Zentralanstalt für Meteorologie und Geodynamik

Playground Session

30 May 2018

Yasmin Markl and Andreas Wirth (ZAMG)

Content of part 3 of the course

Lesson 1: Learn how to identify frontal areas

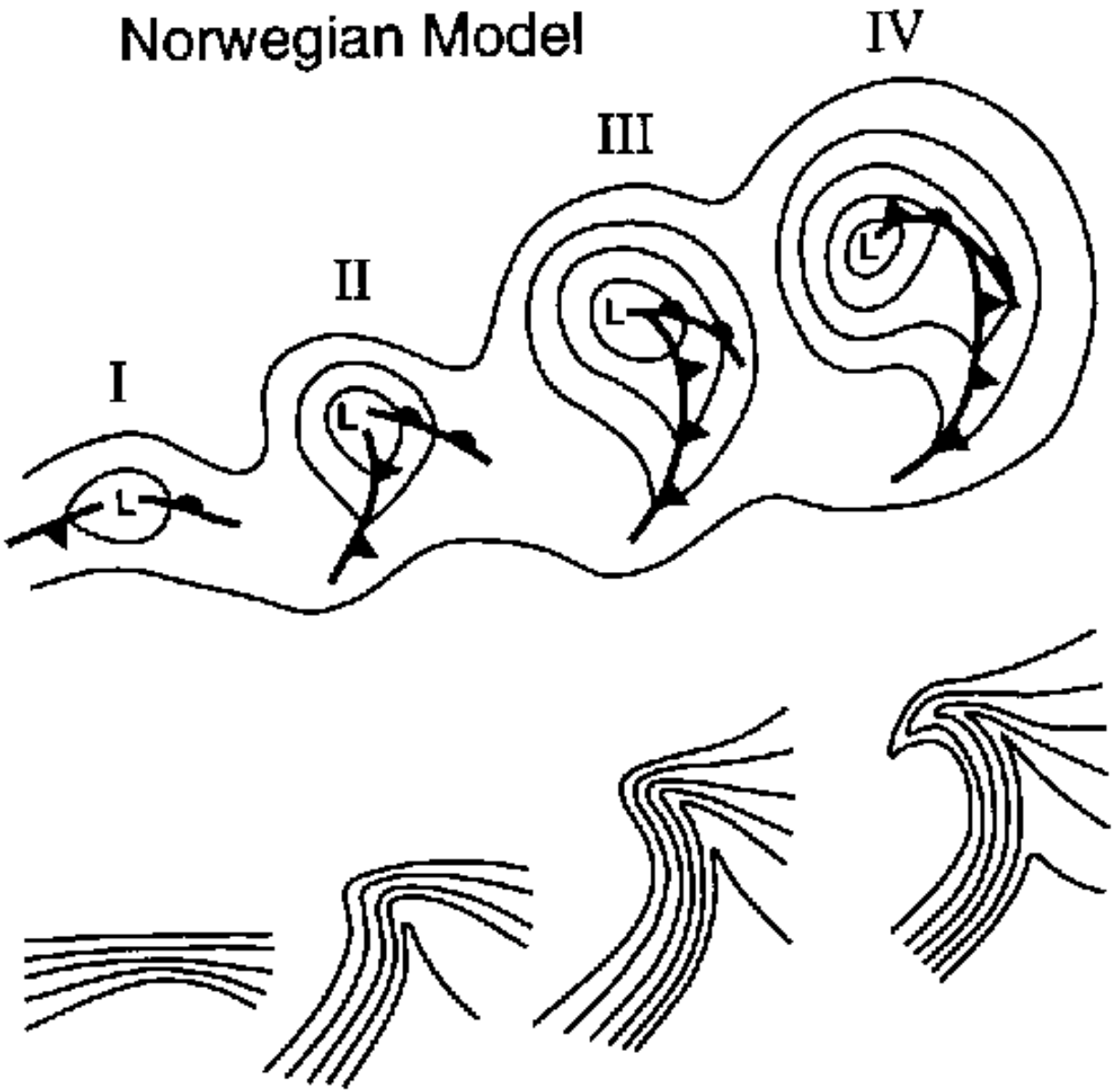
- **Optional:** The benefits of the Airmass RGB for analyzing satellite images

Lesson 2: Learn how to identify Cumulonimbus clouds

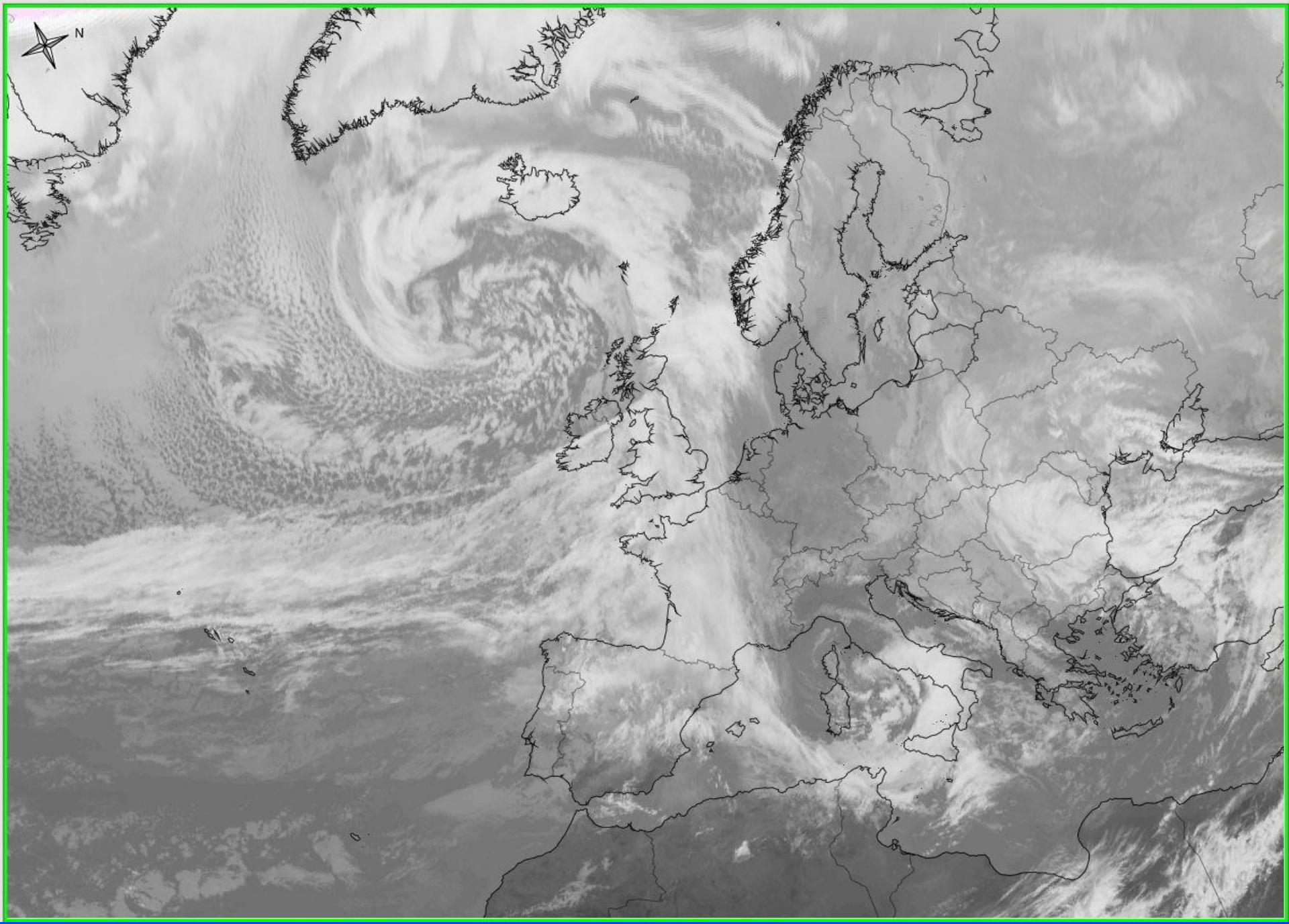
Lesson 3: Learn how to identify fog and low Stratus cloudiness

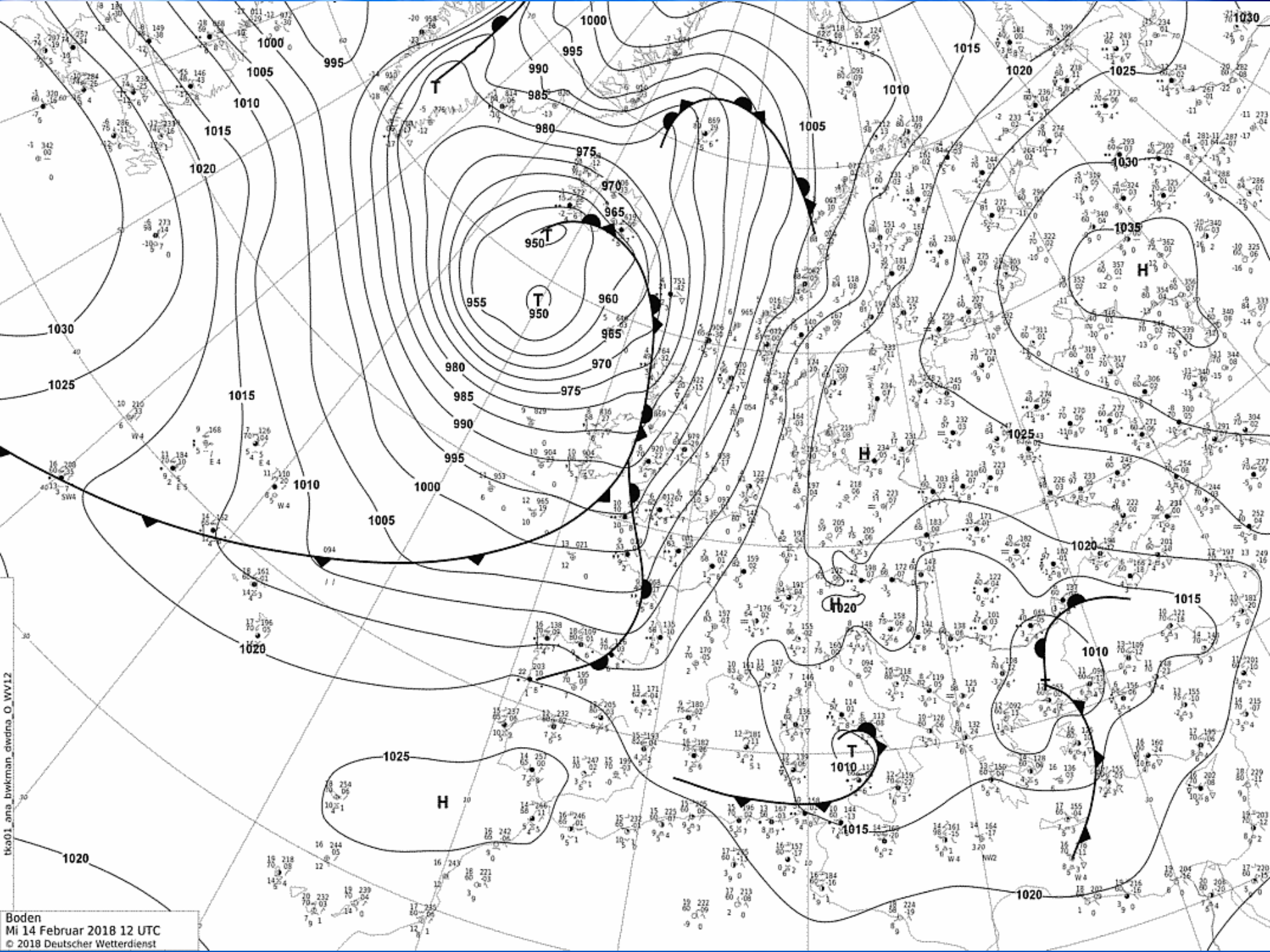
Lesson 4 (optional): Learn how to identify atmospheric wave pattern (lee waves and gravity waves)

Norwegian Model

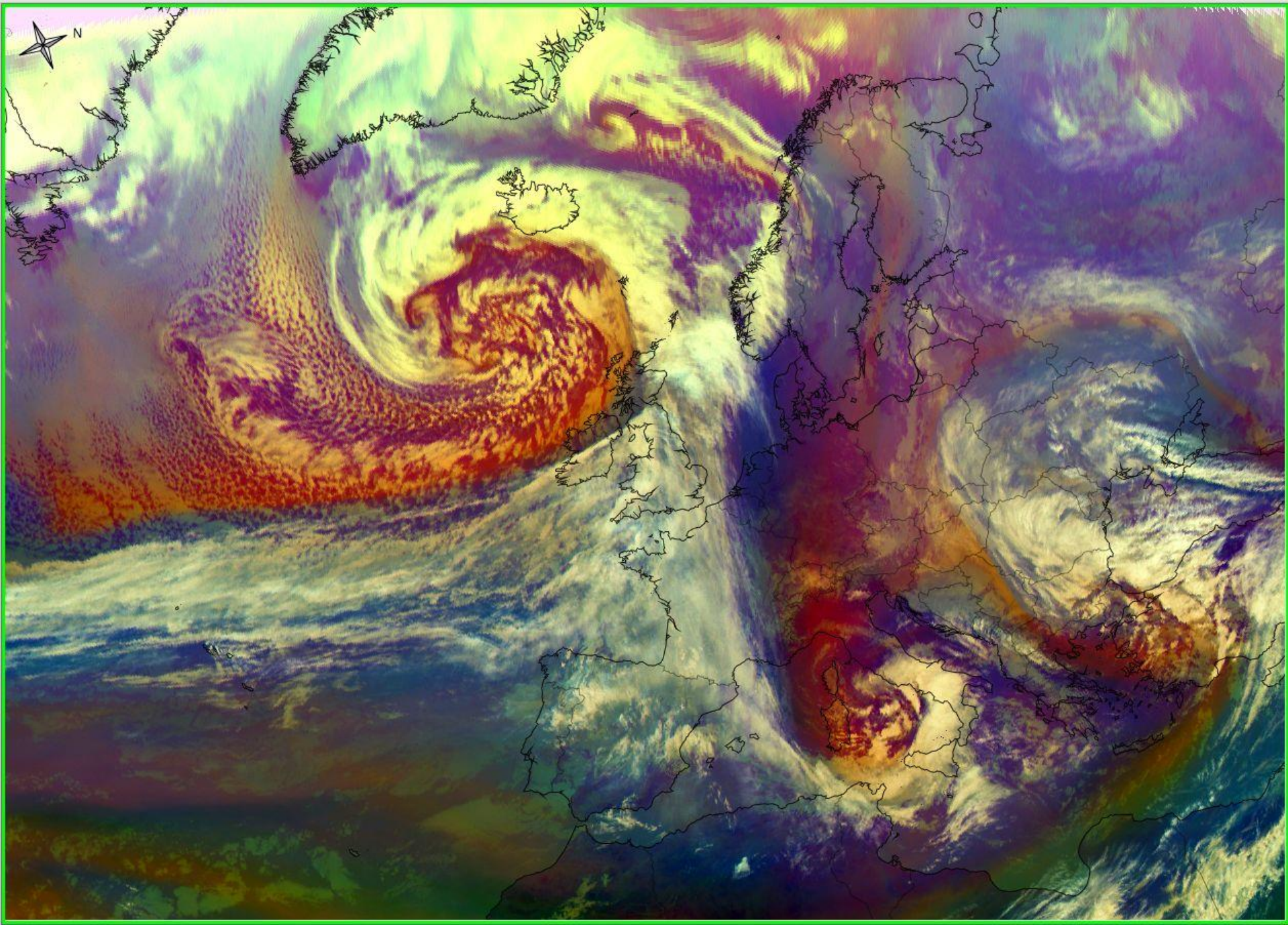


Time Navigation **Frame:** Wed Feb 14,2018 12:00

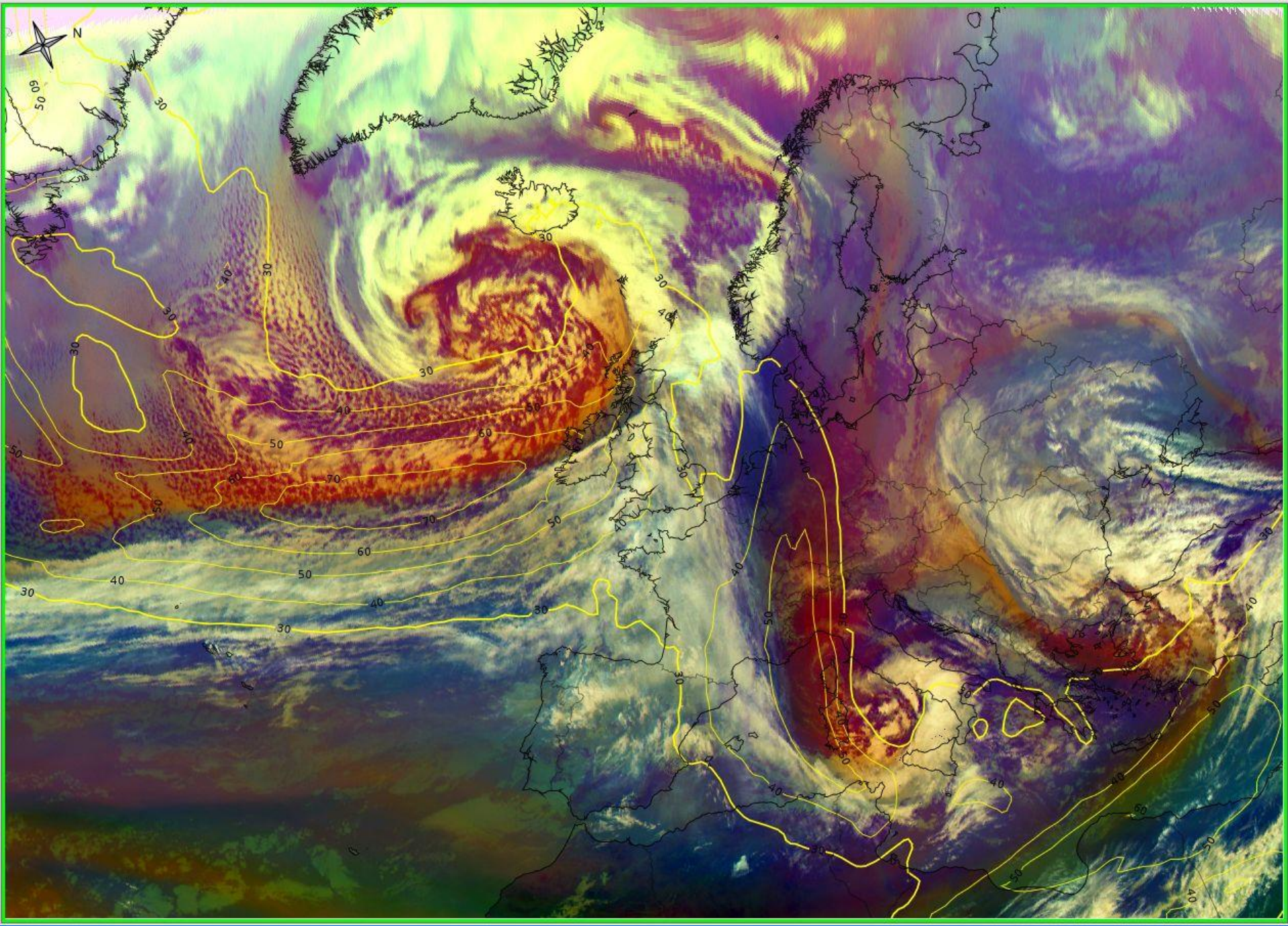



Boden
Mi 14 Februar 2018 12 UTC
© 2018 Deutscher Wetterdienst
tka01_ana_bwkman_dwdna_O_WV12

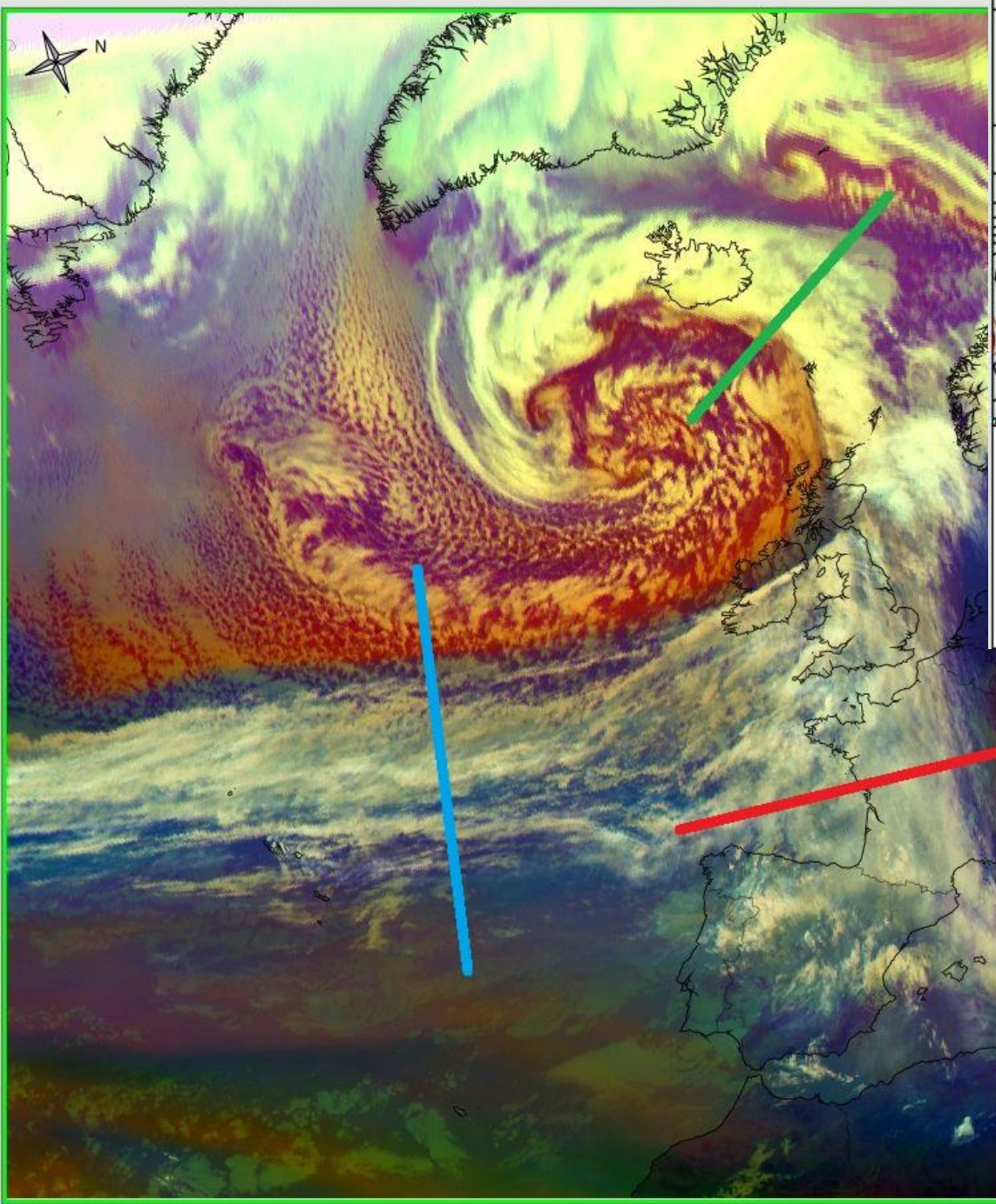
Time Navigation **Frame:** Wed Feb 14,2018 12:00

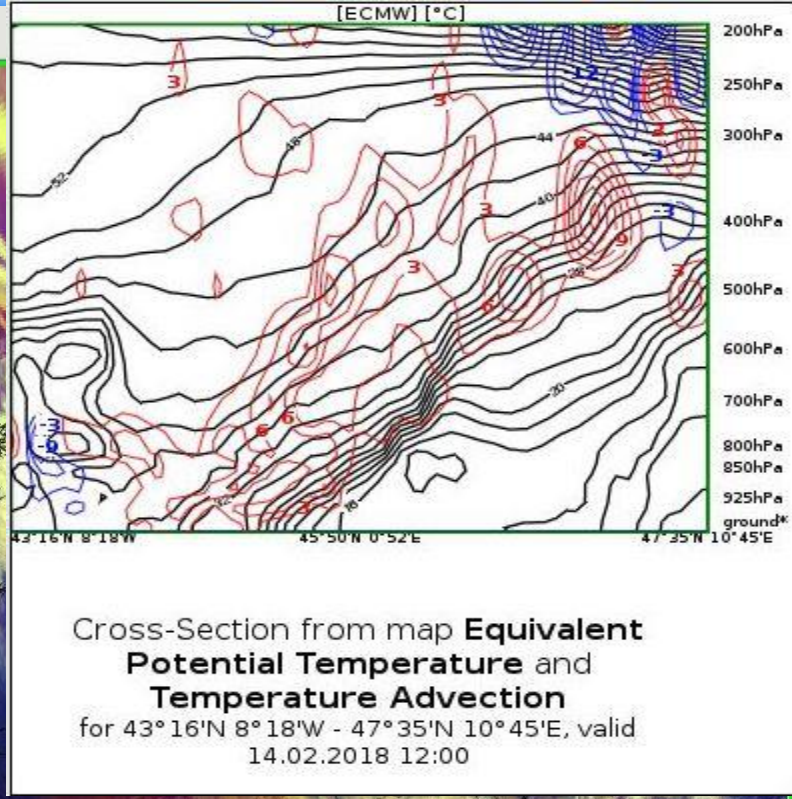


Time Navigation **Frame:** Wed Feb 14,2018 12:00 **Level:** 300hPa



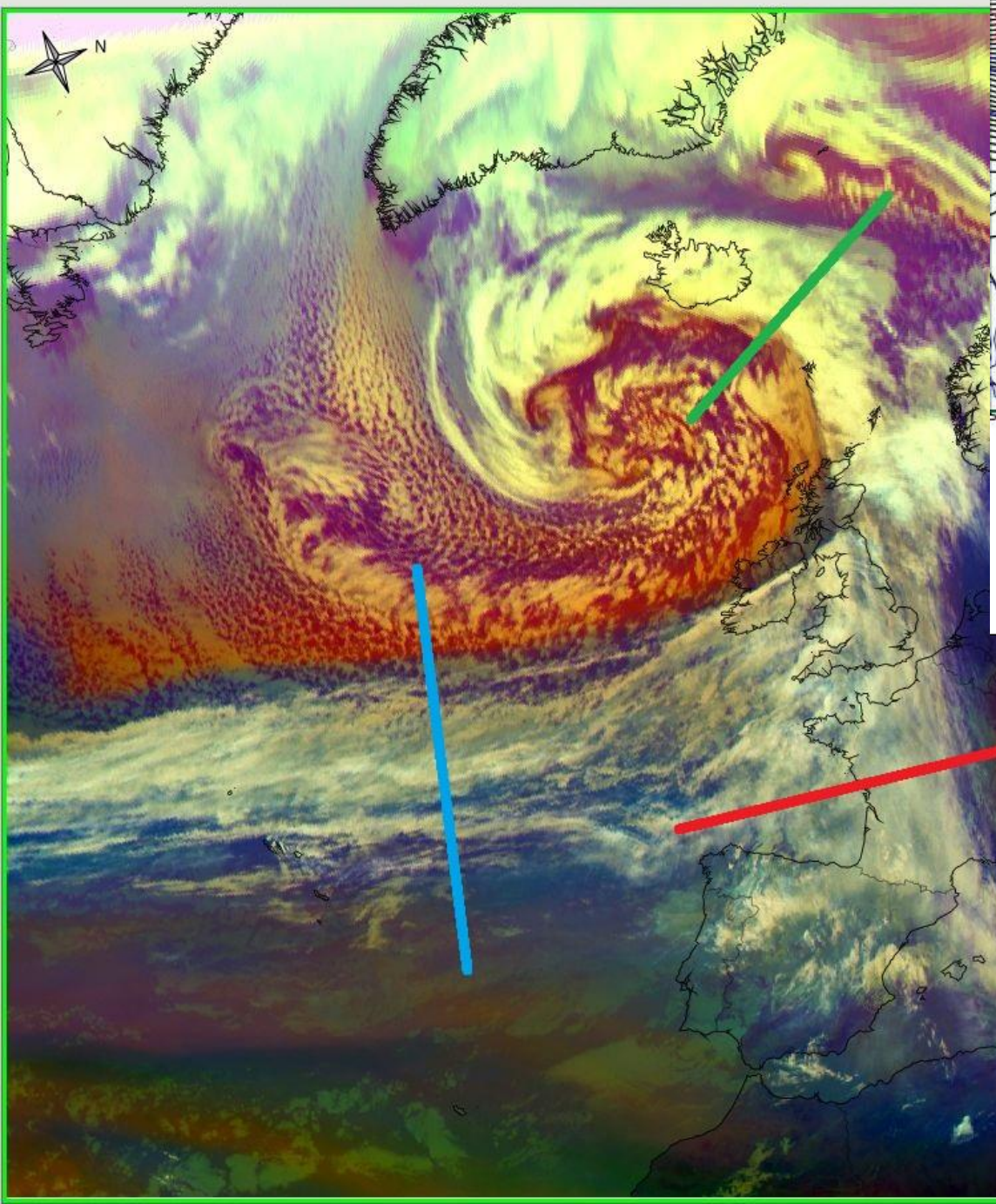
Time Navigation **Frame:** Wed Feb 14,2018 12:00

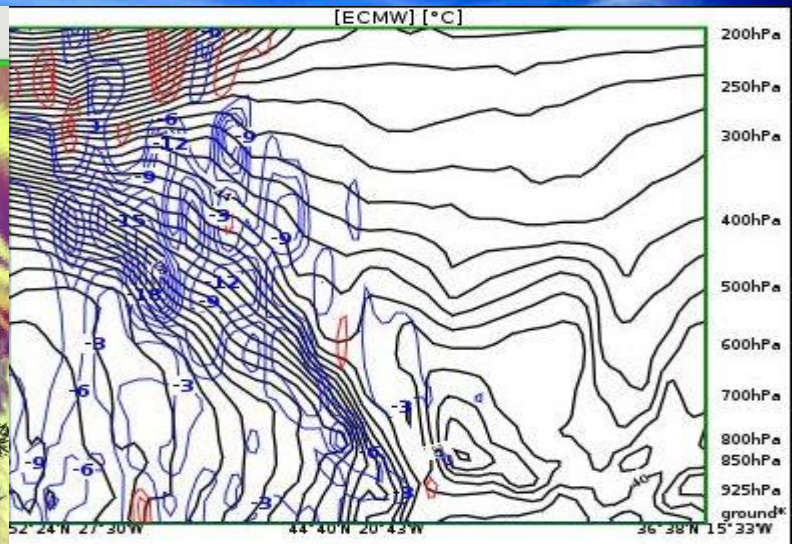




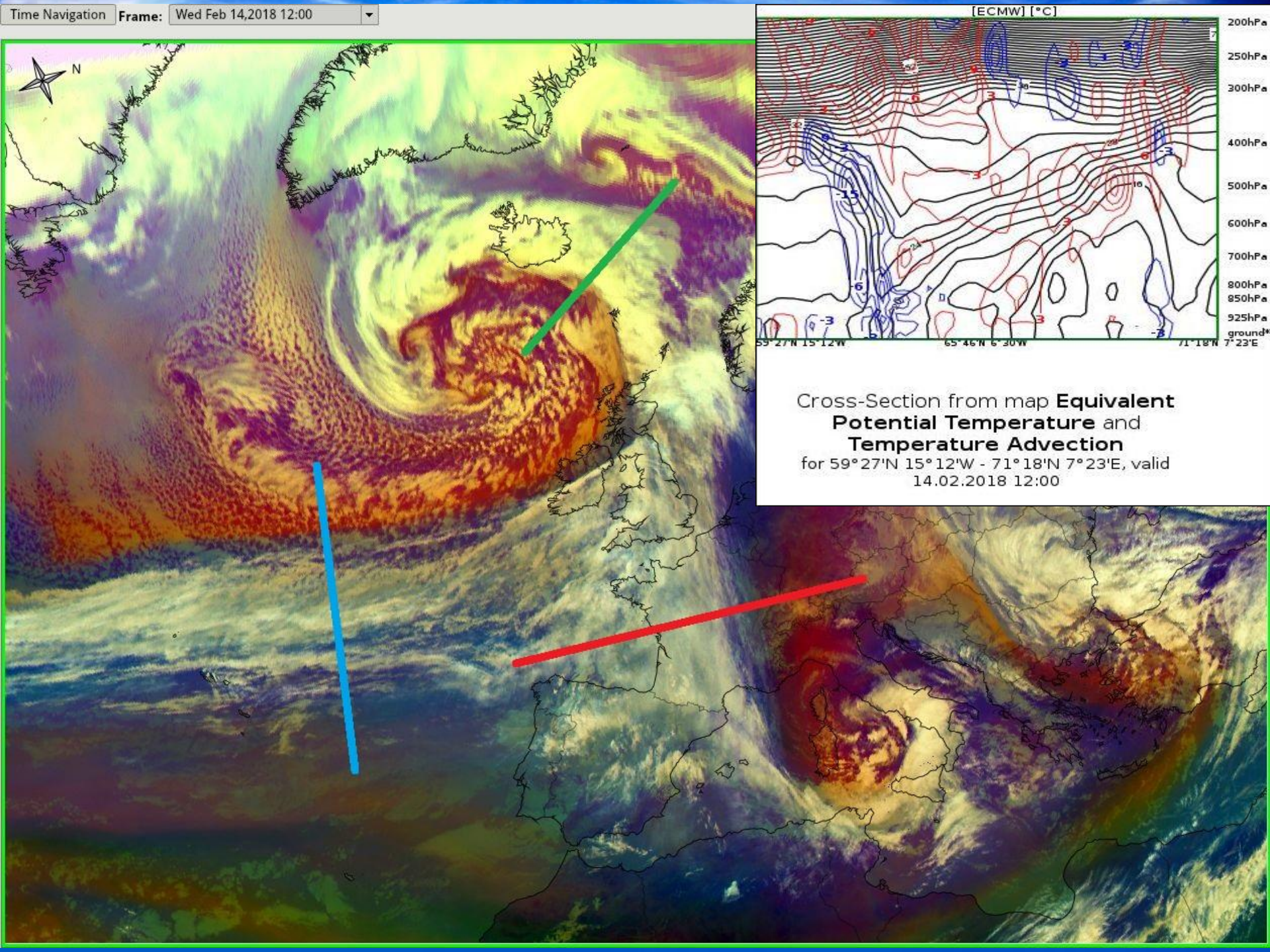
Cross-Section from map **Equivalent Potential Temperature** and **Temperature Advection**
for 43°16'N 8°18'W - 47°35'N 10°45'E, valid 14.02.2018 12:00

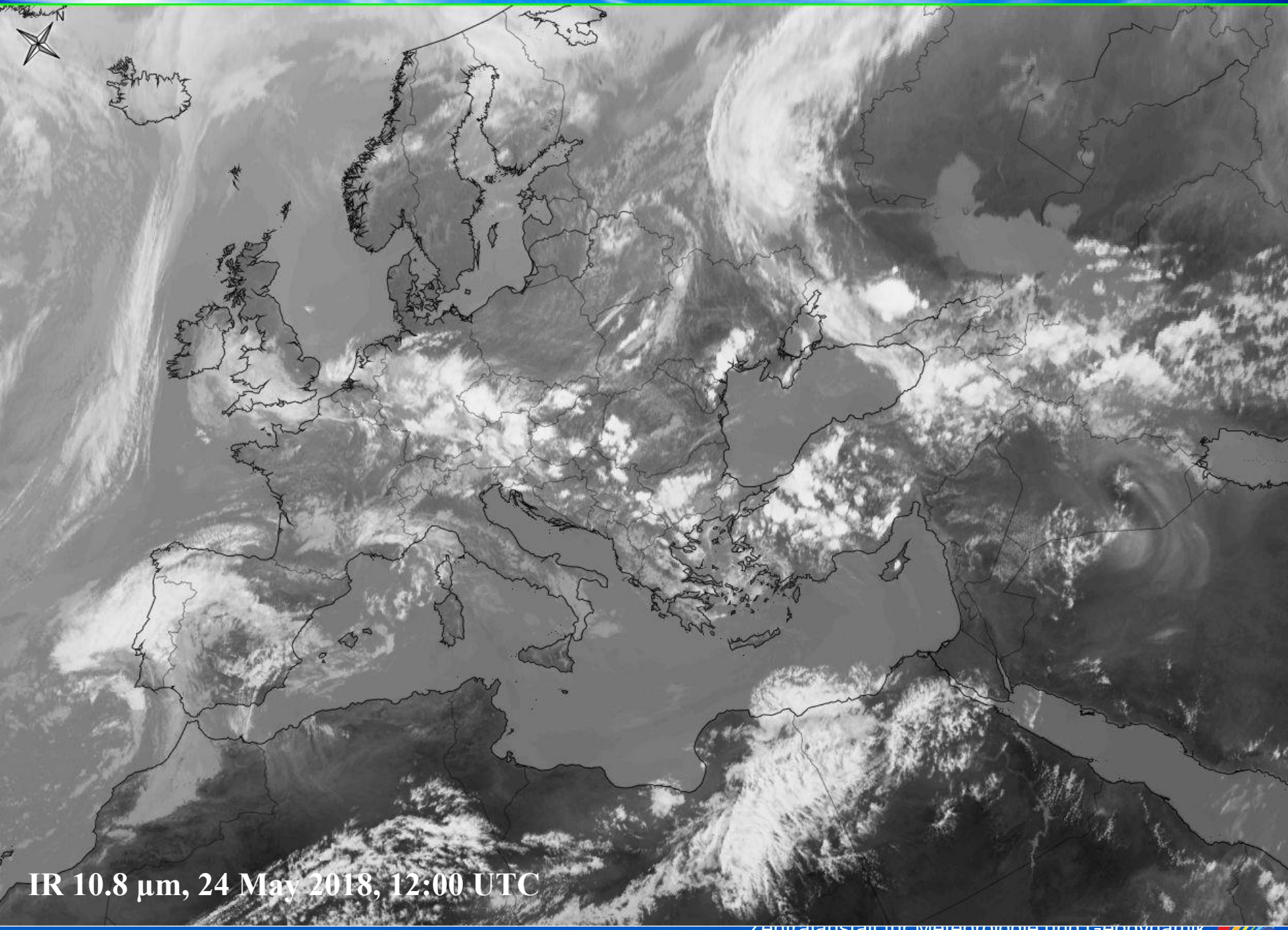
Time Navigation **Frame:** Wed Feb 14,2018 12:00

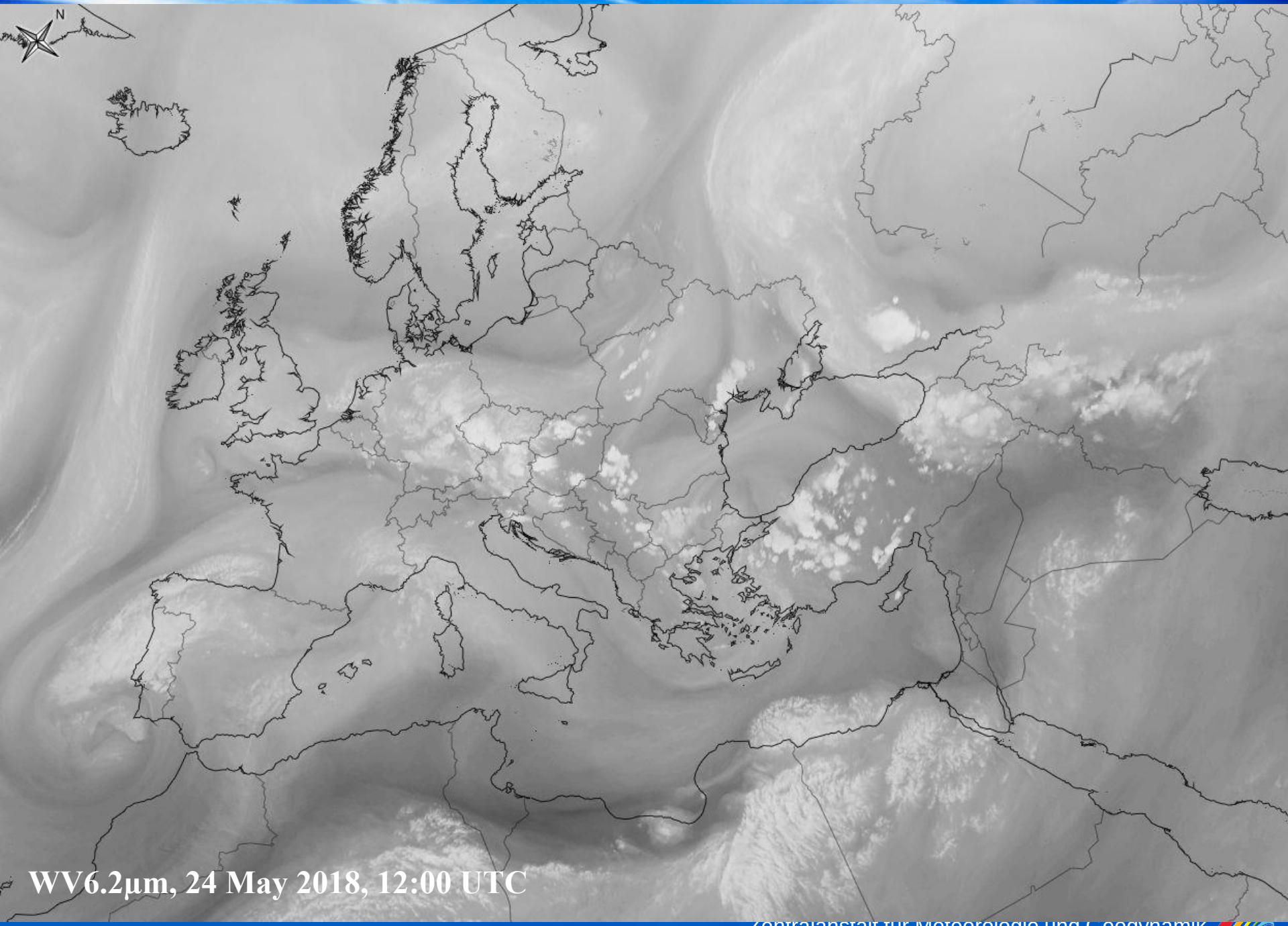




Cross-Section from map **Equivalent Potential Temperature** and **Temperature Advection** for 52°24'N 27°30'W - 36°38'N 15°33'W, valid 14.02.2018 12:00


Time Navigation
Frame:
Wed Feb 14,2018 12:00
N
[ECMW] [°C]
200hPa
250hPa
300hPa
400hPa
500hPa
600hPa
700hPa
800hPa
850hPa
925hPa
ground*
59°27'N 15°12'W
65°46'N 6°30'W
71°18'N 7°23'E
Cross-Section from map **Equivalent Potential Temperature** and **Temperature Advection**
for 59°27'N 15°12'W - 71°18'N 7°23'E, valid 14.02.2018 12:00

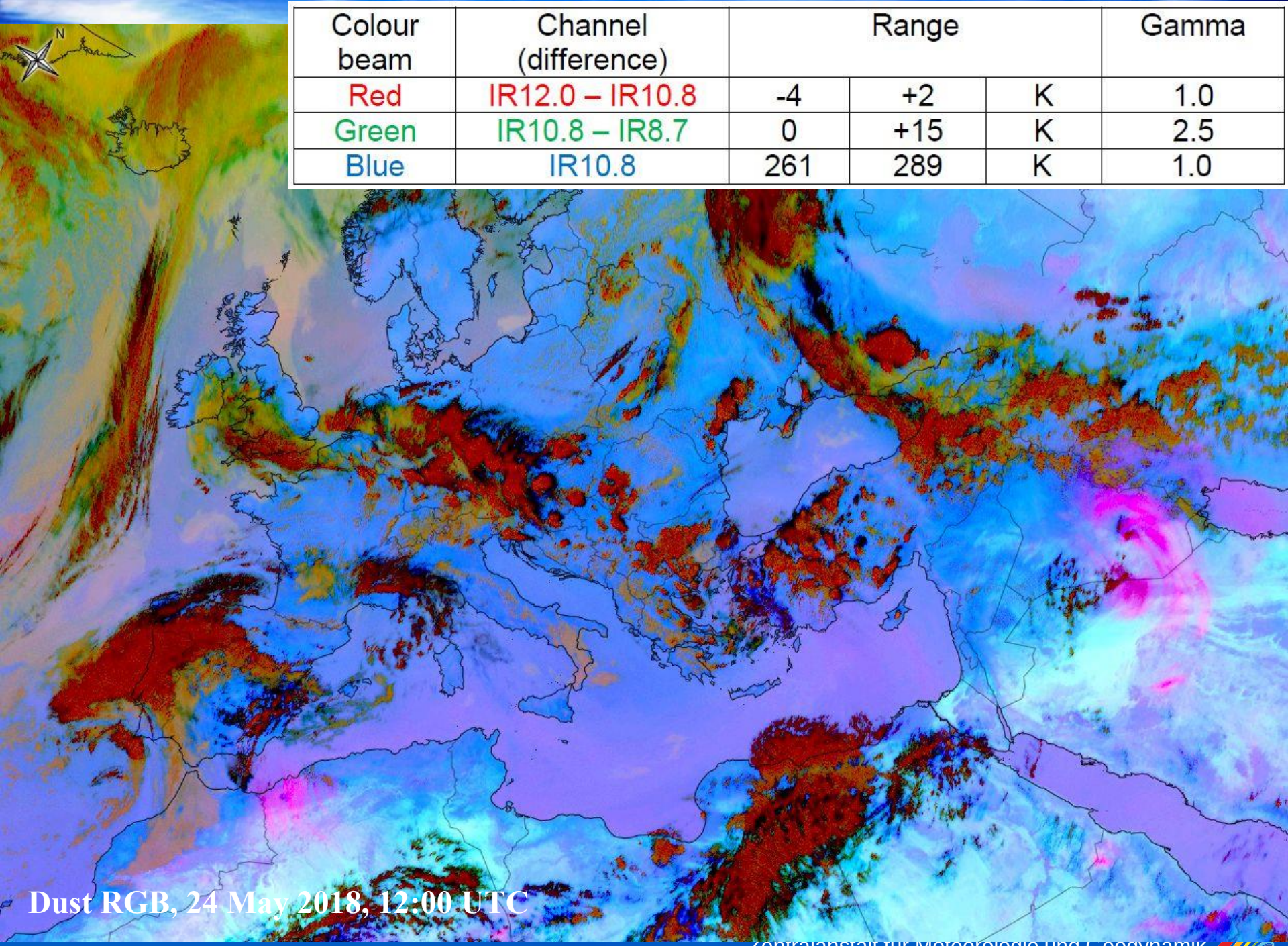

N
IR 10.8 µm, 24 May 2018, 12:00 UTC


N
WV6.2µm, 24 May 2018, 12:00 UTC

Colour beam	Channel difference	Range			Gamma
Red	WV6.2 – WV7.3	-35	+5	K	1
Green	IR3.9 – IR10.8	-5	+60	K	0.5
Blue	NIR1.6 – VIS0.6	-75	+25	%	1

Convection RGB, 24 May 2018, 12:00 UTC

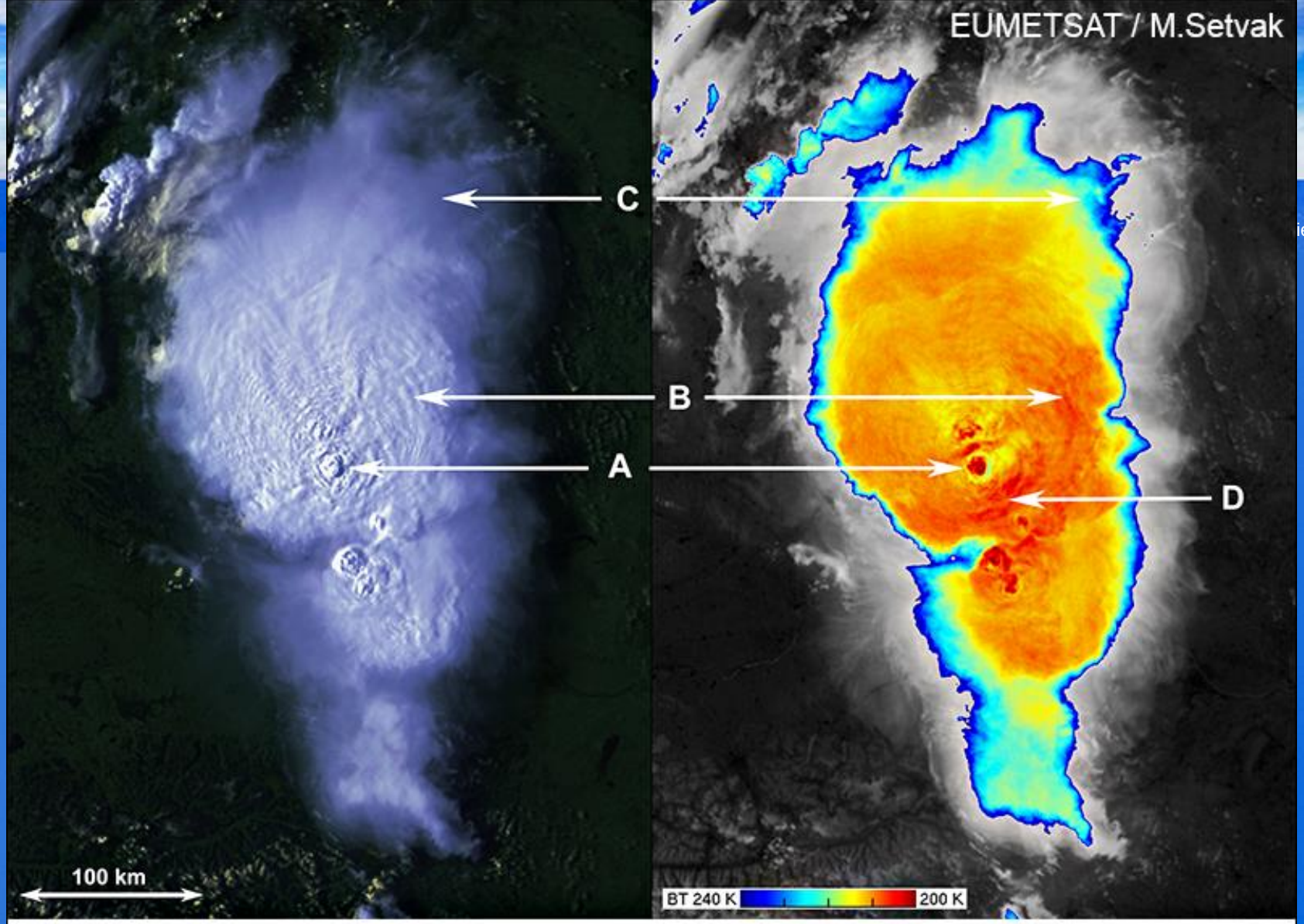
Colour beam	Channel (difference)	Range			Gamma
Red	IR12.0 – IR10.8	-4	+2	K	1.0
Green	IR10.8 – IR8.7	0	+15	K	2.5
Blue	IR10.8	261	289	K	1.0



Dust RGB, 24 May 2018, 12:00 UTC

Overshooting Tops

EUMETSAT / M.Setvak



A - overshooting top

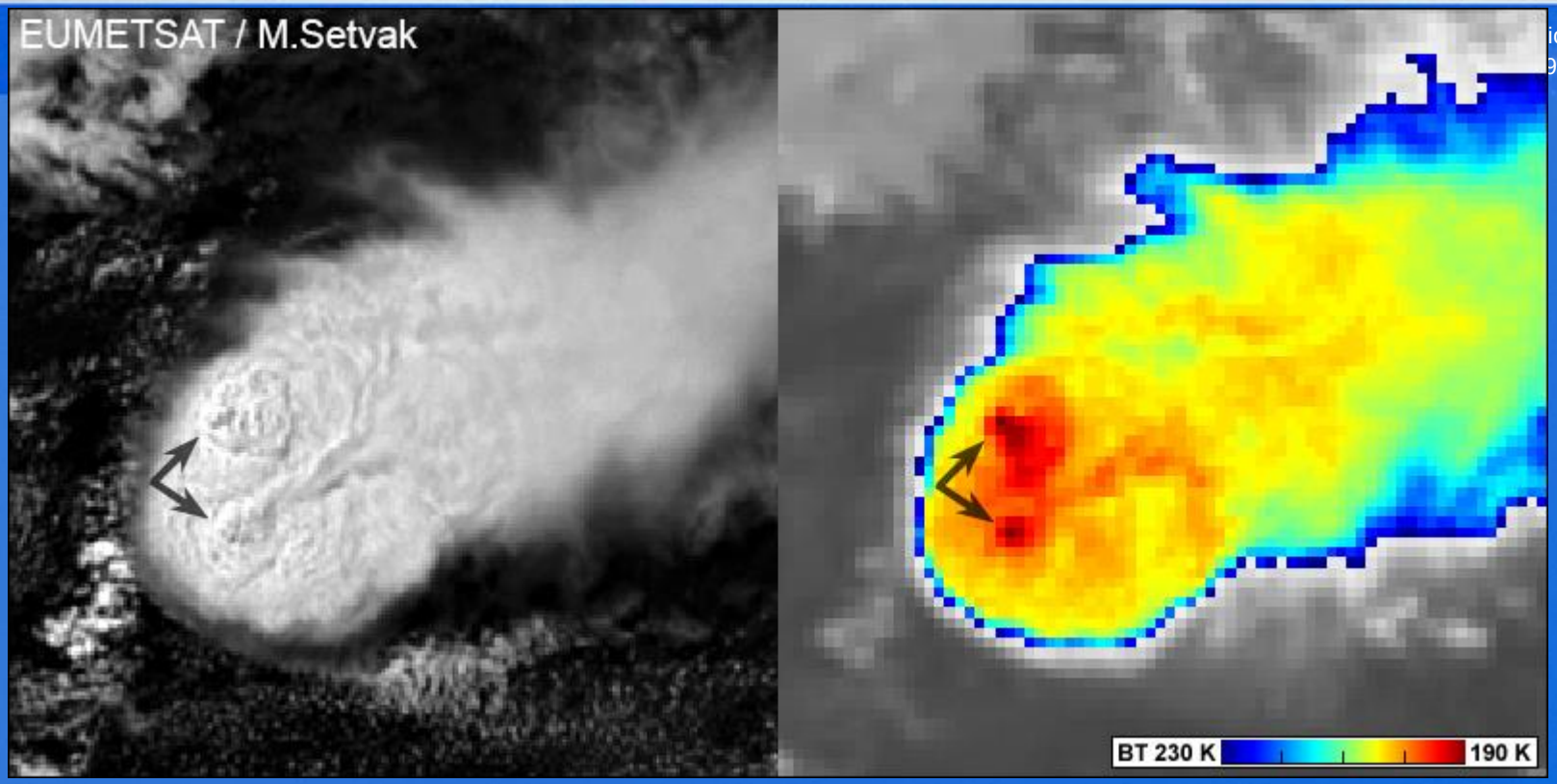
B - gravity waves on the anvil top

C - semitransparent part of the anvil

D - cold-U shape

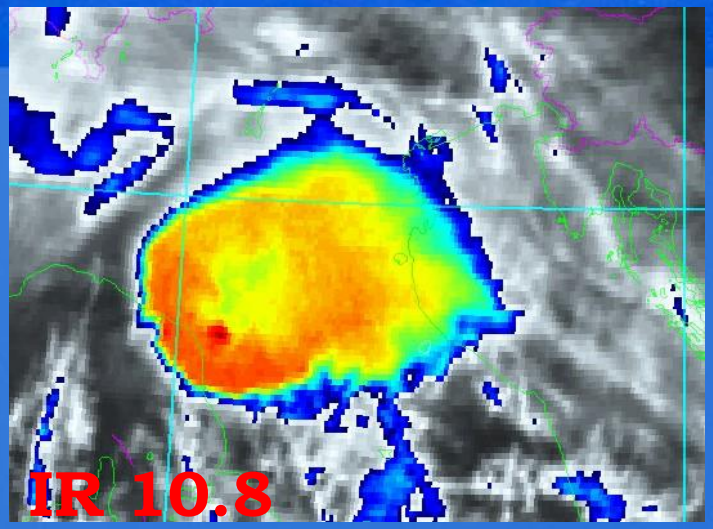
NOAA-15 2006-06-25 16:08 UTC

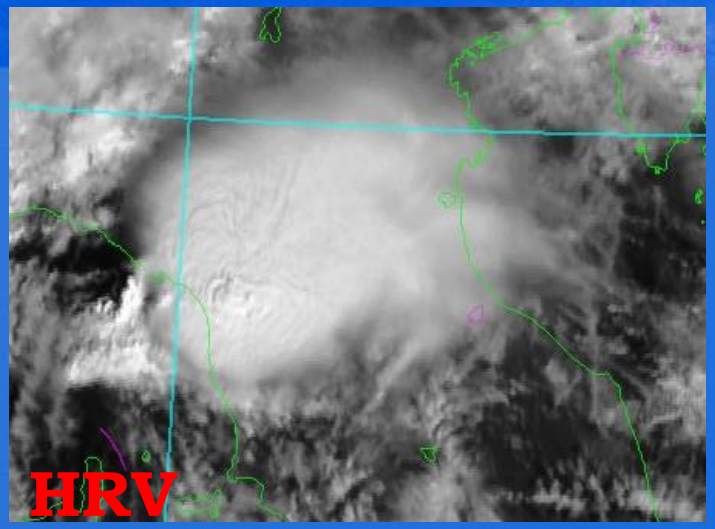
RGB composite of AVHRR bands 1,2 and 4 (left)
and color-enhanced AVHRR band 4 (right)

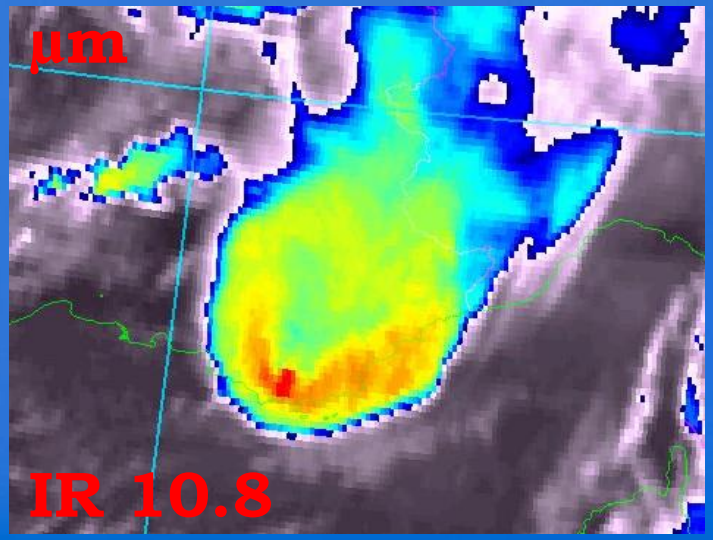


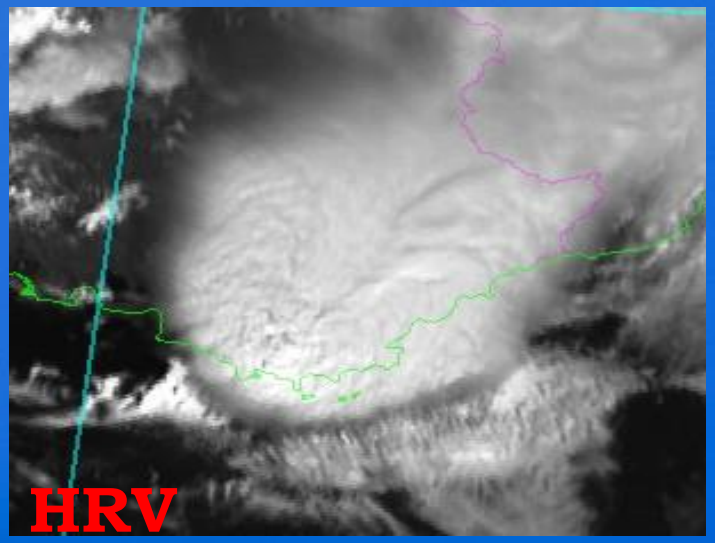
Tall and persistent overshooting tops are frequently observed with strong or severe thunderstorms in which there is a nearly continuous stream of buoyant updrafts (AMS Meteorology Glossary, http://glossary.ametsoc.org/).

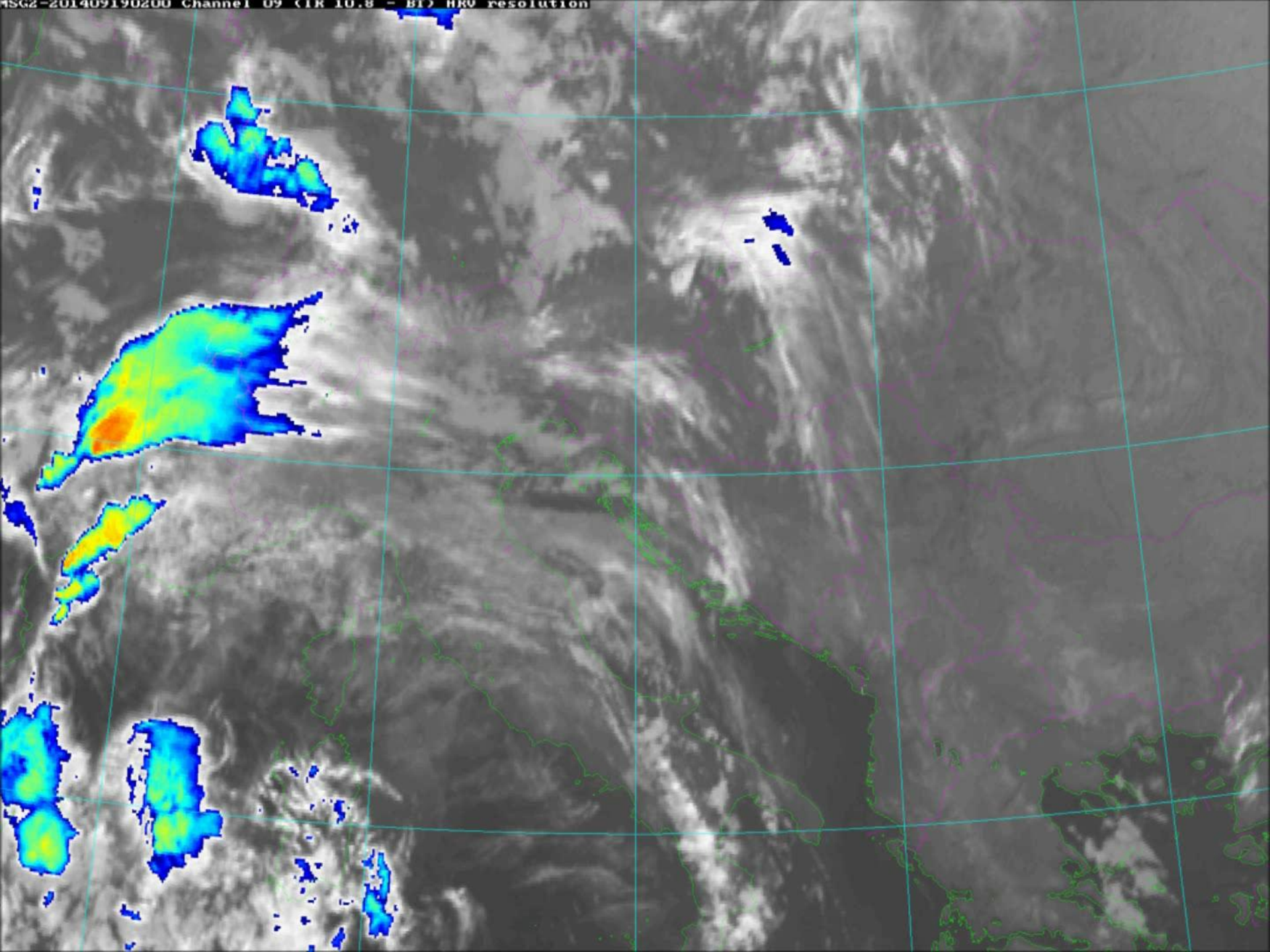
Detectable only in **enhanced IR10.8** satellite images!










MSG2-20140919020U Channel 09 (IR 10.8 - BT) HRV resolution

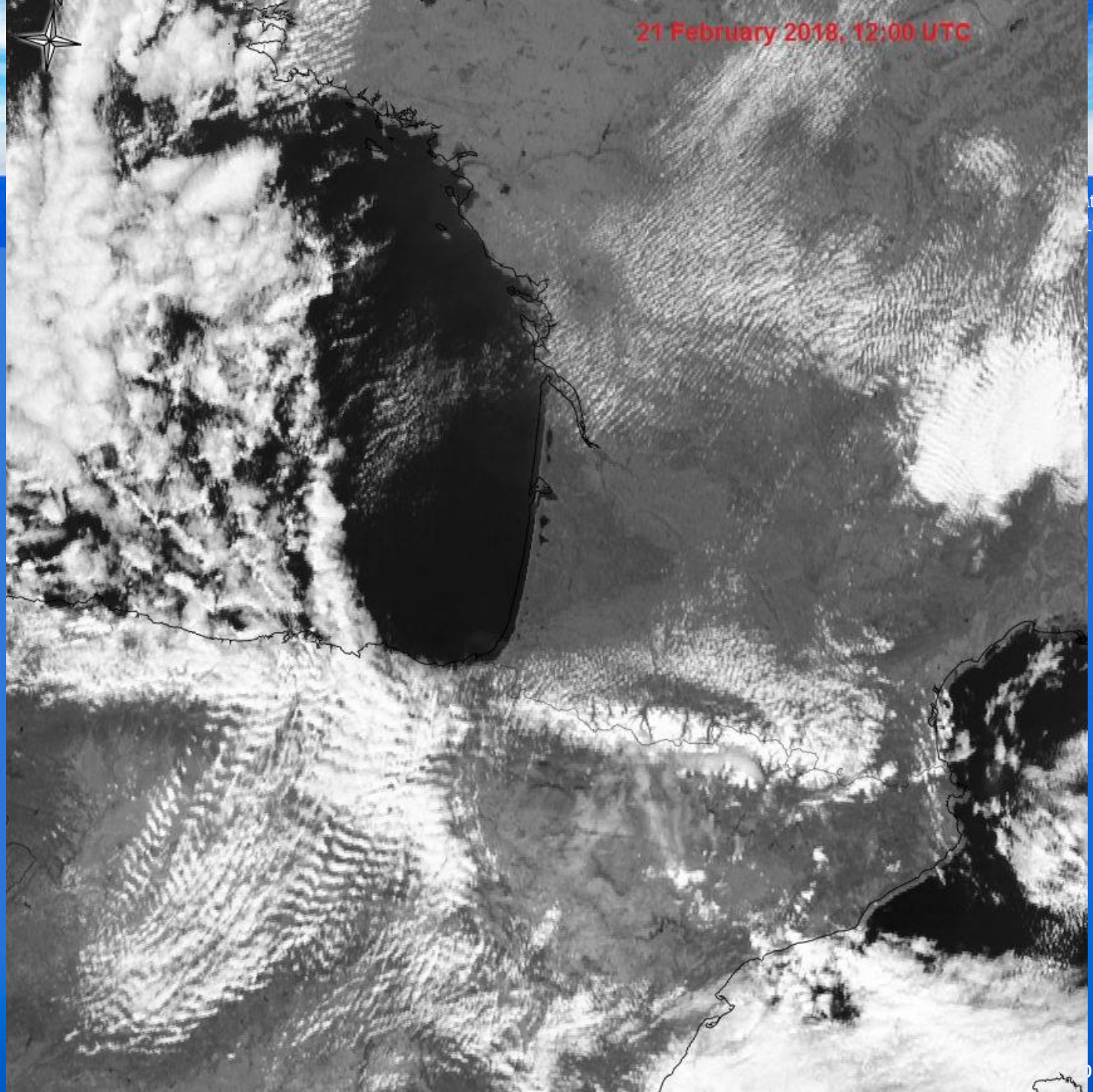
Some characteristics of thermal features

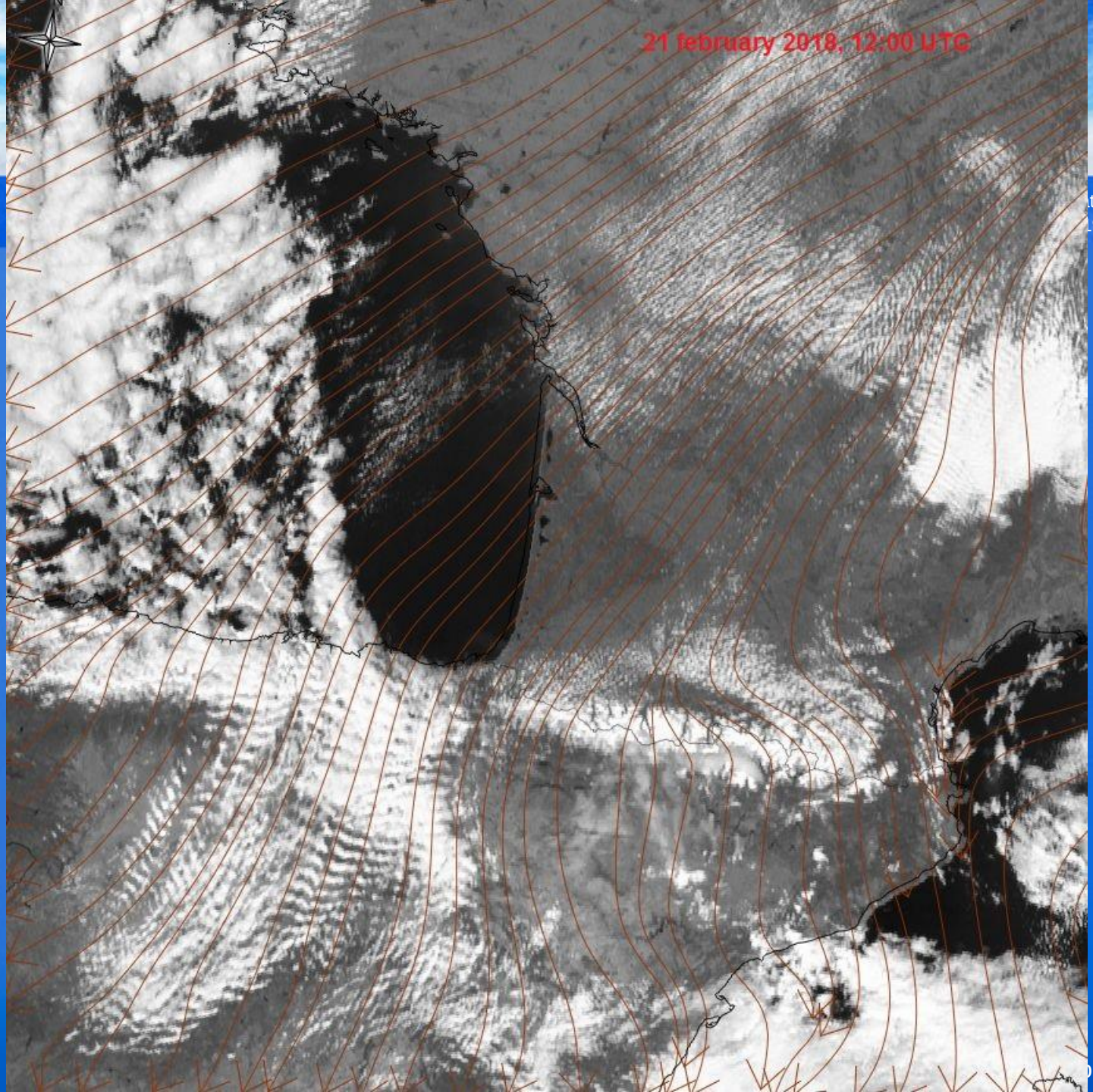
- As the overshooting tops ascend above the cloud-top equilibrium level of the storm, they keep cooling down (by about **0.6 - 0.8 K** per 100 meters), until they loose their energy - which can be up to about **2 - 2.5 km** above the surrounding anvil top.
- Depending on the satellite pixel resolution, OT can be colder by about 15-20 K than the surrounding anvil.
- The typical lifetime of the overshooting tops ranges from about 5 to 20 minutes.
- Short lived features (5 – 20 min) can form downwind of any OT and are no indication for severe weather.
- During lifetime the transition from cold **ring** to cold **U/V** shaped storms can be observed, but ***not*** the opposite way.

Detection of Lee Waves in Satellite Images

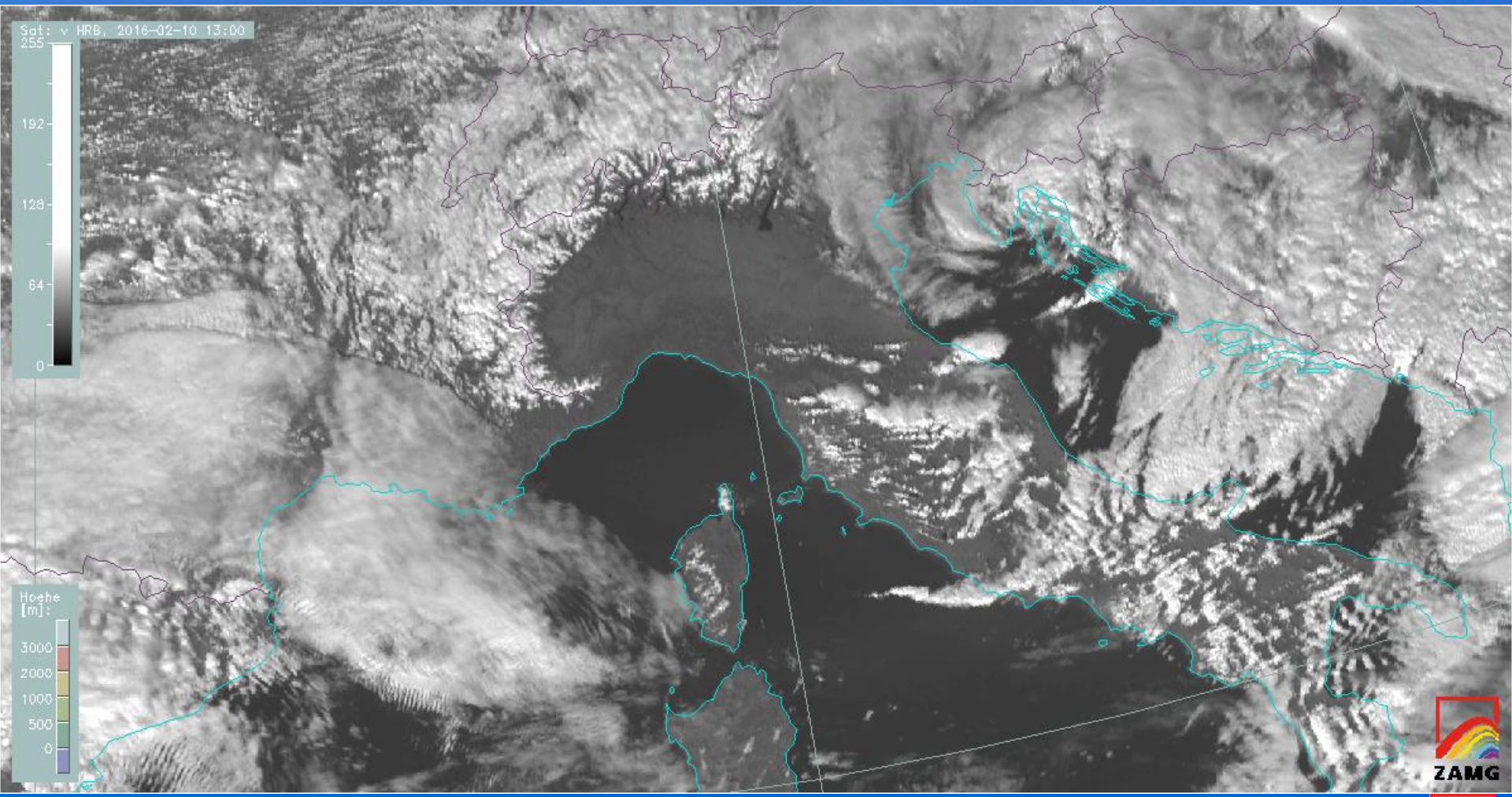
Prerequisites for the formation of lee waves:

- A stable atmosphere
- Wind > 8 m/s at the mountain crest
- An obstacle in the wind flow
- Wind direction within 30° perpendicular to the mountain ridge
- No significant change of the wind direction above the mountain


21 February 2018, 12:00 UTC


21 february 2018, 12:00 UTC

HRV versus WV6.2 µm image



HRV versus WV6.2 µm image