# Overshooting - Lightning - Hail


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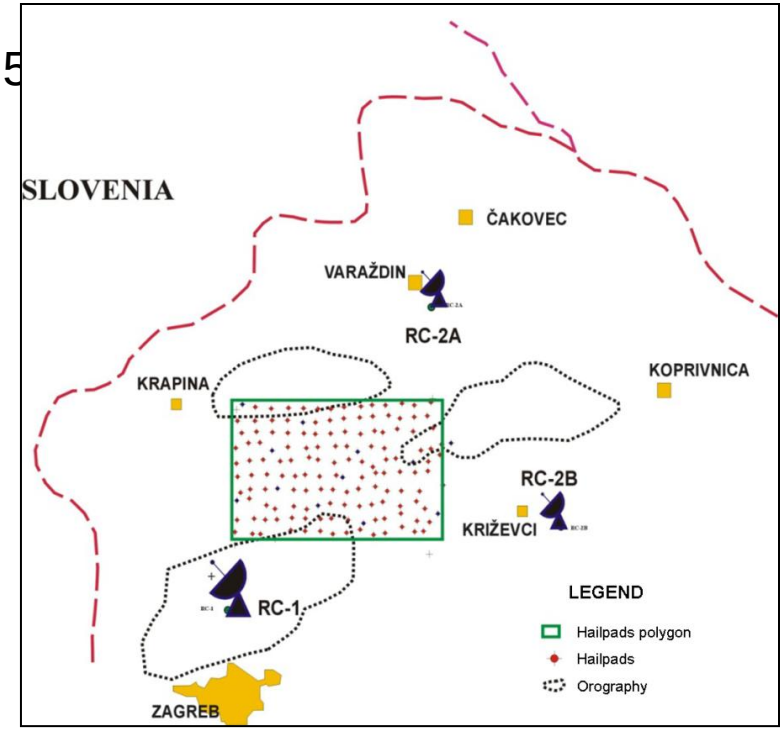
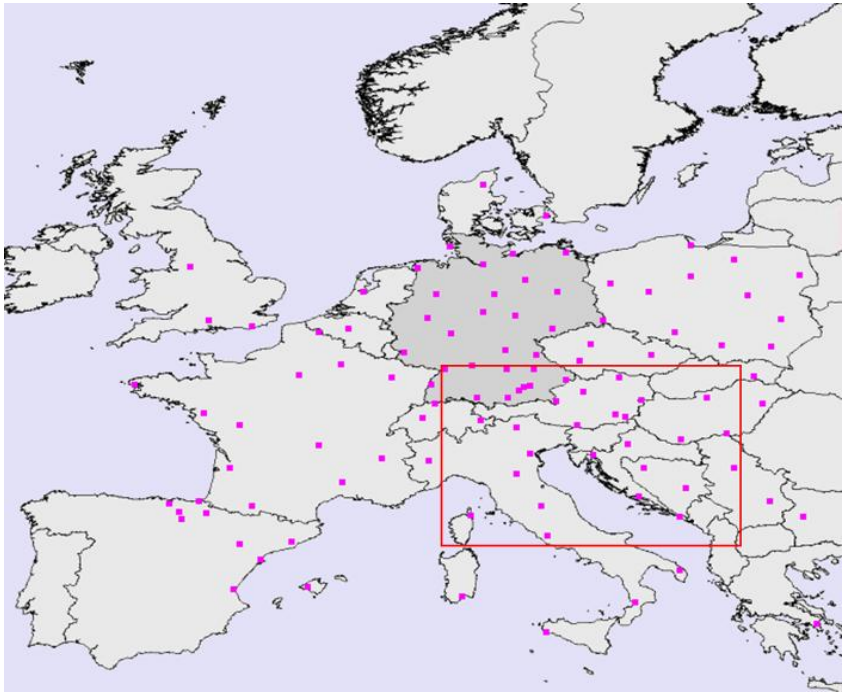
# Data and methods

- May – September 2008 - 2012
- Region: 41.5°N 8.5°E to 49.5°N 20.5
- Lightning data: LINET network
- Satellite data: METEOSAT 9
- Hailpad data: NW Croatia




***Hailpad network ➔ 150 hailpads in NW Croatia***



***Map of LINET sensors***

**Hail characteristics:** diameter, kinetic energy, spatial distribution

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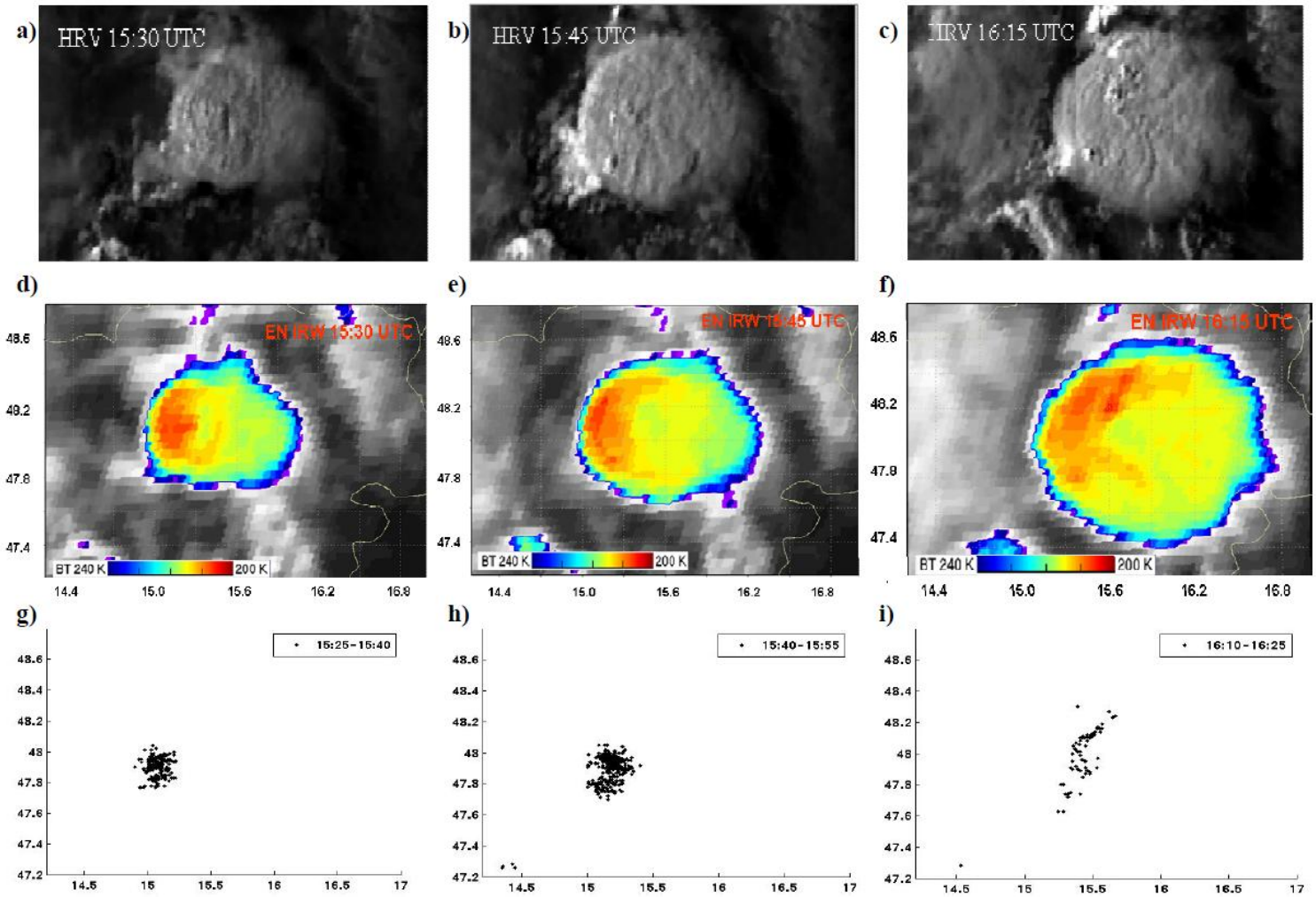
# Overshooting vs. lightning: 23 August 2010




**Map of total lightning activity (IC + CG) above 12 km ➔**

good correlation with locations of the overshooting observed on HRV images



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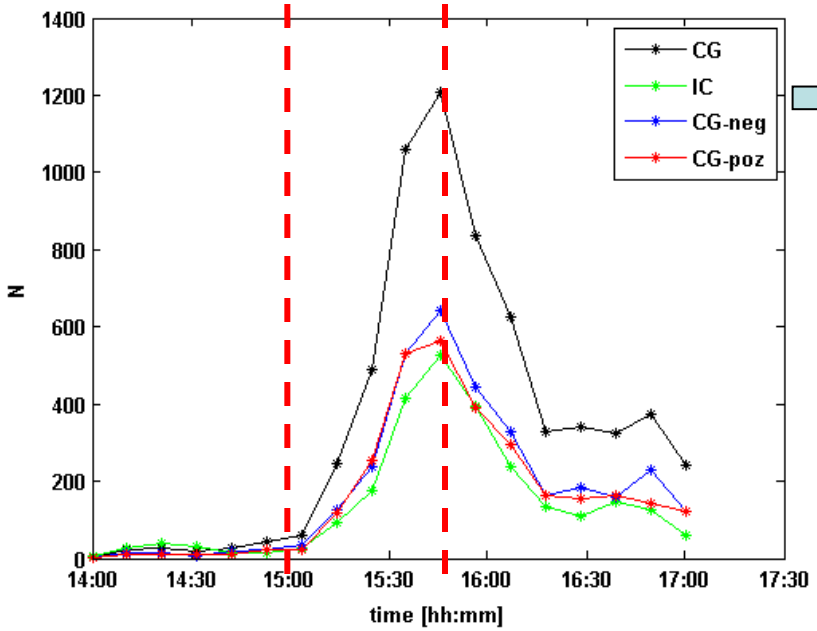
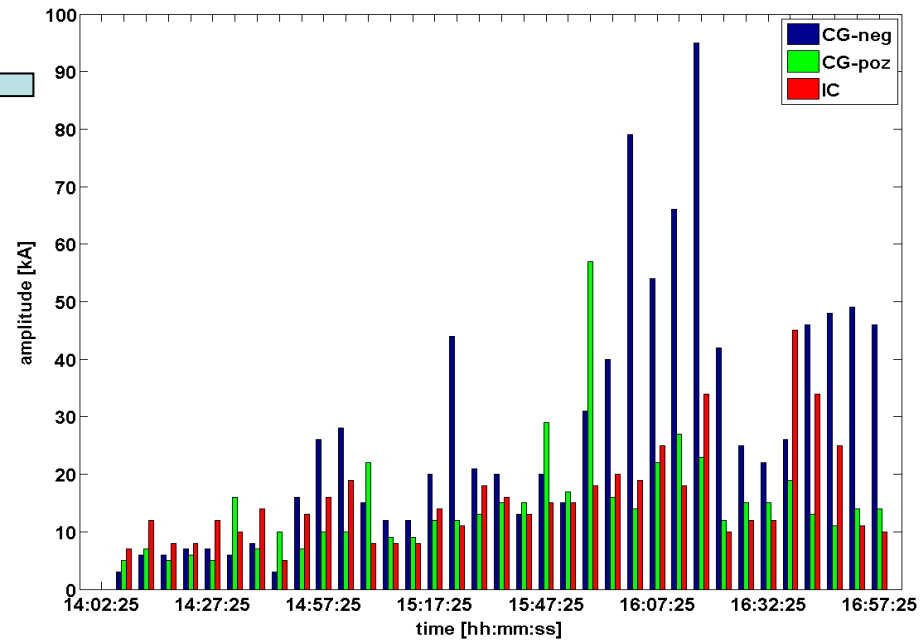


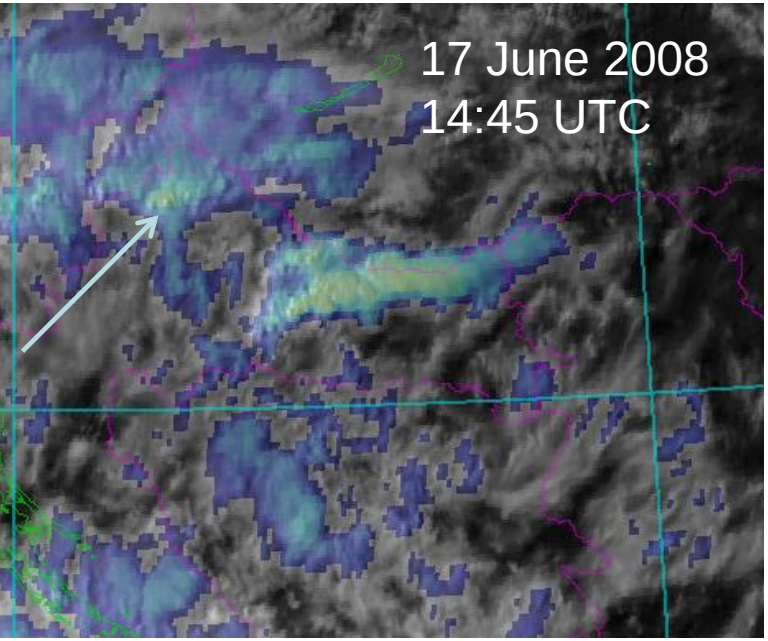

## Temporal distribution of lightning discharges

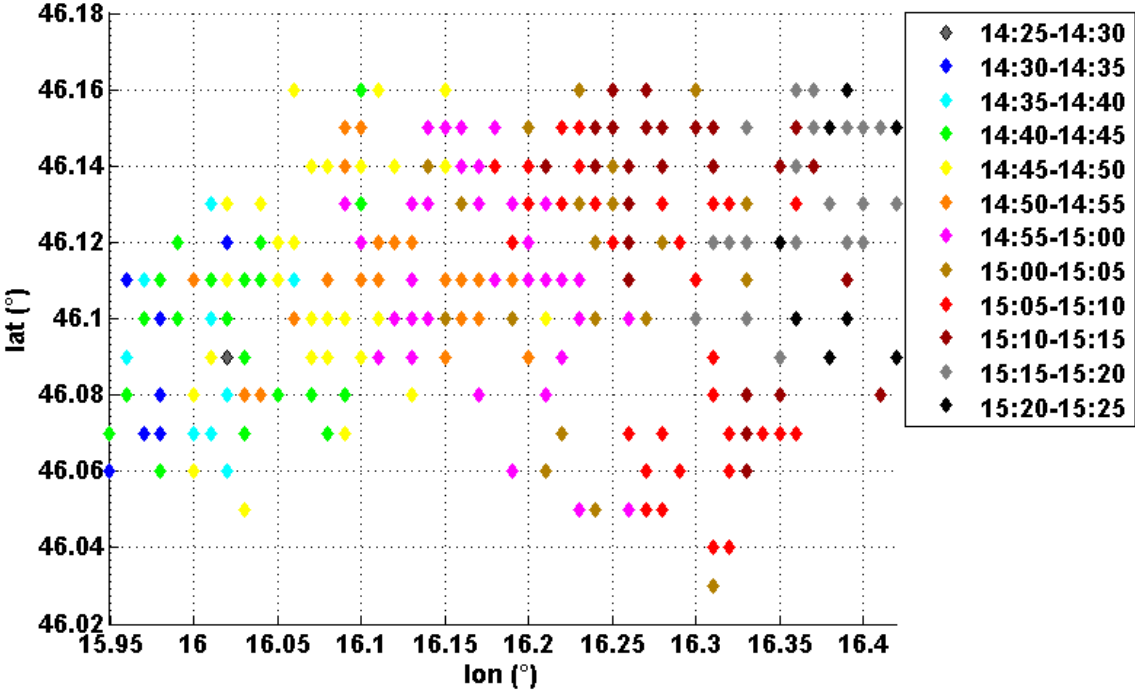
- between 15:15 and 16:15 UTC max. lightning activity
- sharp incrase of lightning activity starts at about 15:00 UTC

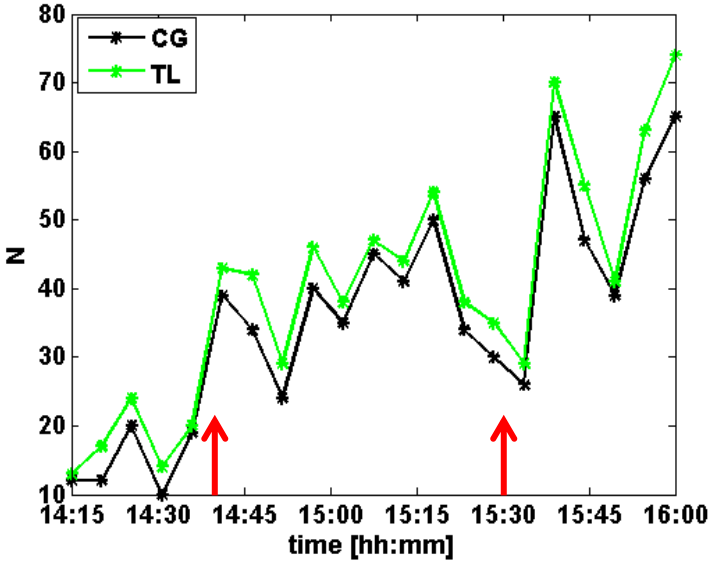
## Temporal distribution of maximum 5-min lightning current

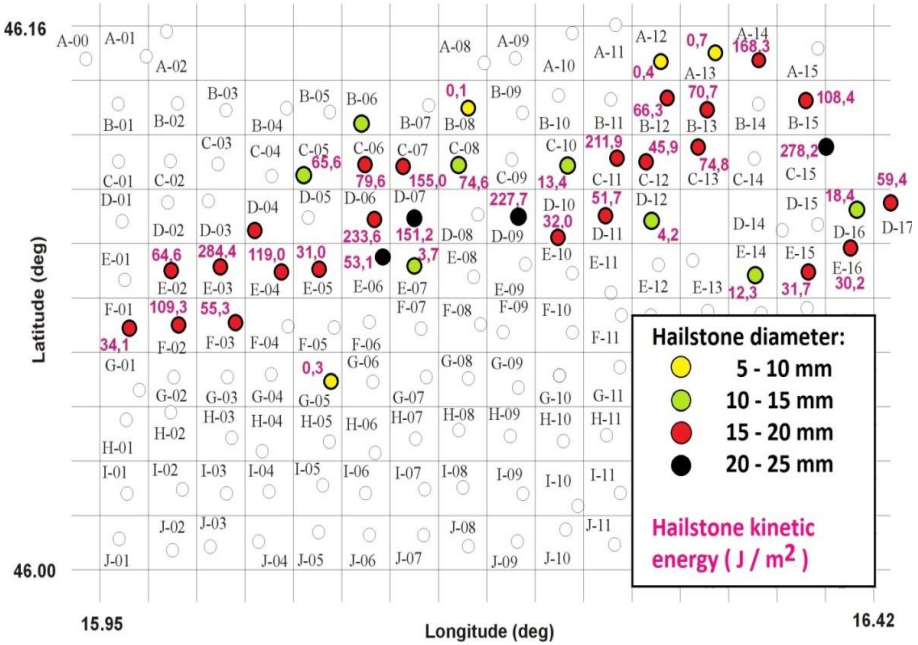
- larger values of electric current at the time of OT detections
- correspond well with max. number of lightning discharges

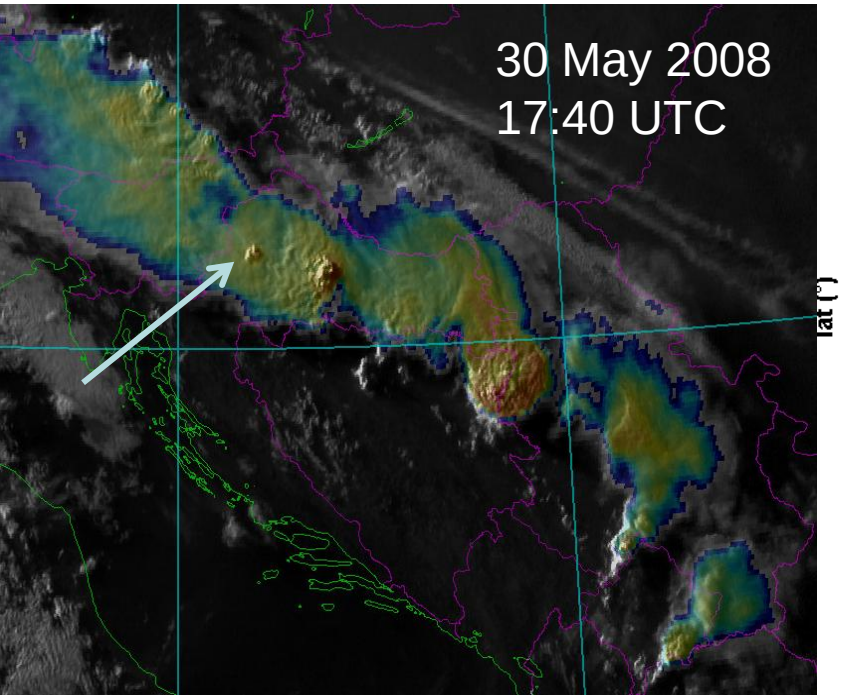


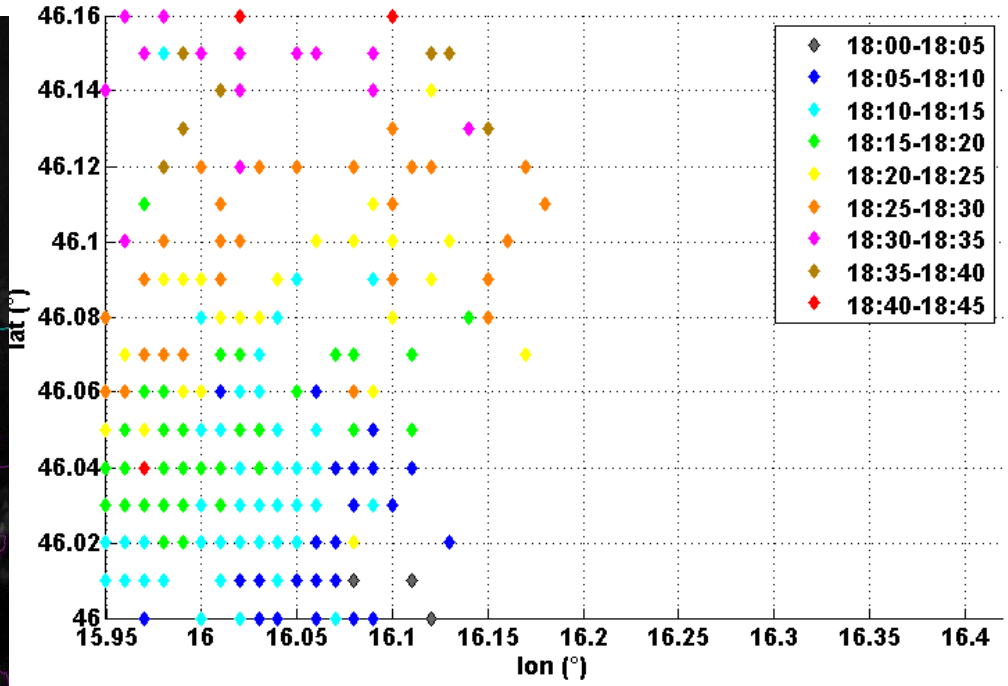

17 June 2008
14:45 UTC

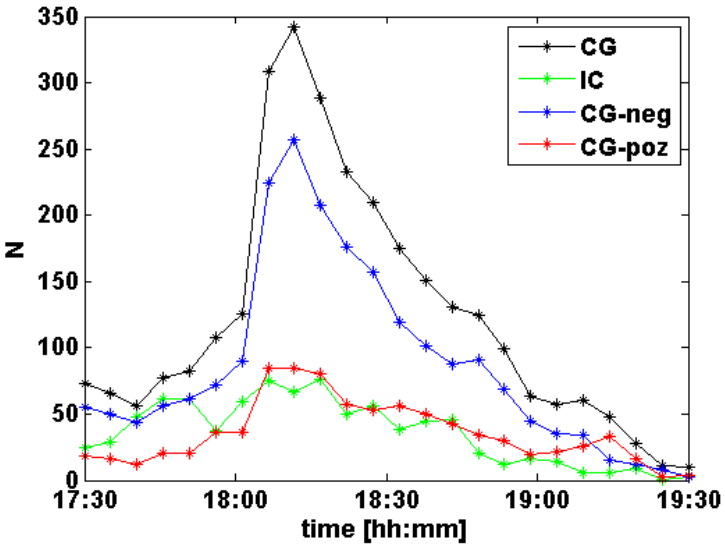

lat (°)
lon (°)
14:25-14:30
14:30-14:35
14:35-14:40
14:40-14:45
14:45-14:50
14:50-14:55
14:55-15:00
15:00-15:05
15:05-15:10
15:10-15:15
15:15-15:20
15:20-15:25

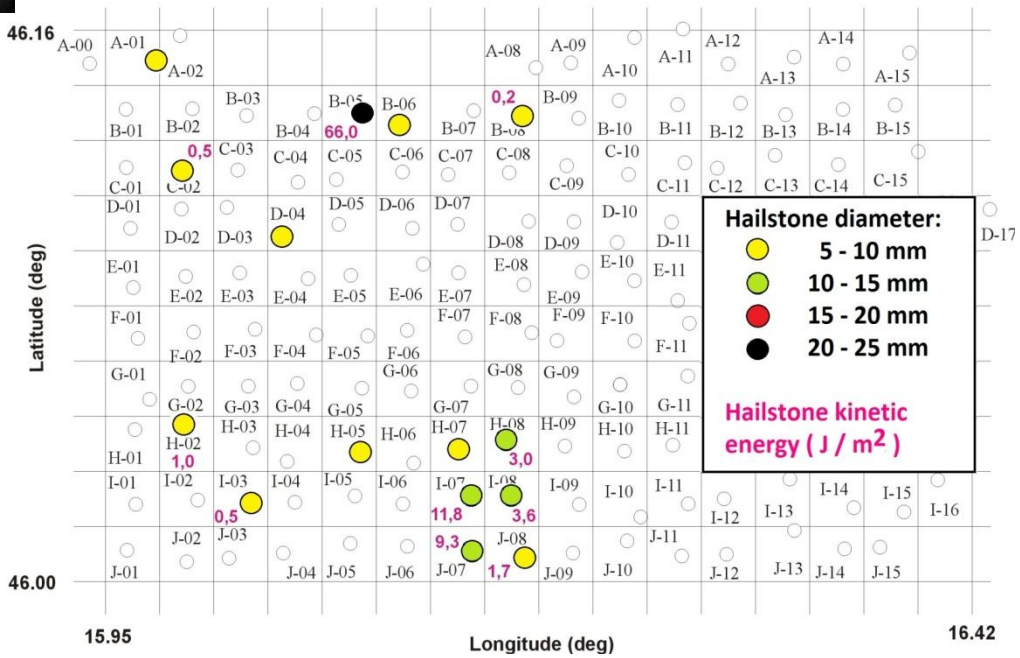

CG
TL
N
time [hh:mm]


Latitude (deg)
Longitude (deg)
Hailstone diameter:
5 - 10 mm
10 - 15 mm
15 - 20 mm
20 - 25 mm
Hailstone kinetic energy ( J / m2 )

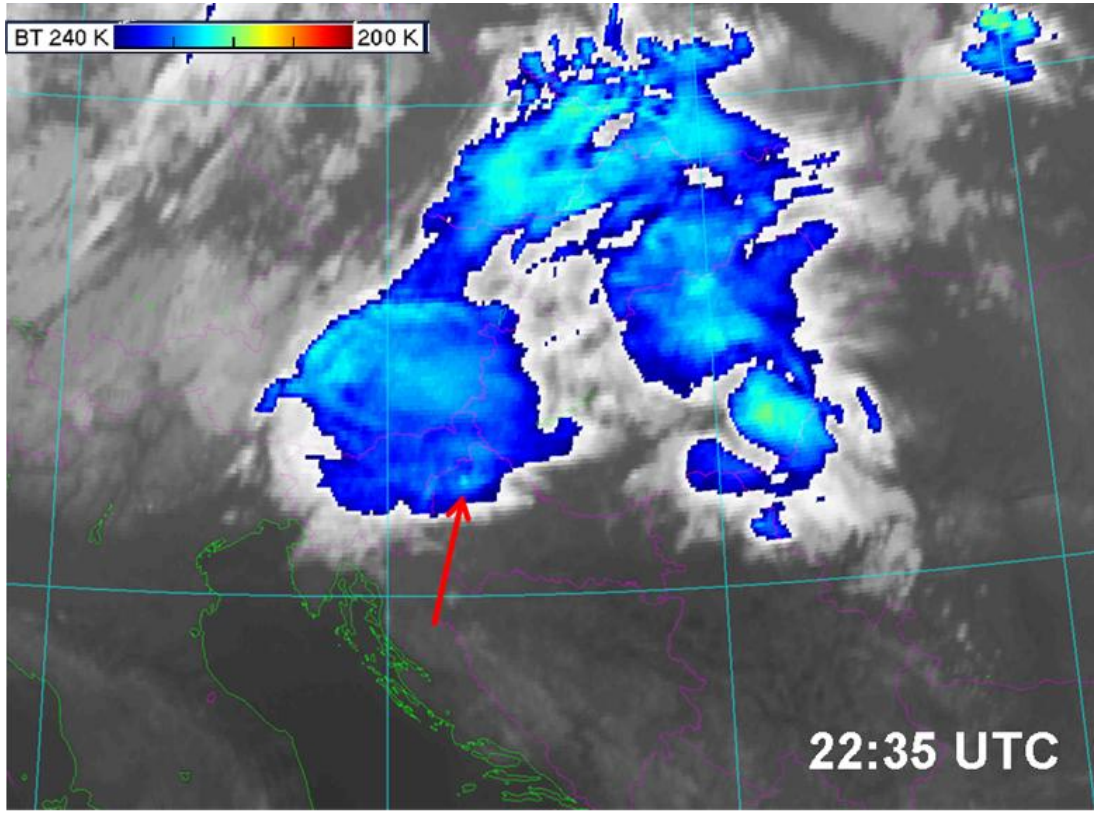

30 May 2008
17:40 UTC

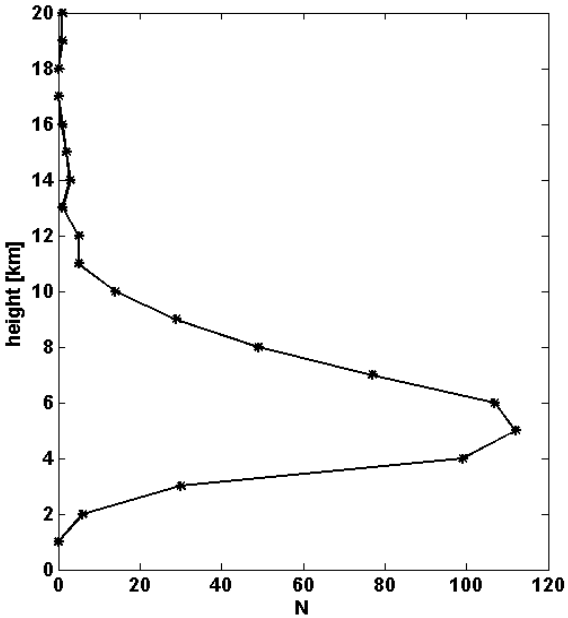

18:00-18:05
18:05-18:10
18:10-18:15
18:15-18:20
18:20-18:25
18:25-18:30
18:30-18:35
18:35-18:40
18:40-18:45
lat (°)
lon (°)
46.16
46.14
46.12
46.1
46.08
46.06
46.04
46.02
46
15.95
16
16.05
16.1
16.15
16.2
16.25
16.3
16.35
16.4

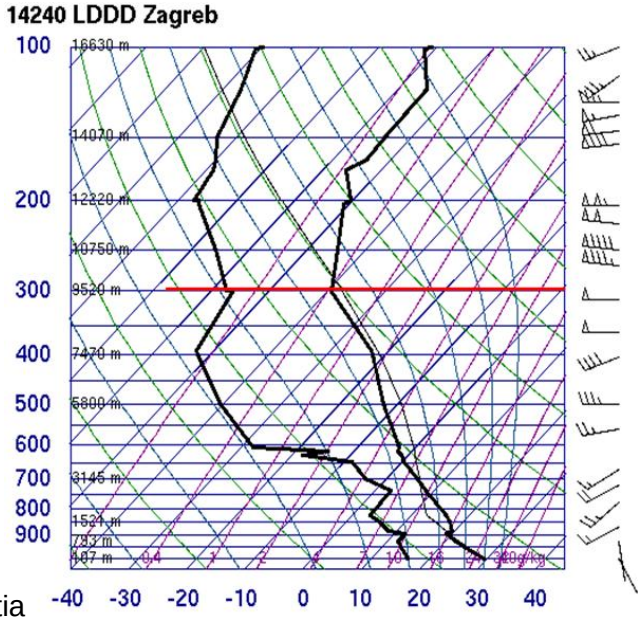

CG
IC
CG-neg
CG-poz
N
time [hh:mm]
350
300
250
200
150
100
50
0
17:30
18:00
18:30
19:00
19:30


Hailstone diameter:
5 - 10 mm
10 - 15 mm
15 - 20 mm
20 - 25 mm
Hailstone kinetic energy ( J / m2 )
Latitude (deg)
Longitude (deg)
46.16
46.00
15.95
16.42
66,0
0,2
0,5
1,0
3,0
0,5
11,8
3,6
9,3
1,7

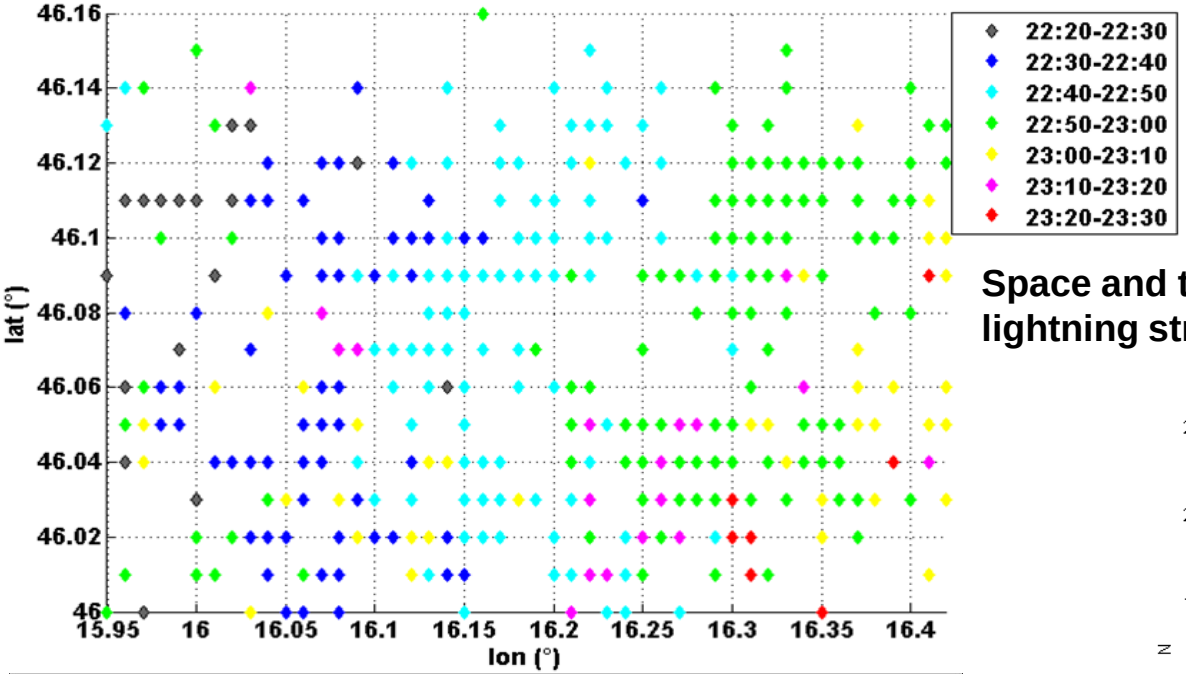
# Hail case: 11 July 2012 - “warm tops” case



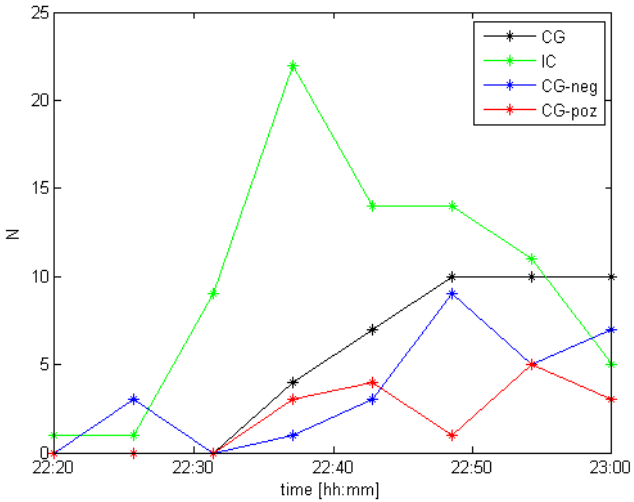



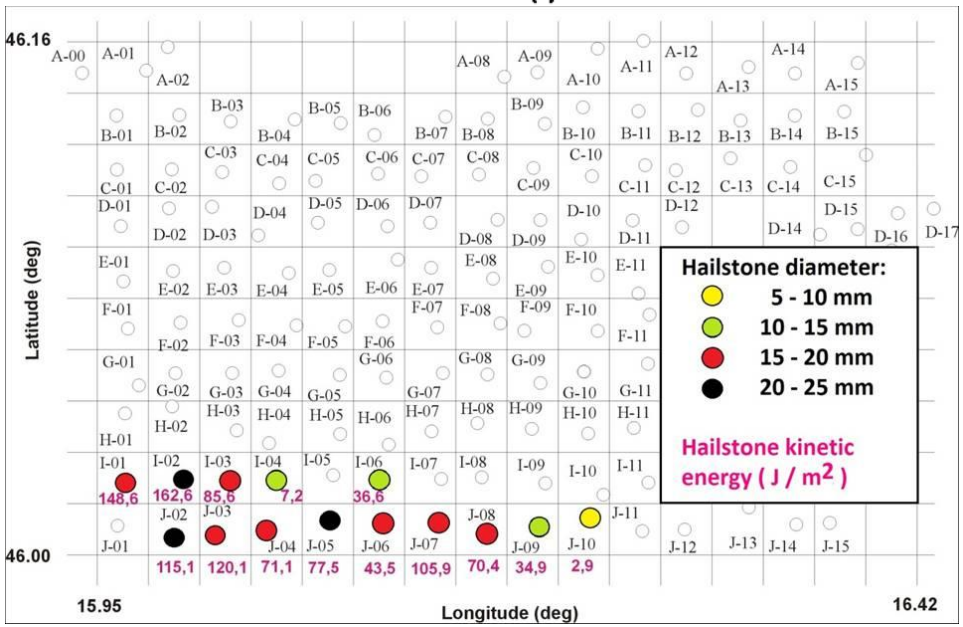

- Cloud top temperatures mostly above - 40°C
- The tropopause level is at cca. 9.5 km



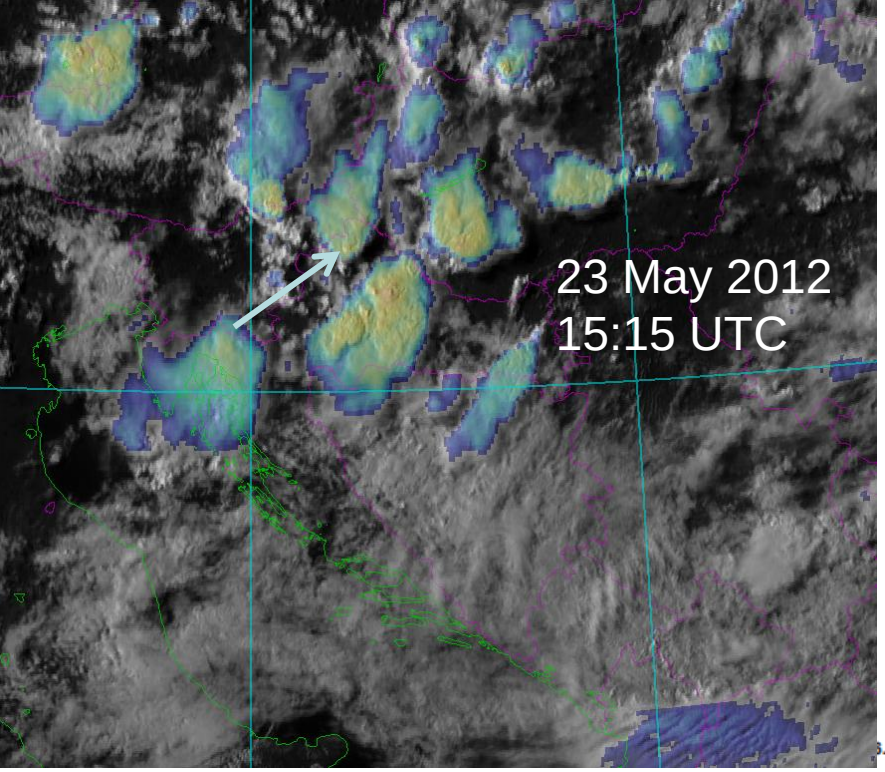

**Space and time distribution of lightning strikes**

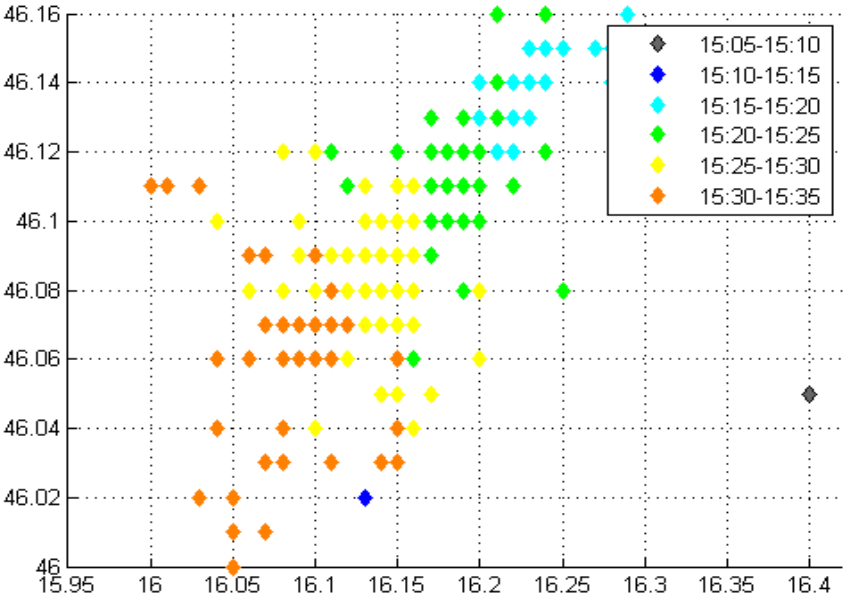



***Number of lightning strikes for the southern part of polygon where hail was registered.***




**Distribution of hailstone maximum sizes and kinetic energy**


23 May 2012
15:15 UTC


15:05-15:10
15:10-15:15
15:15-15:20
15:20-15:25
15:25-15:30
15:30-15:35
46.16
46.14
46.12
46.1
46.08
46.06
46.04
46.02
46
15.95
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16.05
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16.15
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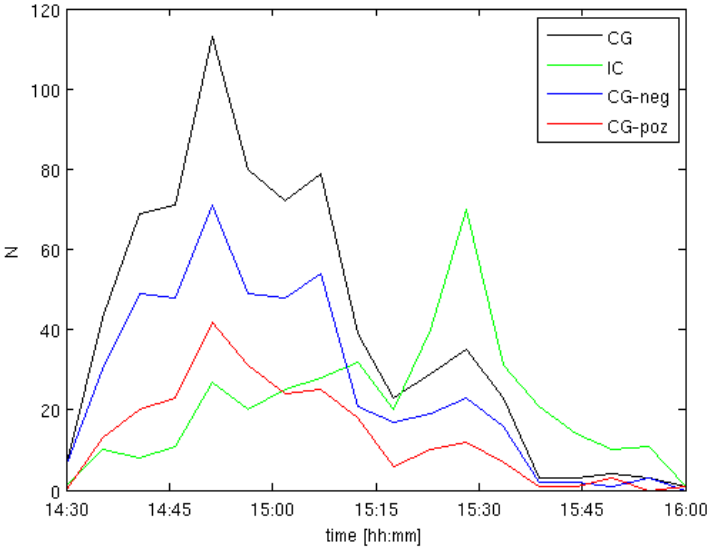
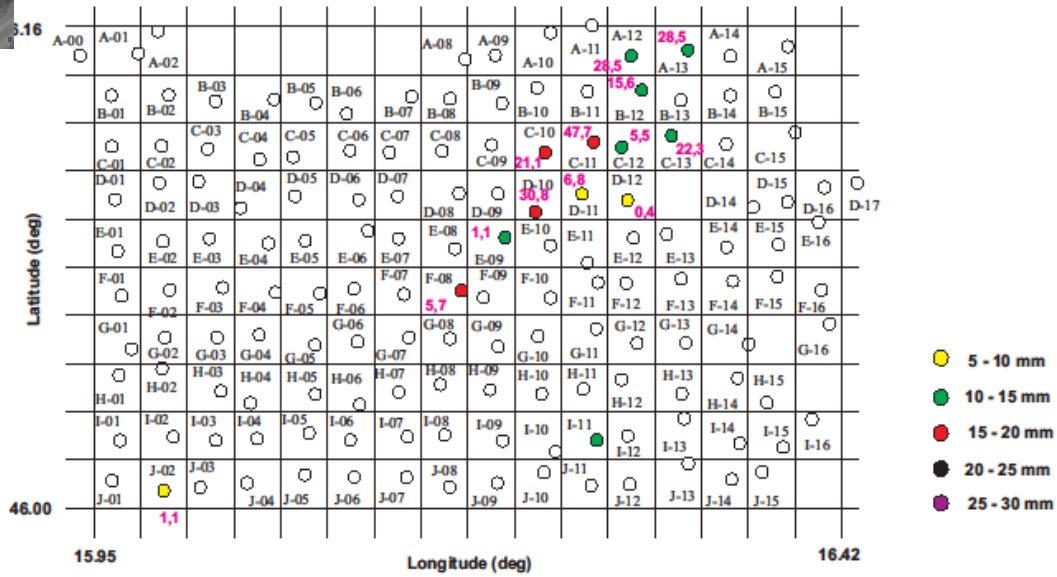
16.25
16.3
16.35
16.4


CG
IC
CG-neg
CG-poz
N
time [hh:mm]
14:30
14:45
15:00
15:15
15:30
15:45
16:00


Latitude (deg)
Longitude (deg)
46.00
15.95
16.42
5 - 10 mm
10 - 15 mm
15 - 20 mm
20 - 25 mm
25 - 30 mm

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# THANK YOU!

Questions?
Comments?
Ideas?

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