

# Nowcasting of severe weather using satellite data in Northern Europe





**2 cases of severe weather  
from forecaster's point of view**

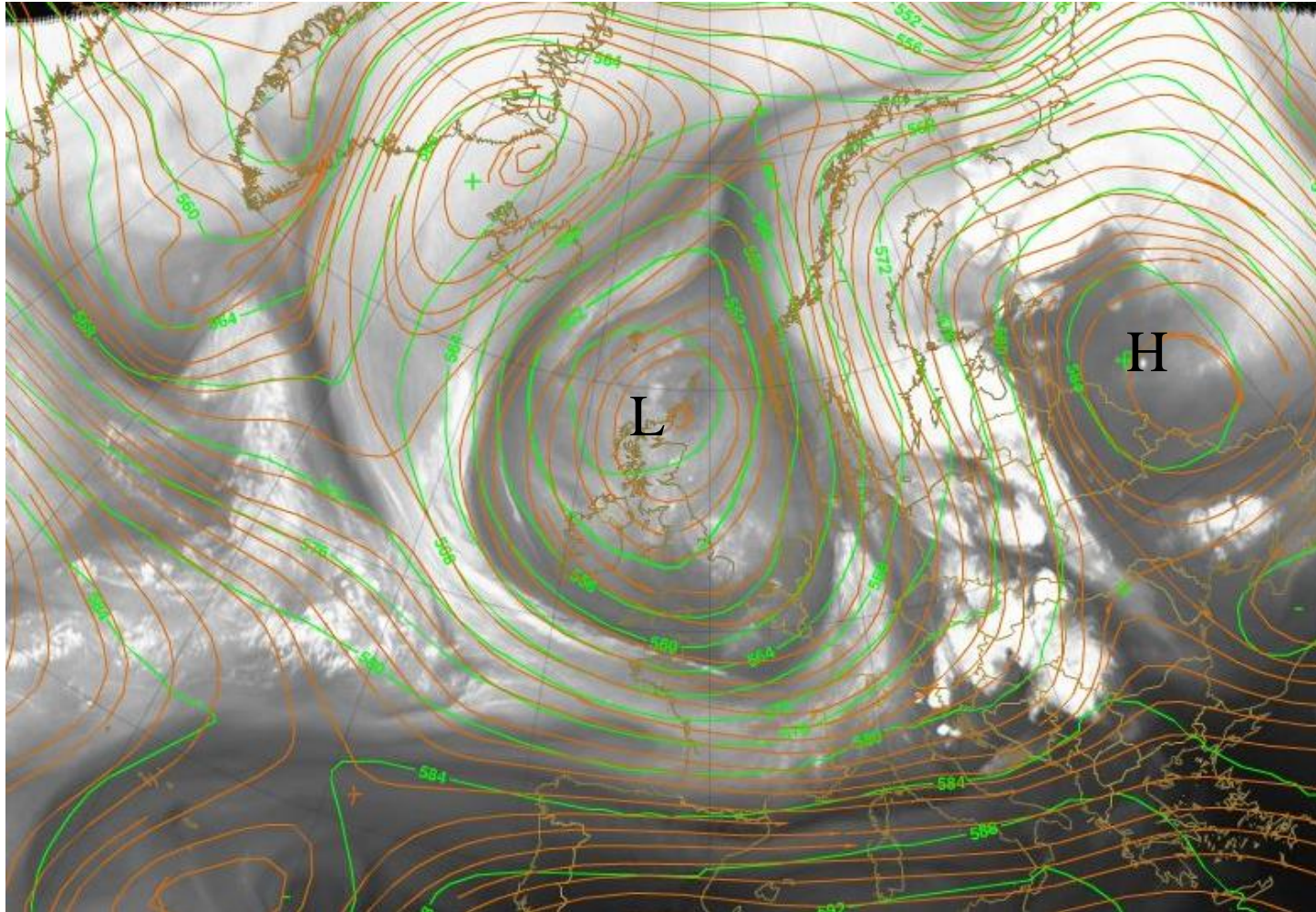
**Izolda Marciniienė**  
Chief forecaster  
Lithuanian Hydrometeorological Service

# Many thanks to colleagues

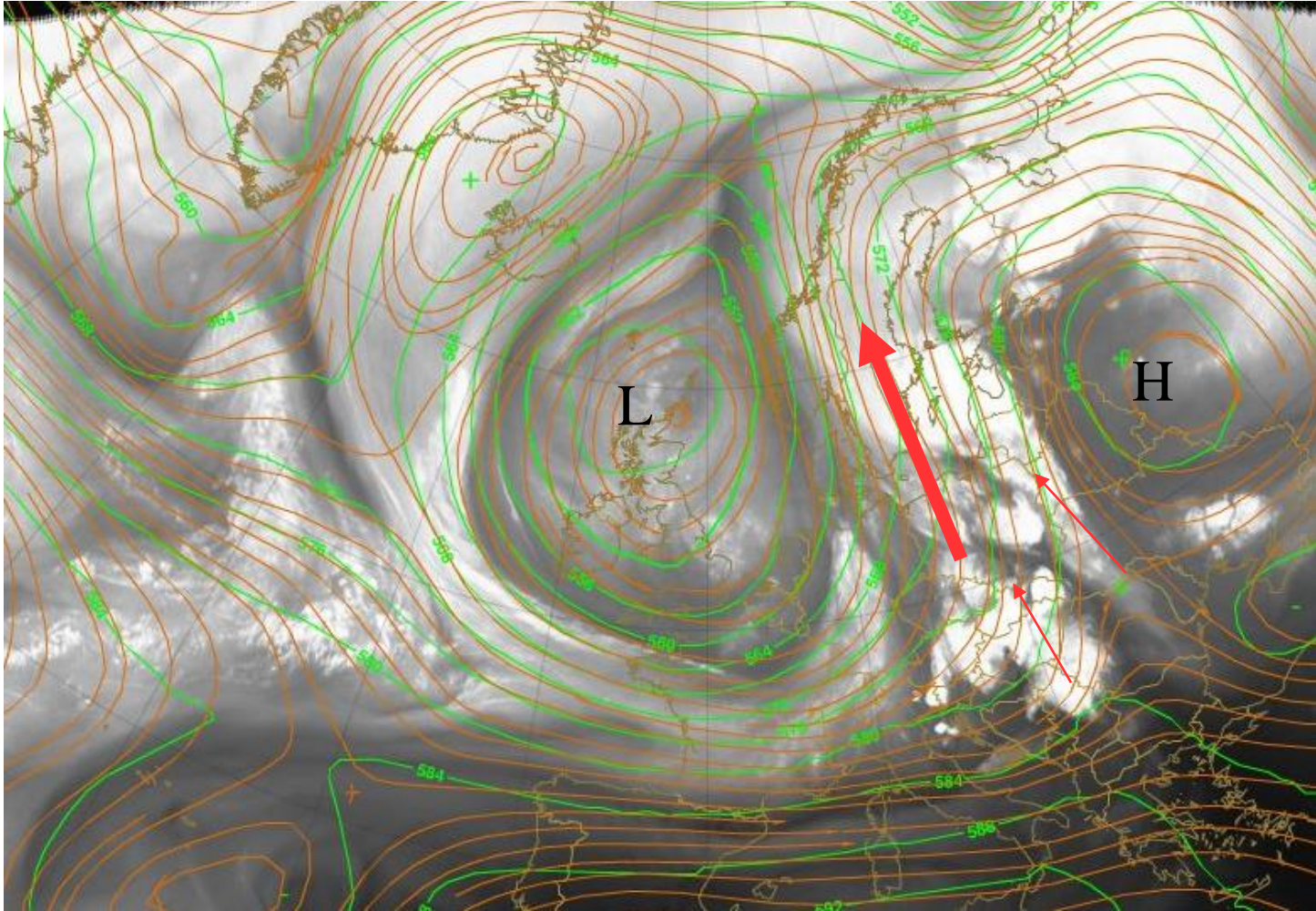
- Piotr Mańczak (Poland)
- Anita Avotniece (Latvia)
- Helve Meitern (Estonia)
- Jenni Rauhala (Finland)
- Teresė Kaunienė (Lithuania)
- Kornel Kollath (Hungary)
- Phil Chadwick (Canada)



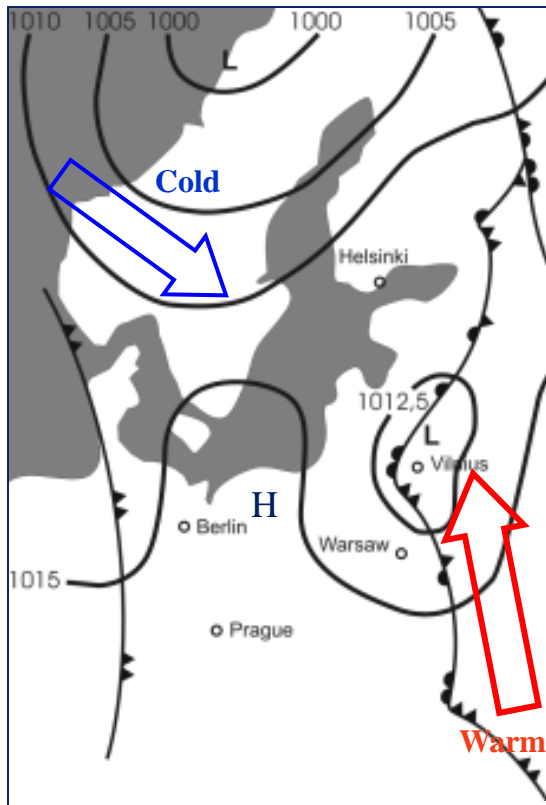
# Which place??



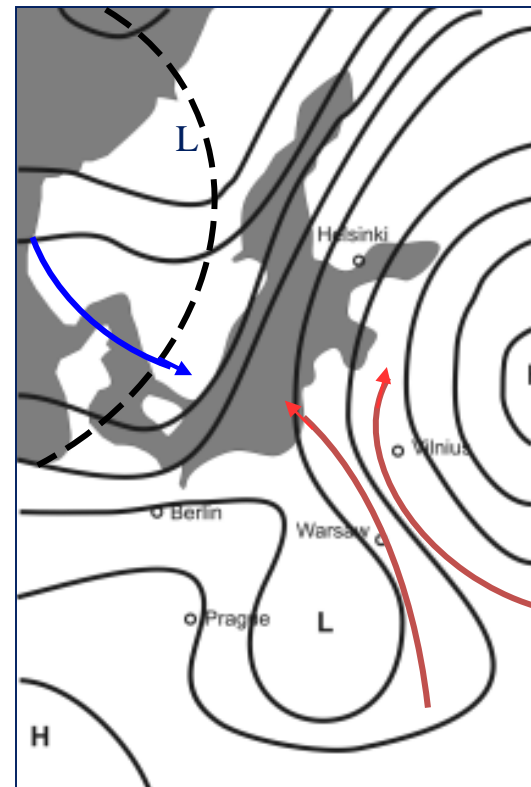
# WCB



# Typical summer severe weather pattern in Lithuania

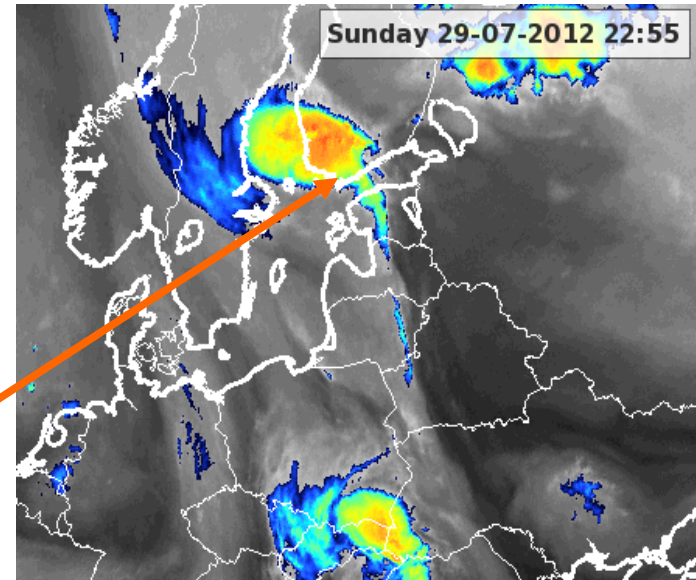
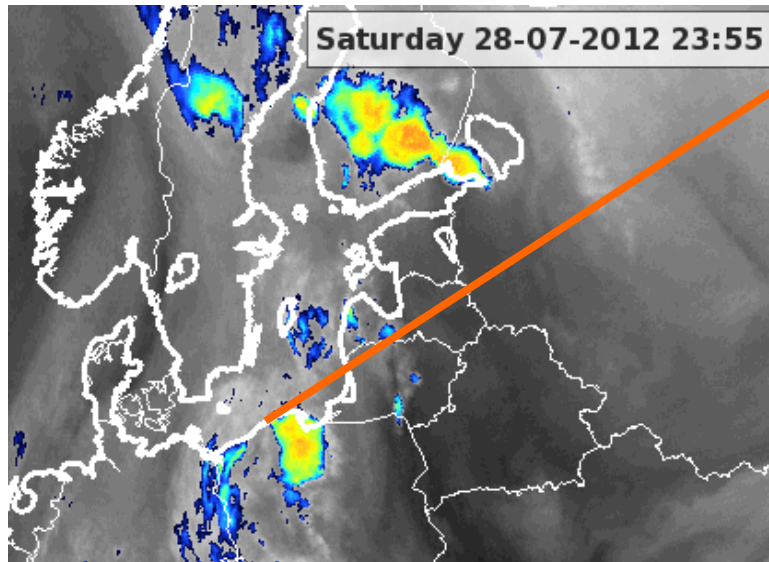


Synoptic situation and TA 850 hPa

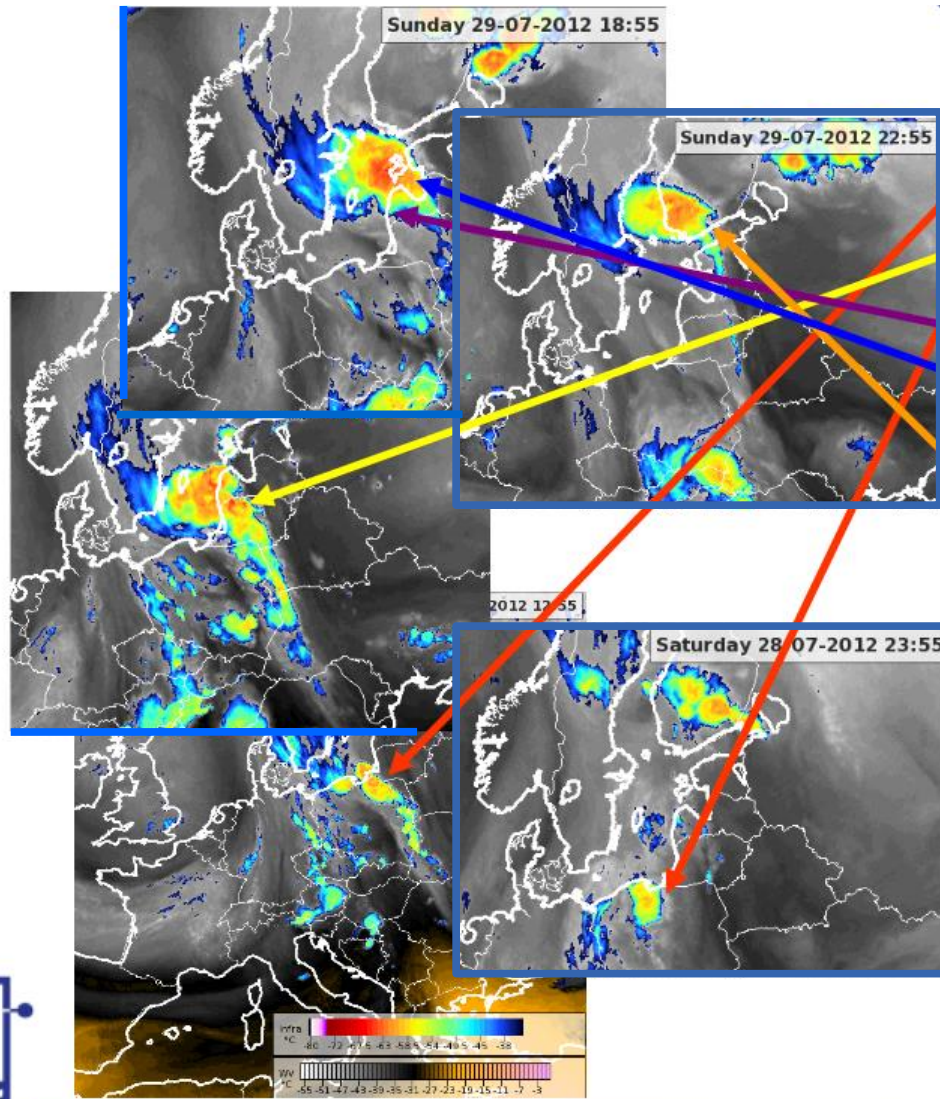


Air flow at 500 hPa

# WV 6,2 and Enhanced IR 10.8: from Poland towards Finland



# The developement



- **Poland:** Severe Storms on 28-29<sup>th</sup>: thunderstorms, squalls, hail, heavy rain;
- **Lithuania:** on 29<sup>th</sup> Catastrophic weather case : on seashore - squall 36 m/s; Severe Storm in the western part: thunderstorms, heavy rain, hail, squalls; Heat Wave - up to 35,5 °C;
- **Latvia:** on 29<sup>th</sup> squalls up to 24 m/s; Heat Wave 30-33 °C; big damage, 2 deaths;
- **Estonia:** on 29<sup>th</sup> Severe Storm: thunderstorms, tornado, squalls up to 32 m/s; Heat Wave - up to 33 °C;
- **Finland:** on 29<sup>th</sup> at night downburst of F1 intensity in Loppi in southwestern Finland-damaged area 100\*300 m; storm overturned a caravan; fallen trees and electricity cuts in southern and central Finland;
- Rescue services received emergency reports:
  - 29 July: 578
  - 30 July: 645

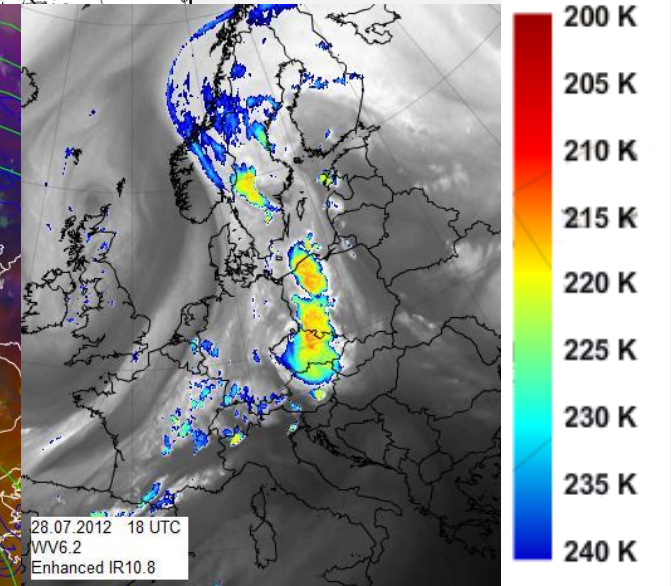
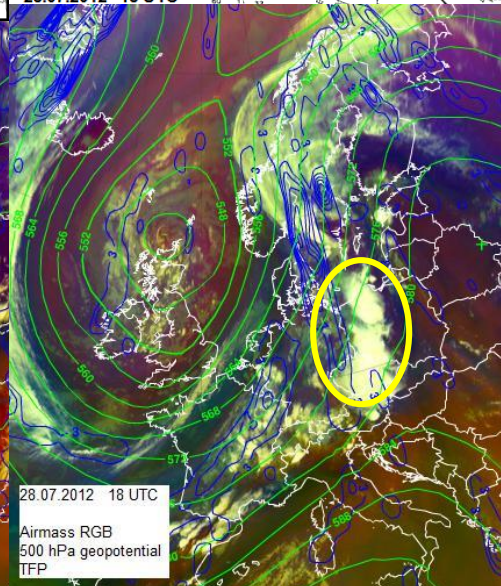
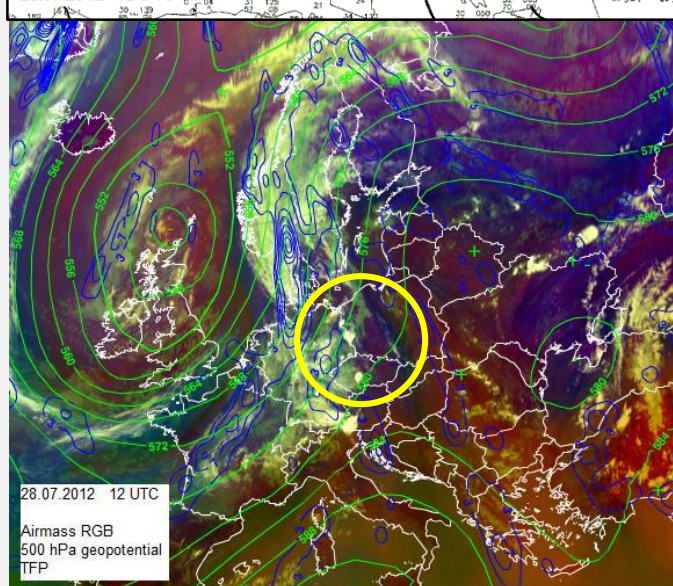
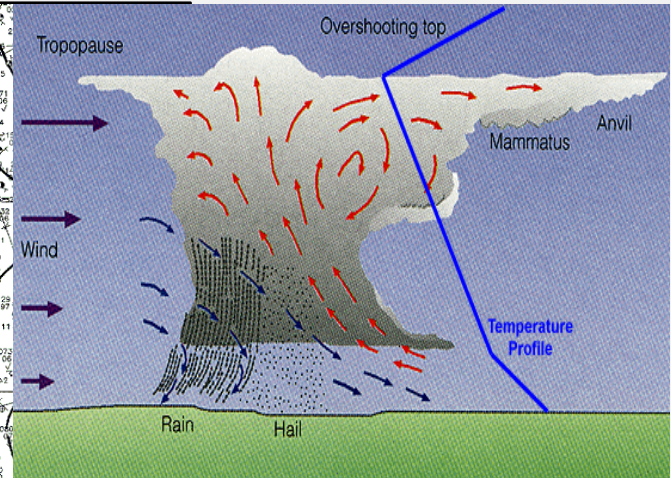
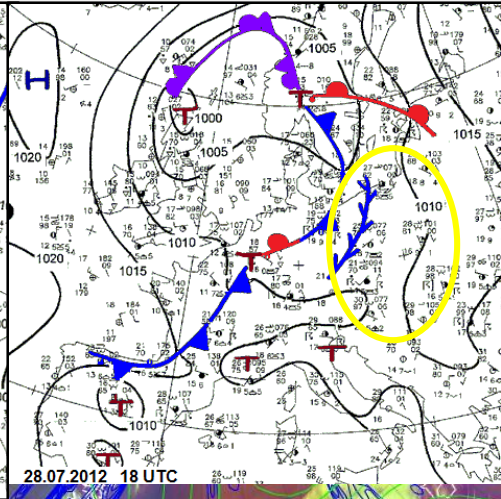
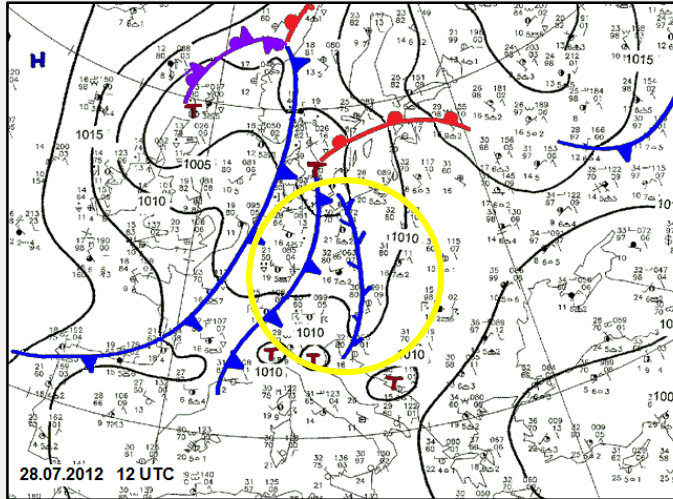




Start in Poland

# POLAND ON 28 JULY - Severe Storm

Synoptic situation, Airmass RGB, Enhanced IR10.8,  
500 hPa geopotential, Thermal Frontal Parameter



# DAMAGE (squalls, heavy rain, hail)

▼ tornado    ■ severe wind    ▲ large hail    ● heavy rain

▽ funnel cloud    ▽ gustnado    ▾ dust devil

☼ heavy snowfall/snowstorm    ❄ ice accumulation    🏠 avalanche    ⚡ damaging lightning

Kochłowy 25 m/s  
(road weather station)

2012-09-30 14:25:55



European Severe  
Weather Database  
www.eswd.eu.  
(c) ESSL

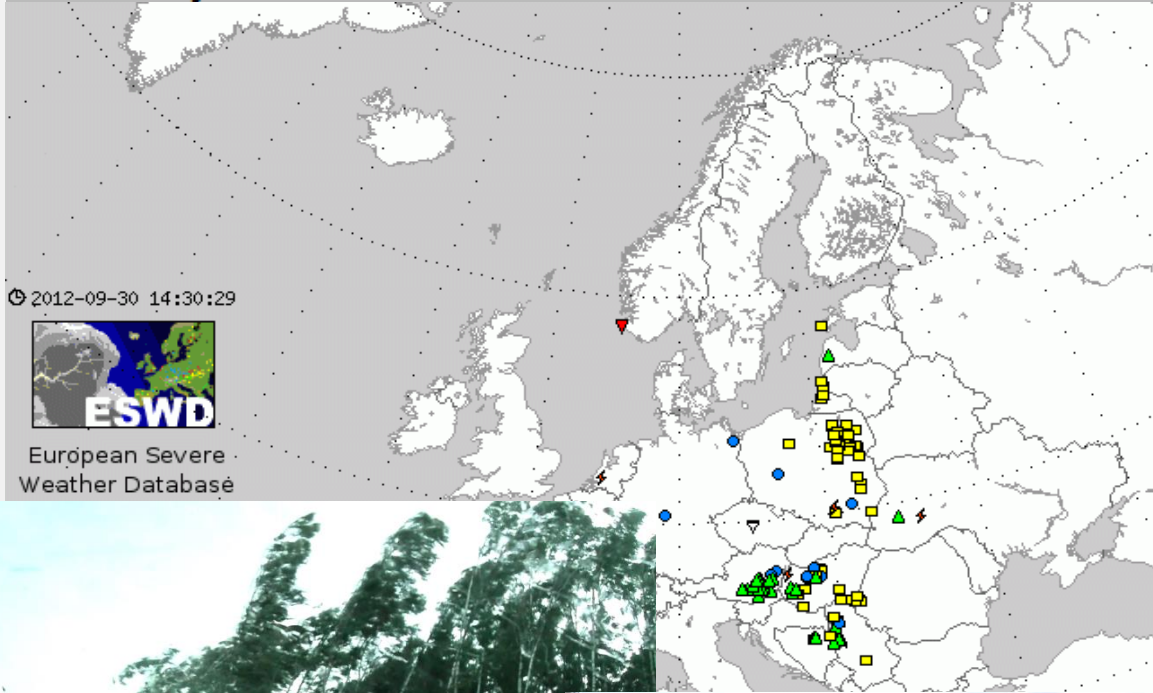


# DAMAGE (squalls, heavy rain) a day later

▼ tornado    ■ severe wind    ▲ large hail    ● heavy rain

▽ funnel cloud    ▽ gustnado    ▾ dust devil

❄ heavy snowfall/snowstorm    ❄ ice accumulation    🏠 avalanche    ⚡ damaging lightning

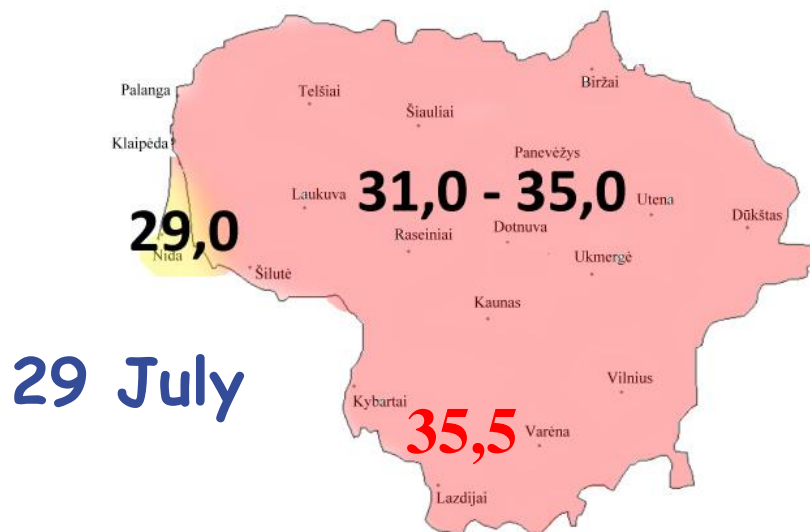
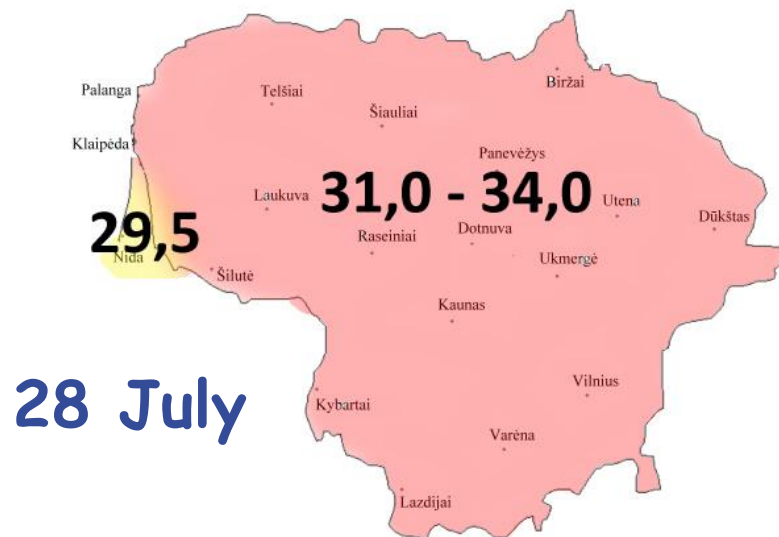
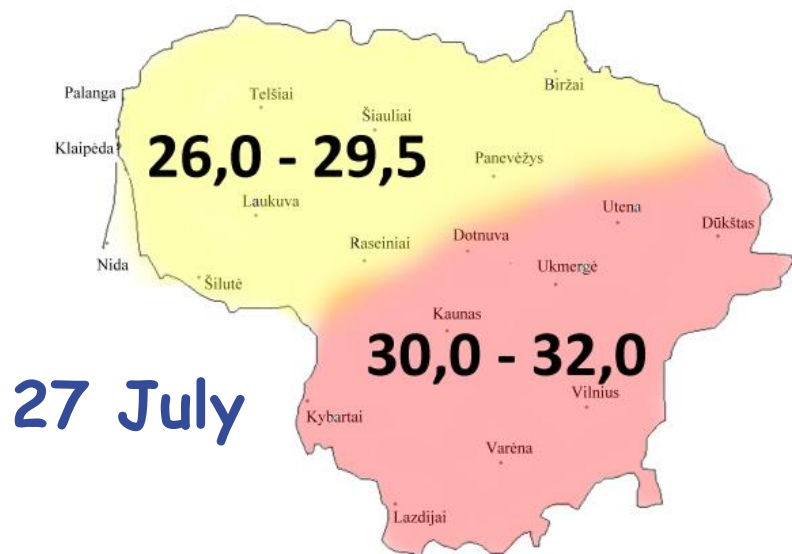


2012-09-30 14:30:29  
**ESWD**  
European Severe  
Weather Database



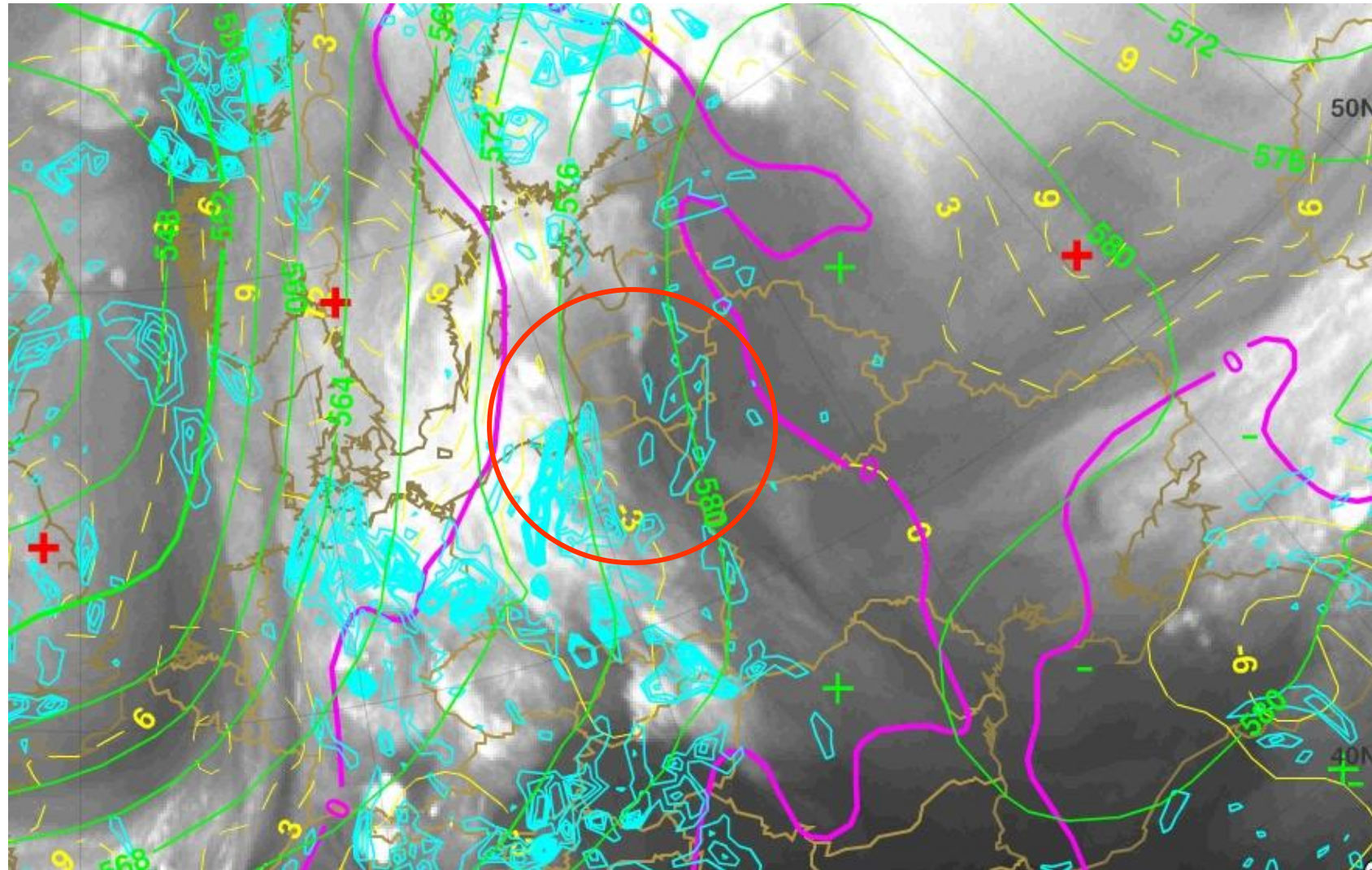
Hit at the Baltic States

# The heat in Lithuania on 27-29 of July (°C)



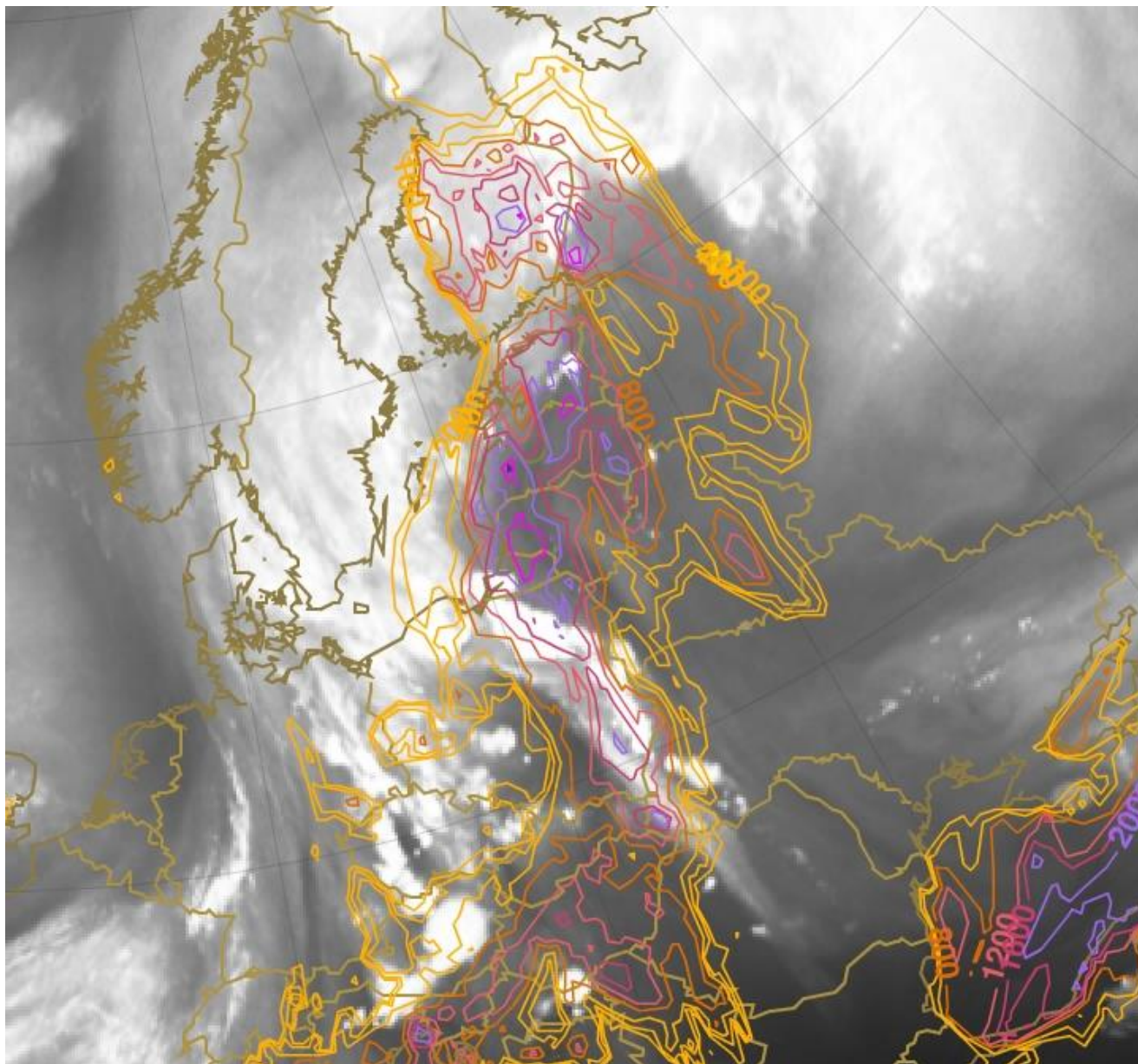
# WV6.2, H500, Omega700 and Showalter Index

29 July  
06 UTC



# WV6.2 and CAPE

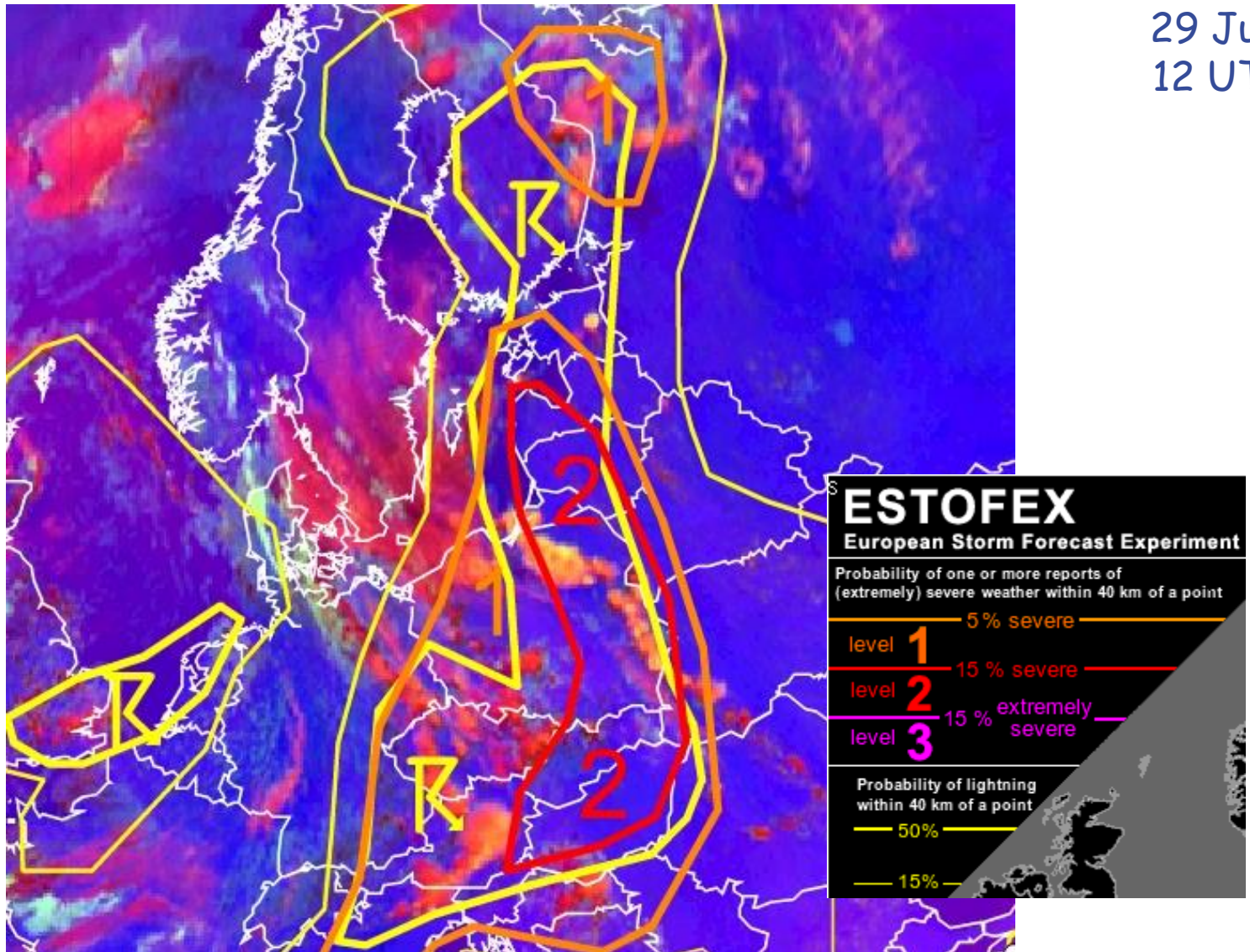
29 July  
12 UTC





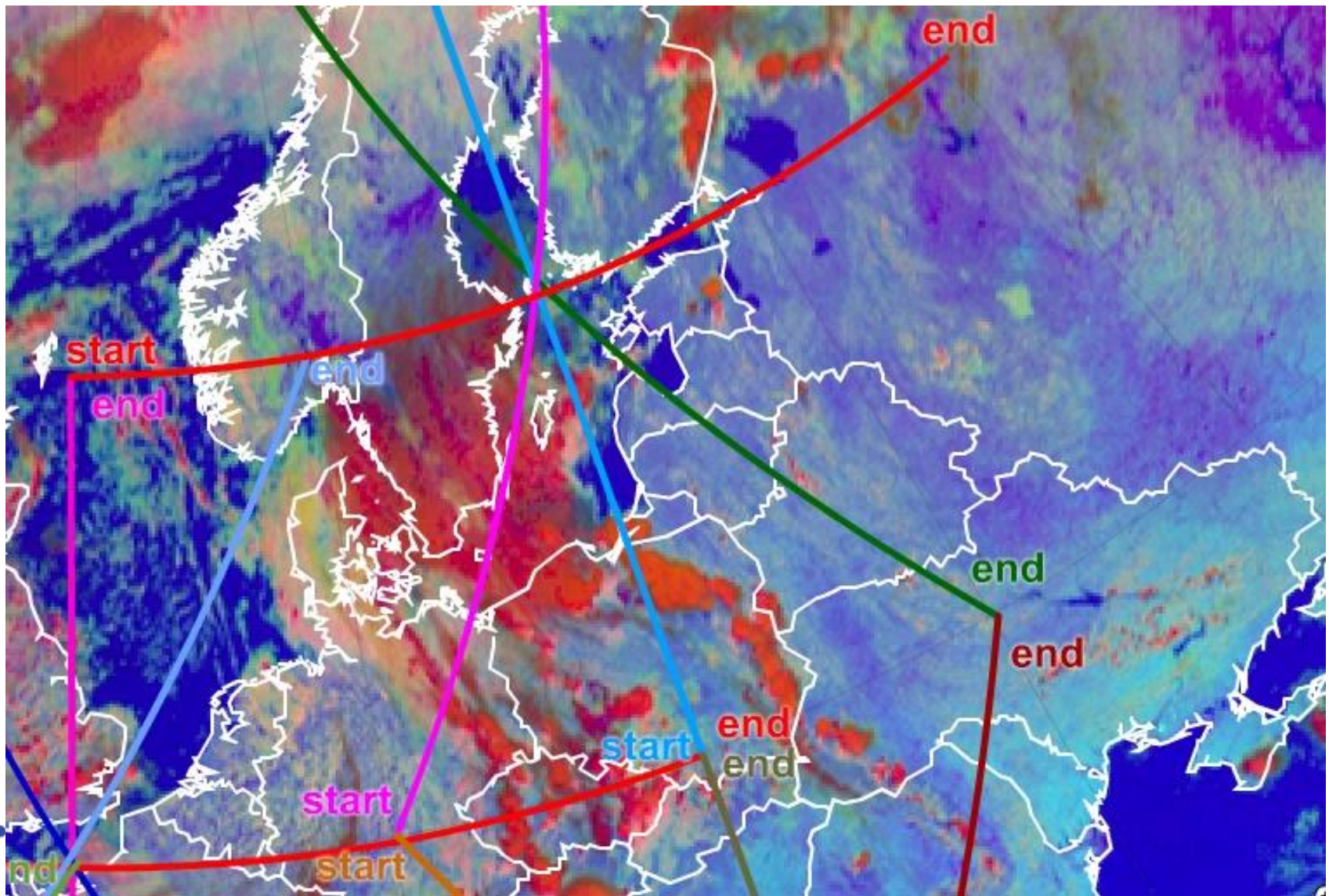
# Severe storm RGB and ESTOFEX forecast

29 July  
12 UTC



# Day Microphys RGB and VCS line (blue)

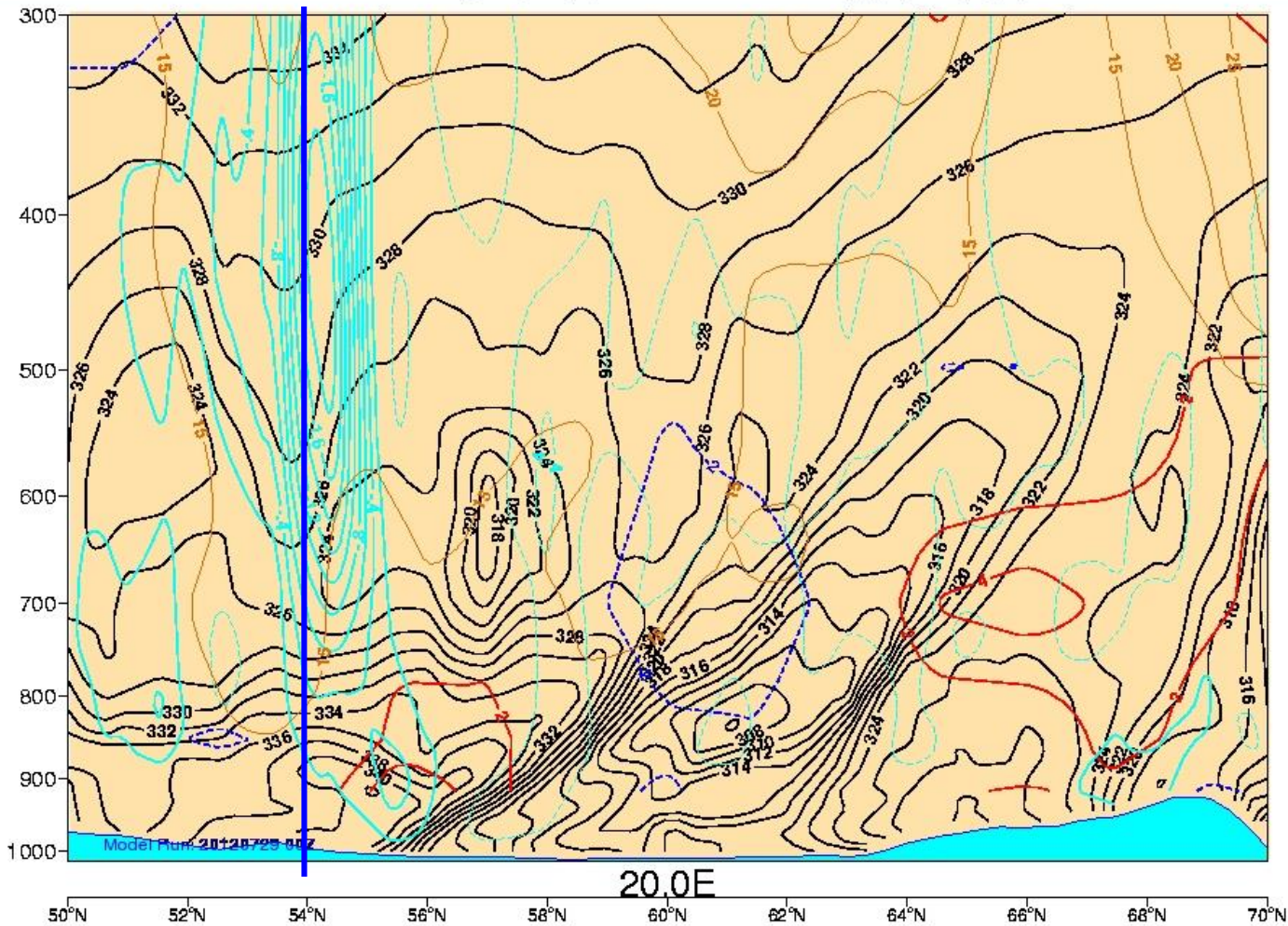
29 July  
12 UTC



# Vertical distribution of atmospheric physical parameters

Vertical Cross Section: 50N20E - 70N20E

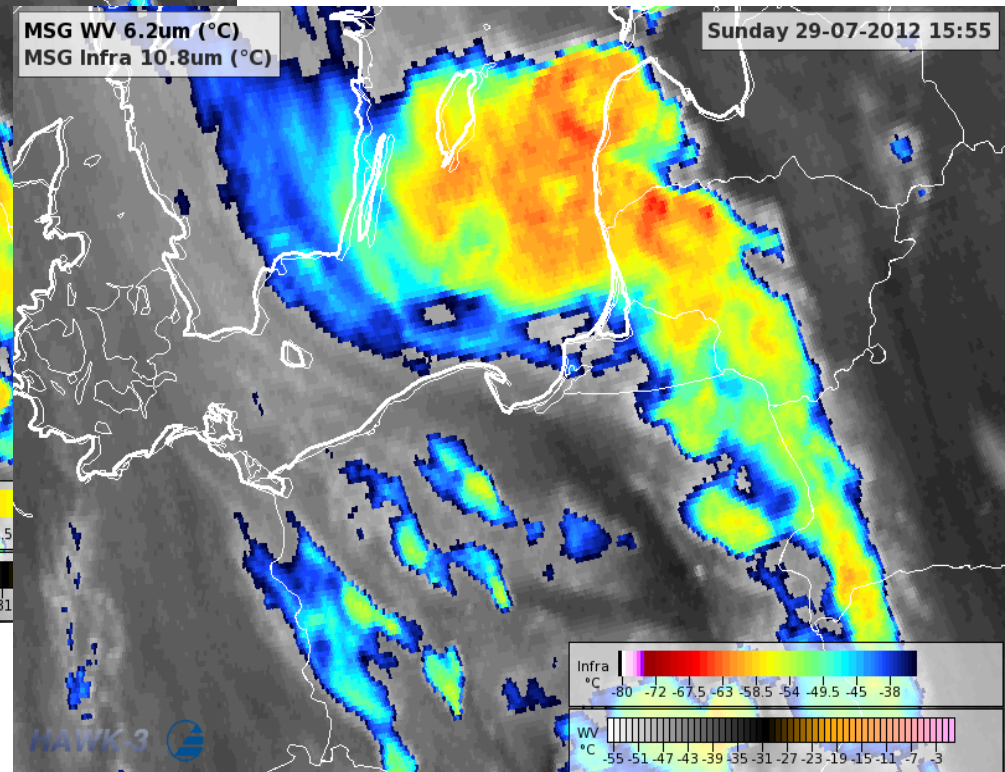
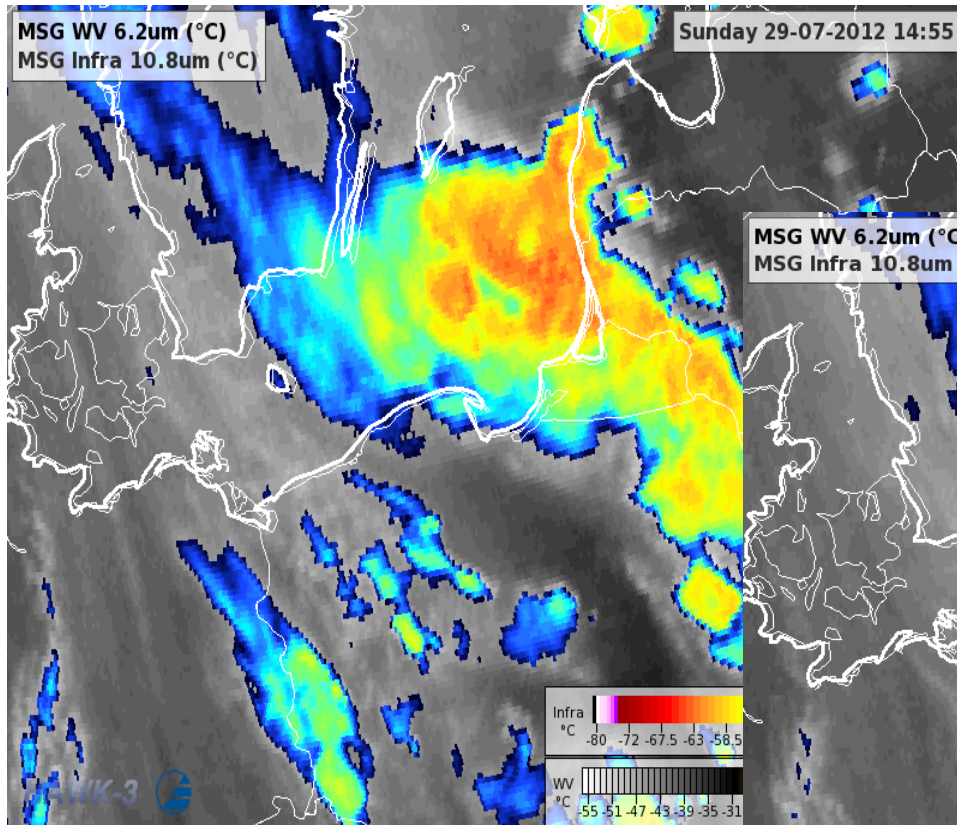
Temperature Advection    Relative Humidity    Vorticity Advection    Potential Vorticity    Convergence/Divergence    Omega    Wind    Cloud Cover



29 July  
12 UTC

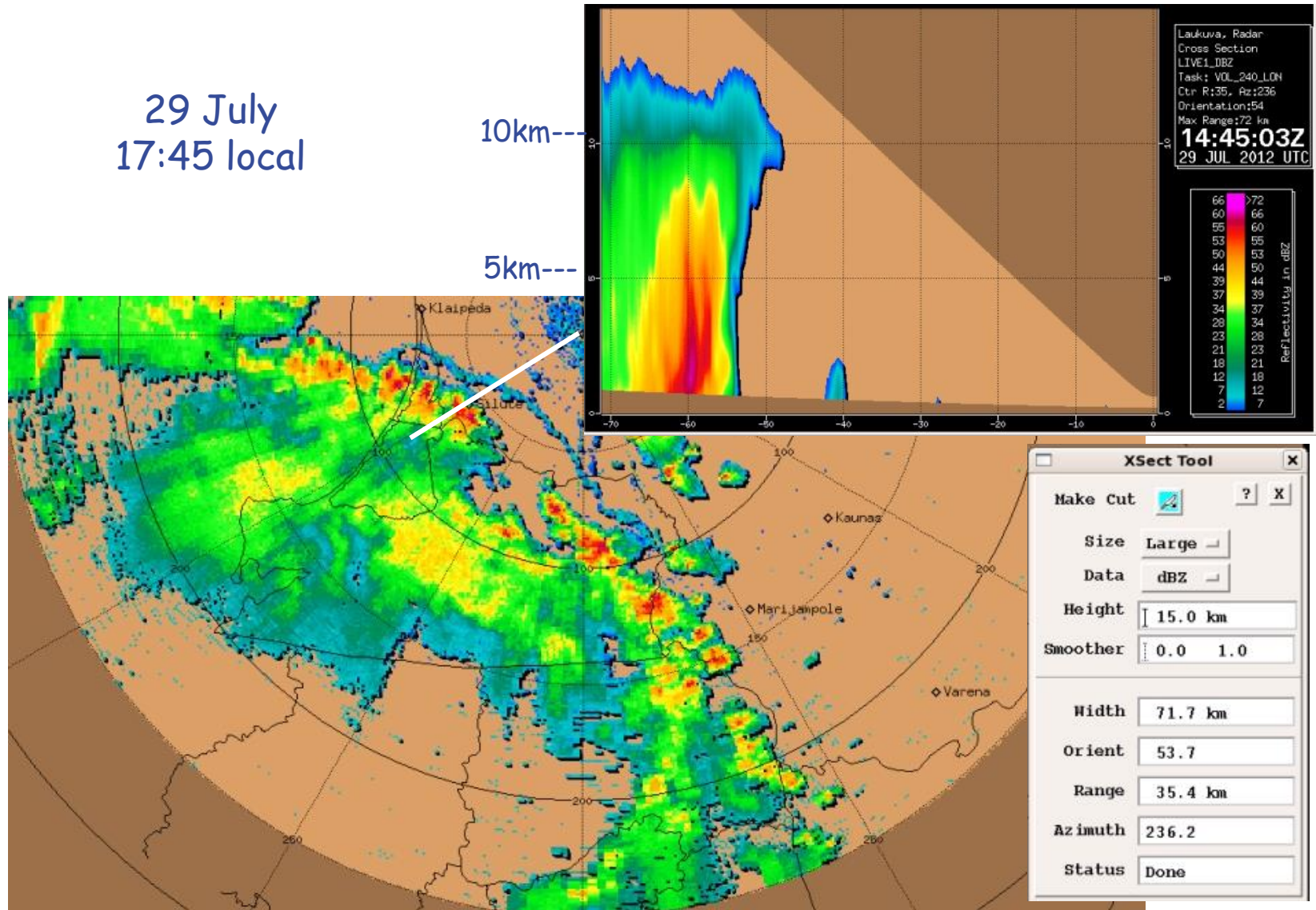


# WV and Enhanced IR10.8



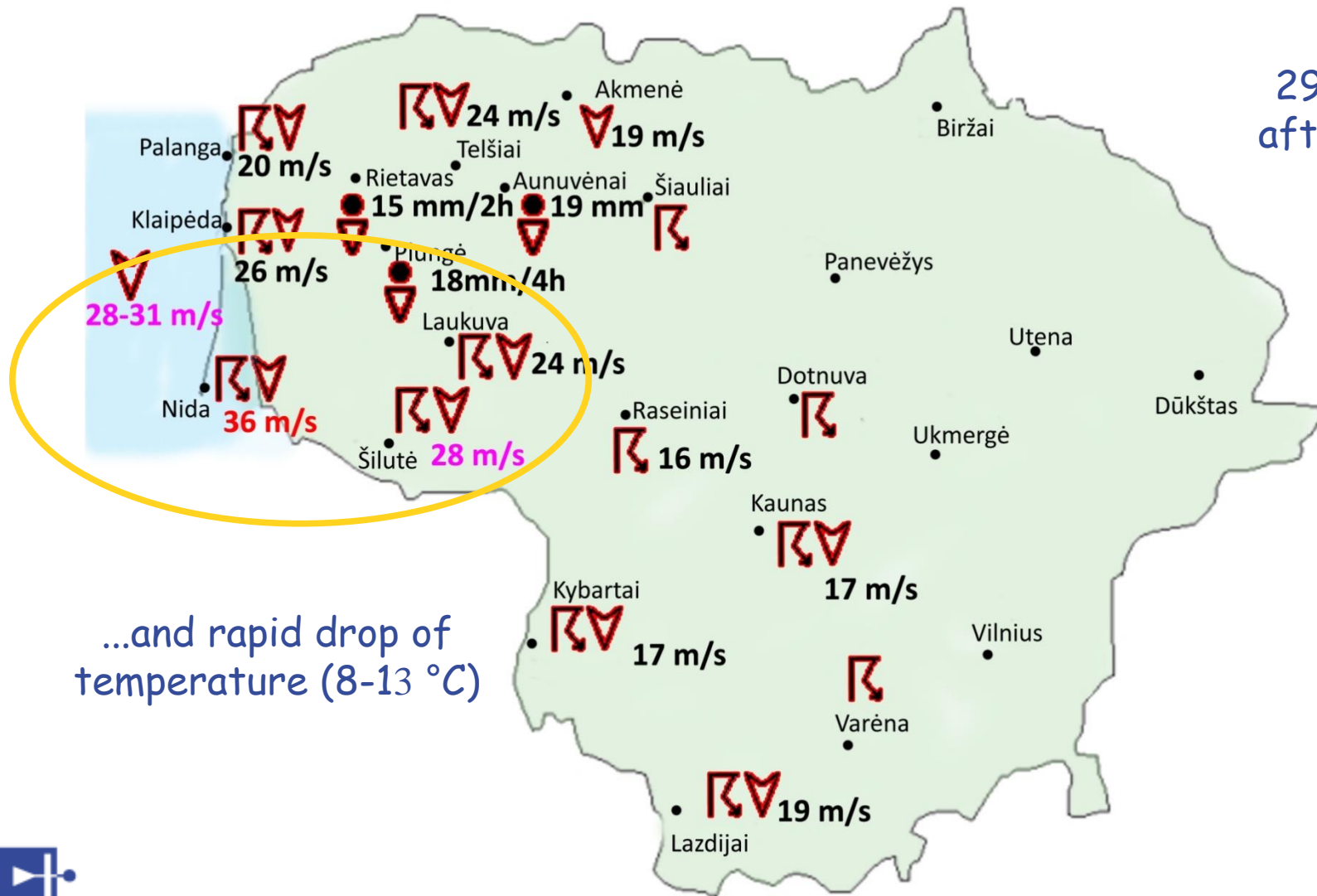
# Gust front in radar image (dBZ) and MCS cross section

29 July  
17:45 local



# Severe weather events in western Lithuania

29 July,  
afternoon



...and rapid drop of  
temperature (8-13 °C)



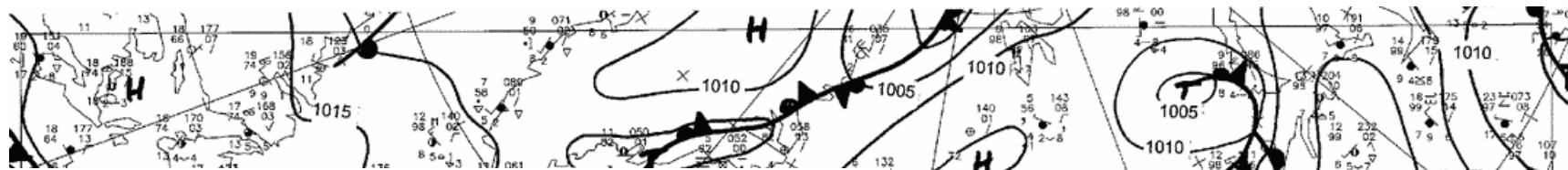
# Damage on 29 July

- 4 people injured in Nida resort (the Baltic coast)
- Uprooted and broken trees, damaged cars
- Devastated roofs, greenhouses, summerhouses
- Disrupted vehicle traffic and electricity supply

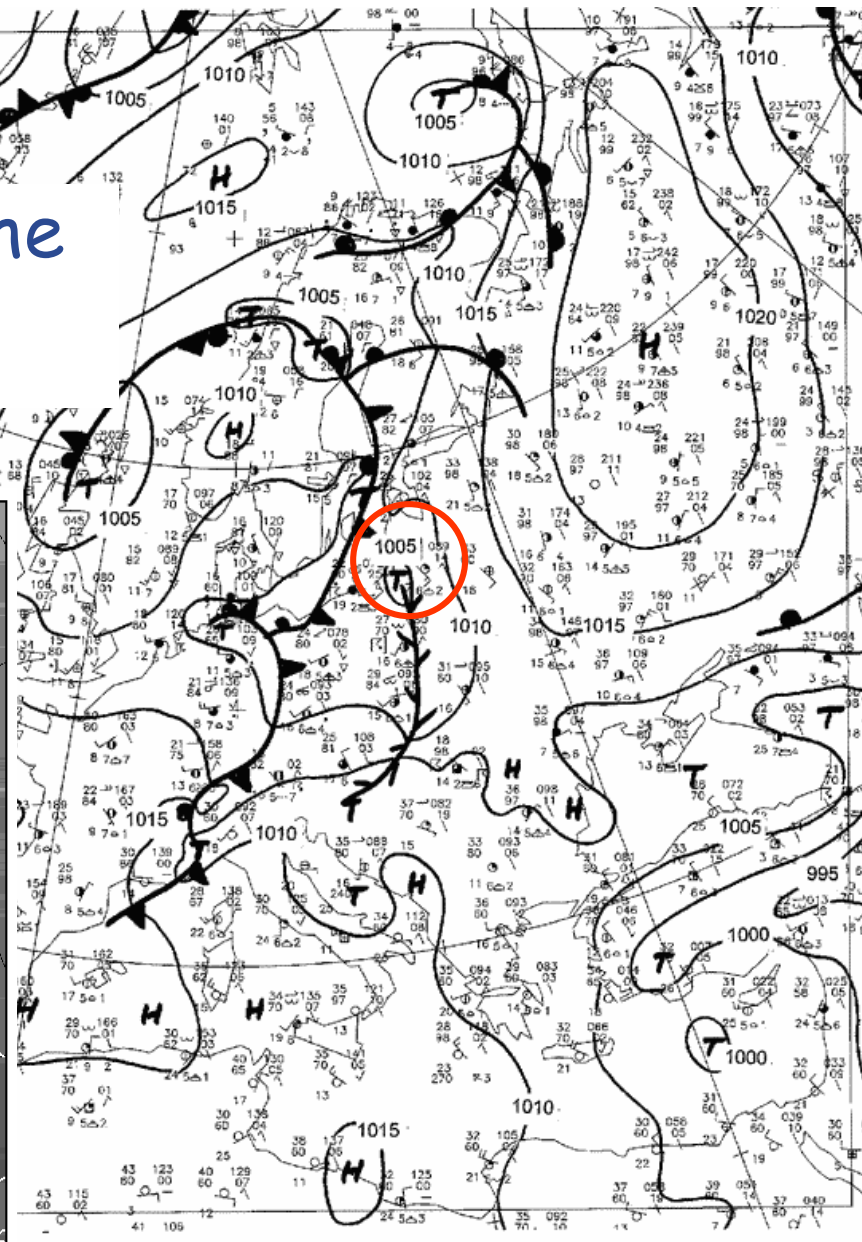
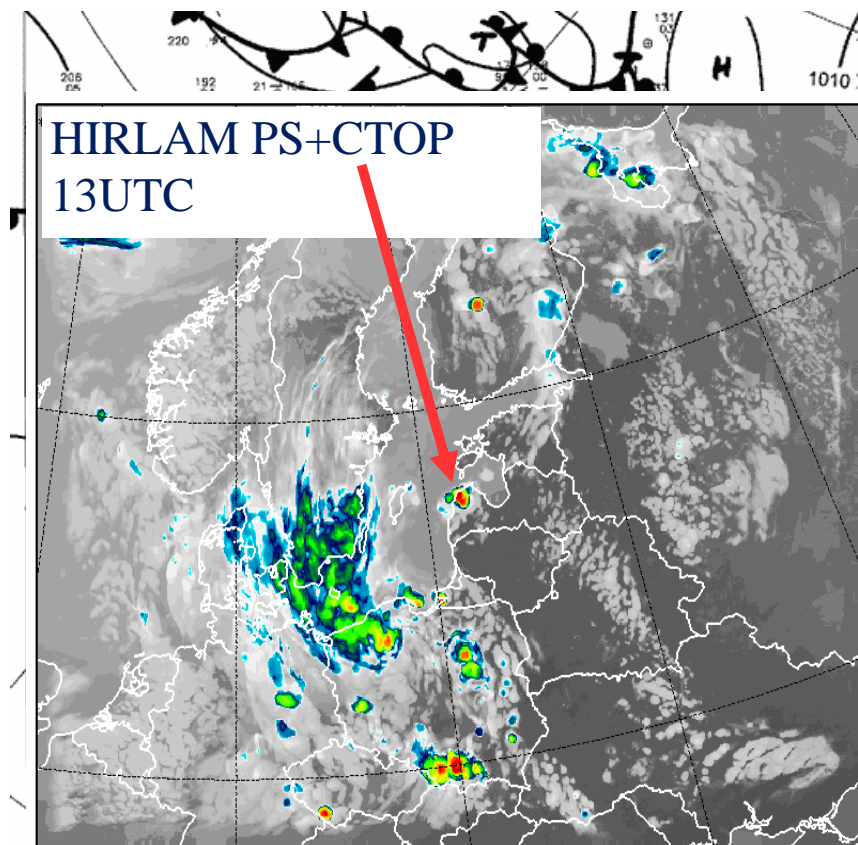


# Situation in Latvia



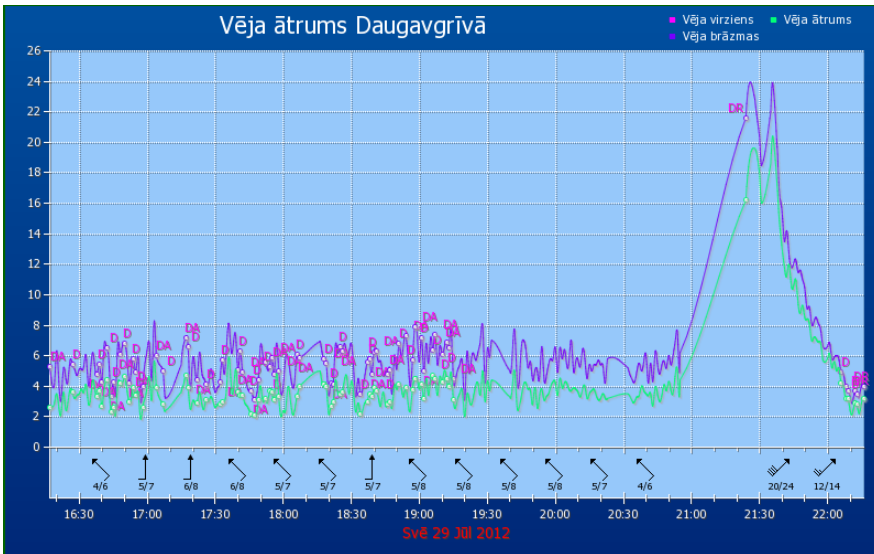


# High temperature and the first thunderstorm



# Riga

- At 18:00 UTC air temperature 30,9°C
- Thunderstorm started at 18:32
- In the city center squalls up to 19 m/s,
- At the seaport up to 23 m/s.

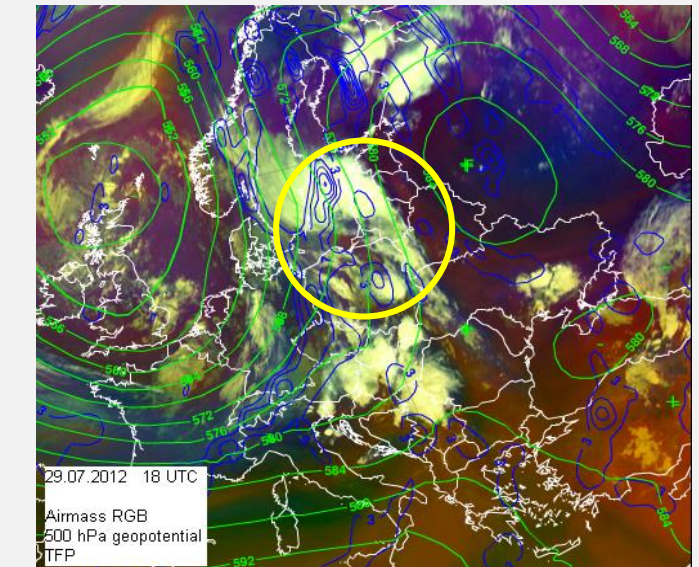
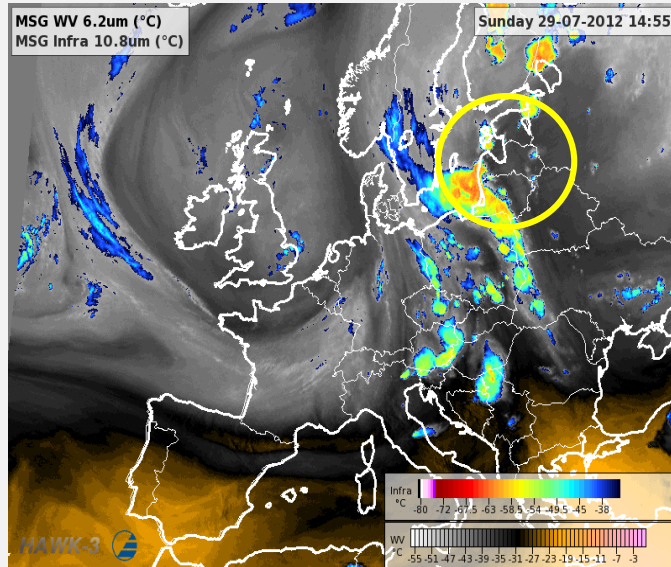
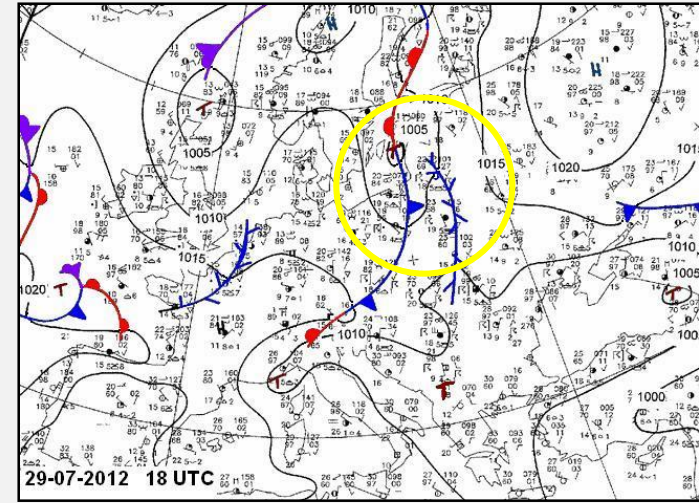
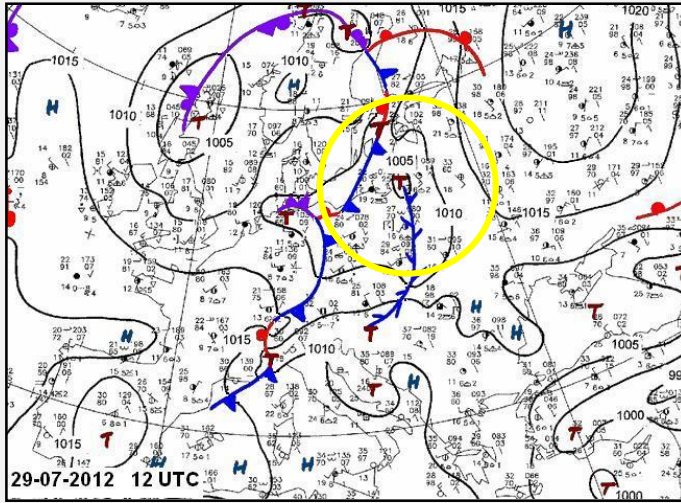




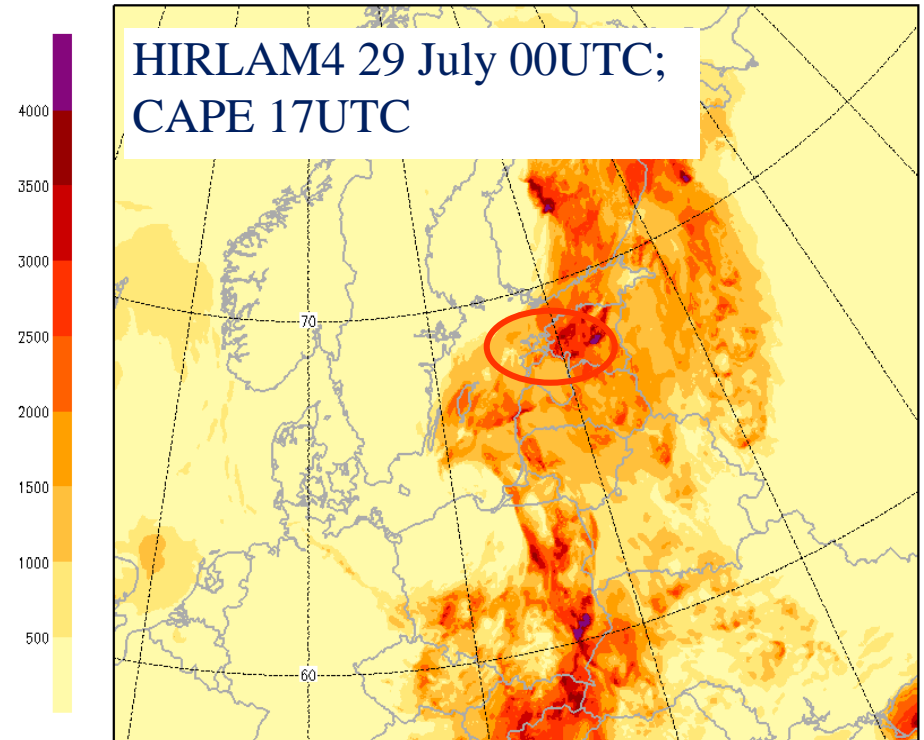
The 29<sup>th</sup> of July in Estonia

# SEVERE STORM IN ESTONIA ON 29 JULY

Synoptic situation, 500 hPa geopotential, Thermal Front Parameter, Enhanced IR10.8, Airmass RGB,



# Convective regions



# At night of 29<sup>th</sup> in Ambla (Estonia)



# Damage

- At 22 local time (19 UTC) the tornado moved over Kuressaare, broke the trees, destroyed lots of roofs and broke many cars



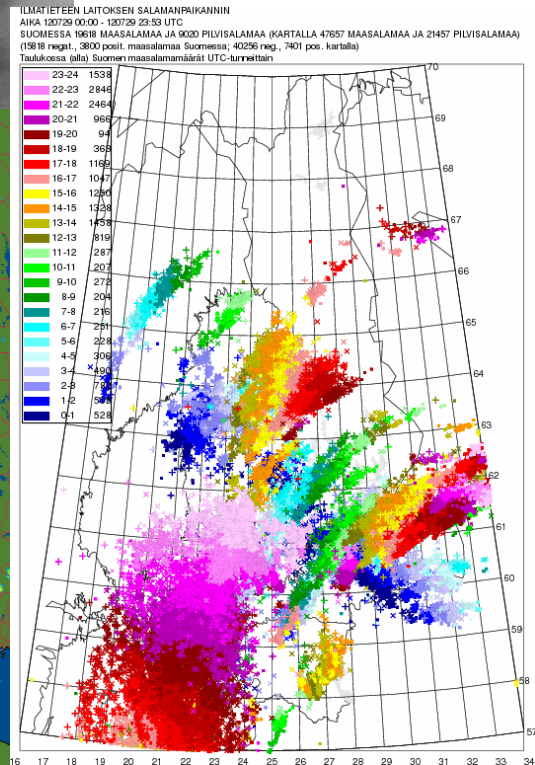
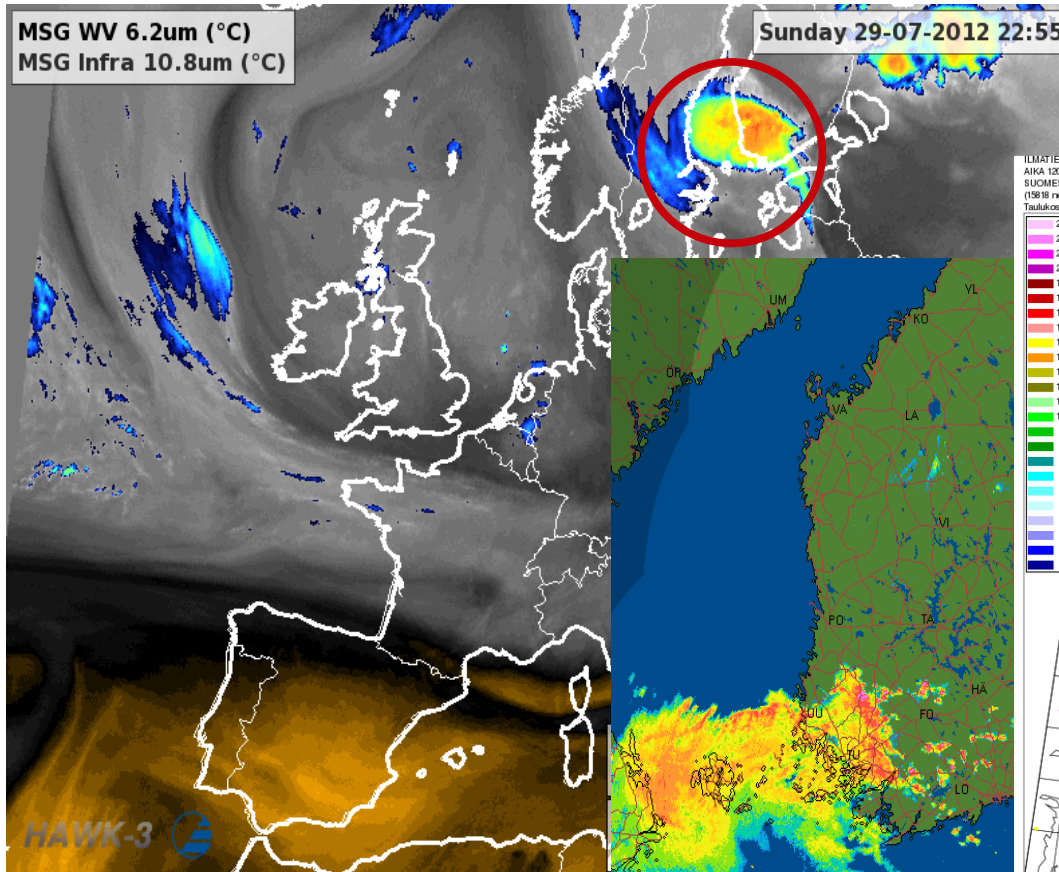
- The storm lasted about 20 minutes. Most damages were in Saaremaa and in Western Estonia.



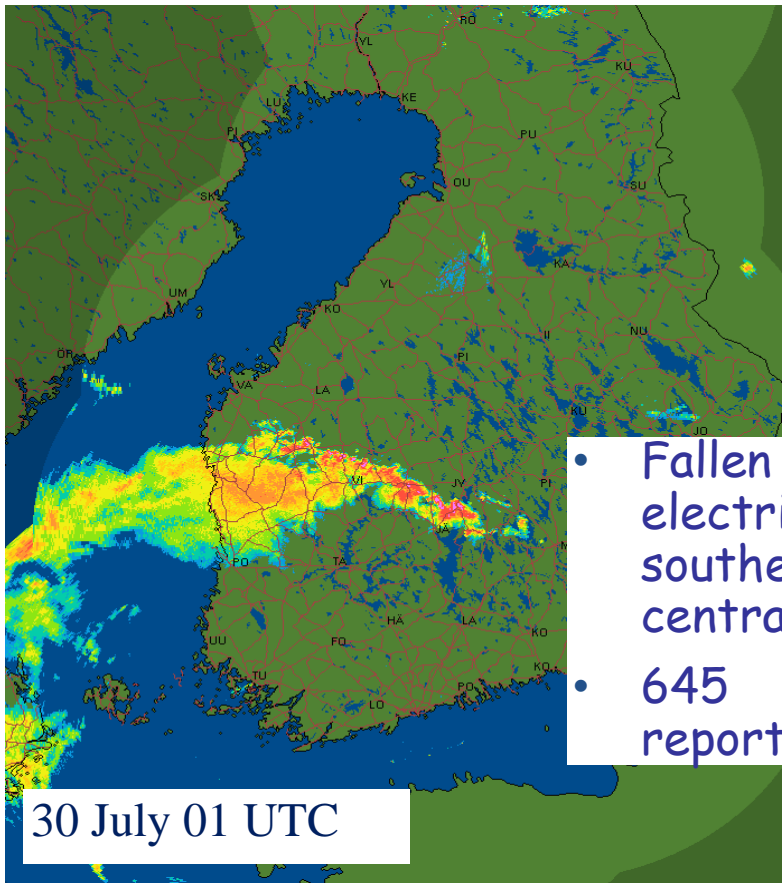
Stroke to the North

# On 29<sup>th</sup> of July

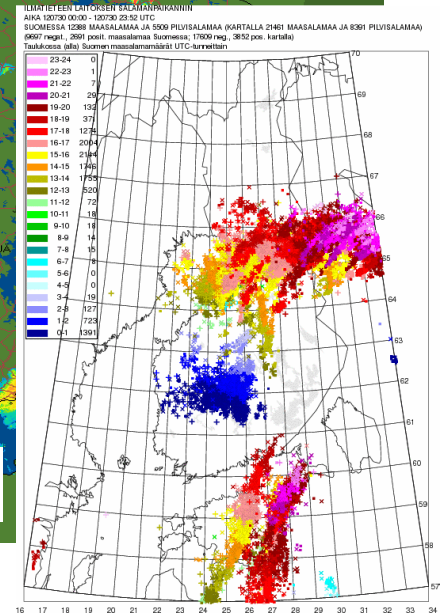
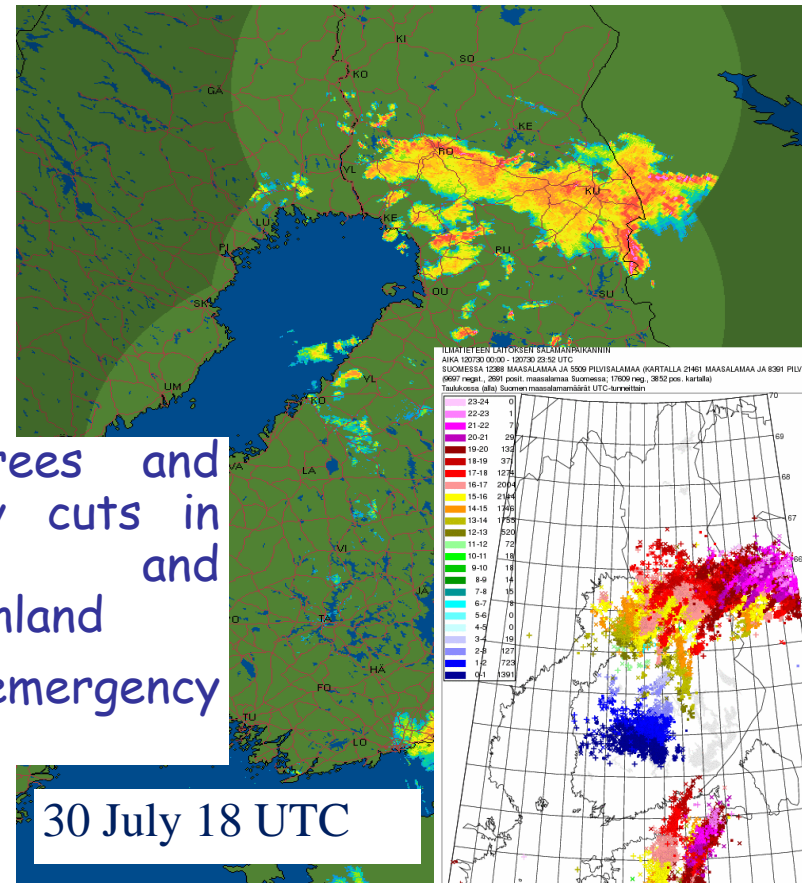
At night tornado of F1 intensity in Loppii at SW Finland; damaged area 100\*300 m;



# Further developement on 30 July



- Fallen trees and electricity cuts in southern and central Finland
- 645 emergency reports

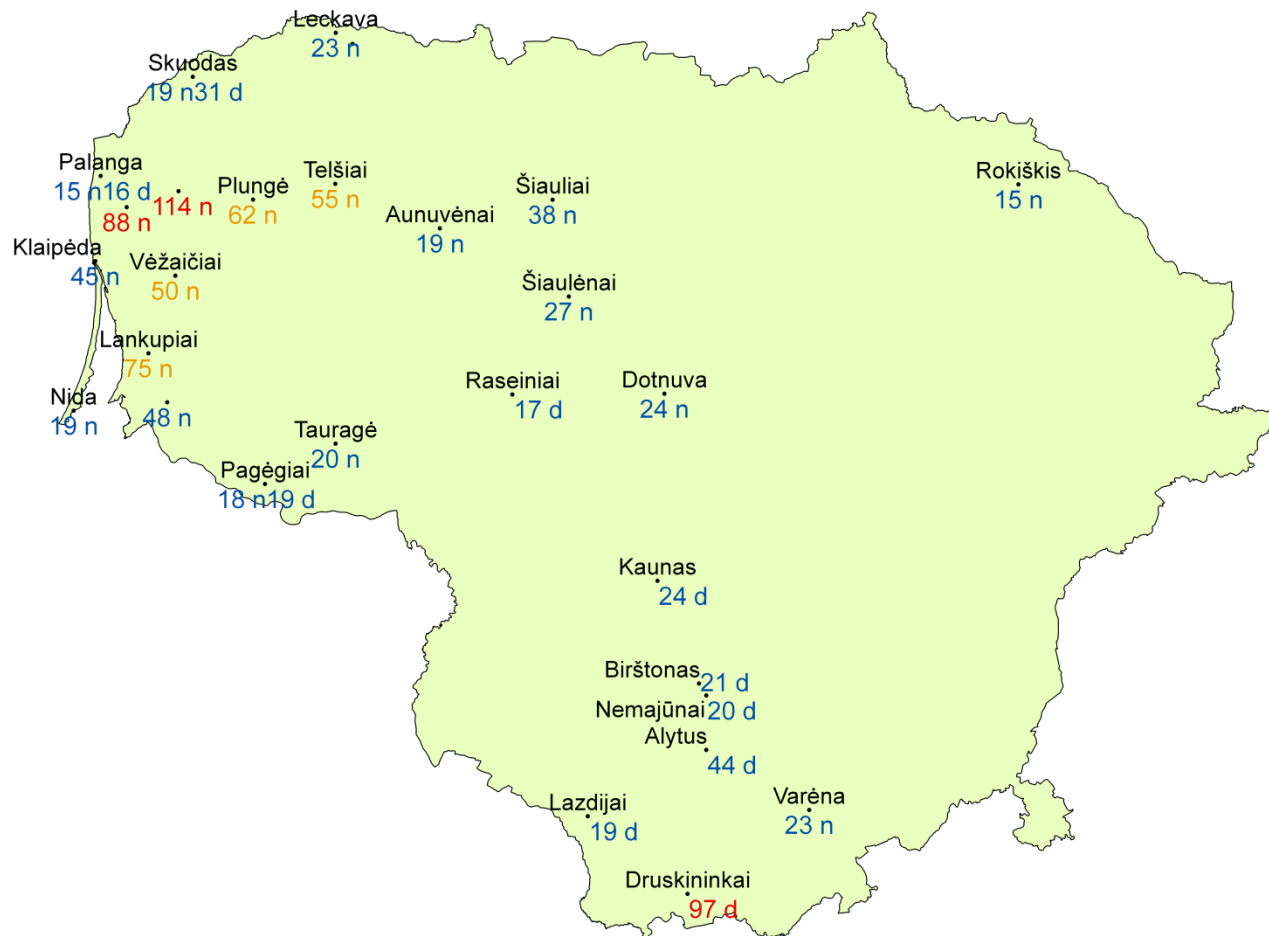


Satellite information:  
very heavy rain in Lithuania  
on 30 July, 2013

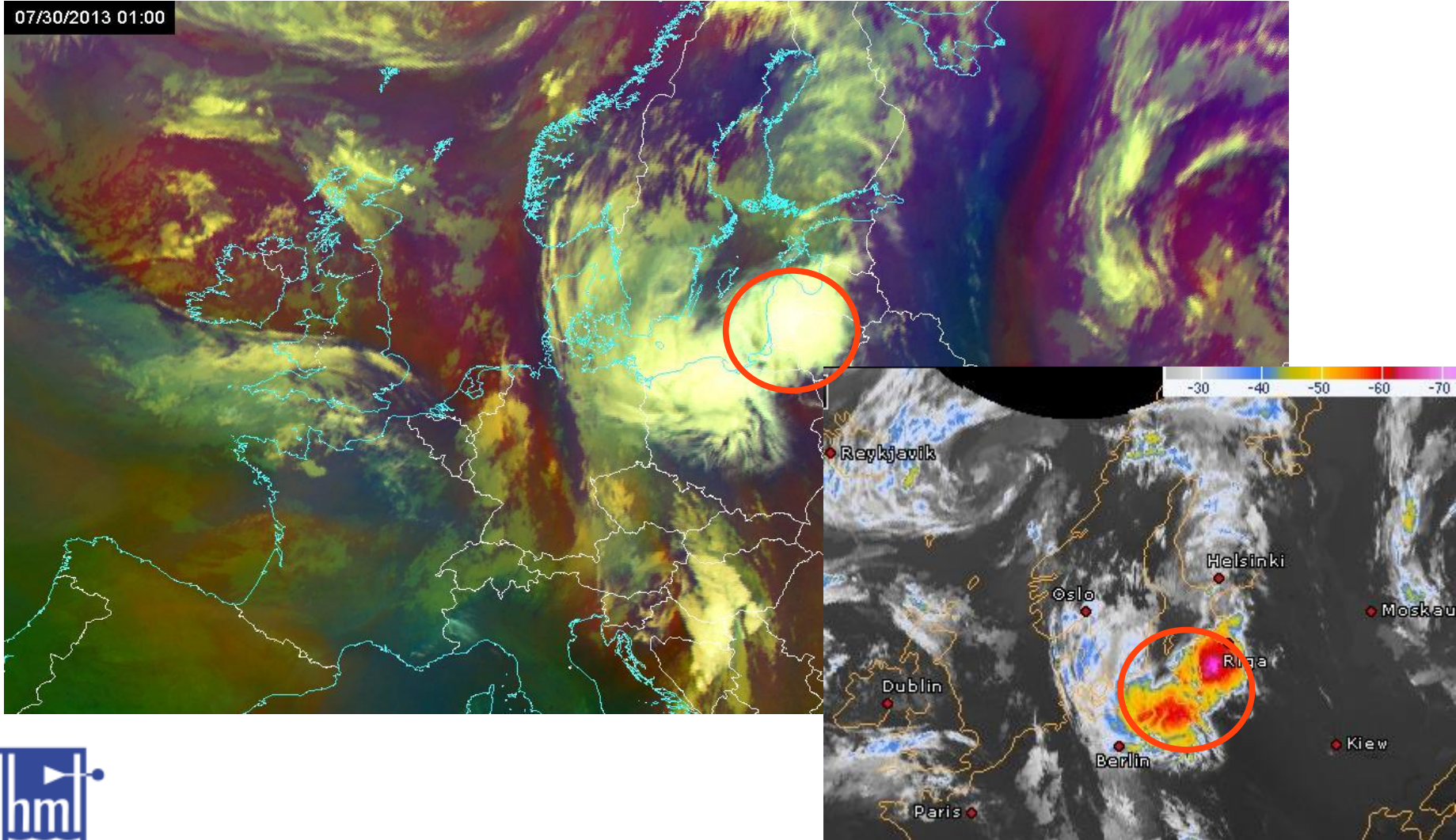


# Rainy night (n) and day (d)

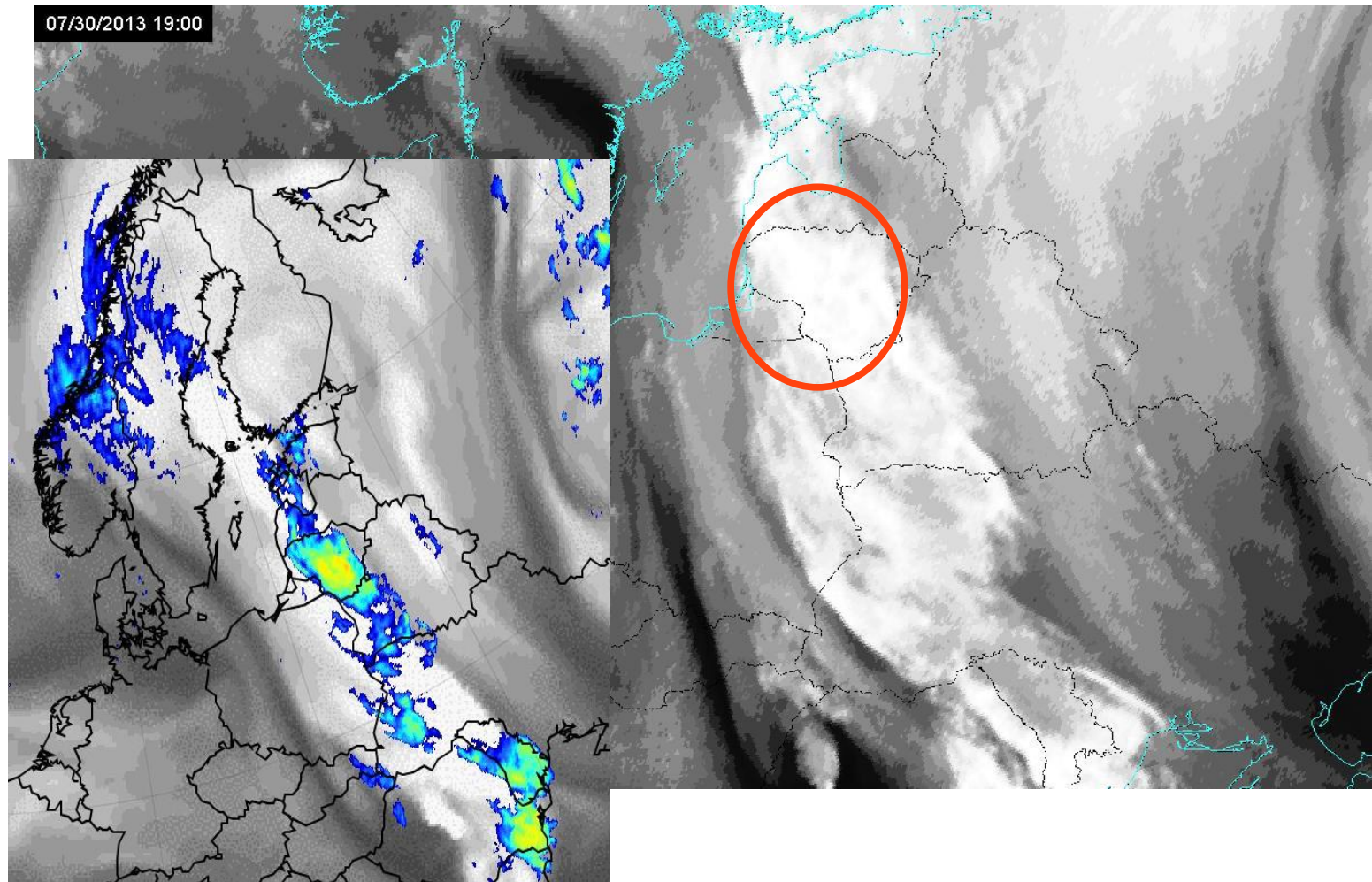
The  
Baltic  
sea



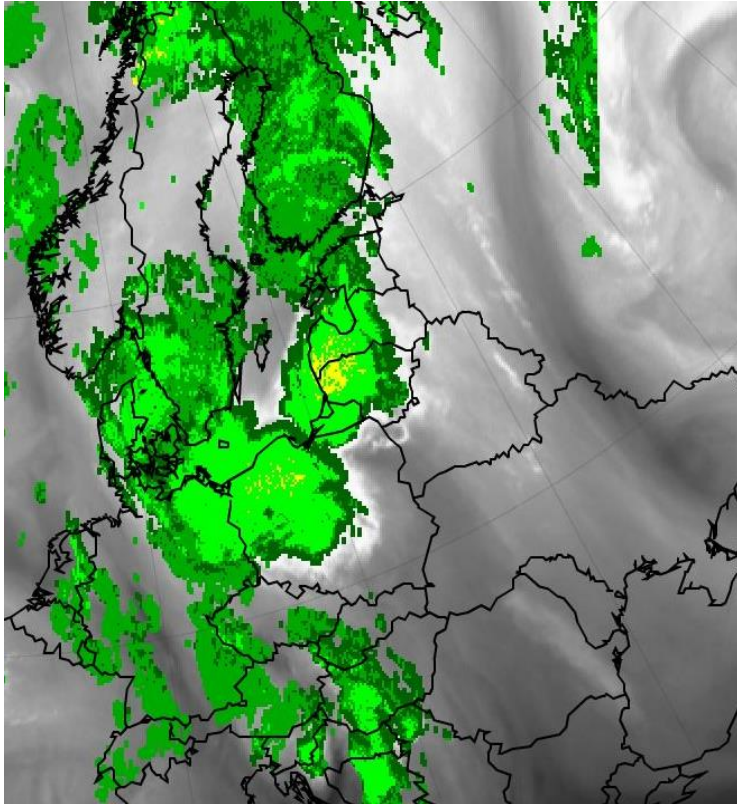
# Use what you have ...



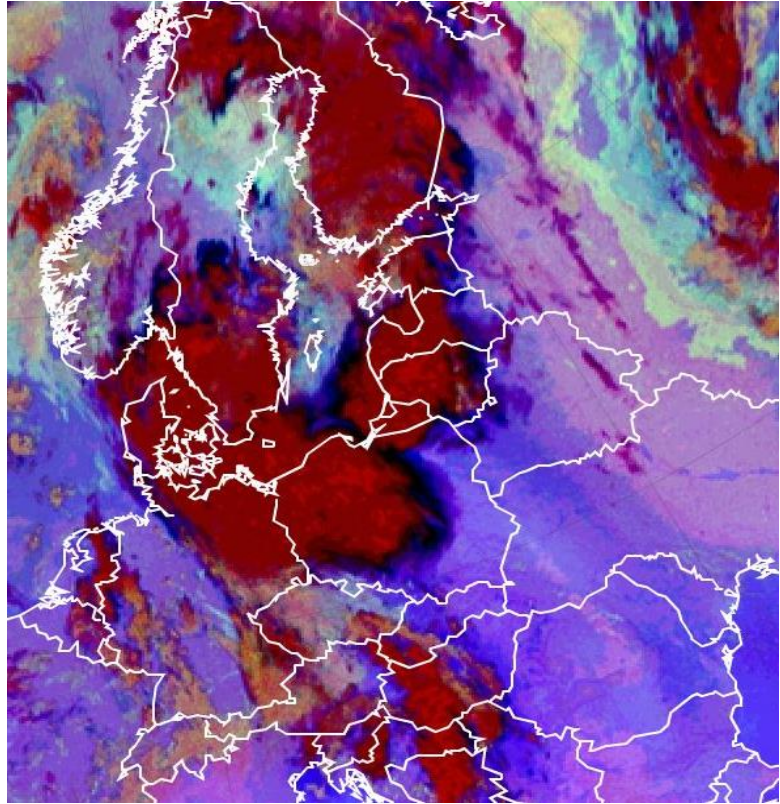
# Comparison WV (pseudo and fact)



# Intensive convection at night and day



SAF Precipitating Clouds at night

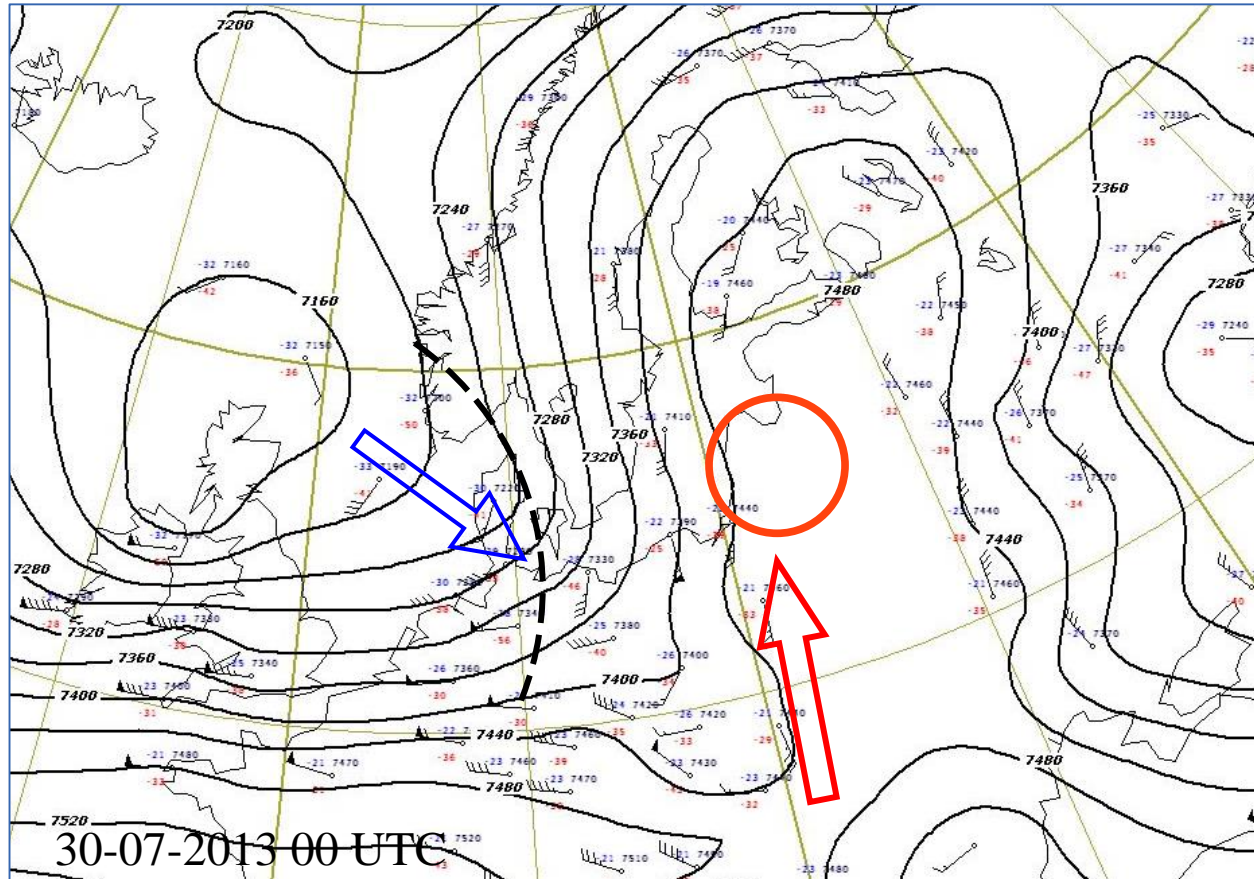


Day Microphysics RGB





# Typical situation on 500 hPa



# Problems we met...

- Data (sounding, satellite, radar)
- Models (HIRLAM, ECWMF, DWD, pseudo satellite info...)
- METOP information
- Decision making (forecast and warnings)



# Recommendations

- Firstly, wide glance at satellite images - find important convective features!
- Observant analysis of WV, Air Mass RGB, Enhanced IR
- Deep studies of Microphysics
- Compare models (pseudo satellite info, TFP ...) and fact
- Add radar, sounding, lightning, obs material
- Think and share your opinion and results with colleagues
- Make presentations - you loose if

**We can achieve better**

**results**

**working together!**



Thank you!