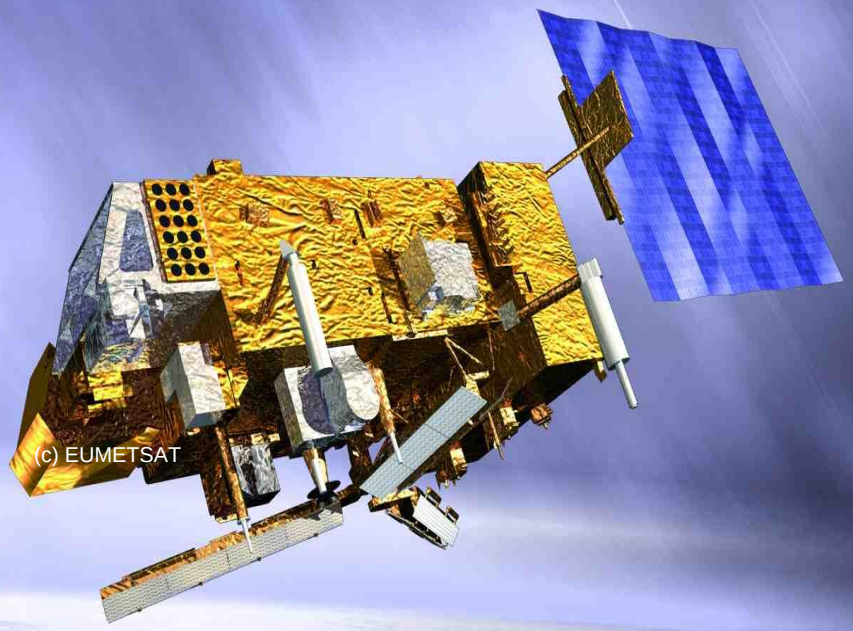
Importancy of remote sensing data in cases when NWP does not capture convection Night-time convection



Mateja Iršič Žibert
Slovenian Environment Agency

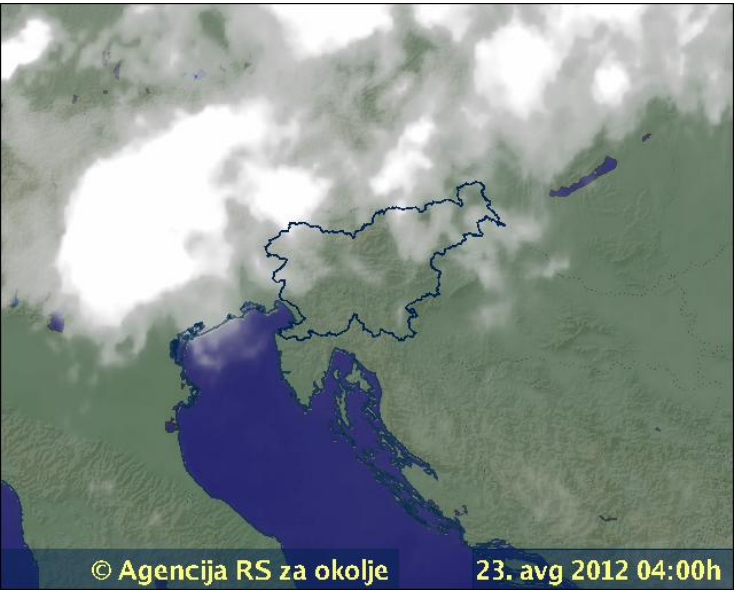
Overview

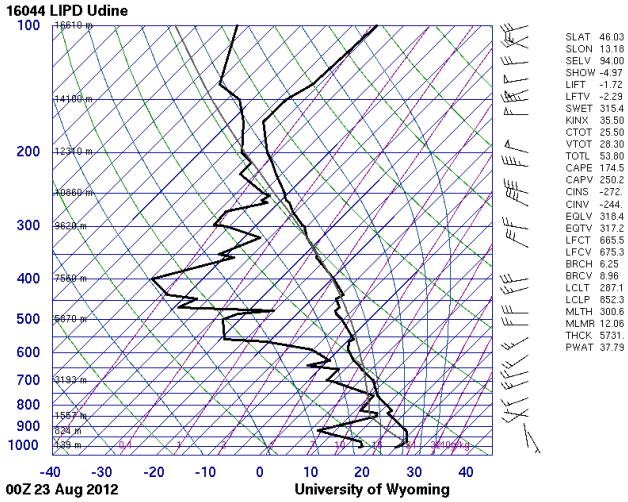
- Night-time convection over N Italy and Slovenia often not well captured in operational NWP

- Potential of satellite soundings from hyperspectral measurements

- Summary

How good is night-time convection forecast in NWP?

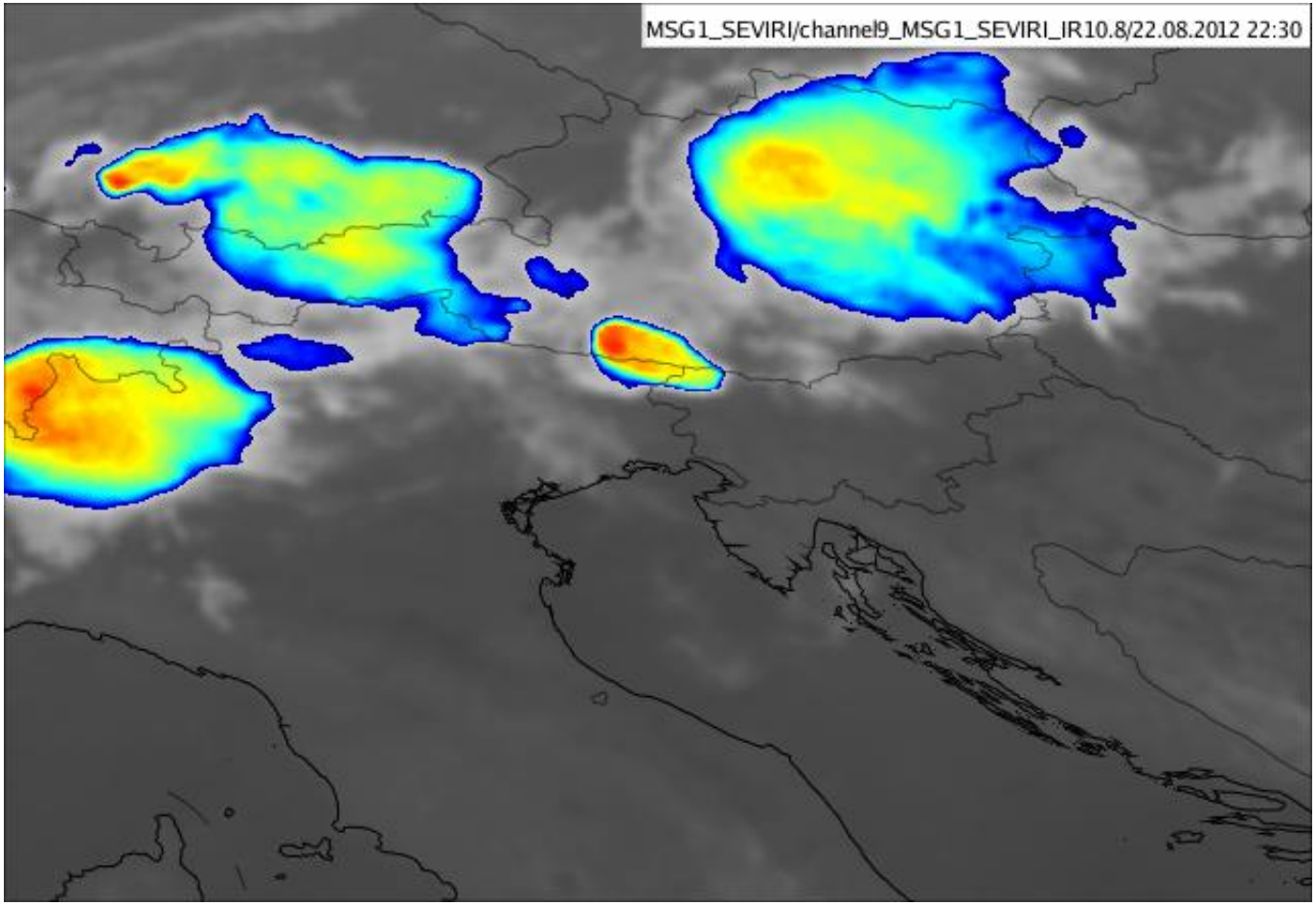




23 August 2012

- Cold front on N part of Alps
- Prefrontal convection was forecasted for afternoon and evening based on NWP
- NWP did not capture night and morning convection in this case it was lasting many hours

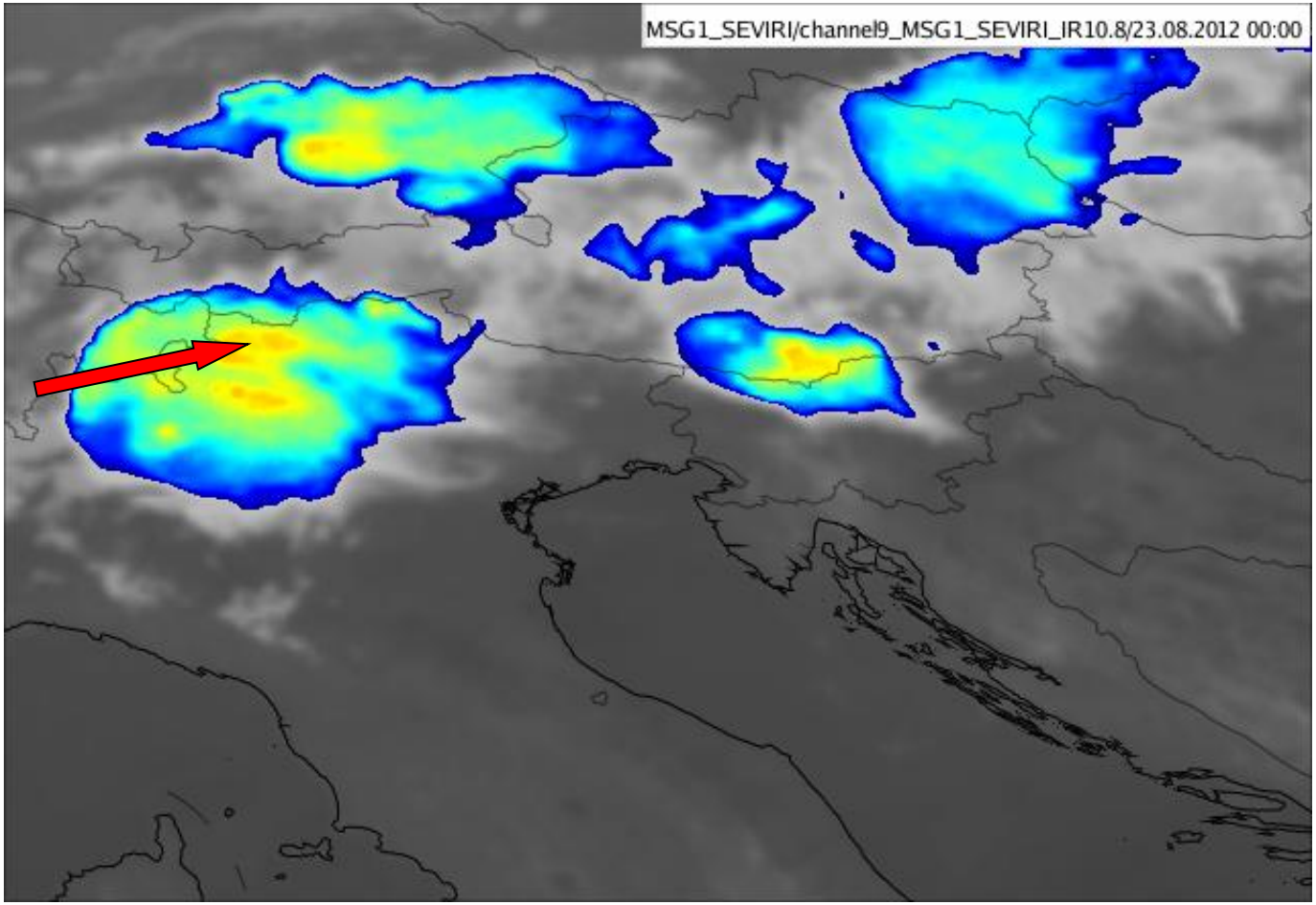
MSG IR 10.8



22:30 UTC

22 Aug

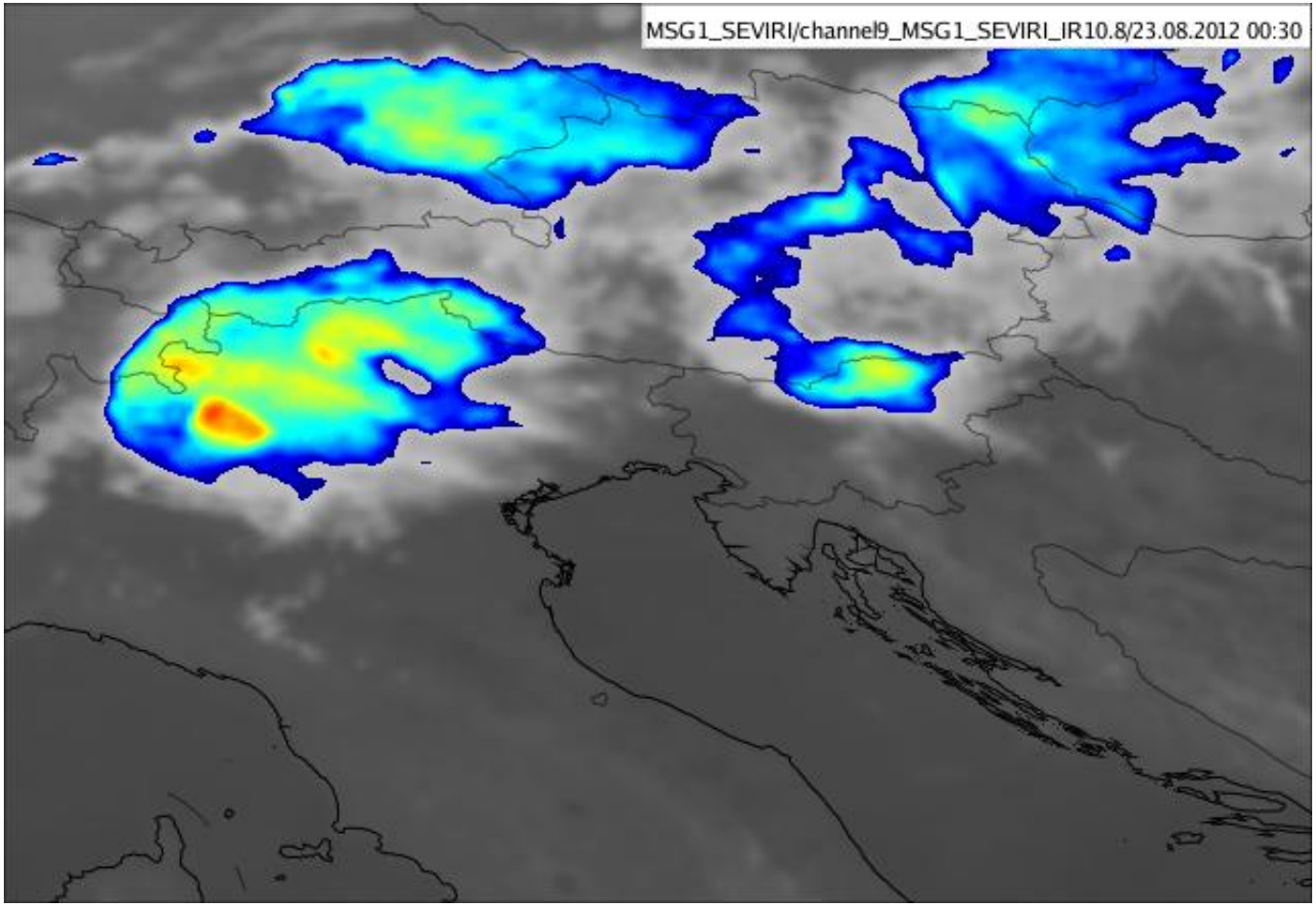
MSG IR 10.8



22:30 UTC 00:00 UTC

22 Aug 23 Aug

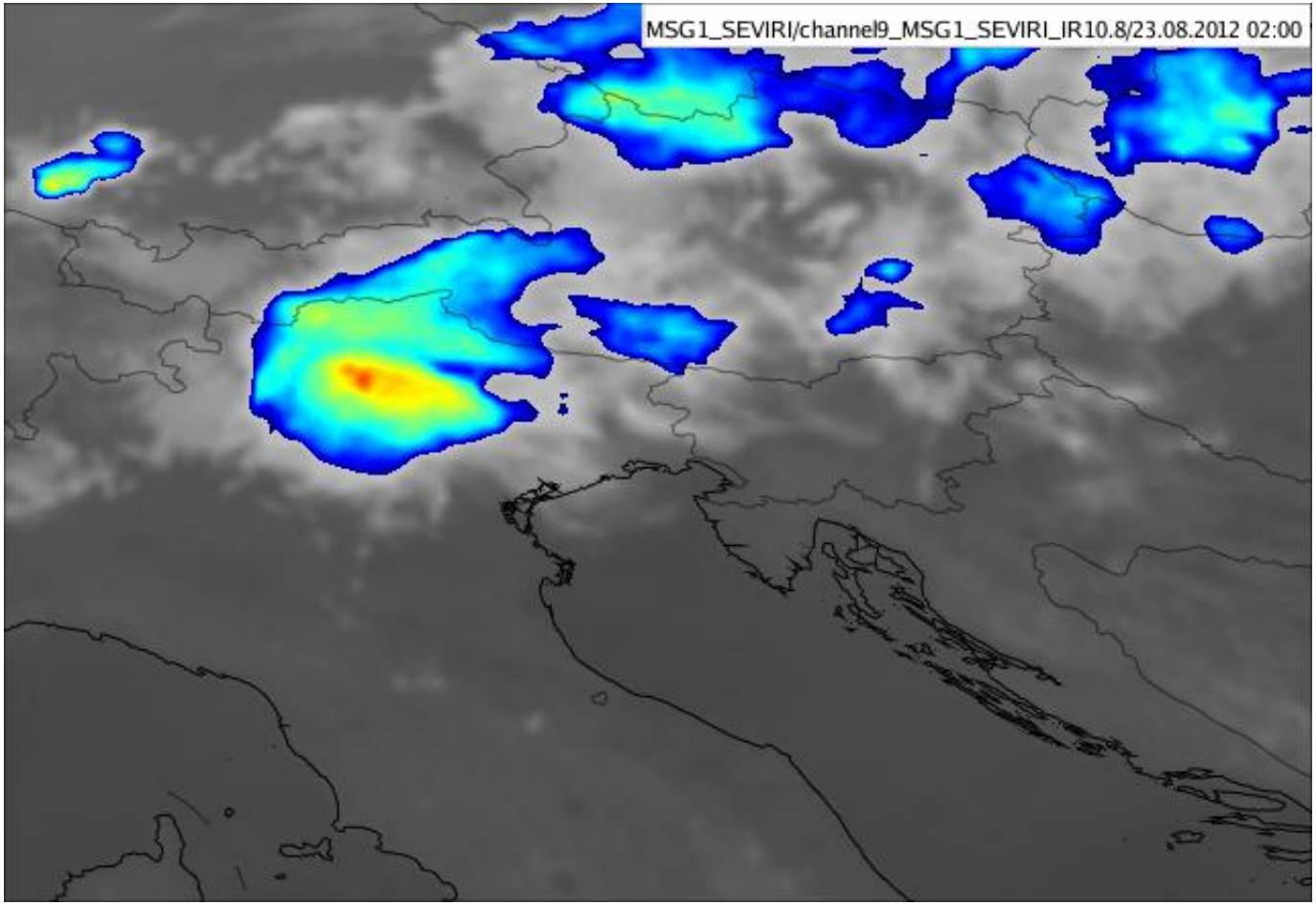
MSG IR 10.8



22:30 UTC 00:15 UTC

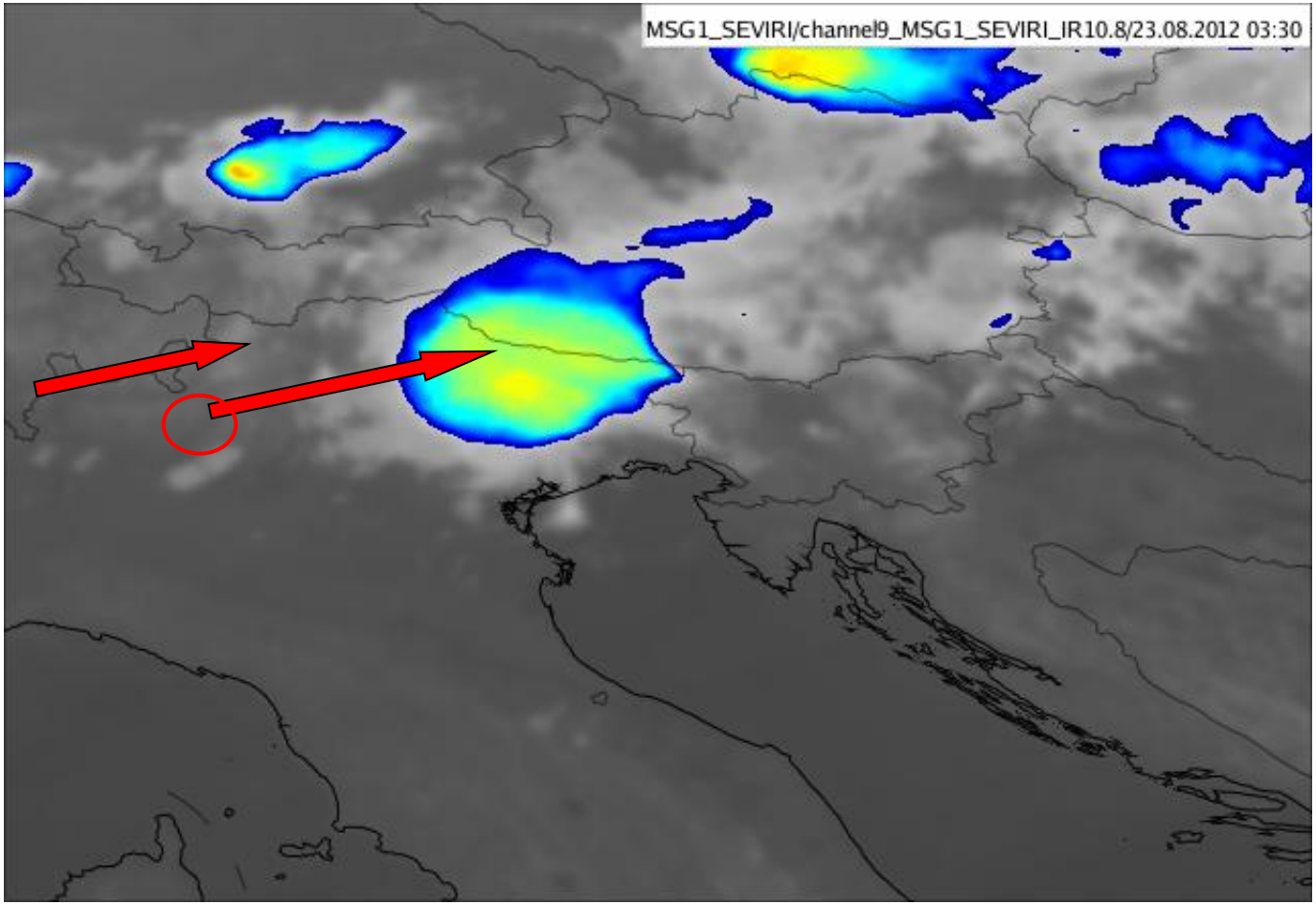
22 Aug 23 Aug

MSG IR 10.8



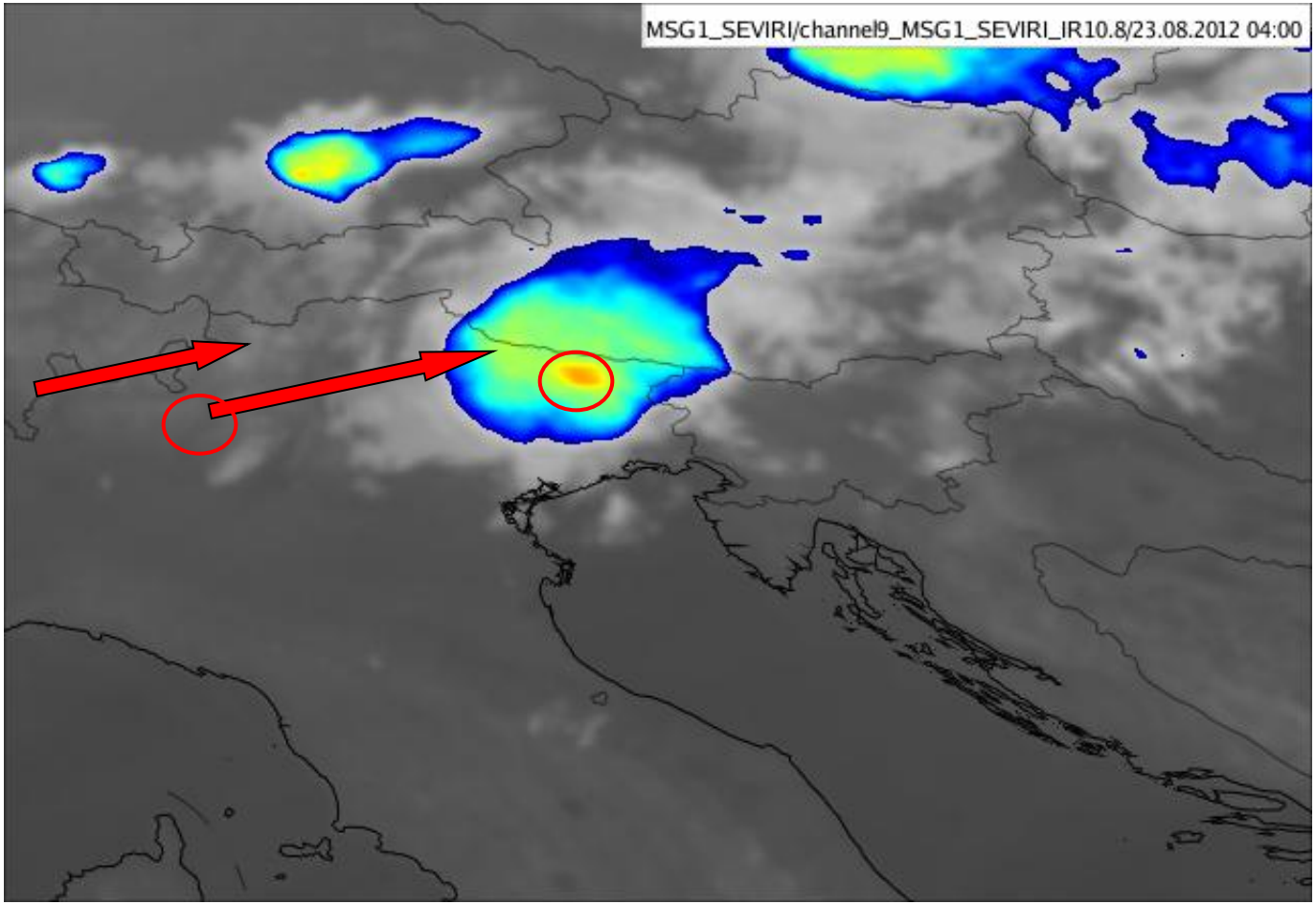
22:30 UTC	00:00 UTC	02:00 UTC
22 Aug	23 Aug	23 Aug

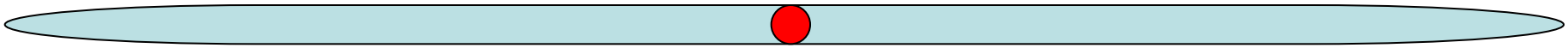
MSG IR 10.8



22:30 UTC	00:00 UTC	03:30 UTC
22 Aug	23 Aug	23 Aug

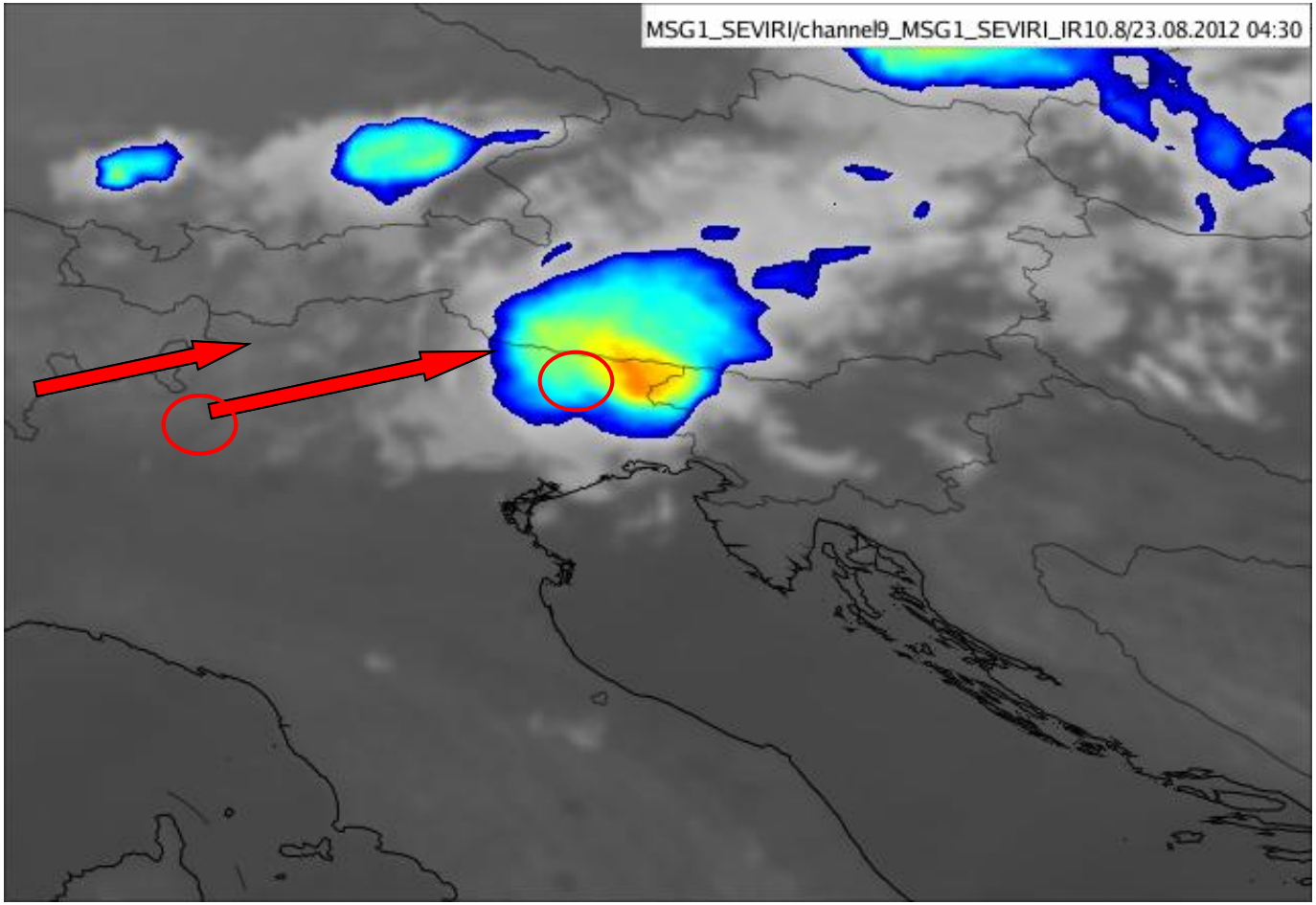
MSG IR 10.8





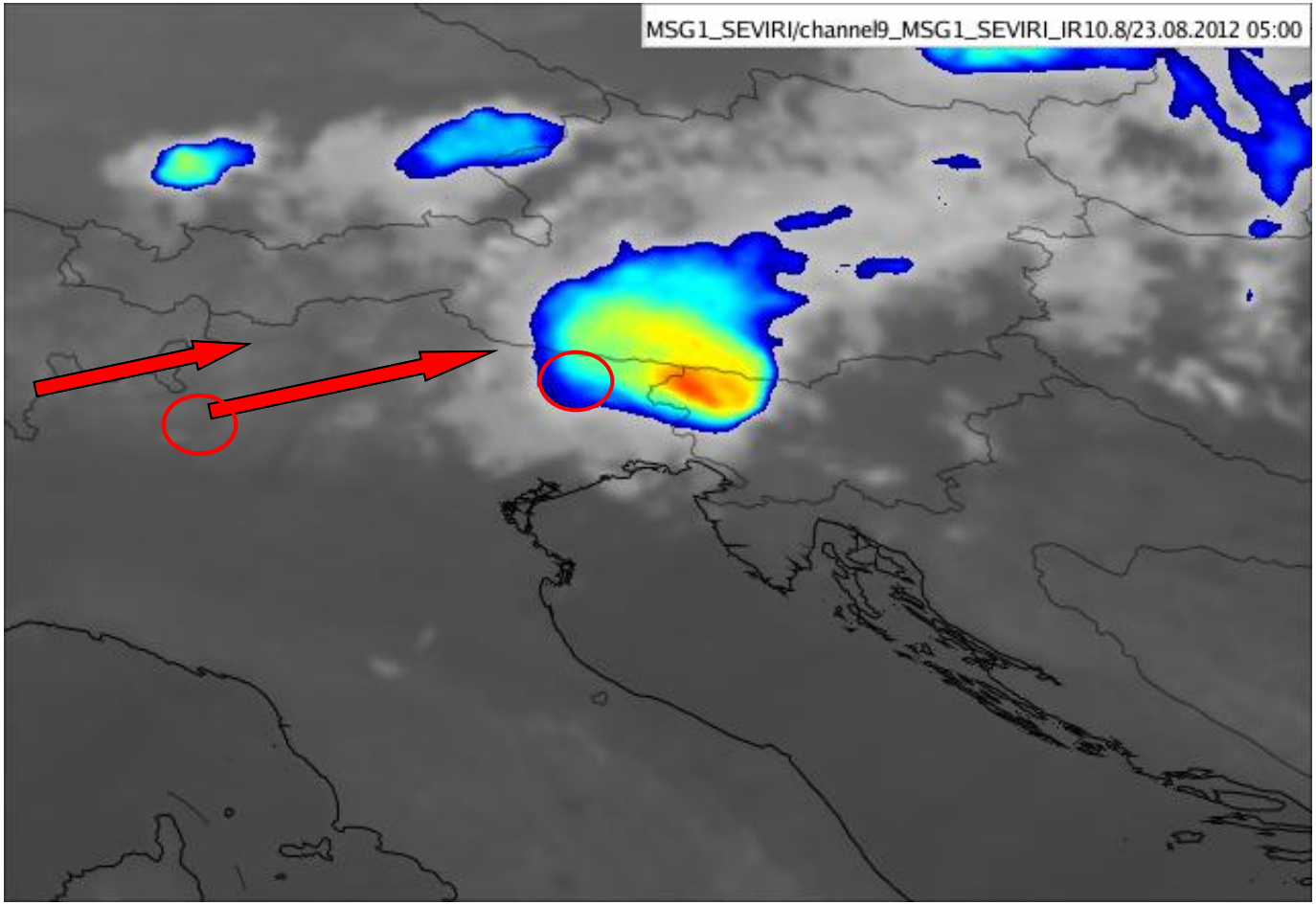
22:30 UTC	00:00 UTC	04:00 UTC
22 Aug	23 Aug	23 Aug

MSG IR 10.8



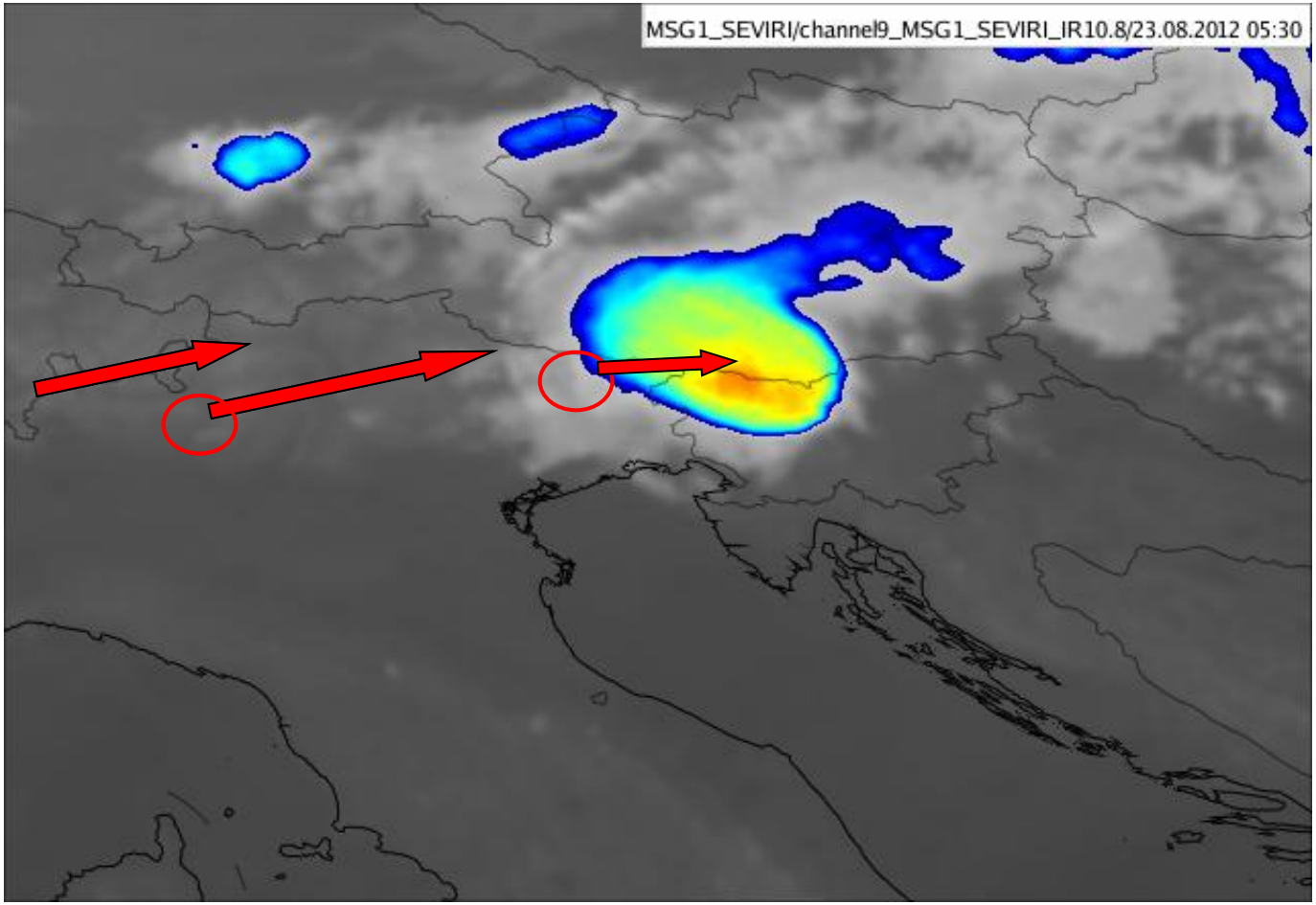
22:30 UTC	00:00 UTC	04:00 UTC
22 Aug	23 Aug	23 Aug

MSG IR 10.8



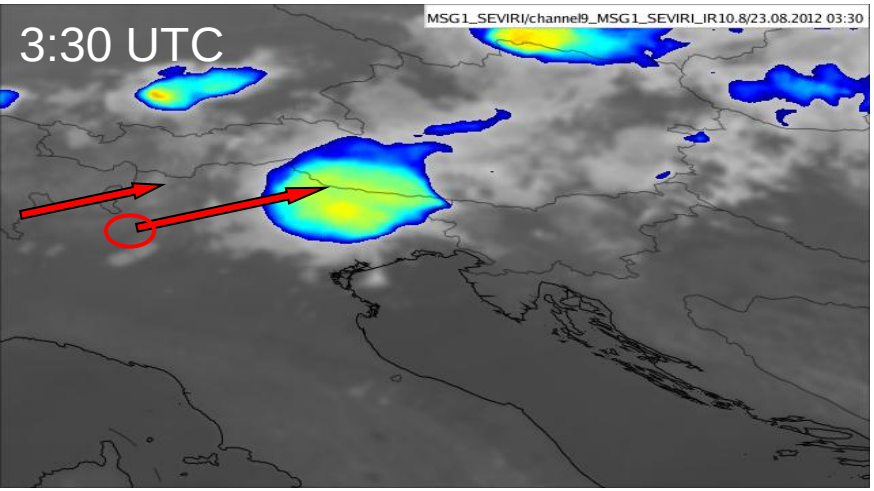
22:30 UTC	00:00 UTC	04:00 UTC	05:00 UTC
22 Aug	23 Aug	23 Aug	23 Aug

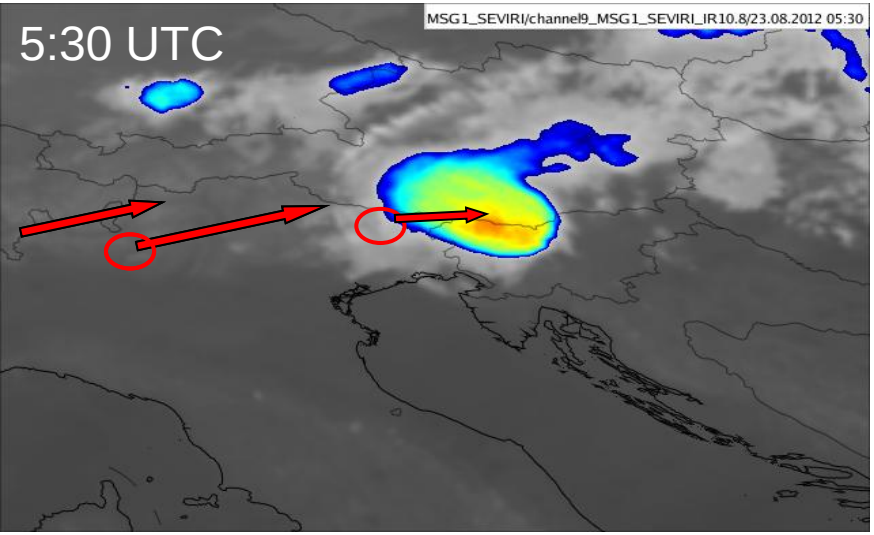
MSG IR 10.8



22:30 UTC	00:00 UTC	04:00 UTC	05:30 UTC
22 Aug	23 Aug	23 Aug	23 Aug

23 August 2012 – night time convection





- How forecaster can know which convection system will be long lasting and not short lasting as it was predicted by NWP?

Satellite indications:

- NWCSAF RDT (the conv. cell was already in mature phase)

in combination to air mass characteristics:

- satellite vertical profiles

(how good are)

good conceptual model and all possible measurements

INCA or NWP

- Night time convection over N Italy and Slo often not well captured in operational NWP?
- Potential of satellite soundings from hyperspectral measurements?
- Summary

Hyper spectral sounders

Now on low-orbital satellites:

- METOP/IASI (Infrared Atmospheric Sounding Interferometer)
- Suomi NPP/ CrIS (Cross-track Infrared Sounder)
- Aqua/*AIRS* (Atmospheric Infrared Sounder)

In 2021 on GEO:

- MTG/IRS Infrared Sounder (IRS)

Database
years 2008-2013 cases without clouds
at 9:30 UTC

Satellite sounding in combination to all other NMS data

MODEL

Assimilation of satellite data

ECMWF 10 km (analyse 6 h)

ALADIN 4 km (analyse 6h ->3h)

Good horizontal extent and ground resoluton

Satellite sounding

MTG IRS (every hour)

METOP/IASI (2 per day):

over Slovenia

8:30 UTC, 21 UTC

Good horizontal extent,

How good is vertical resolution?

IN SITU Measurements

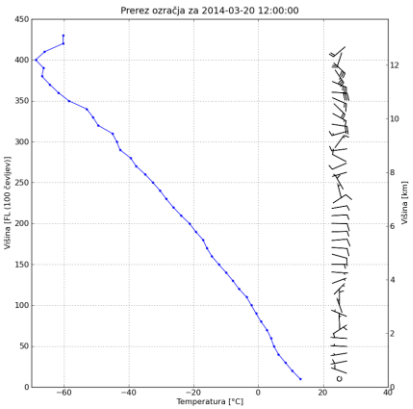
Radisonde measurements (a few times per day)

Aircraft measurements

(up to 4 times per hour)

Good vertical resolution

Aircraft measurements



At Ljubljana airport radar receives from aircraft:

- measured temperature profile
- measured wind profile
- about 4 profiles per hour
- range 250 km
- frequency: 4s
- vertical resolution: 1 FL cca 30 m
- quality control

B. Strajnar (2012).Validation of Mode-S Meteorological Routine Air Report aircraft observations Journal of Geophy. Res.: Atmospheres, Vol. 117, Issue D23,

Summary

- Cases where NWP does not capture night-time convection well:
  - satellite products (decaying - growing phase)
- Use of hyperspectral satellite soudings in:
  - Stability analyse (study like A. Manzato&P. Antonelli)
  - INCA (together with other data)
- New generation of NWP rapid cycles (re-run every 1-3 hours):
  - the first hour is very important, later NWP already have assimilated satellite data