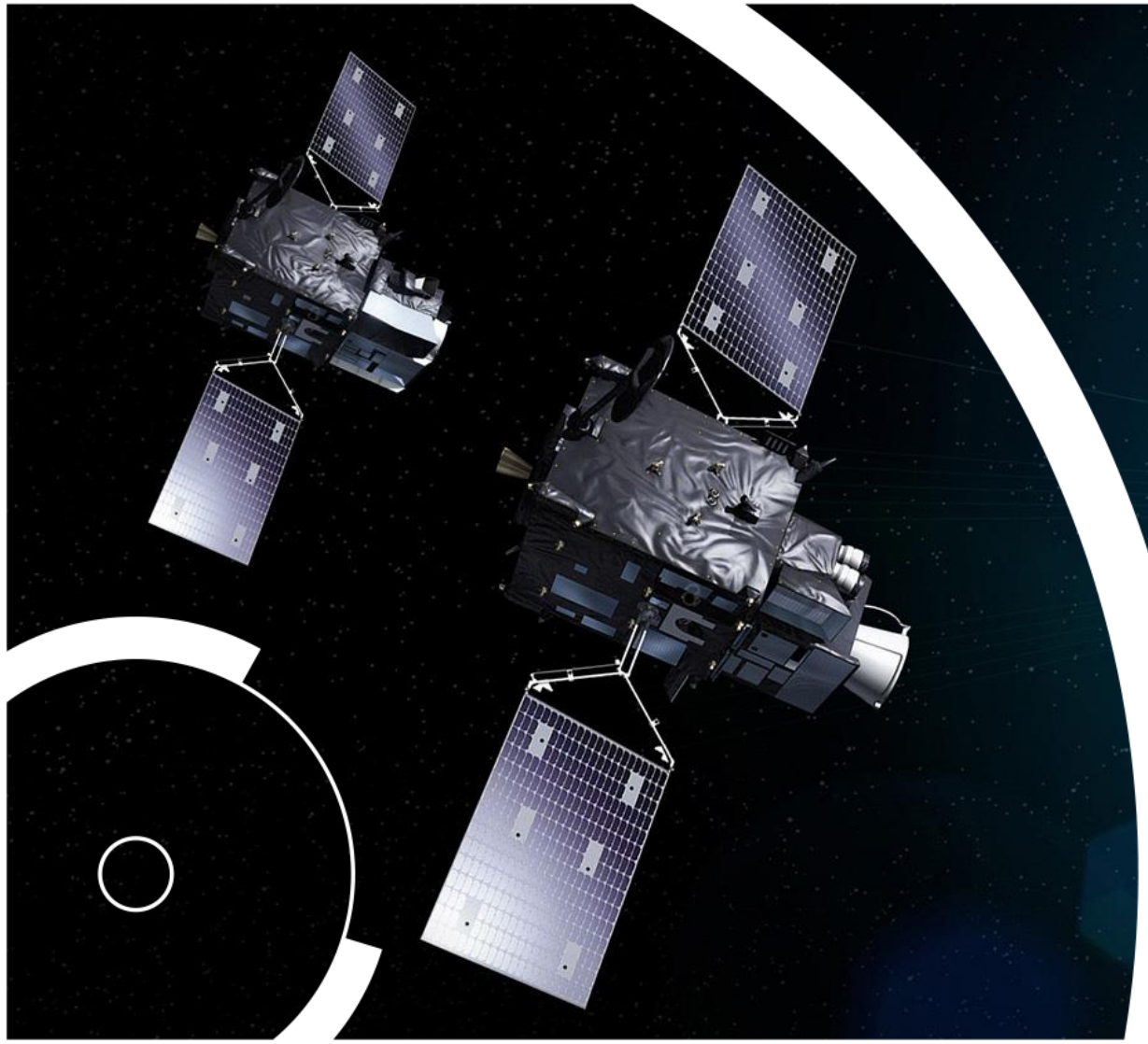
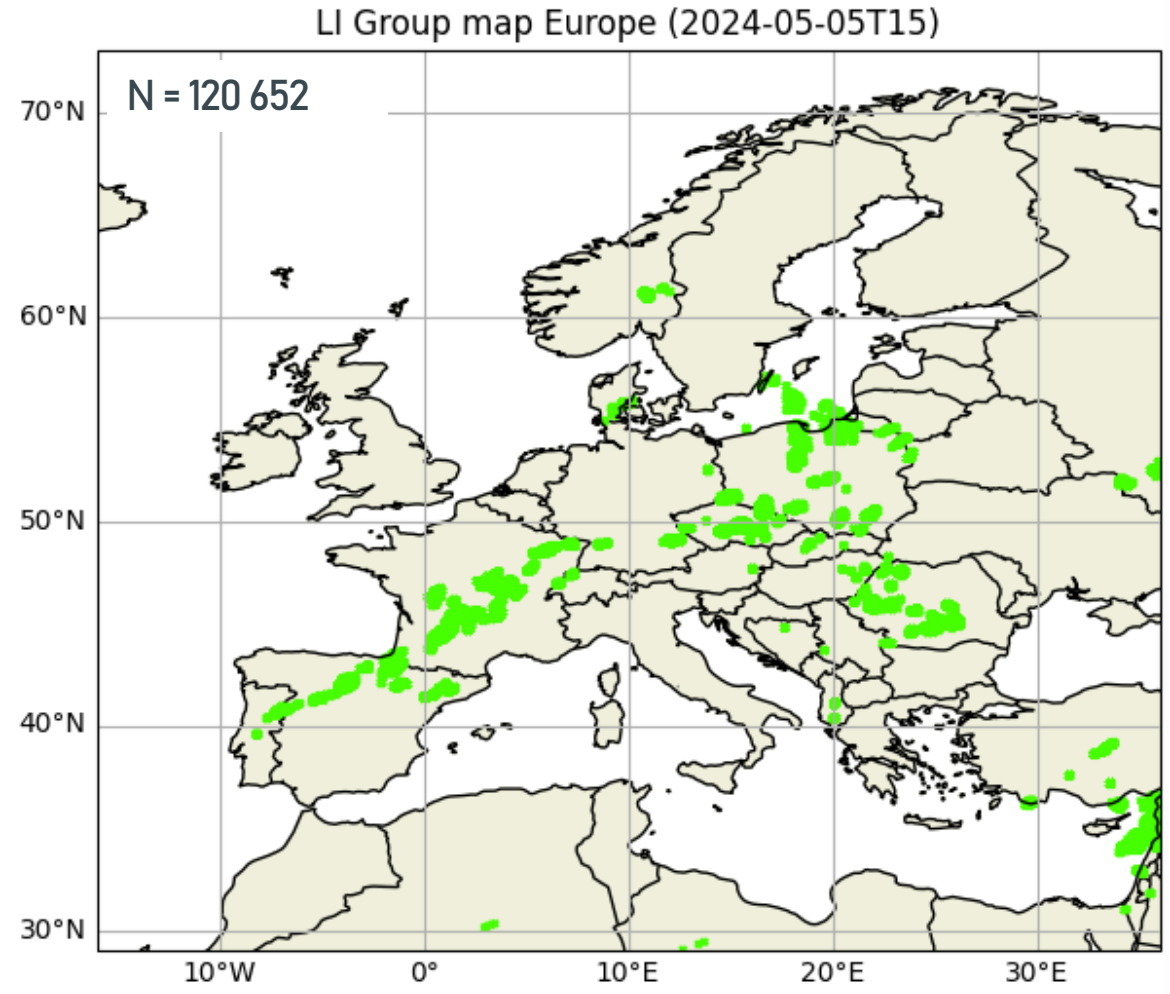
EUMETSAT

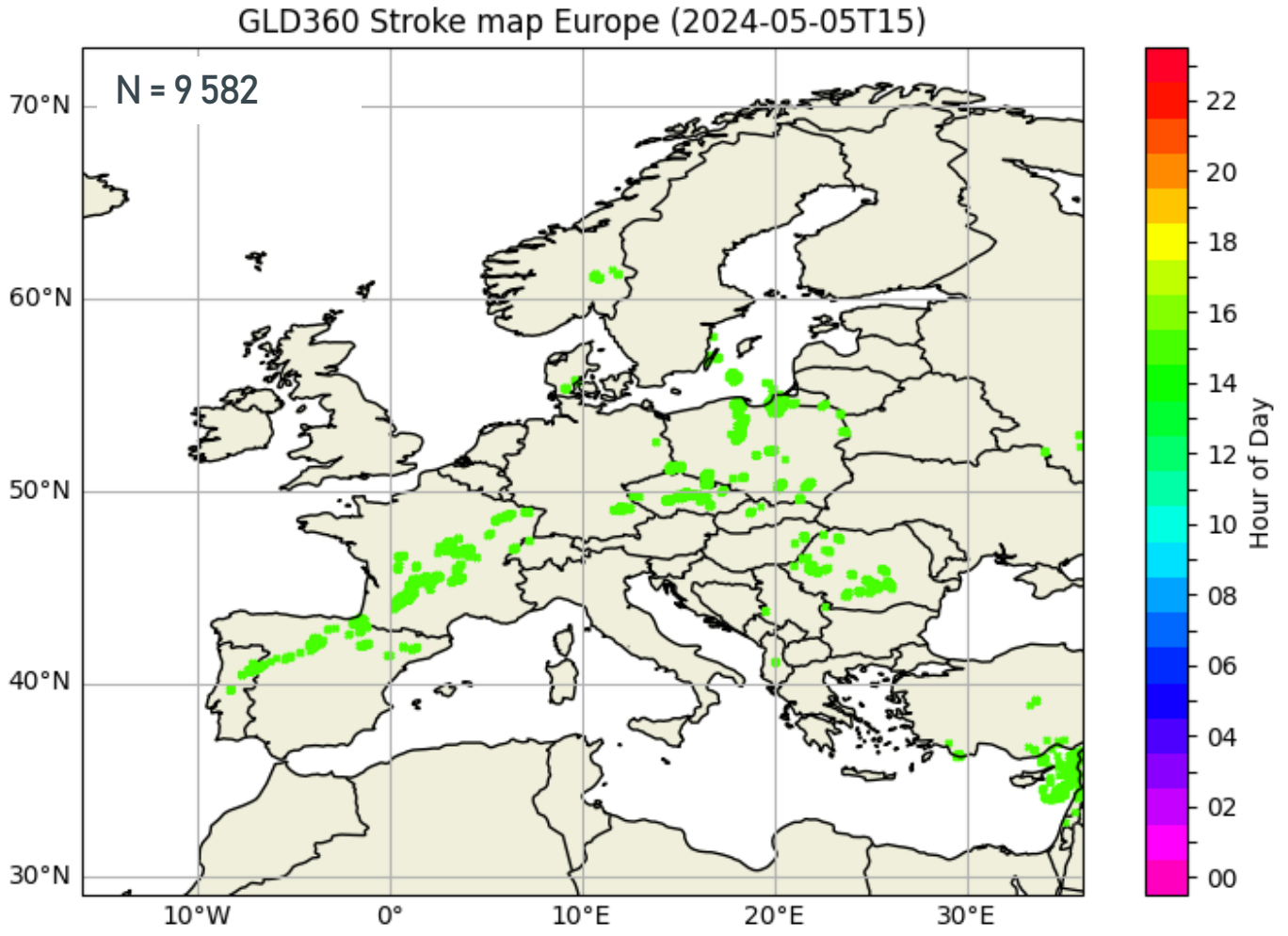


LI data visualization and comparison with other lightning location systems using Jupyter Notebooks

Sven-Erik Enno, Bartolomeo Viticchiè, David Navia, Andrea Meraner
LI Science Team

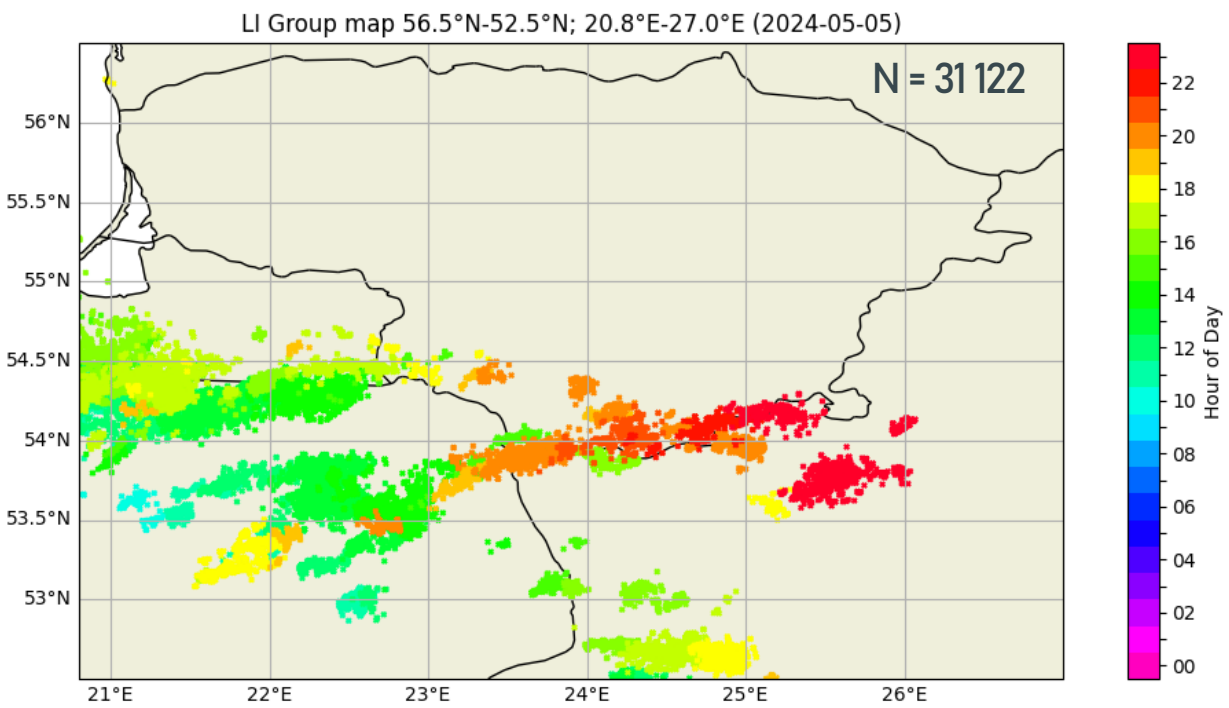
LI-L2-LGR vs ground-based lightning strokes/pulses

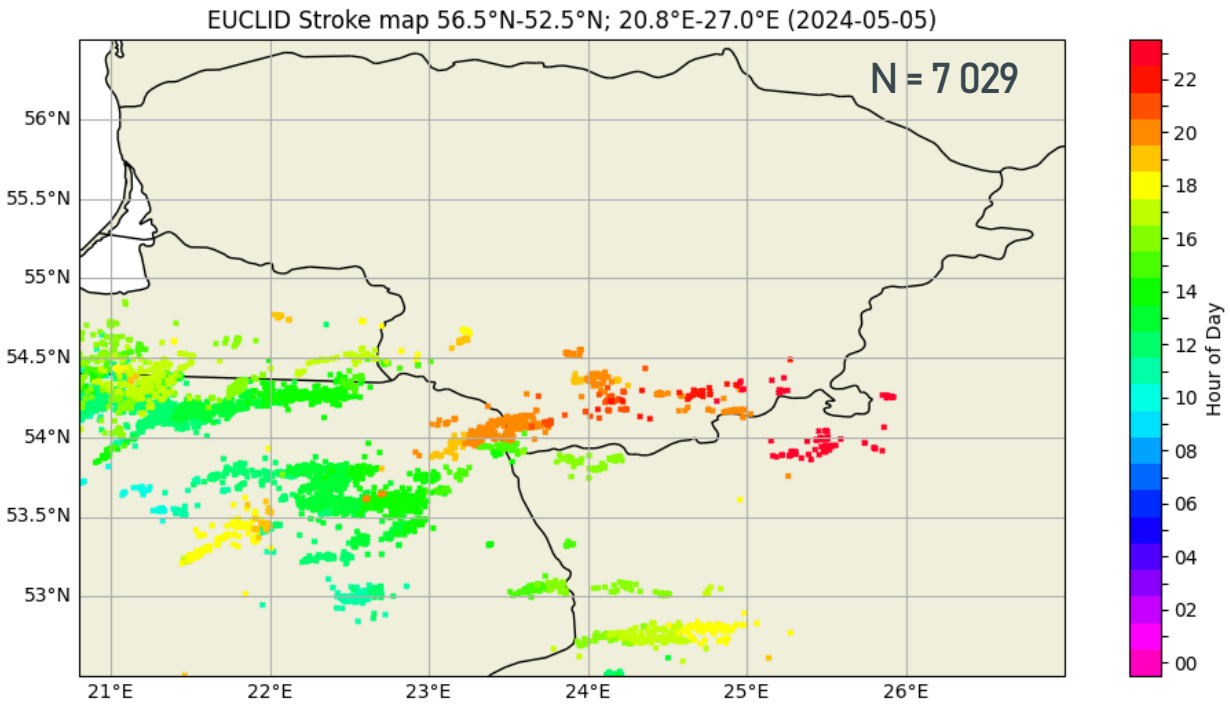




- Similar spatial storm pattern between LI LGR clusters and ground-based GLD360 stroke/pulse clusters.
- Note the **~12x greater number of LI LGRs**, compared to GLD360 strokes/pulses.

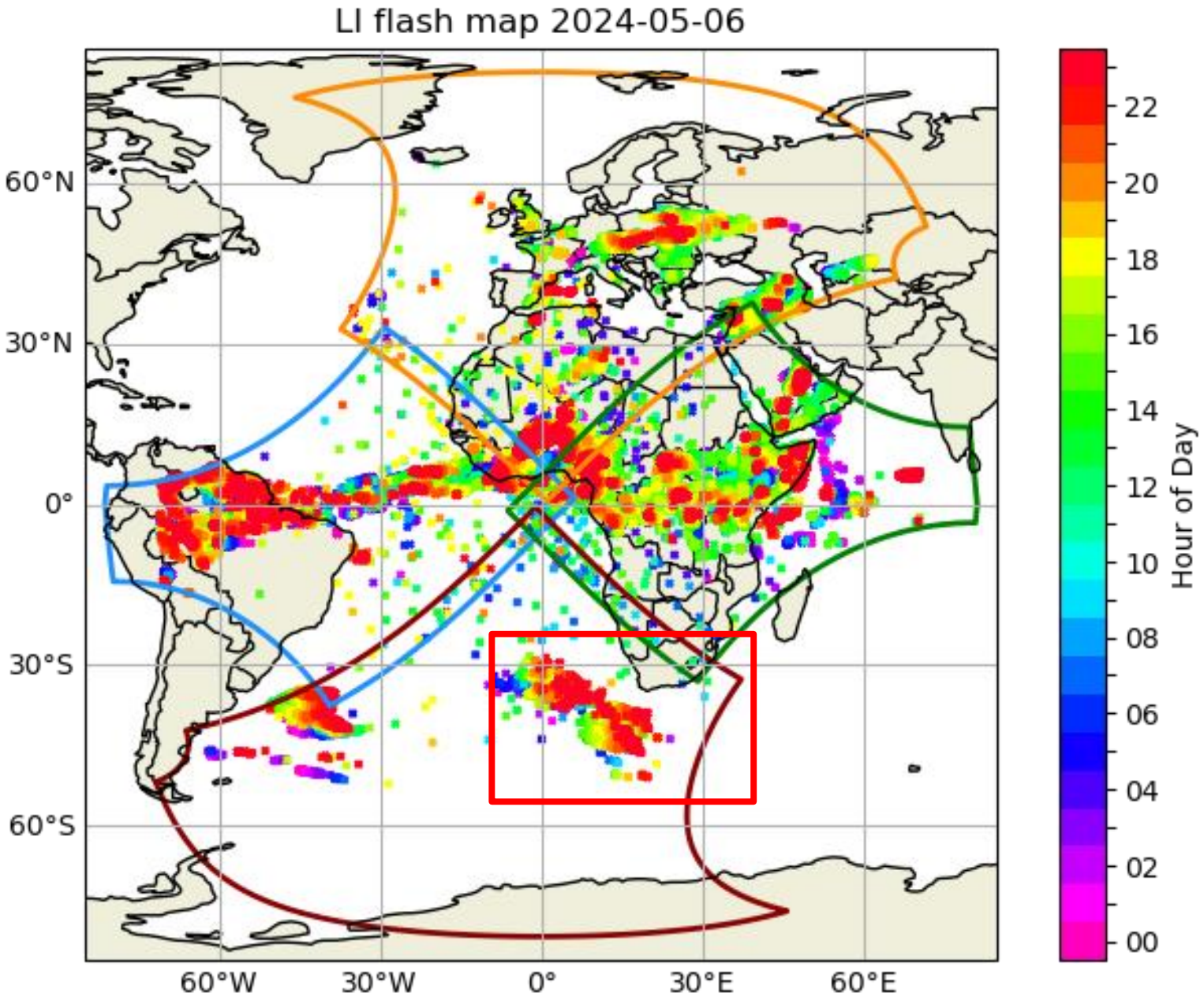
LI-L2-LGR vs ground-based lightning strokes/pulses





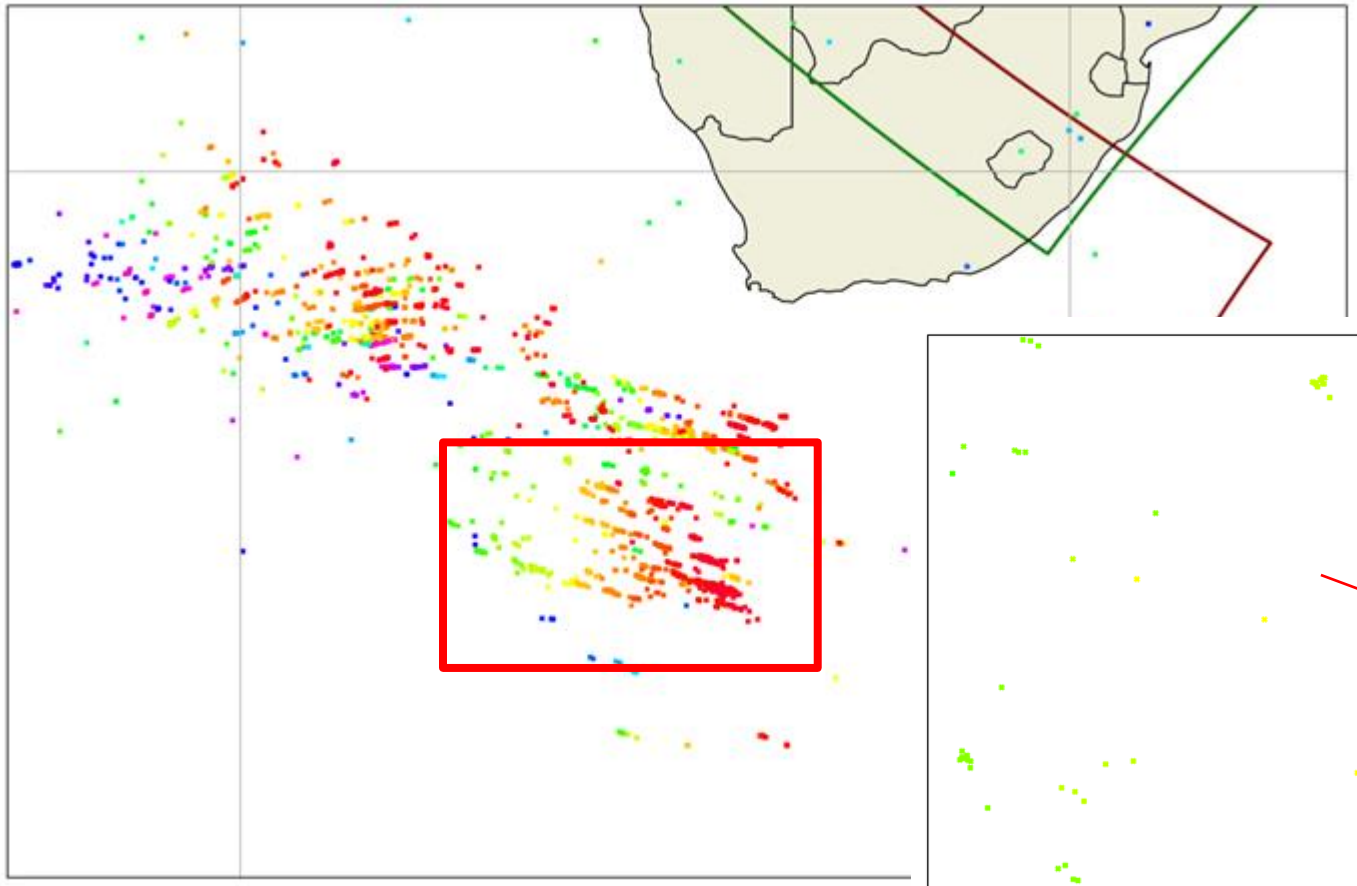
- The real horizontal extent of lightning is better presented in LI group product, compared to ground-based strokes/pulses.
  - Ground-based stroke/pulse is a point in space while real lightning has horizontal extent that is better captured by the LI.
- However, gridded products (shown later) show the spatial extent of lightning even better (as Lightning Event, rather than group extent is considered in gridding).

LIL2 data demo – LI flashes on 6 May 2024

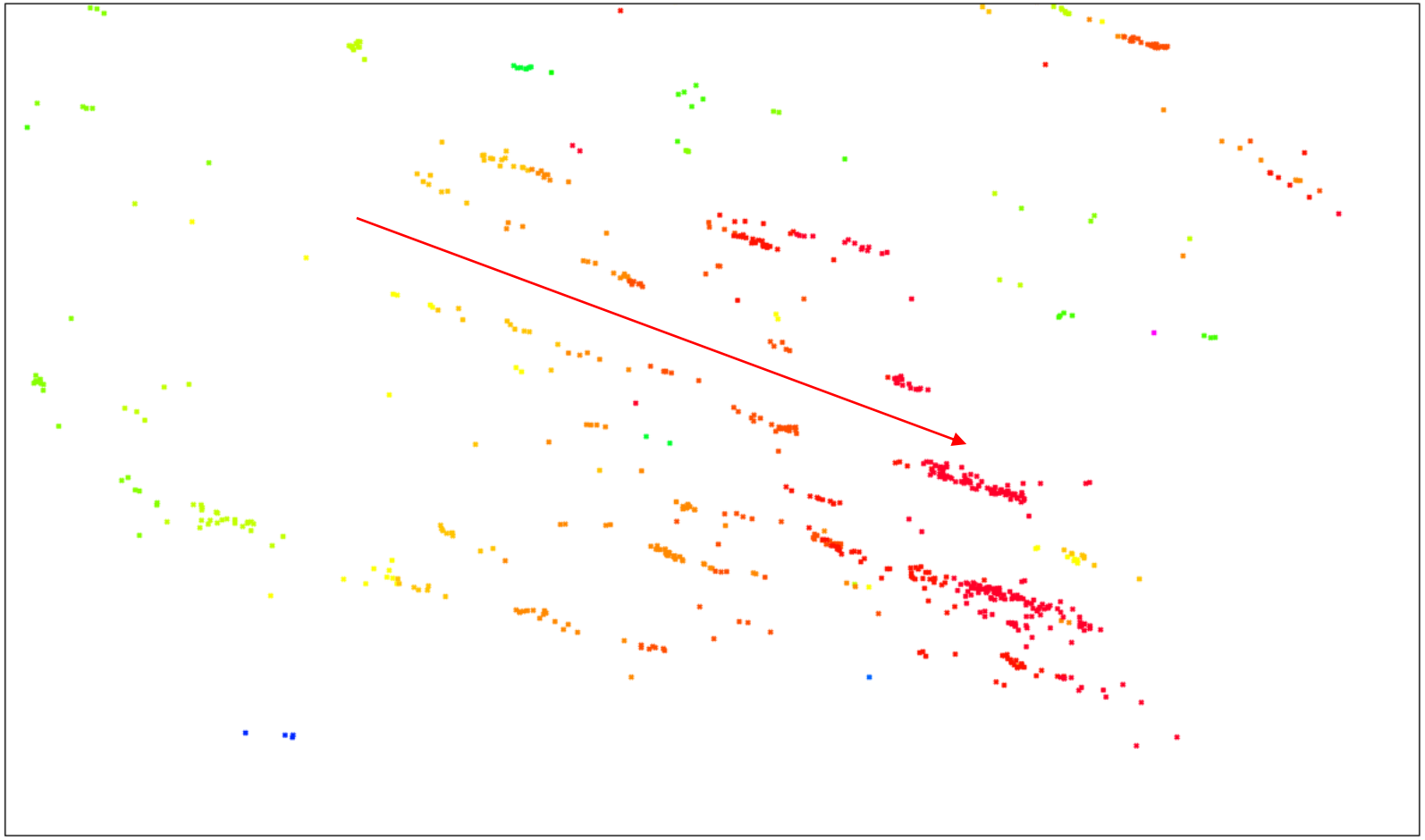


- LI Flash locations during 24 hours on 2024-05-06, colored by hour.
- The polygons represent the field-of-views of individual LI cameras.
- A total of ~1.3 million flashes, made of 19.8 million groups (i.e., an average of ~15 groups per flash).
- Can see a lot of interesting storms.
- Note also the presence of some False Alarms (isolated flashes in space and time.

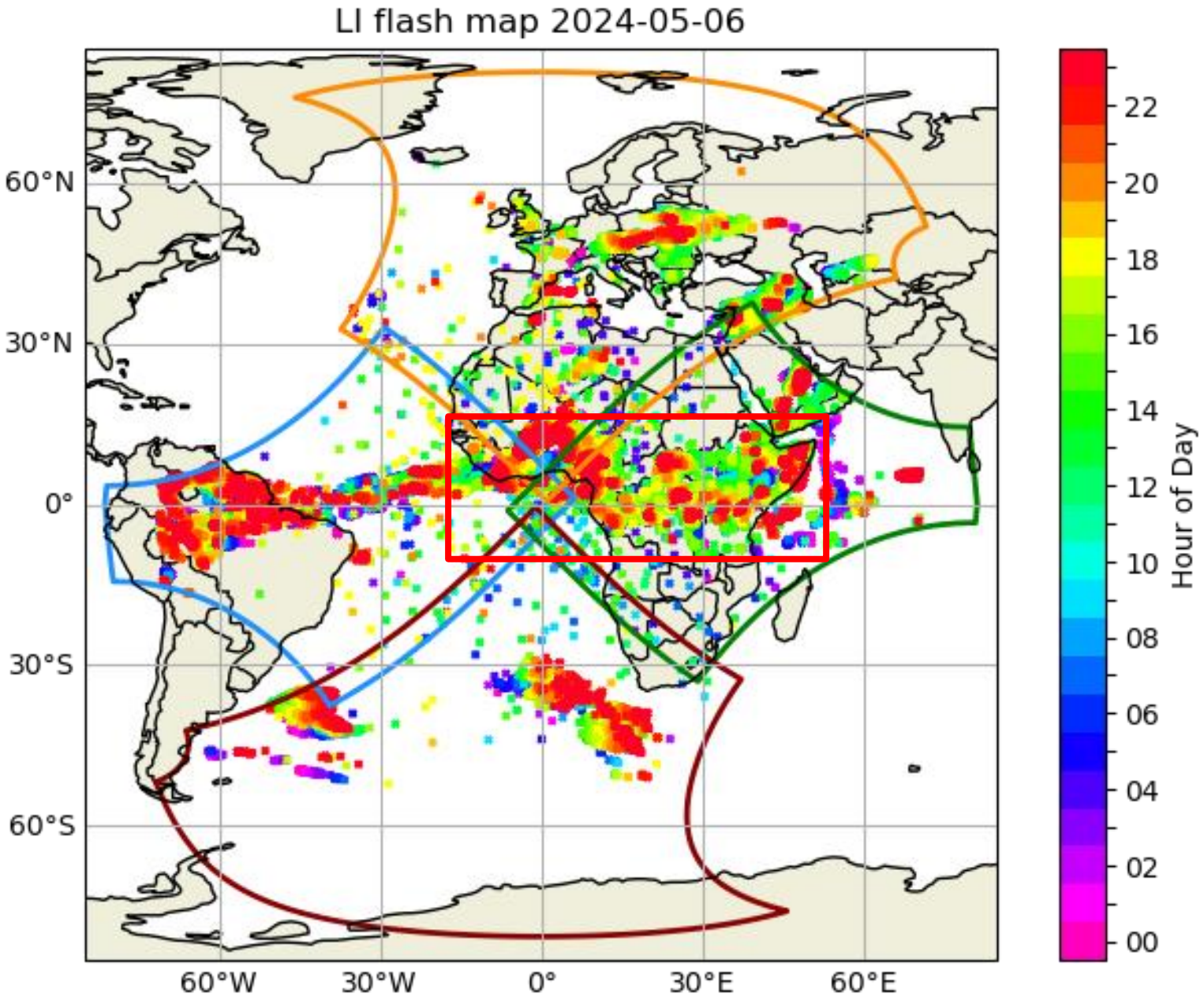
LIL2 data demo – LI flashes on 6 May 2024



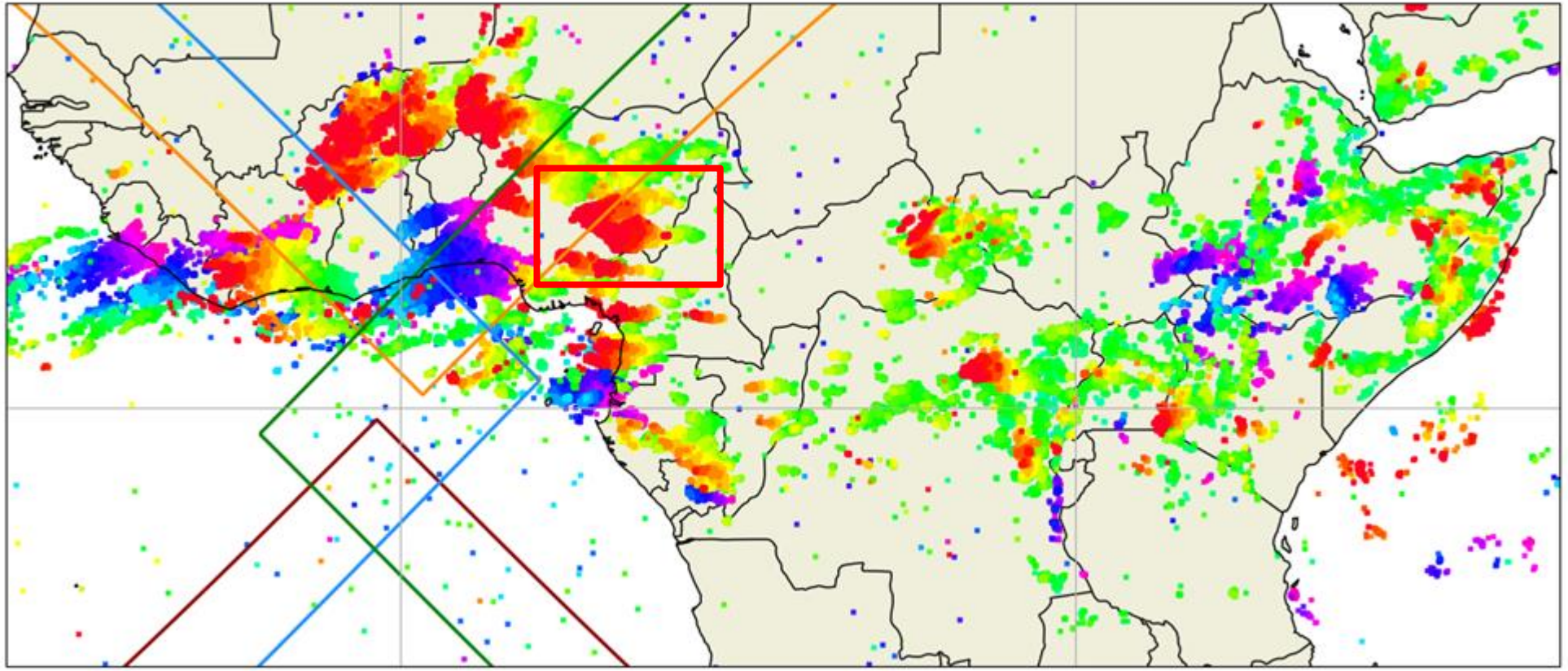
Tracking the movement of individual storm cells, also over remote ocean areas.



LIL2 data demo – LI flashes on 6 May 2024

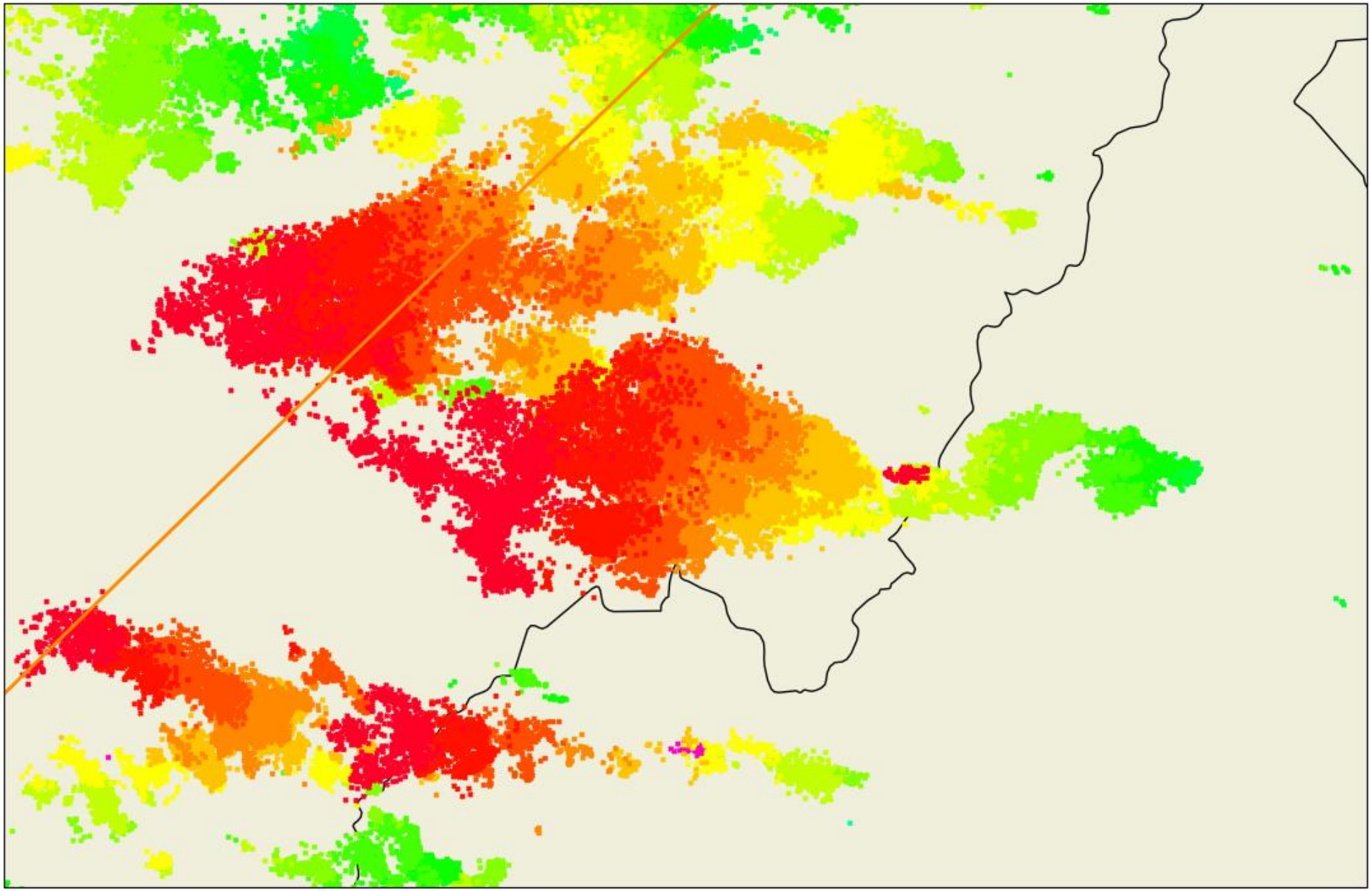


LIL2 data demo – LI flashes on 6 May 2024

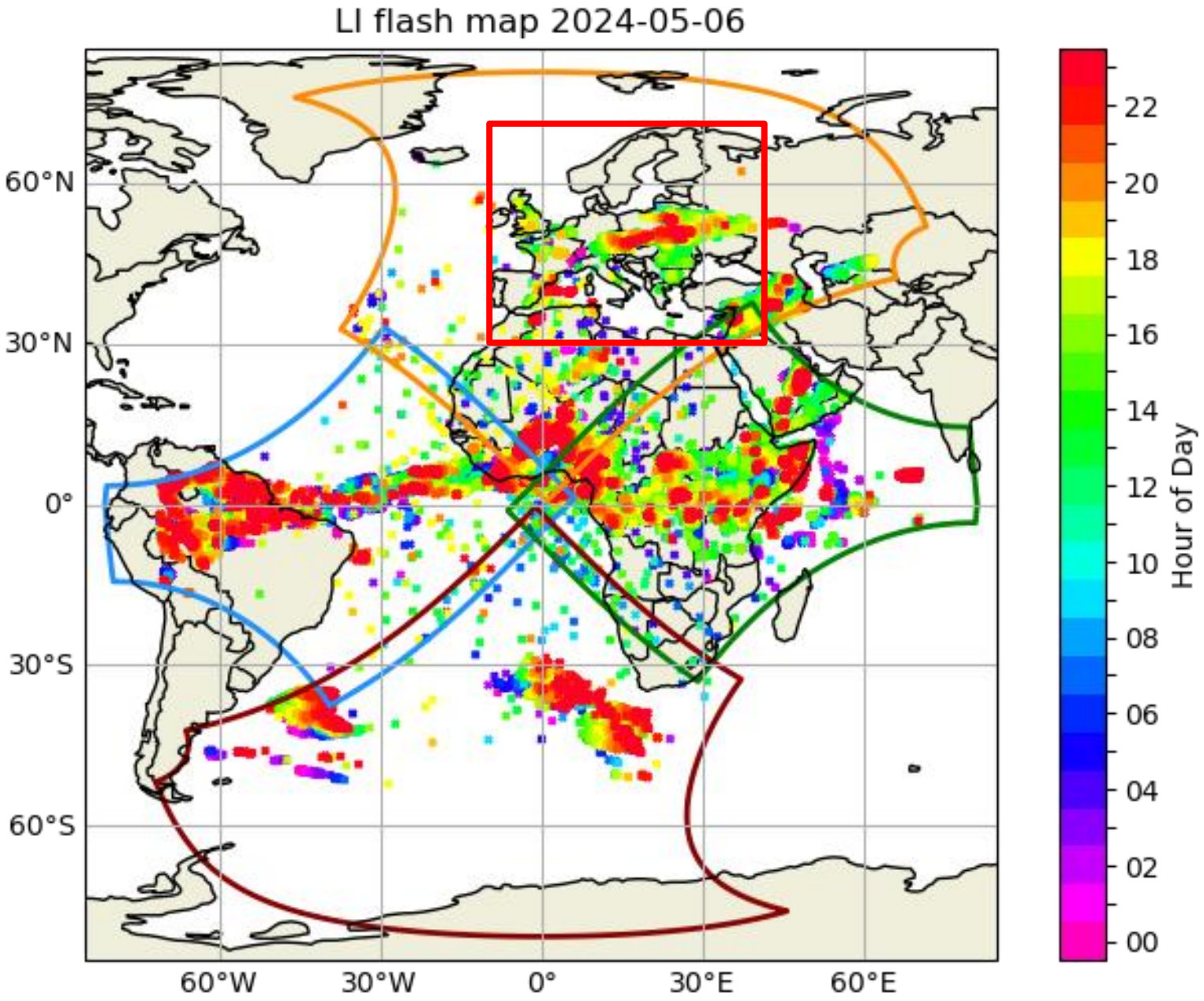


Unprecedented view to Intertropical Convergence Zone (ITCZ).

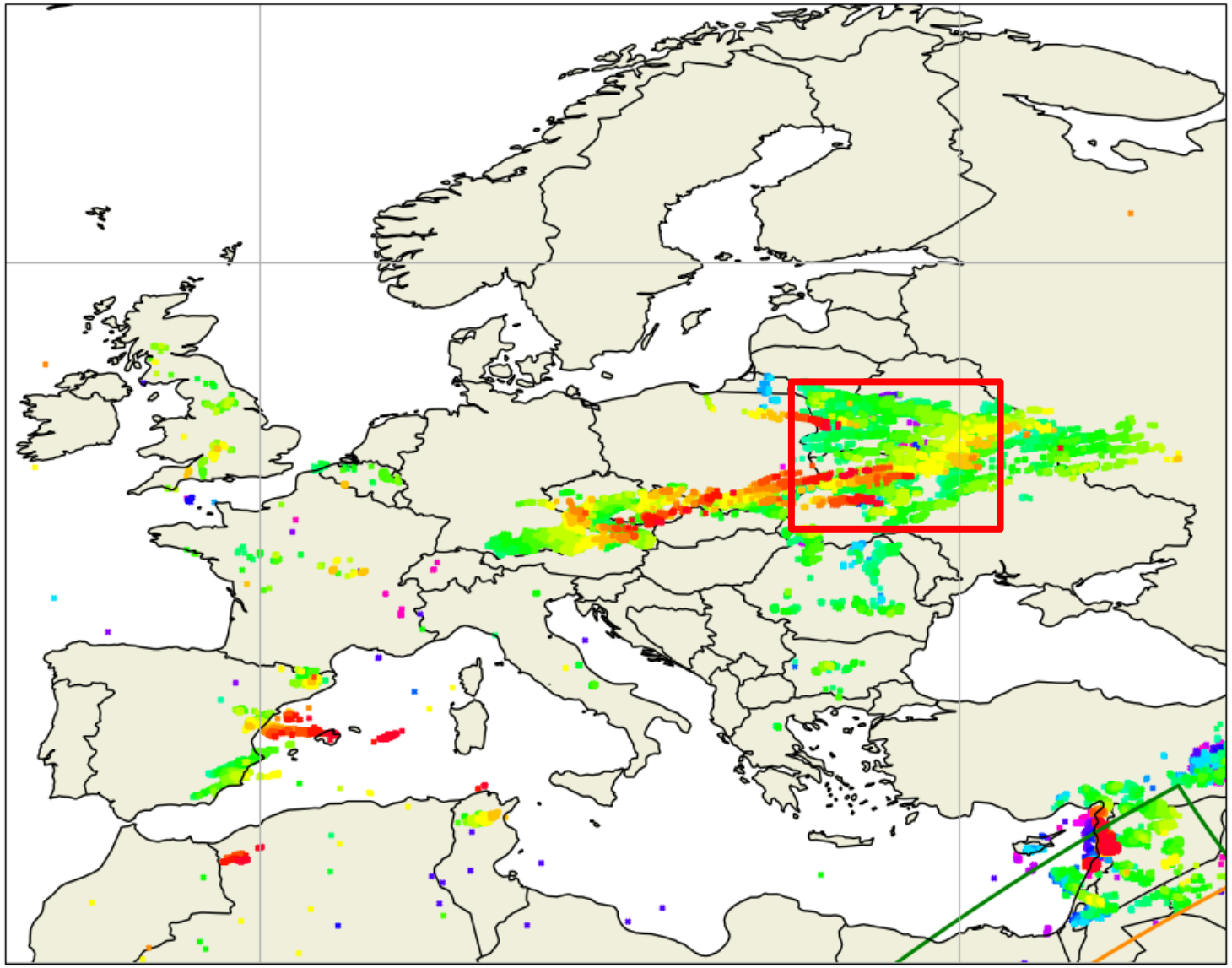
LIL2 data demo – LI flashes on 6 May 2024



LIL2 data demo – LI flashes on 6 May 2024

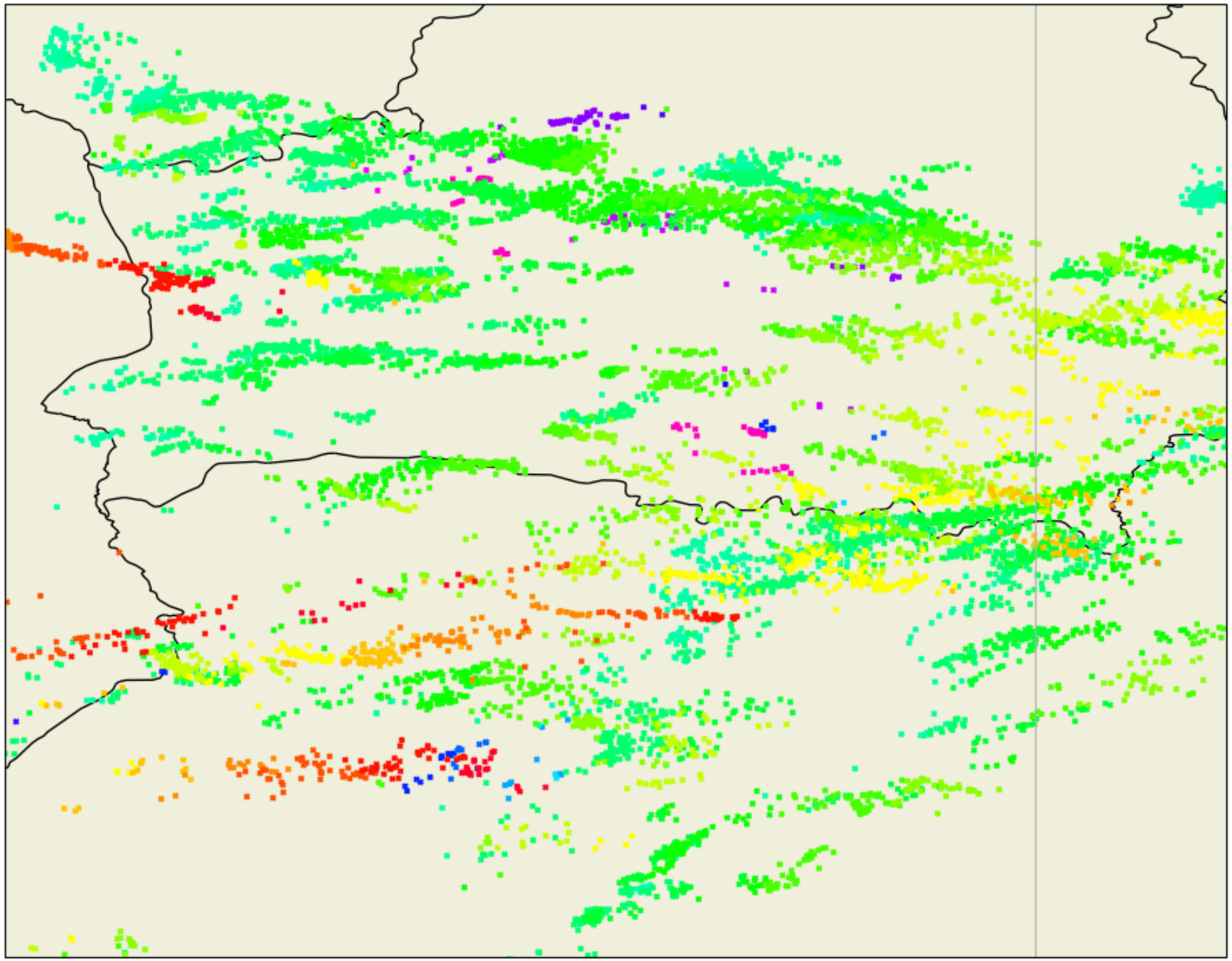


LIL2 data demo – LI flashes on 6 May 2024

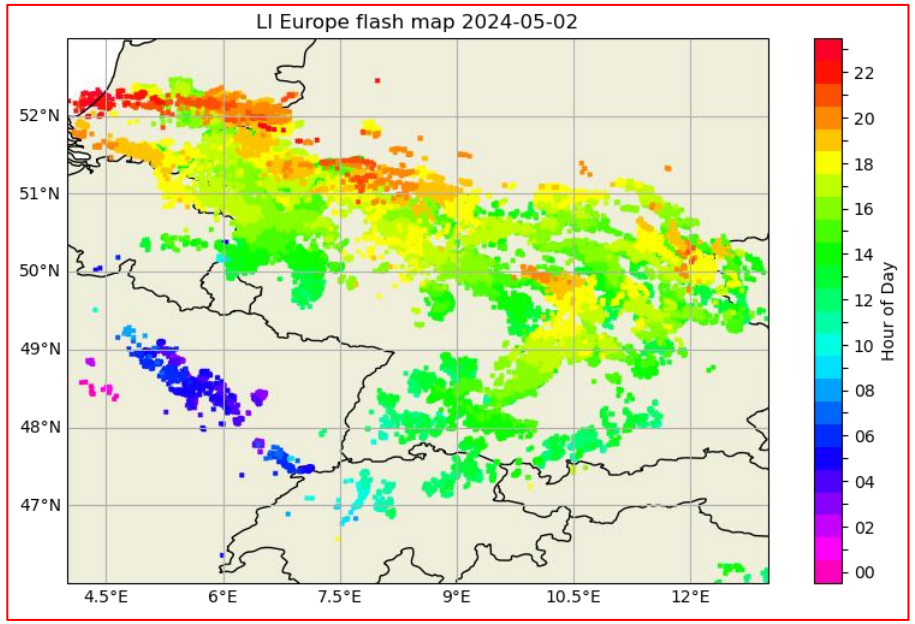


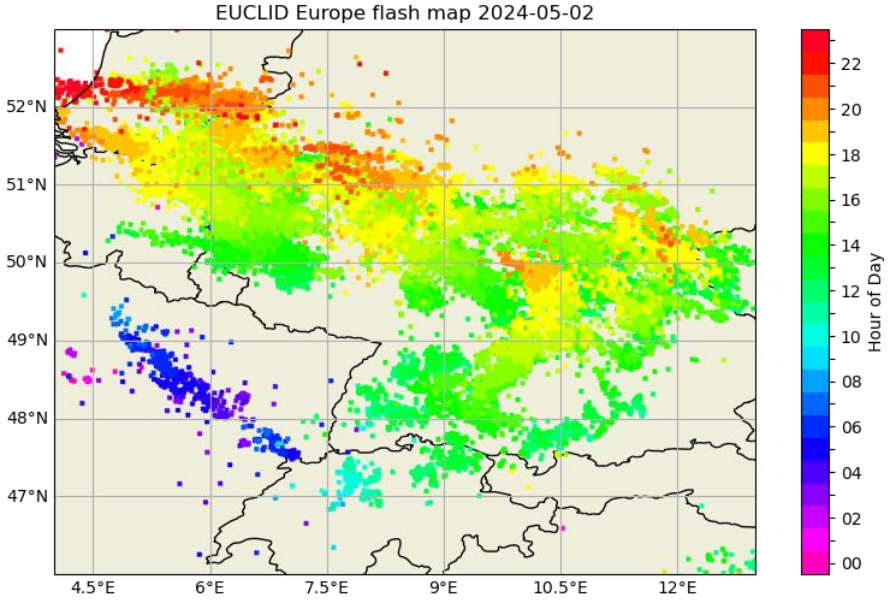
The northern camera observes Europe

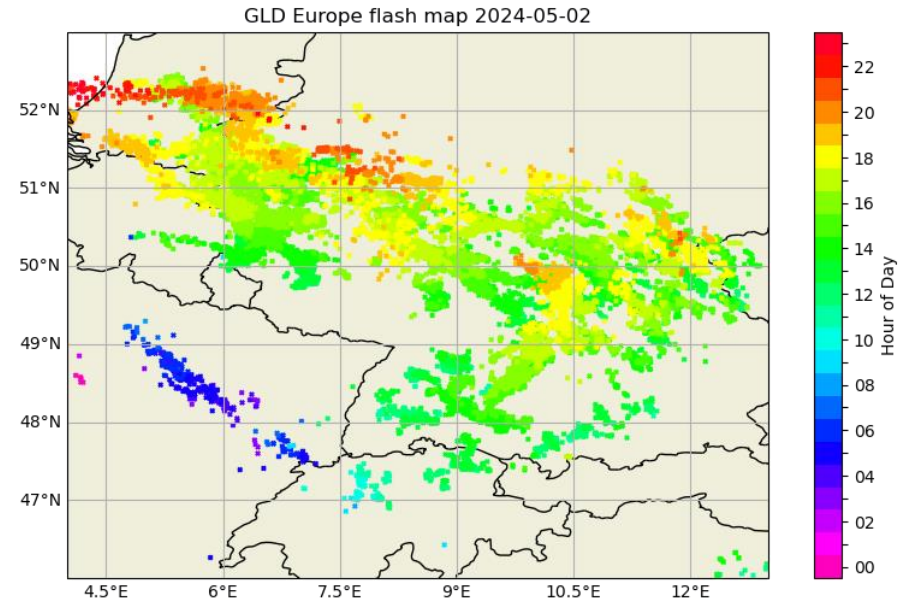
LIL2 data demo – LI flashes on 6 May 2024

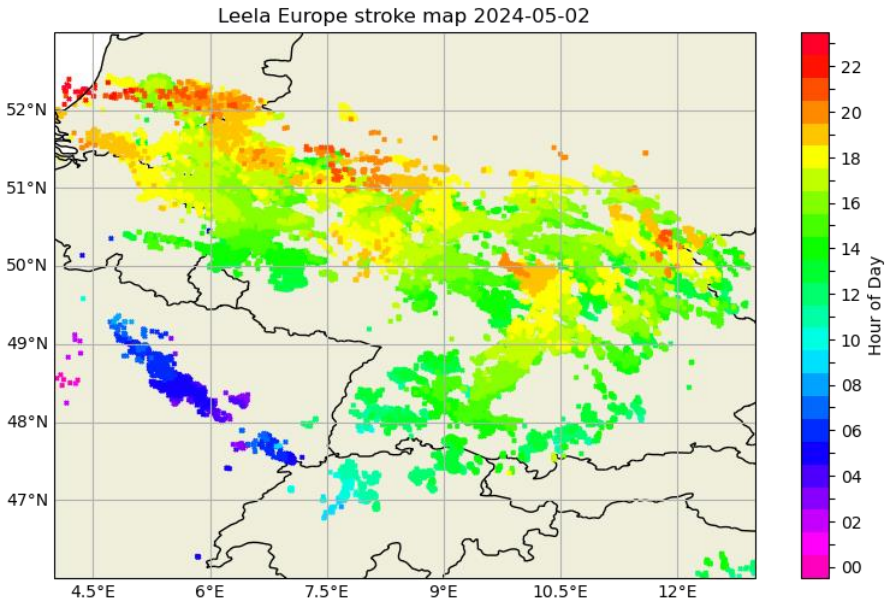


LIL2 data demo – storms in southern Germany 2024-05-02



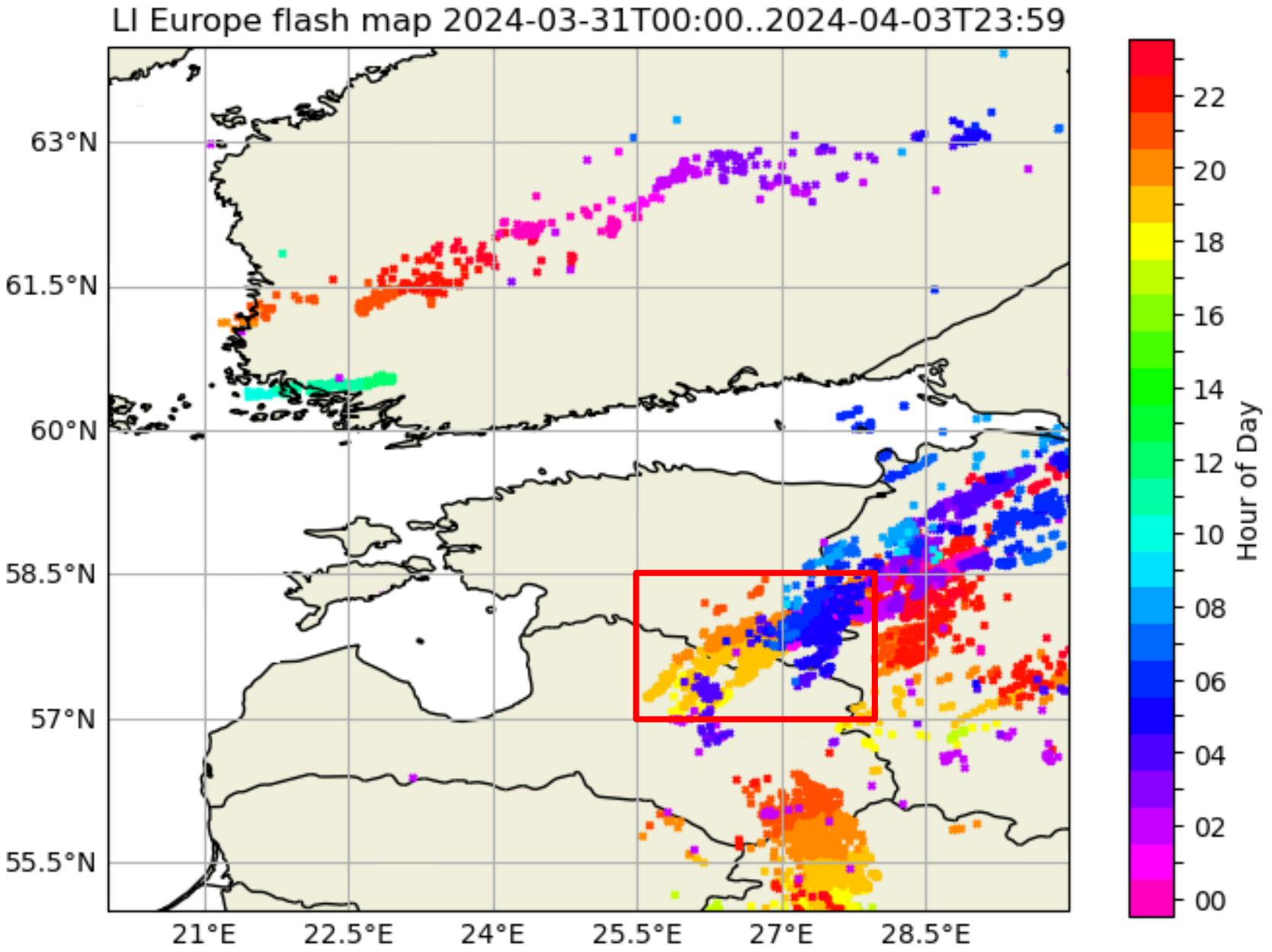






LI and the three ground-based LLSs all observed very similar space-time patters of lighting, storm development and movement.

LIL2 data demo – high-latitude storms



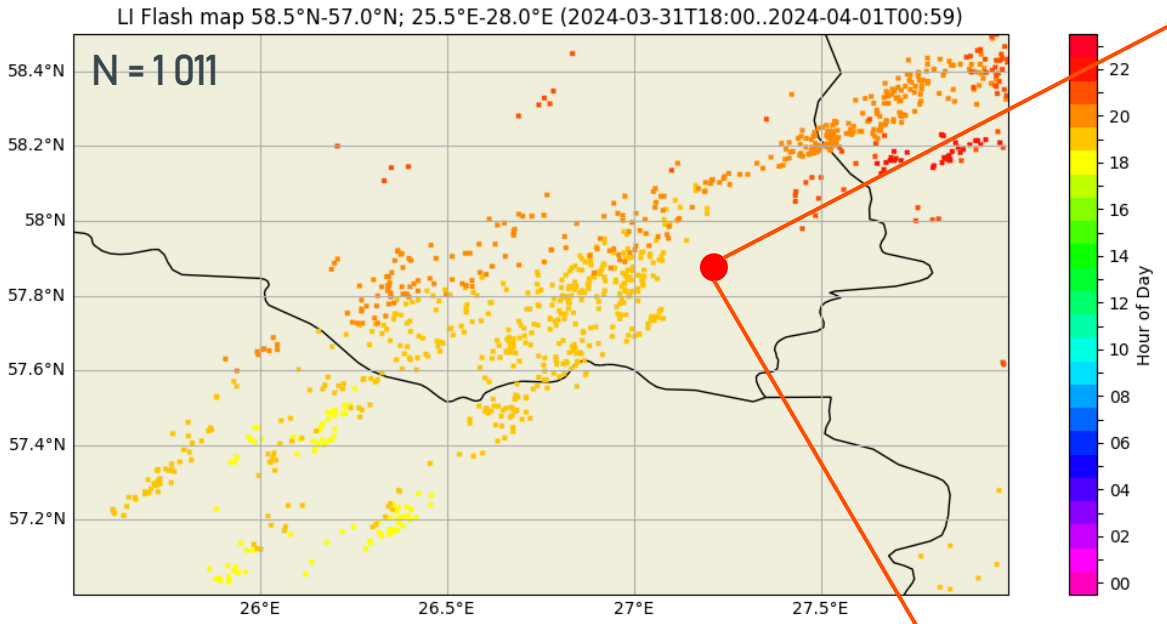
Unusually early outbreak of significant thunderstorms in the Baltic countries and the south of Finland.

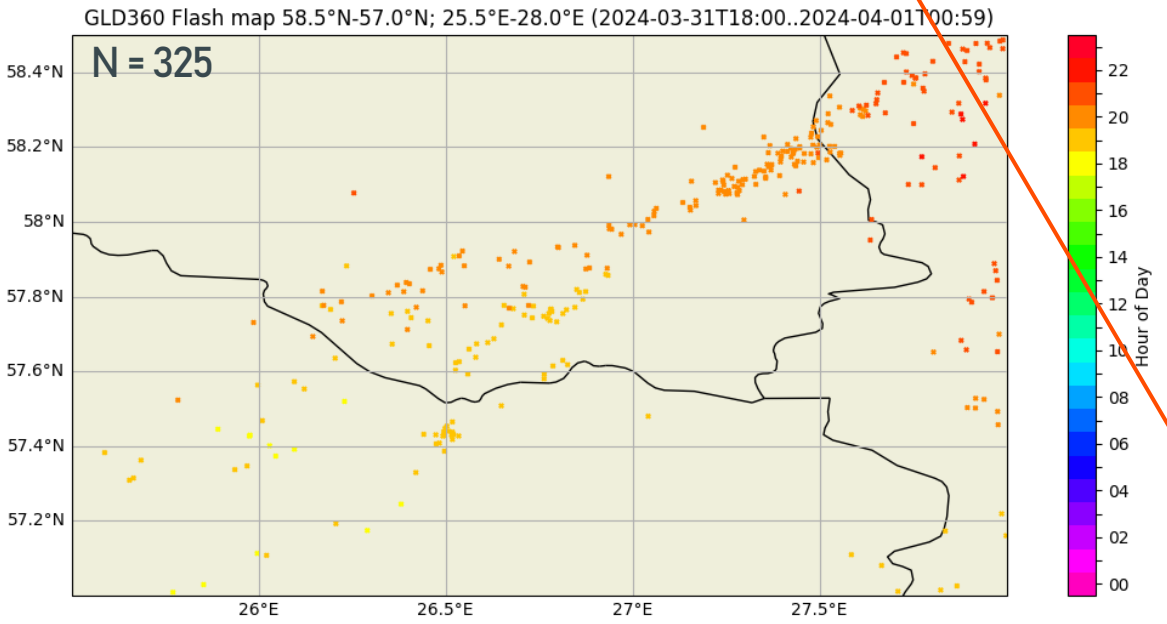
- First component late 31 March to early 1 April (S Finland, SE Estonia, NE Latvia).
- Second component 1 April afternoon (SW Finland).
- Third component 3 April morning (E Latvia, SE Estonia).

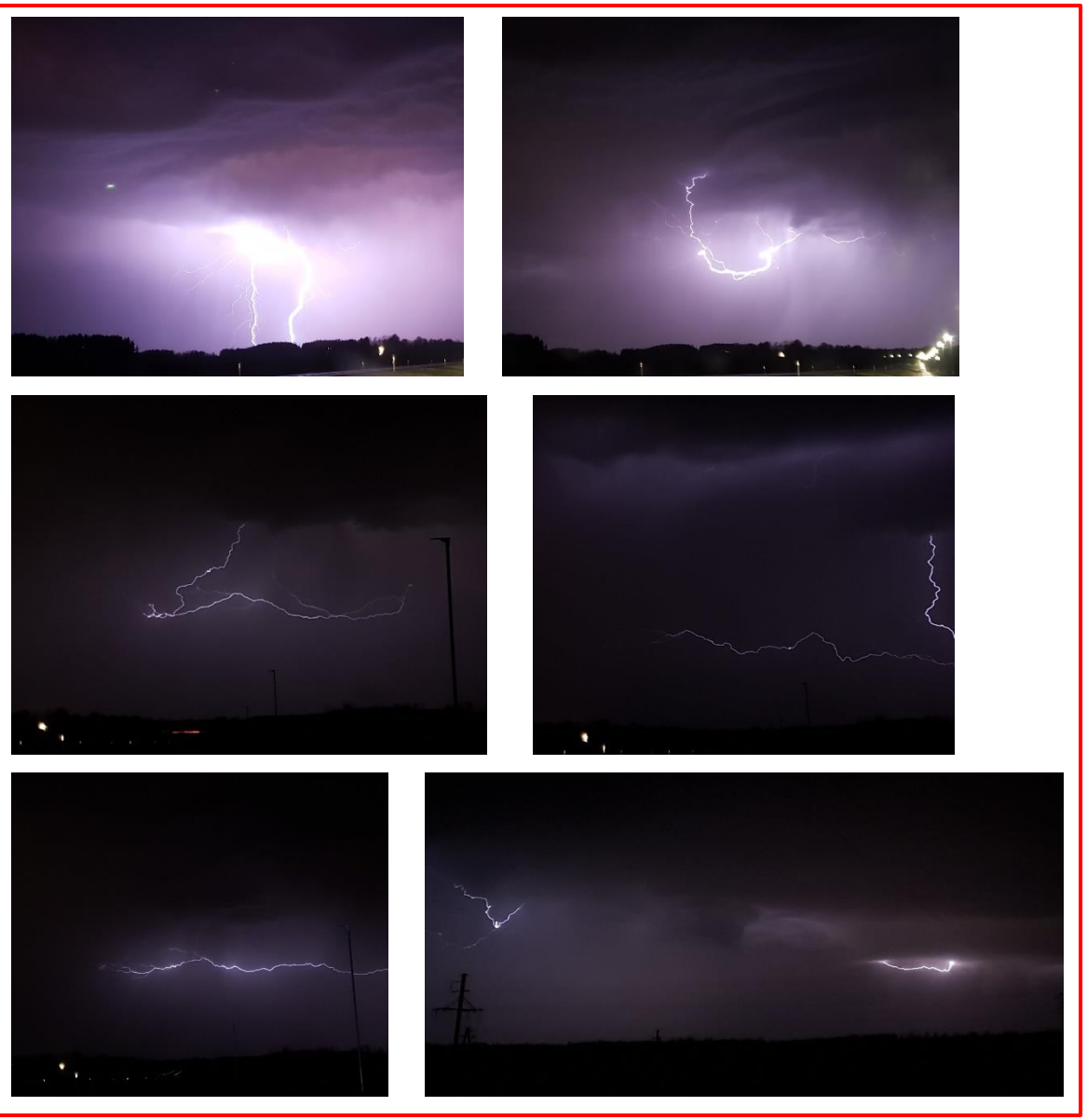
First that scale of storm so far north with LI real-time full processing on.

- Let's have a bit closer look at the 31 March – 1 April storms in the SE Estonia.

LIL2 data demo – high-latitude storms

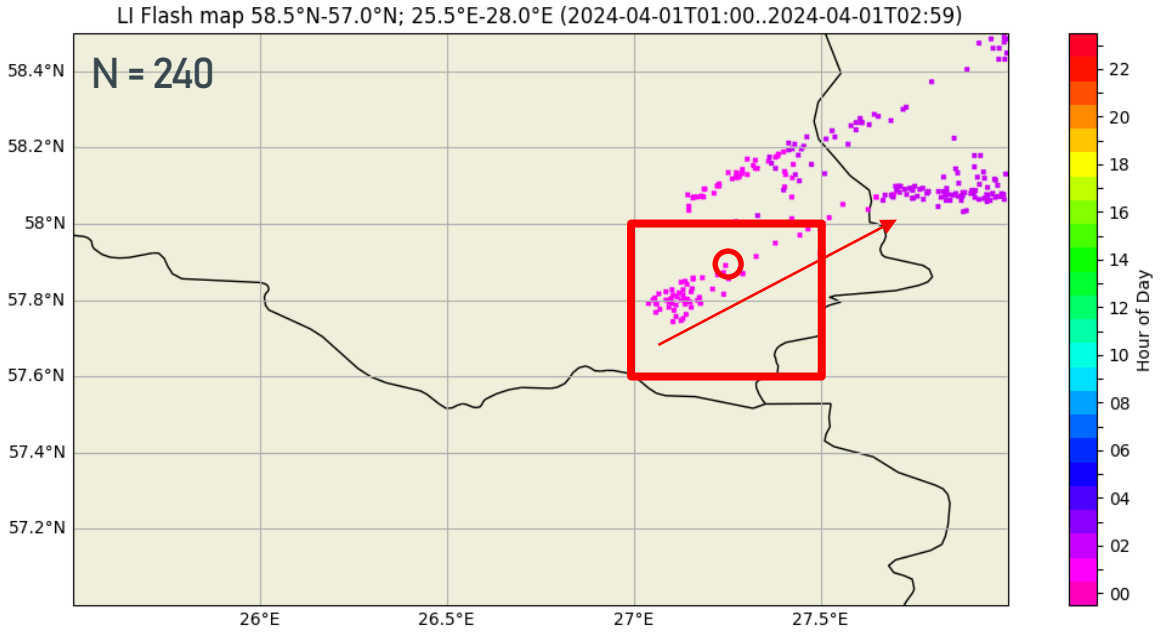


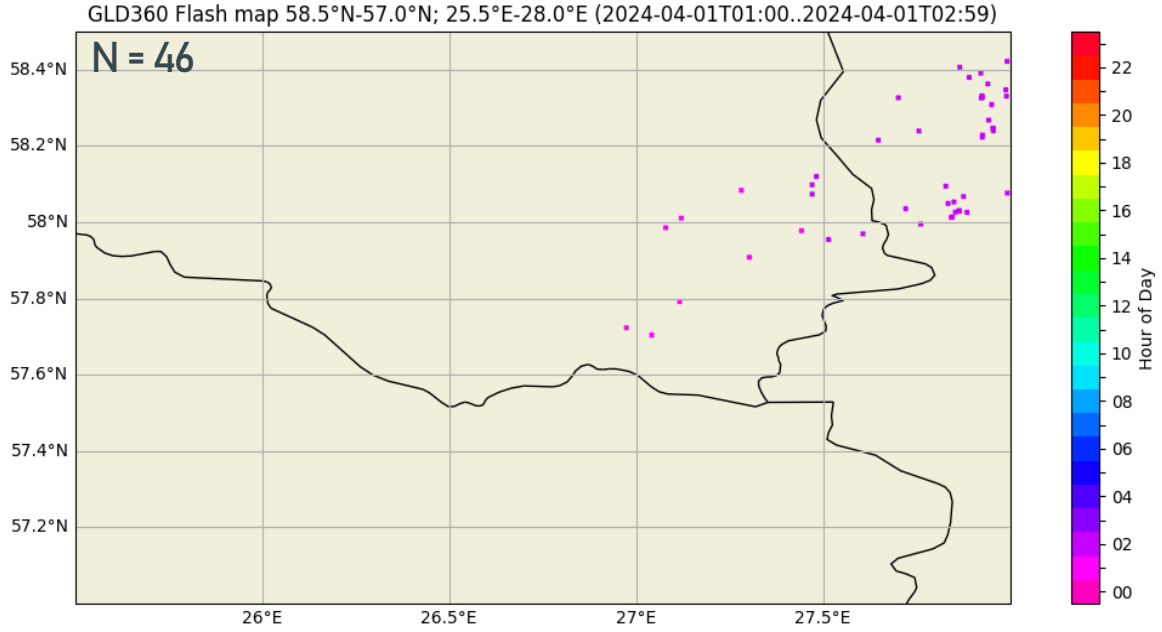




Lots of (long horizontal) cloud lightning, little cloud-to-ground lightning.

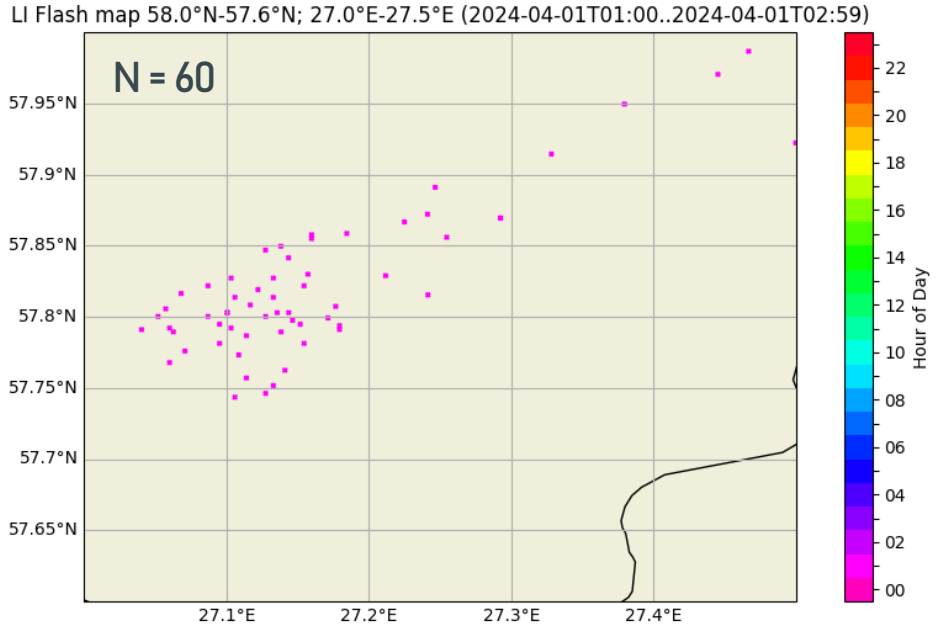
LIL2 data demo – high-latitude storms

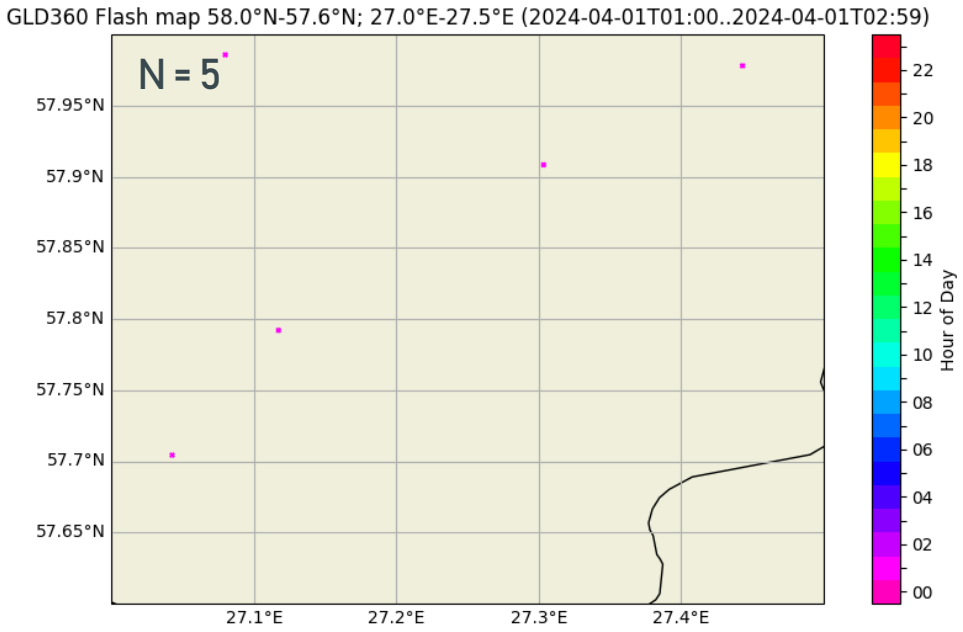


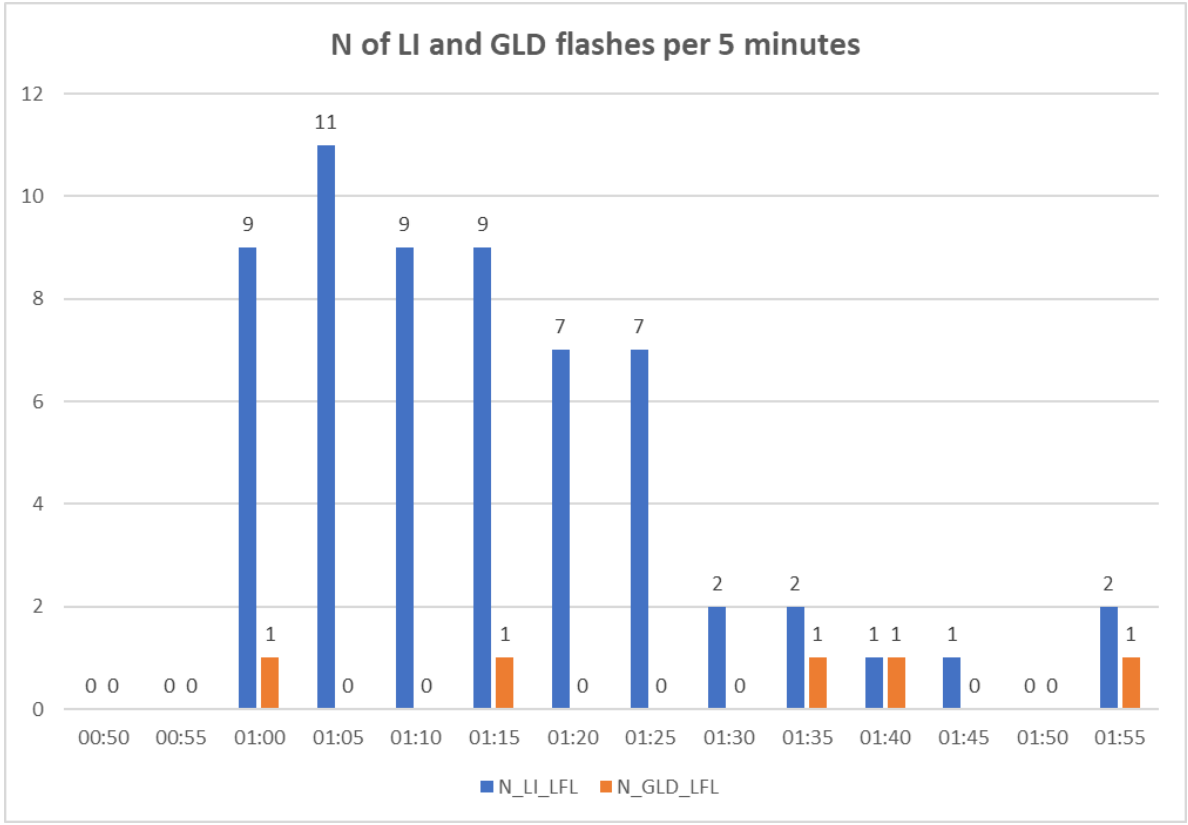


- The next storm developed over Haanja Uplands, SE Estonia, shortly after 01UTC on 1 April. Moved from southwest to northeast.
- Frequent cloud lightning was visually observed as the storm reached its mature stage and started producing lightning, located to the southwest of the observing site (red circle).
- By the time the storm hit and passed the observing site, the lightning frequency had dropped significantly.
- In this case, only the LI data was in line with the visually observed initial frequent cloud lightning phase of the storm, and the significant drop in the lightning activity that followed.

LIL2 data demo – high-latitude storms

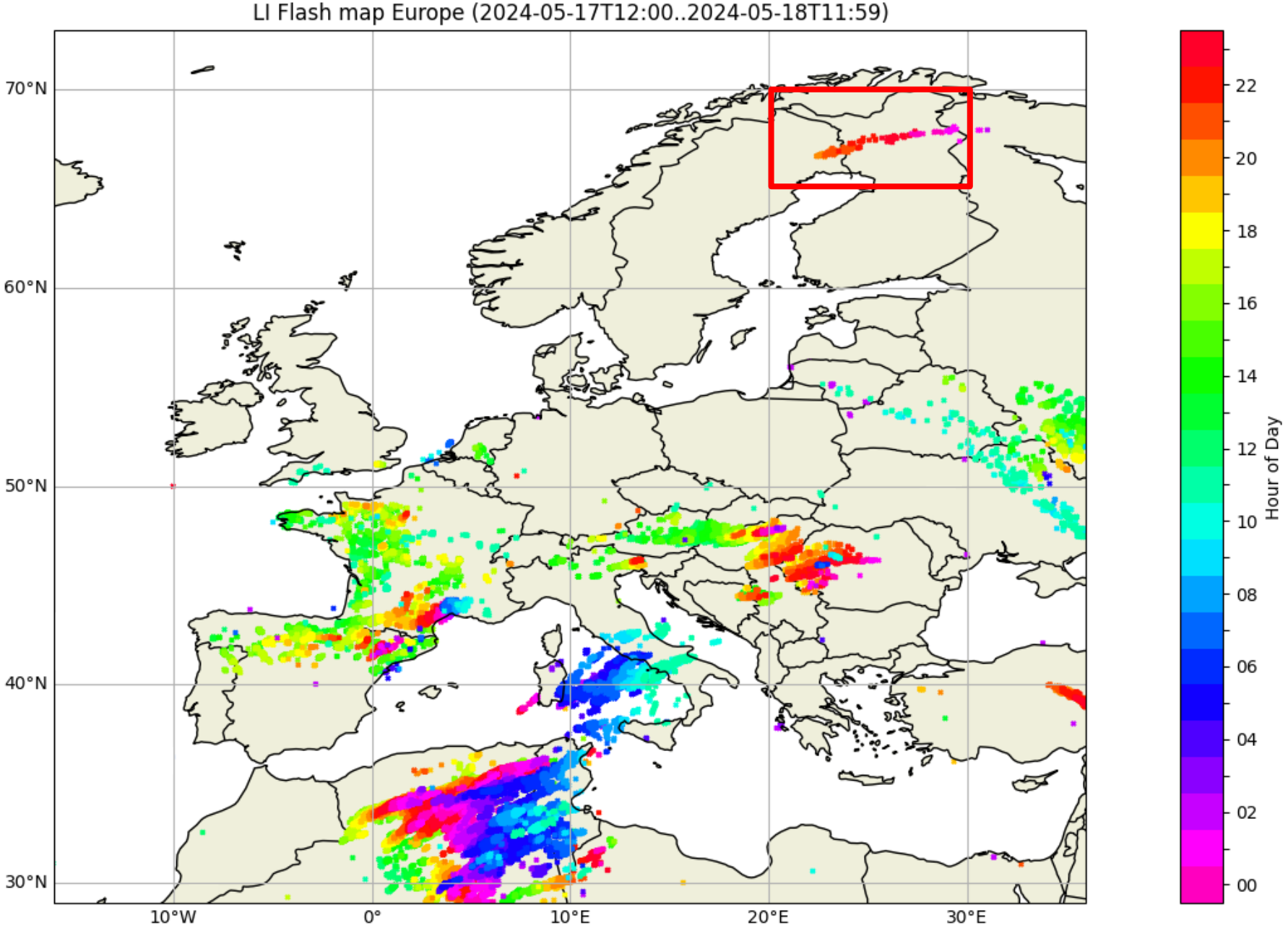




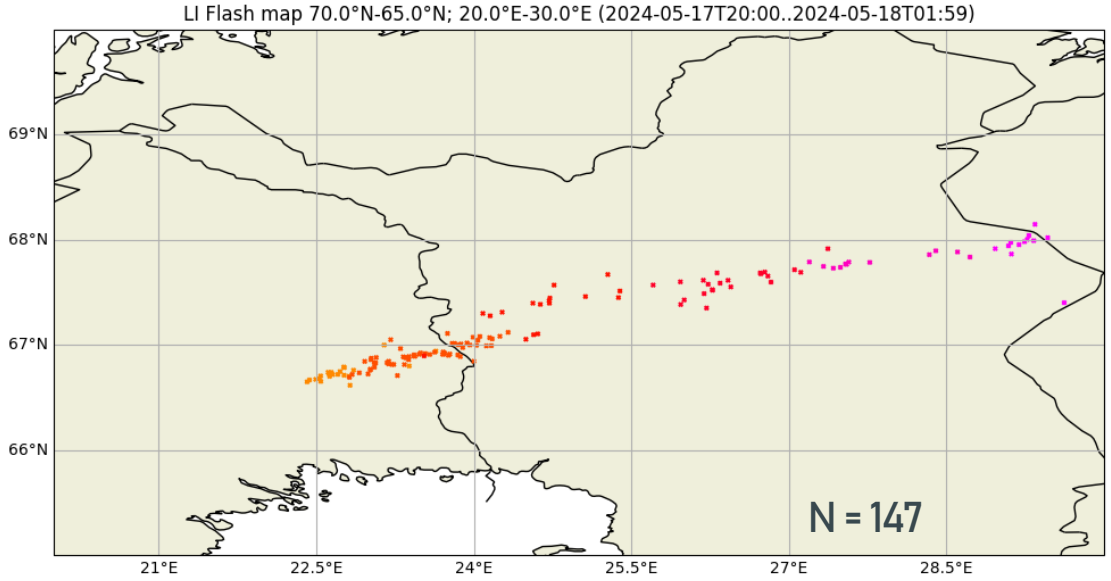


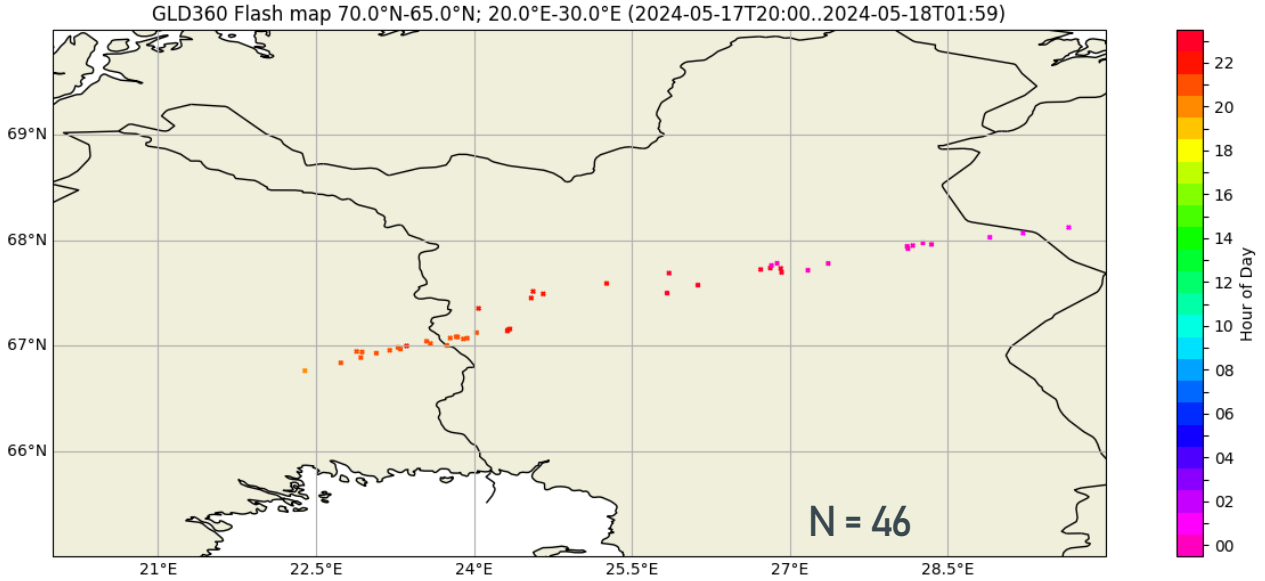
- 1st LI flash 01:00:49UTC
- 1st GLD flash 01:04:22UTC
- LI detected 7 flashes before GLD detected its 1st flash.

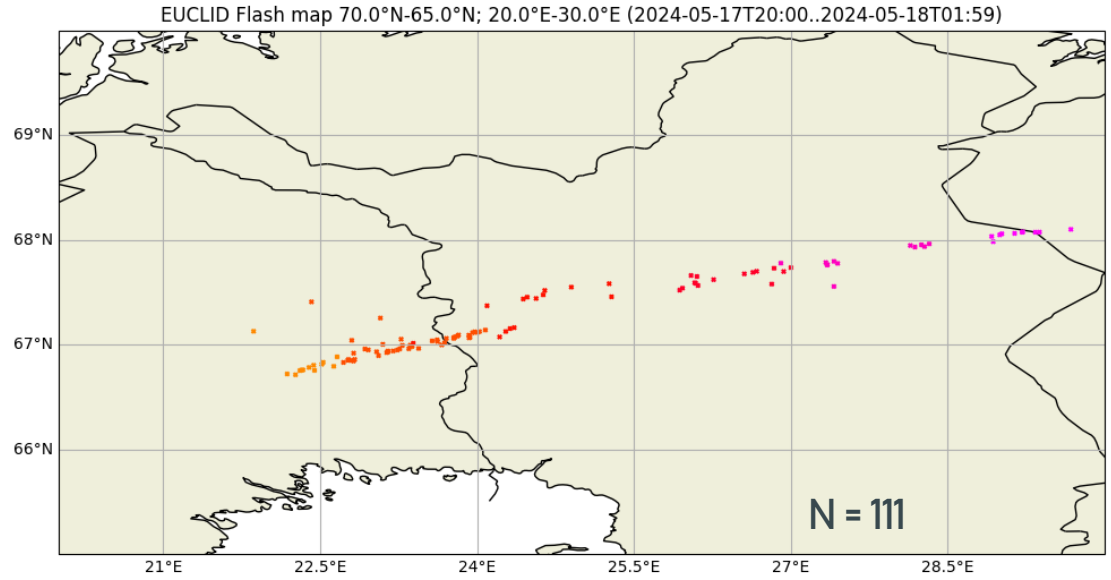
LIL2 data demo – high-latitude storms



LIL2 data demo – high-latitude storms

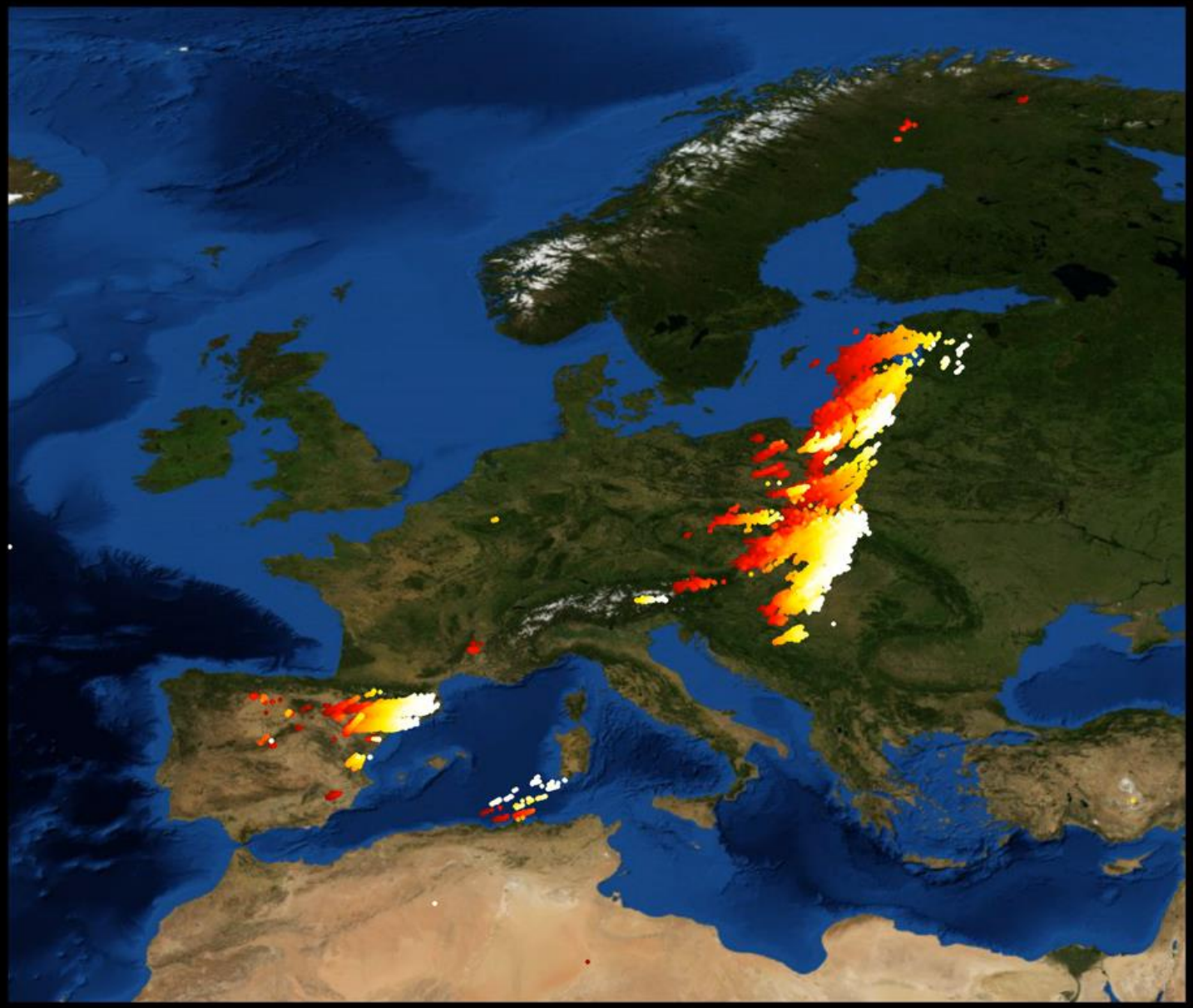




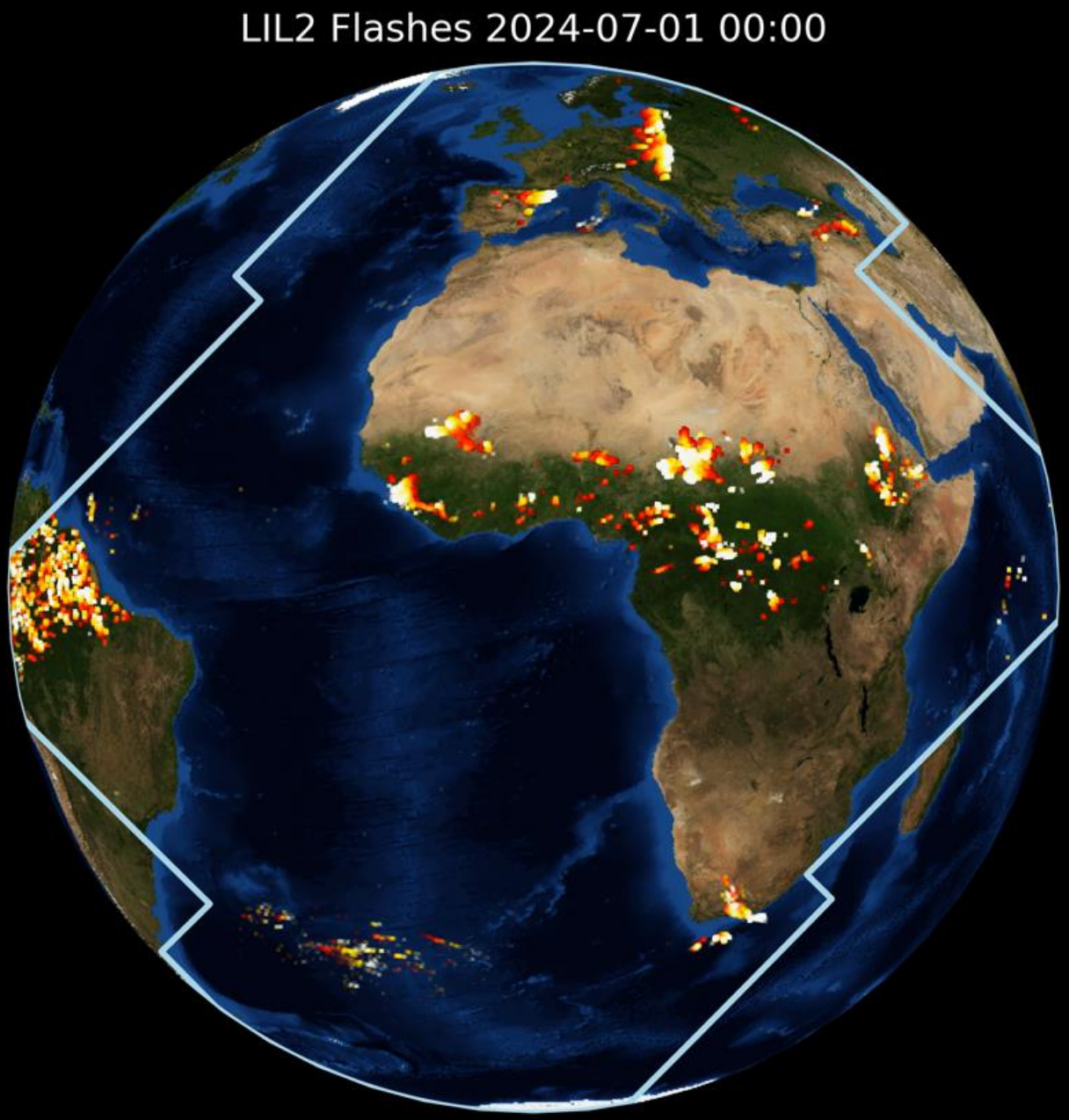


- 1st LI flash 20:26:00UTC
- 1st EUCLID flash 20:26:00UTC
- 1st GLD flash 20:33:21UTC
- LI and EUCLID detected the same first flash
- LI detected 5 flashes and EUCLID detected 4 flashes before GLD detected its 1st flash.

LIL2 data demo – 2-month L2LFL Europe



LIL2 data demo – 2-month L2LFL global



LIL2 data demo – LIL2 AFA + L1B BCK 29 June 2024 ITCZ

LIL2 data demo – LIL2 AFA + L1B BCK 29 June 2024 Europe

Thank you!

Questions are welcome.