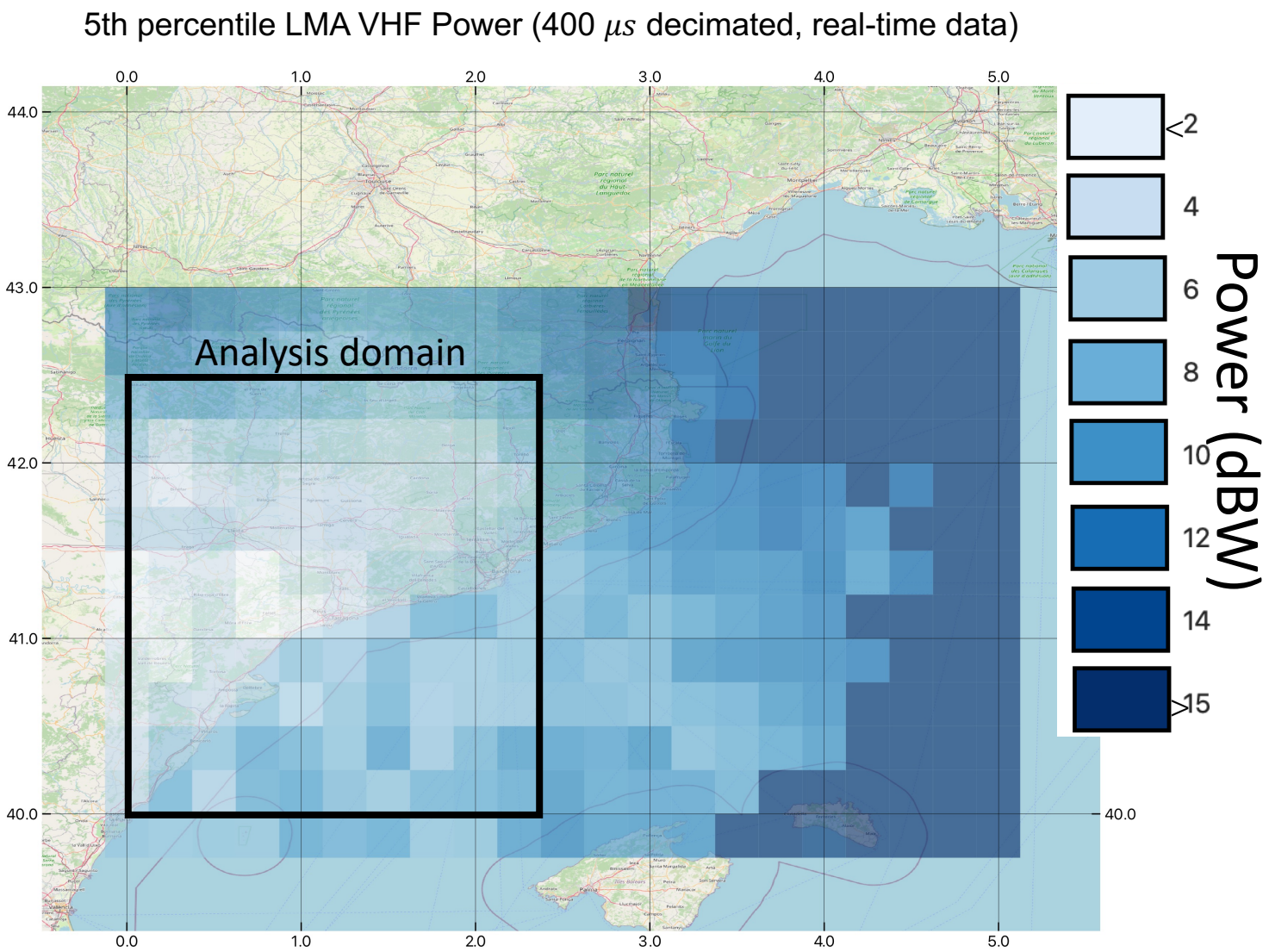
2. Example of a single flash (II)



Daytime flash

In this case, LI groups are mostly related to positive leader development (1.2s to end).

3. LI Flash Detection efficiency (eLMA as reference)



LMA:

400 μs decimated real-time output data is used (not standard 80 μs)

Sources are grouped:

- First: 'noise' filter.
- Second: Grouping space-time.

Domain is selected according to the LMA sensitivity (figure on the left).

LI:

Level 2 LI Lightning groups

3. LI Flash Detection efficiency (eLMA as reference)

- LMA is used as reference.

- LI has detected a LMA flash if:

  At least one group is detected during the time of the flash determined by the LMA ($\pm 2ms$)

  &

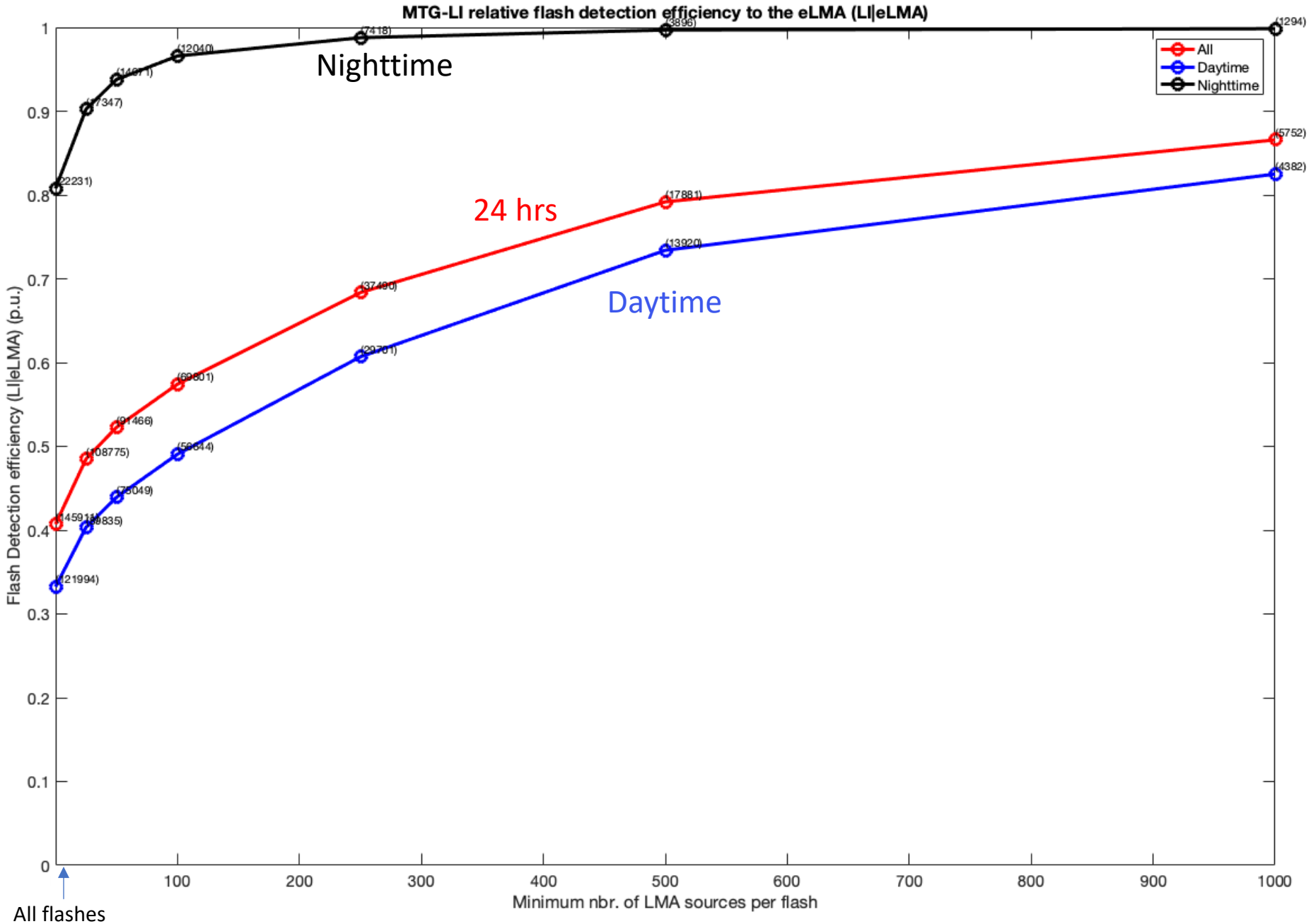
  At least one group is detected withing 25 km of the LMA flash centroid.

- The analysis is conducted for LMA flashes considering several minimum number of sources per flash.

- The analysis is conducted for all 24 h, daytime and nighttime flashes.

- Calculated DE results from the weighted average for each day.

3. LI Flash Detection efficiency (eLMA as reference)

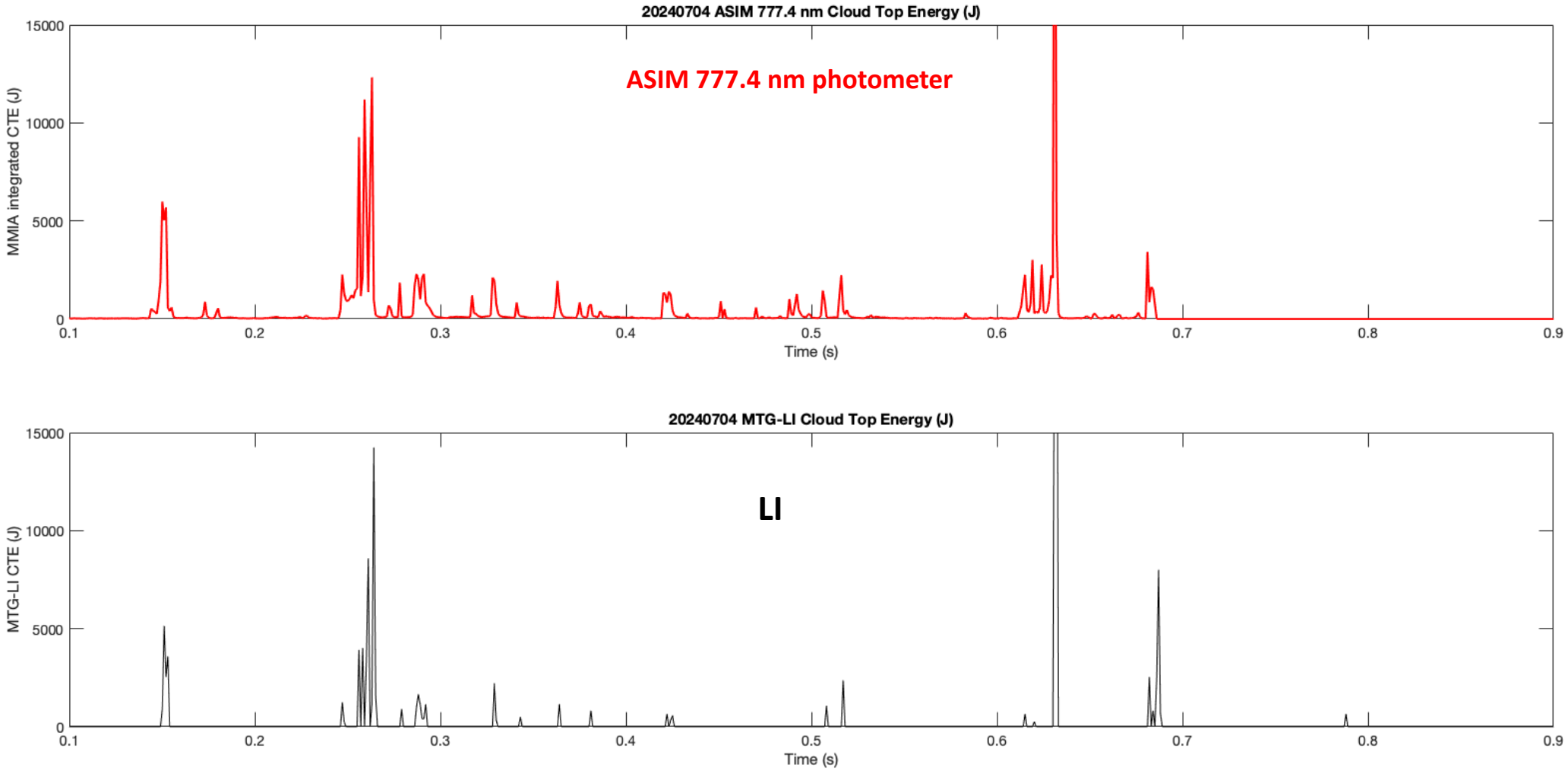


DE is given for all LMA flashes and for those with more than 25, 50, 100, 250, 500 and 1000 sources.

Numbers in parenthesis corresponds to the sample size (number of flashes).

4. Example of ASIM-MMIA 777 nm photometer and LI detection

Cloud top energy (J)



1. Detection efficiency

Matching LI groups with LMA has shown how LI can follow lightning leader horizontal development. In some flashes positive leader development is nicely tracked by LI groups.

The spatial and temporal resolution of LI seems to produce accurate locations of LI groups along lightning leaders.

LI flash detection efficiency has been investigated for July-August, 2024.

- Detection efficiency over 24 hours ranges from 40% to 86% for all LMA flashes and for LMA flashes with more than 1000 sources, respectively.

- Nighttime detection efficiency for all LMA flashes resulted 86 %, whereas it reaches 99 % for LMA flashes with more than 1000 sources.

So far, LI looks very promising!