MESO-NH FORECASTS DURING COPS: PRELIMINARY RESULTS

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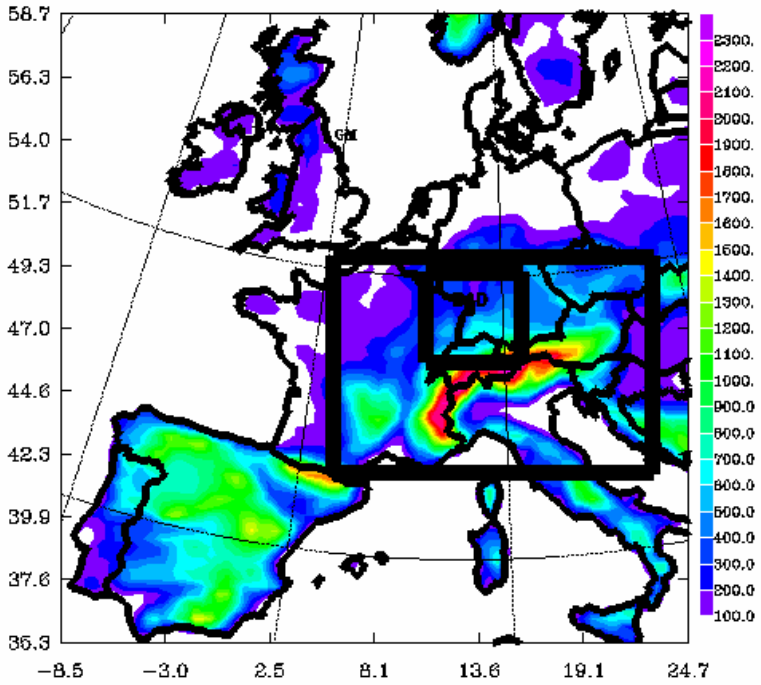
Meso-NH Forecasts
http://mesonh.aero.obs-mip.fr/mesonh/cops/

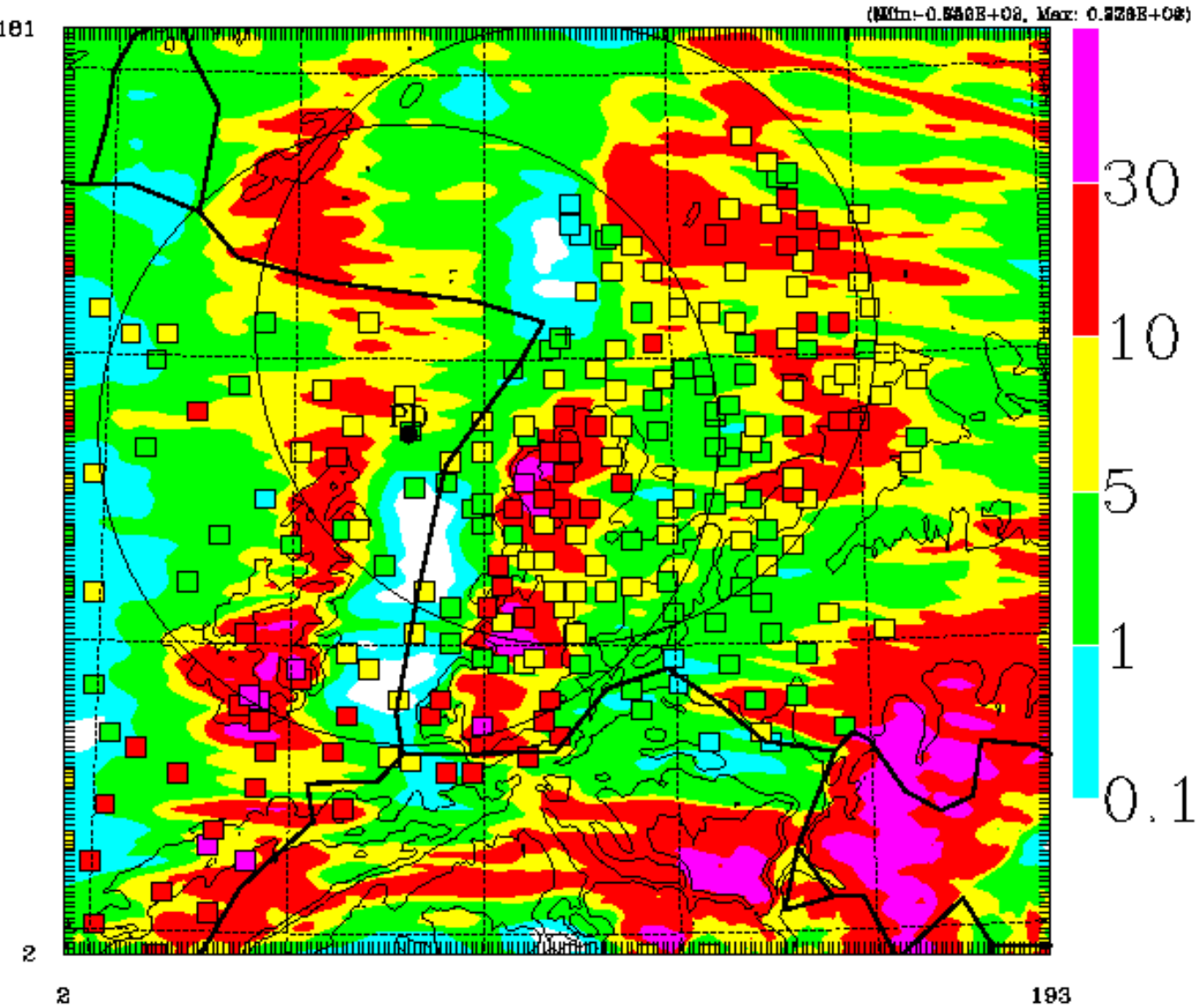


• 3 domains (32, 8, and 2 km) with 2-way interaction.
•Vertical grid with 50 levels up to 20 km with a grid length varying from 60 m to 600 m.
• Initial and coupling fields with ECMWF operational forecasts
• 30 h forecast starting at 00 UTC
• Parameterization schemes:
    o 1.5-order turbulence scheme
    o ECMWF radiation package
    o ISBA surface scheme
    o Mixed-phase bulk microphysics: cloud, rain, ice, snow, graupel, and hail (hail is simulated for the inner model only)
    o Deep and shallow convection scheme for the 32 and 8 km models only

Outline

- Basic model evaluation
  - Raingauges precipitation measurements
  - Meteosat IR observations
- An example of an isolated thunderstorm forecast
  - 15 July

24h precipitation (P30h – P06h): 04 July 2007 (J185)

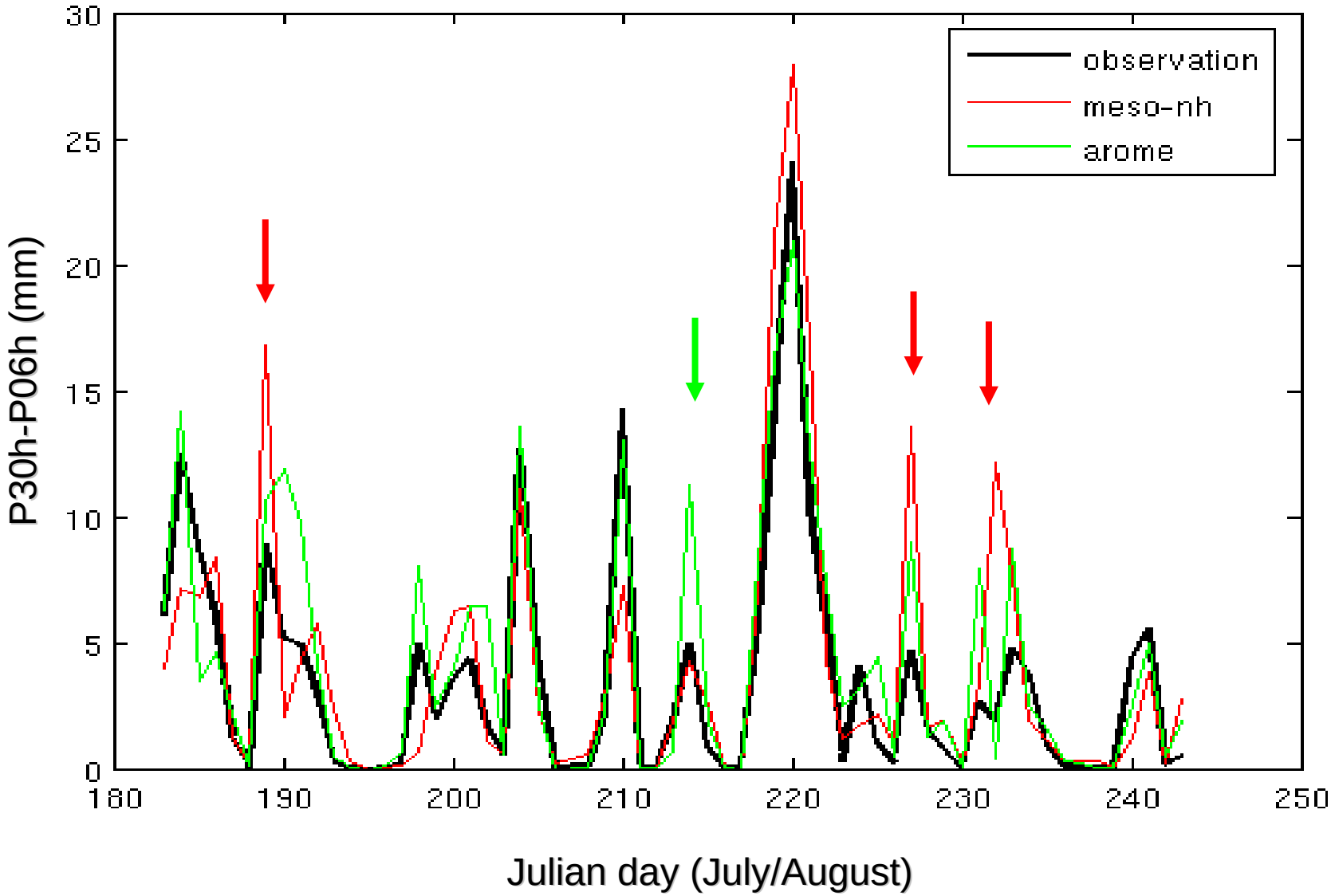


Precip evaluation :

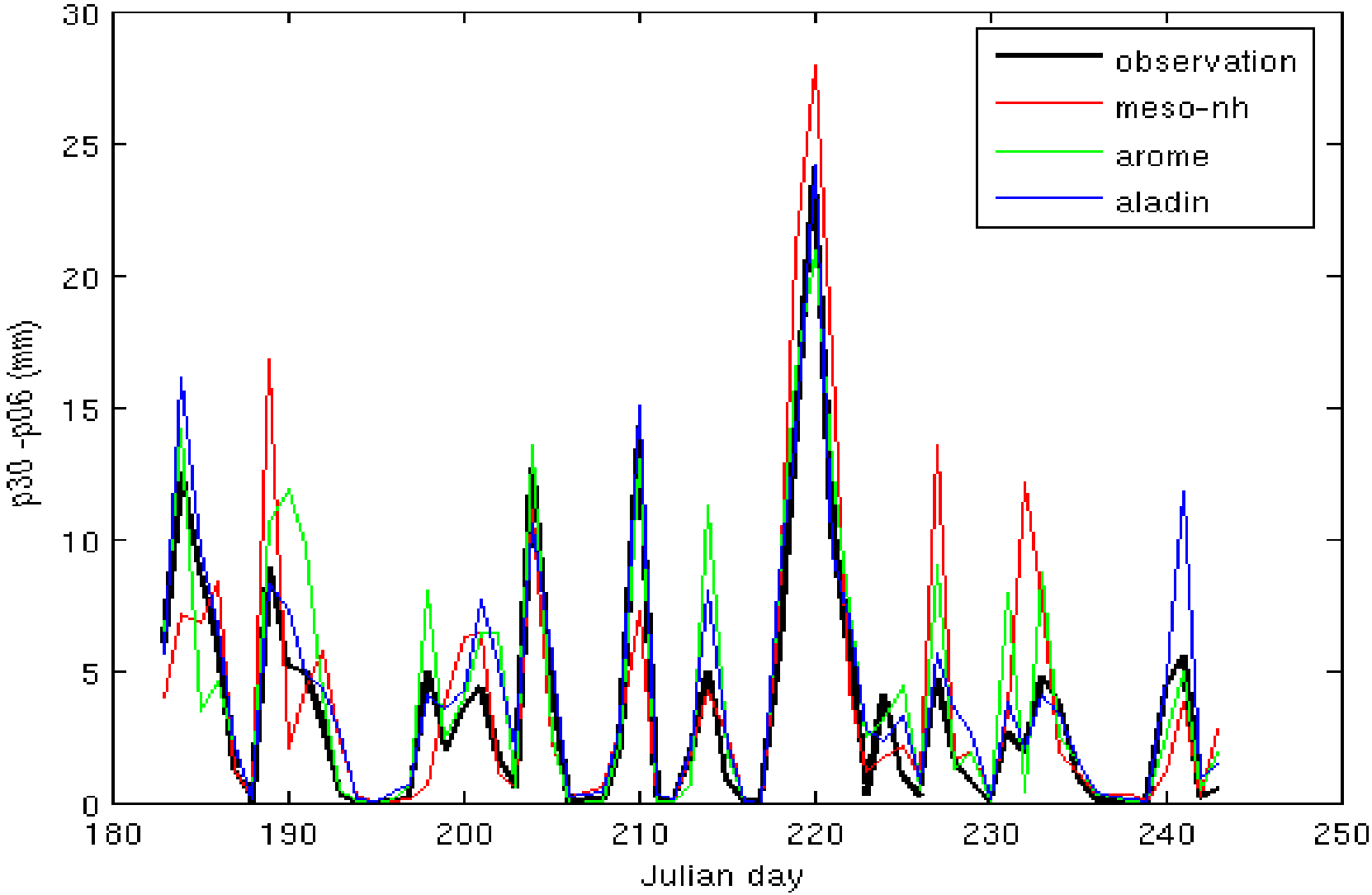
- BW stations
- MF automatic stations
- Model fields interpolated at rain gauge location

Thanks to M. Kunz and P. Limnaios

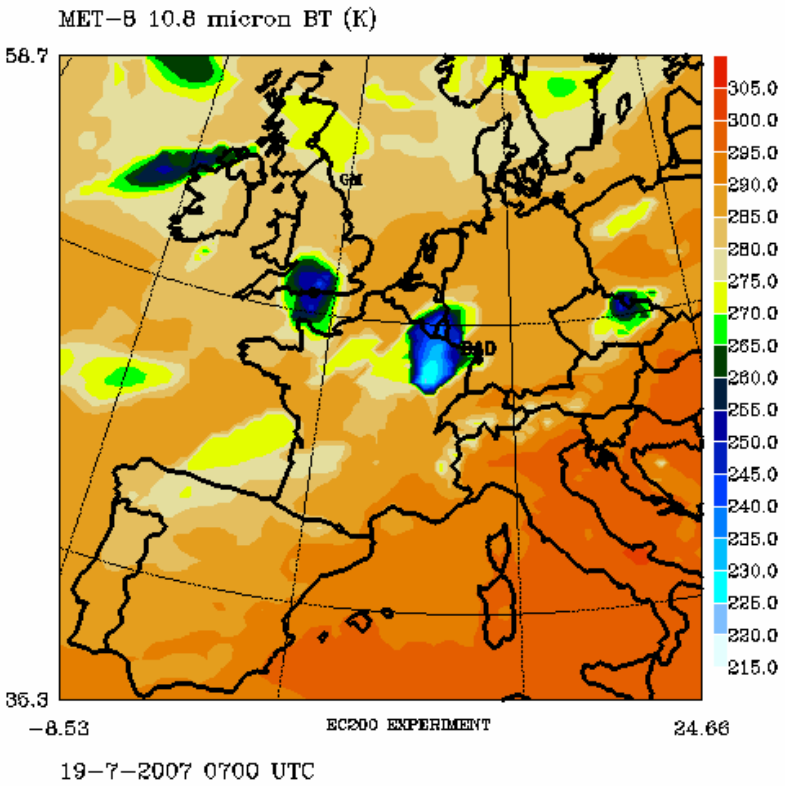
Time evolution of the spatially averaged 24h precip.

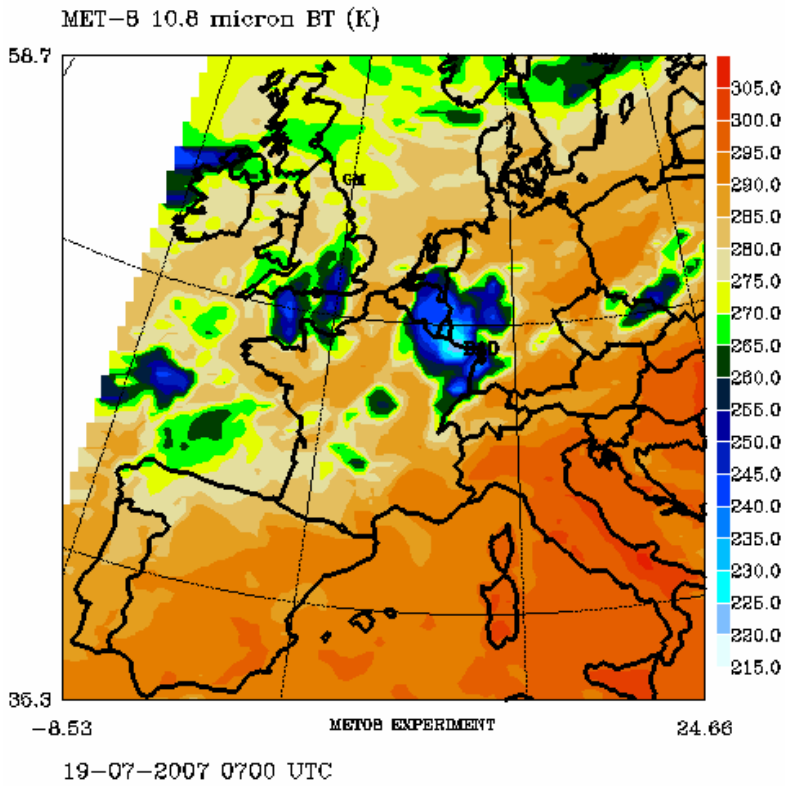


Time evolution of the spatially averaged 24h precip.



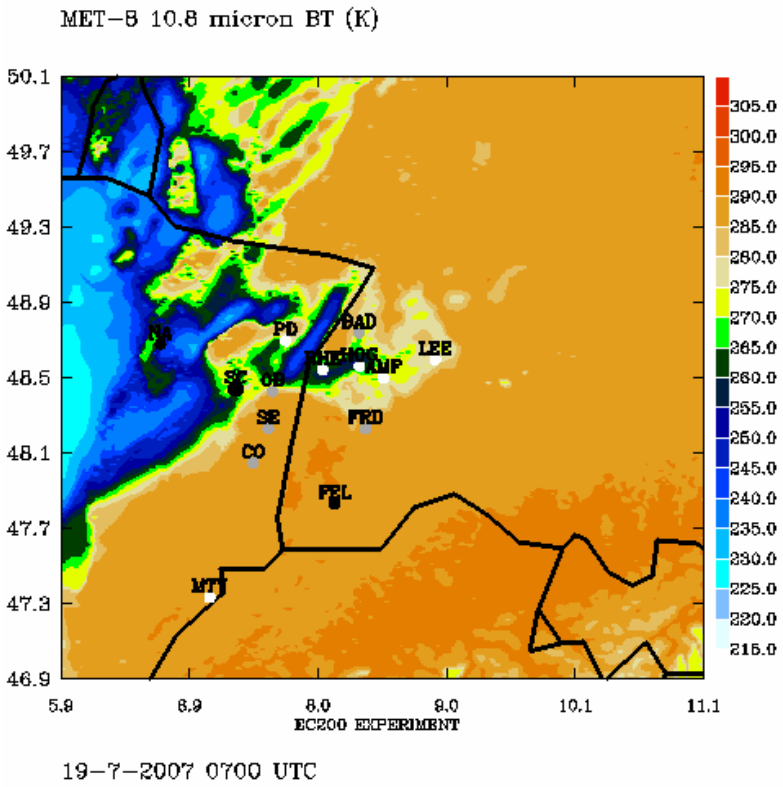
Model to Satellite approach: Objective evaluation of METEOSAT brightness temperatures

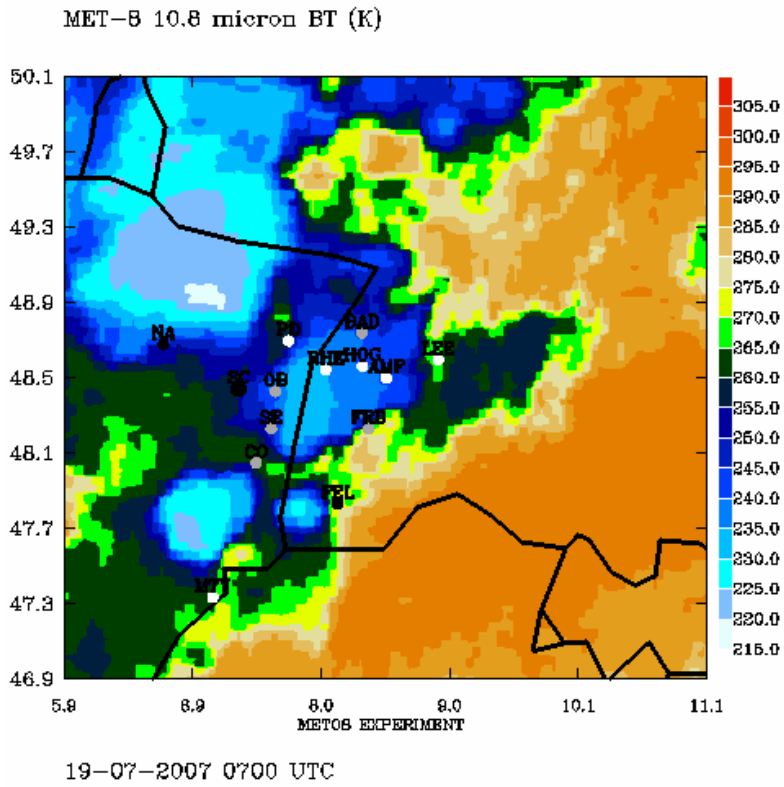




32km domain - 29 July 2007

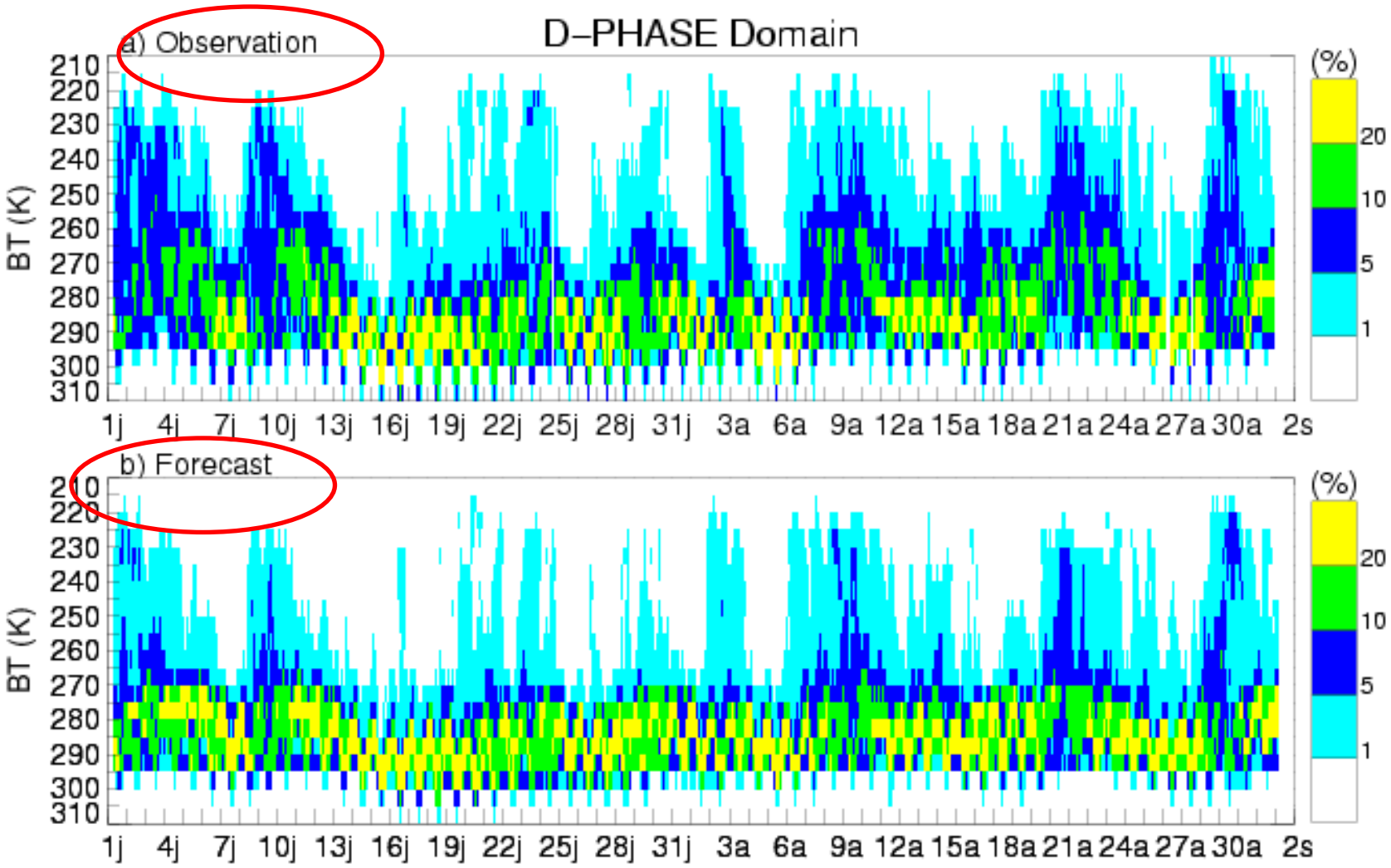
Model to Satellite approach: Objective evaluation of METEOSAT brightness temperatures





2km domain - 29 July 2007

Frequency diagramm

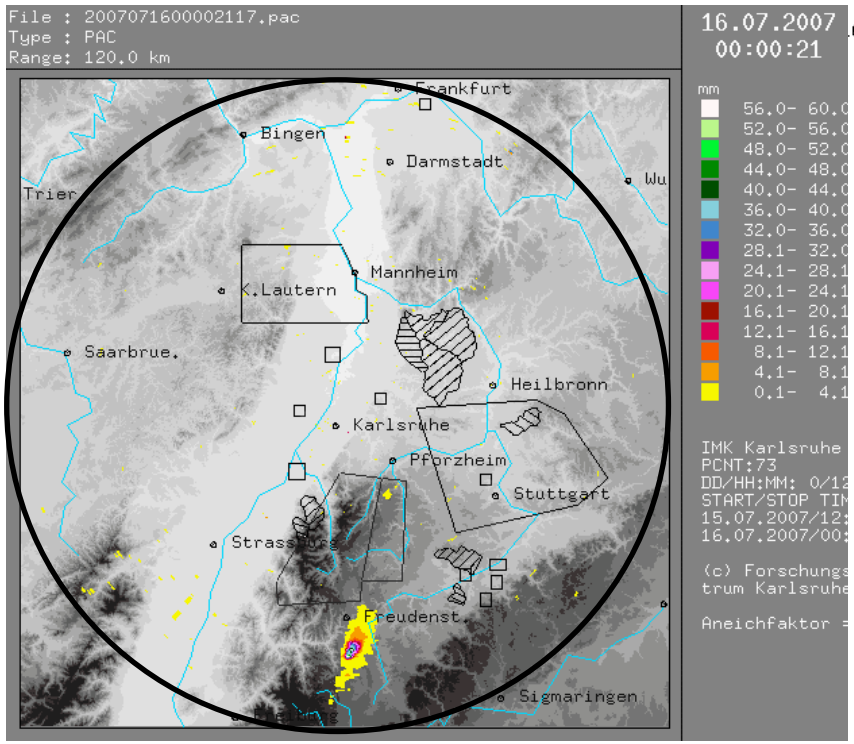


(8km domain)

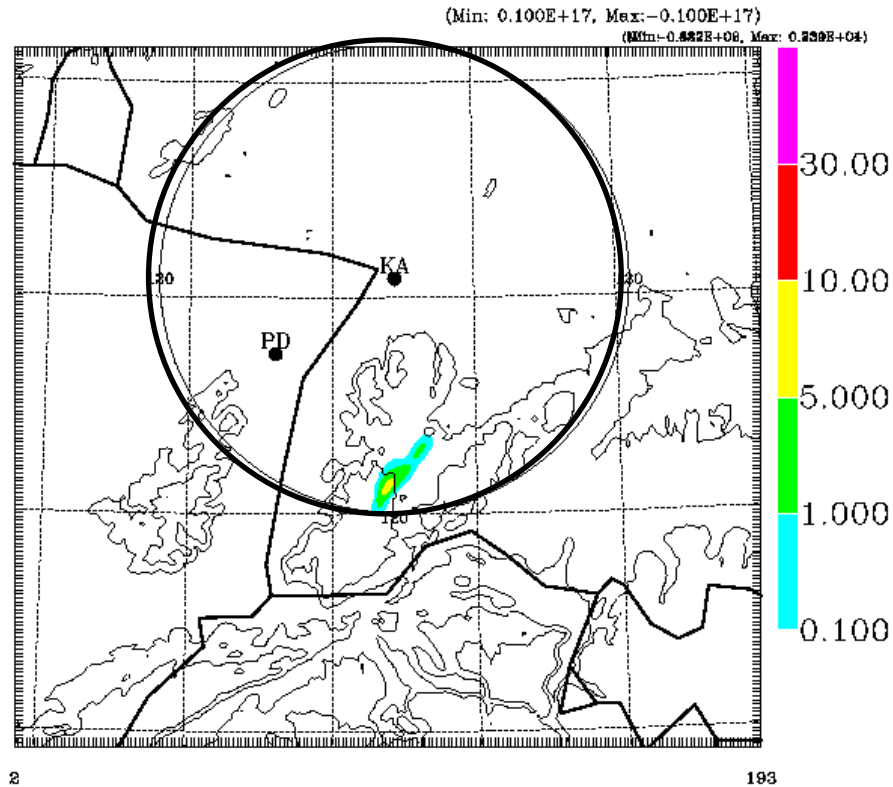
A surprisingly good forecast : 15 July 2007

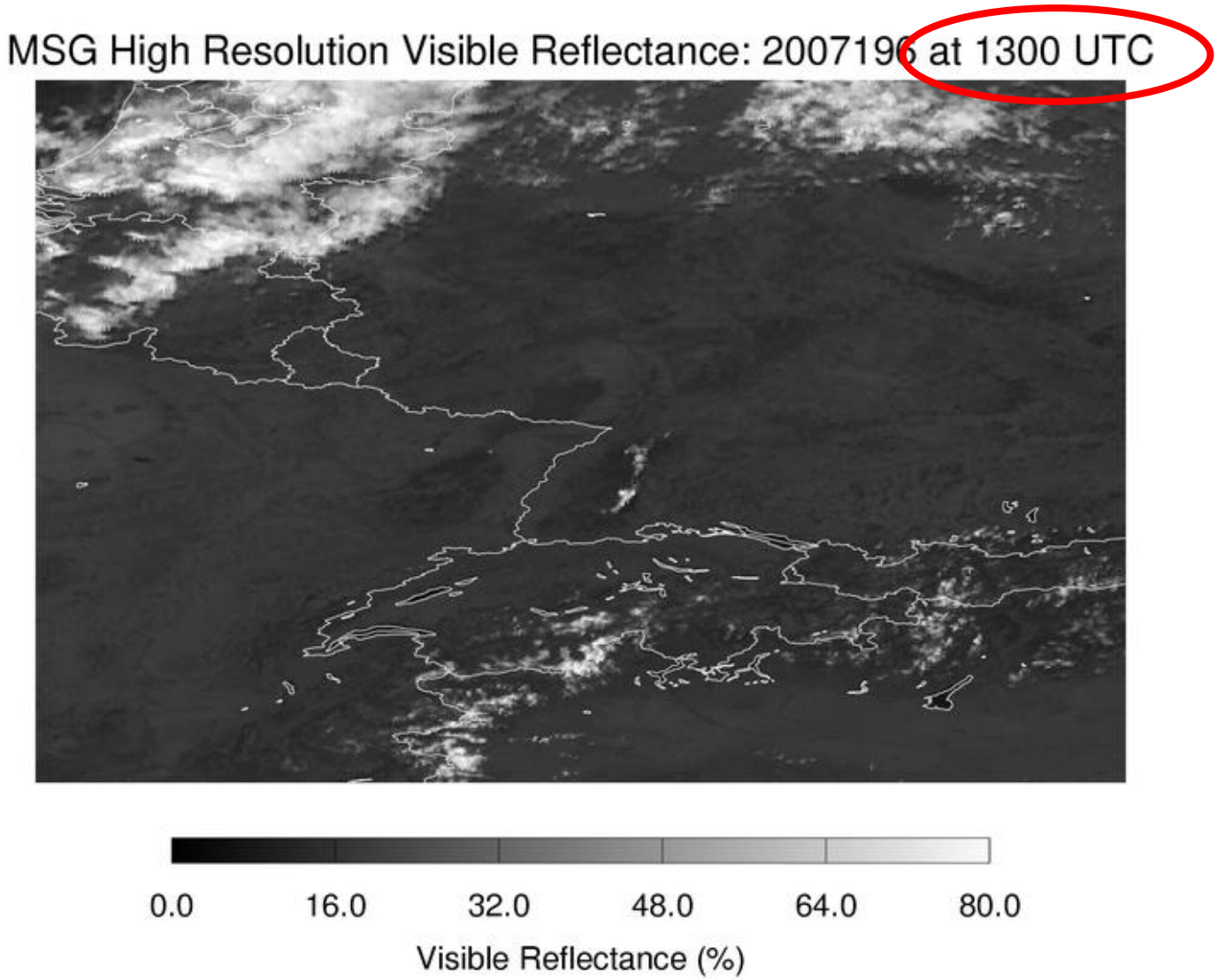
Accumulated precip from 12 UTC to 24 UTC

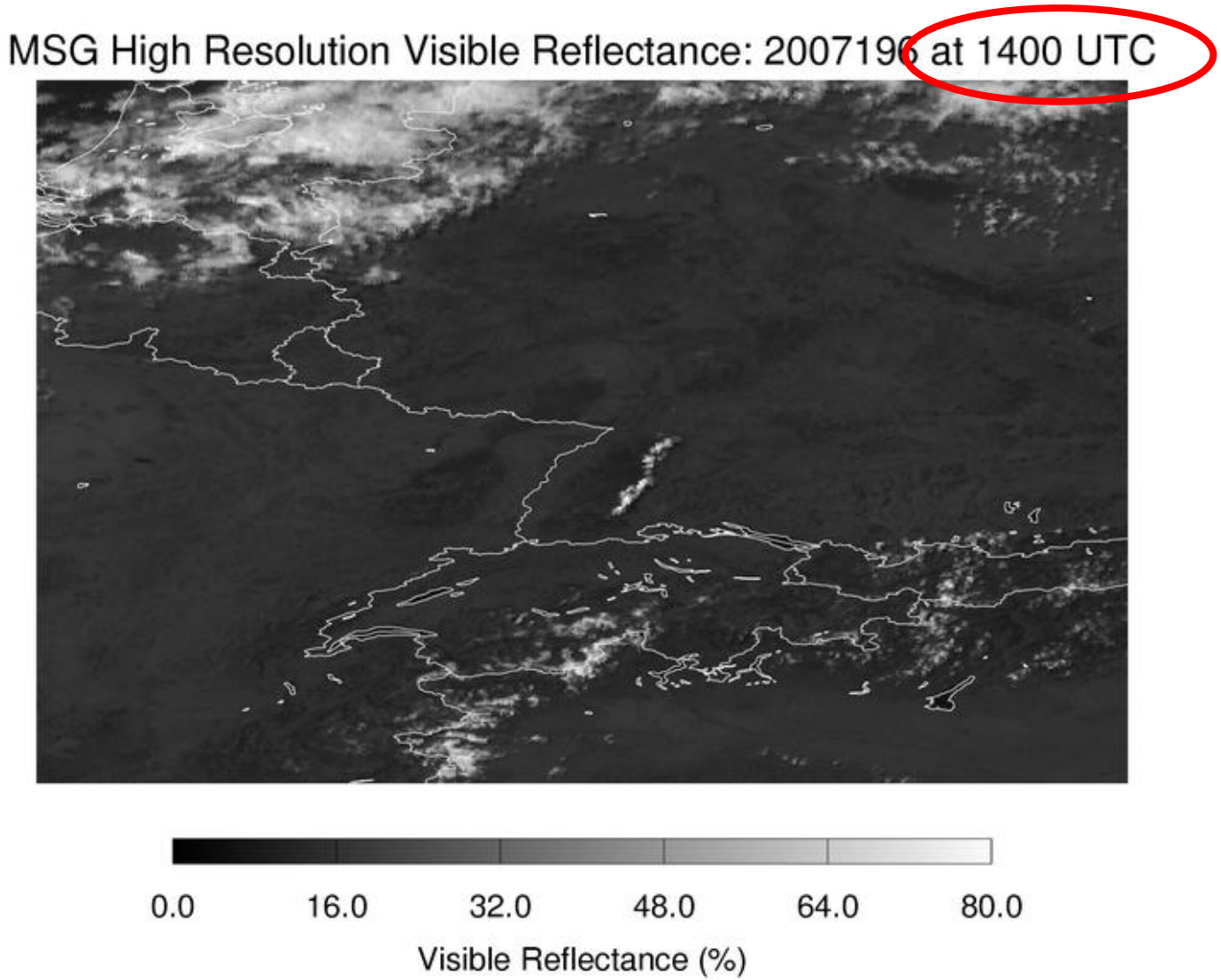
Karlsruhe radar



Meso-NH forecast




MSG High Resolution Visible Reflectance: 2007196 at 1300 UTC
0.0
16.0
32.0
48.0
64.0
80.0
Visible Reflectance (%)


MSG High Resolution Visible Reflectance: 2007196 at 1400 UTC
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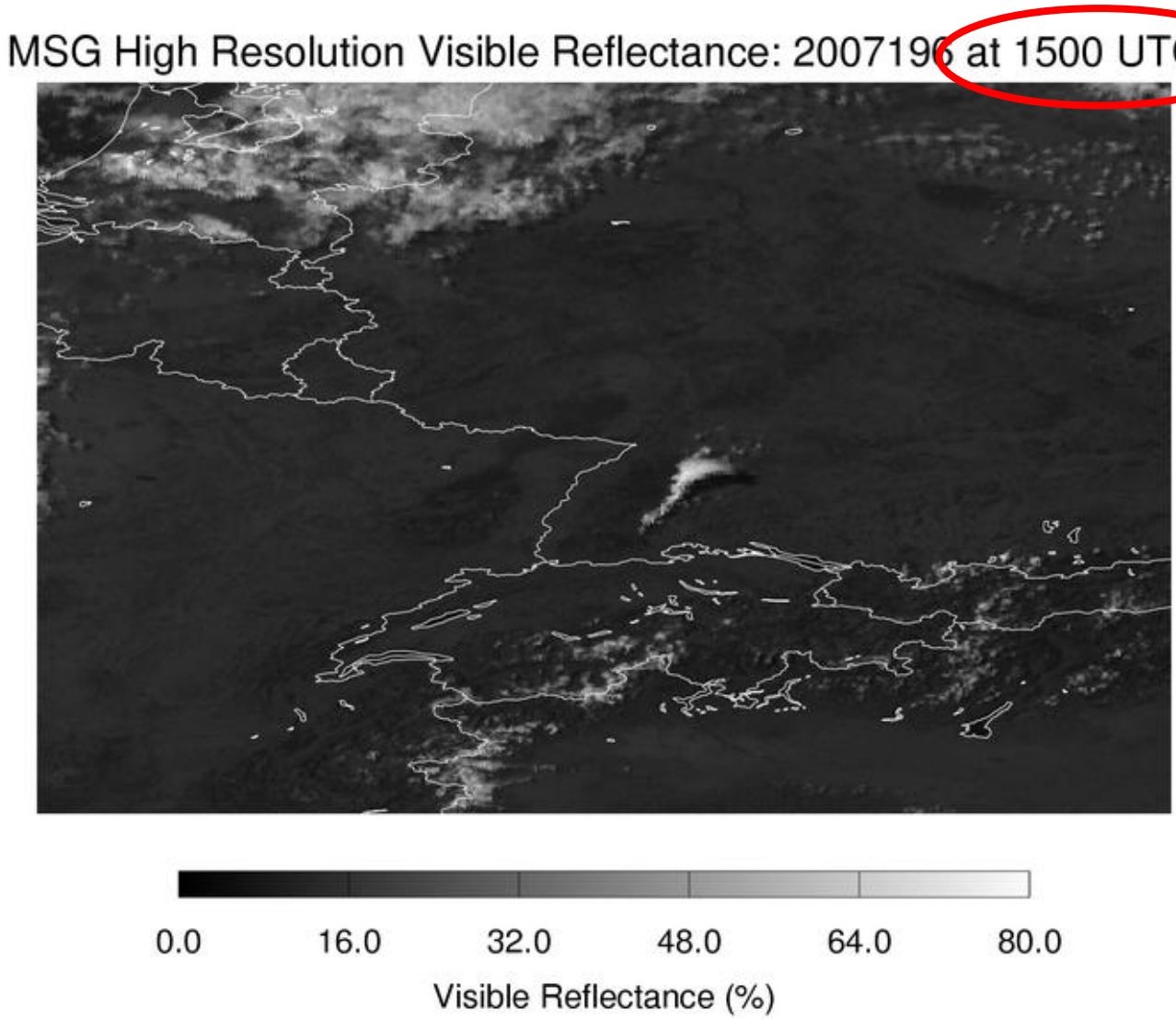
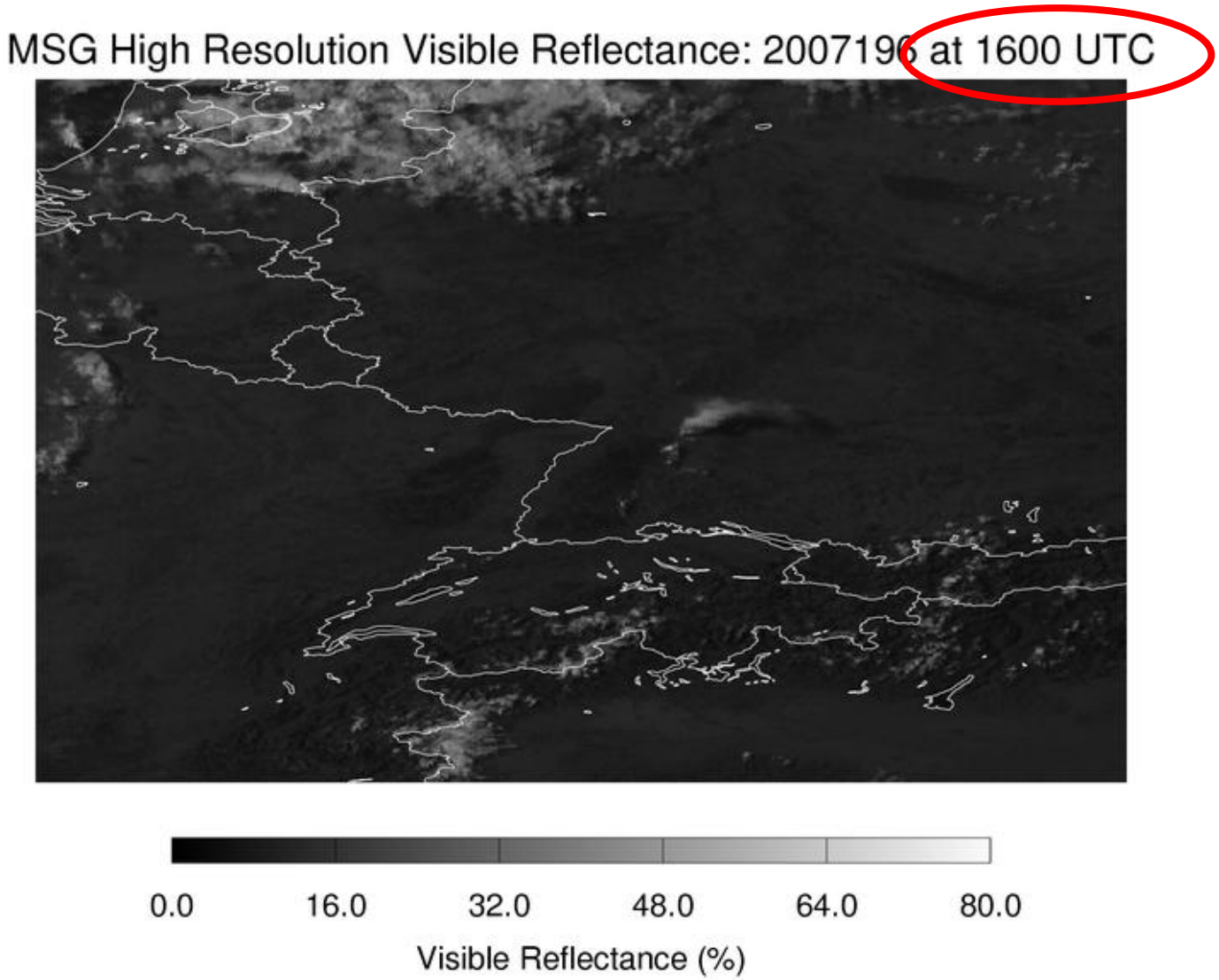
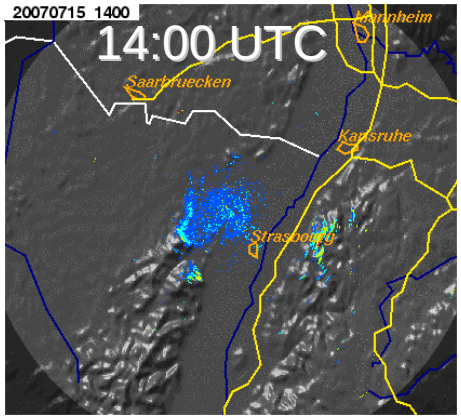
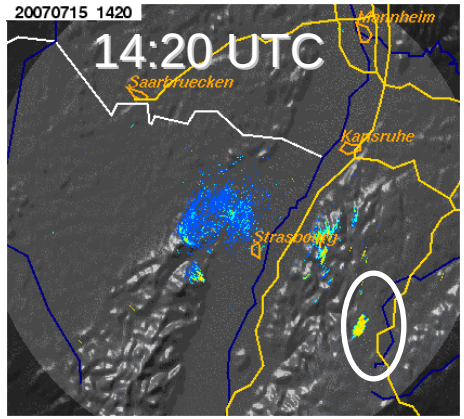
16.0
32.0
48.0
64.0
80.0
Visible Reflectance (%)

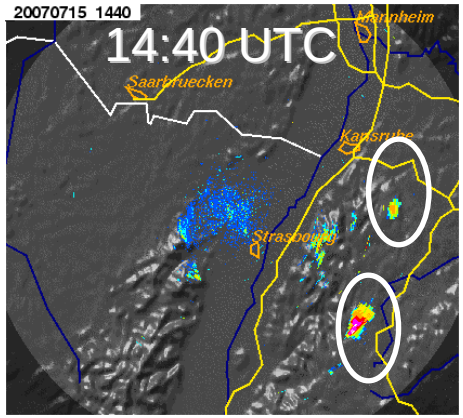

MSG High Resolution Visible Reflectance: 2007196 at 1500 UTC
0.0
16.0
32.0
48.0
64.0
80.0
Visible Reflectance (%)

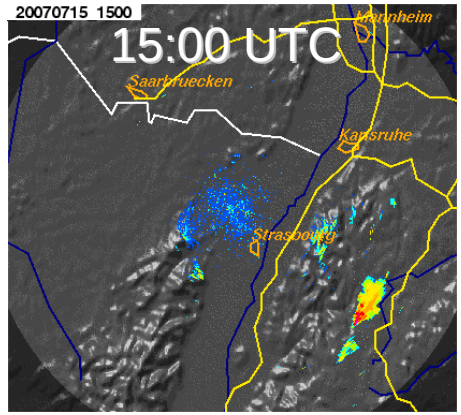

MSG High Resolution Visible Reflectance: 2007196 at 1600 UTC
0.0
16.0
32.0
48.0
64.0
80.0
Visible Reflectance (%)

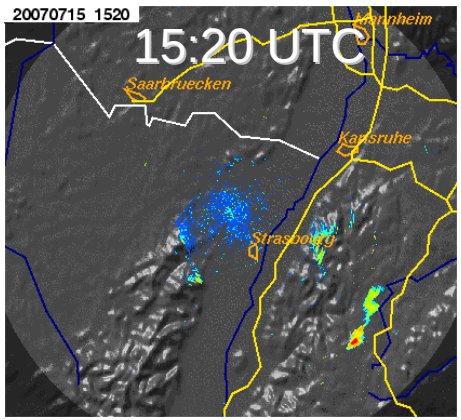
DLR Poldirad at Waltenheim sur Zorn

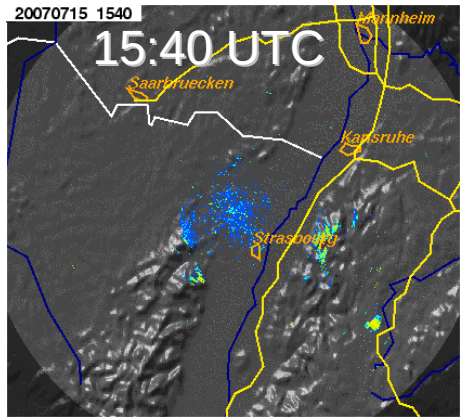


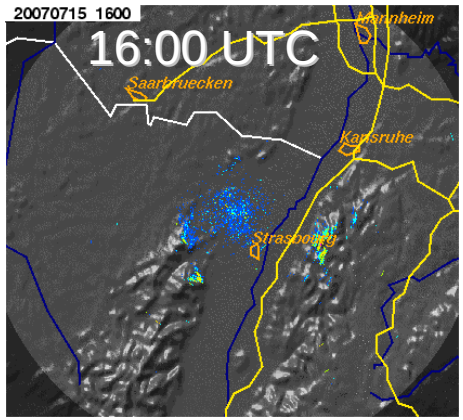




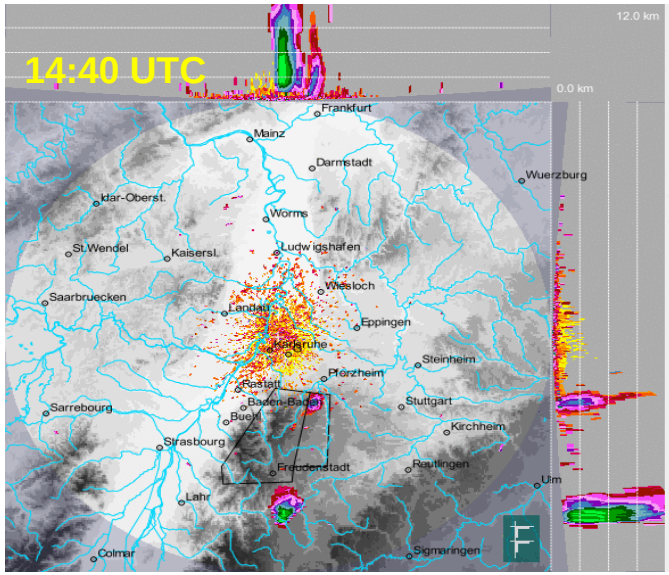


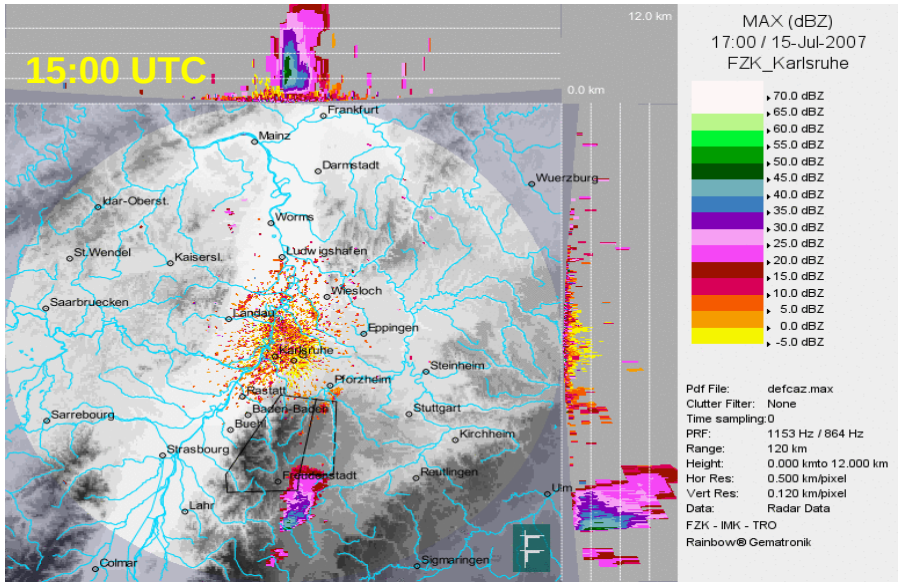






FZK radar


14:40 UTC
12.0 km
0.0 km
Frankfurt
Mainz
Darmstadt
Wuerzburg
Worms
Ludwigshafen
Wiesloch
Landau
Karlsruhe
Eppingen
Steinheim
Pforzheim
Rastatt
Baden-Baden
Buehl
Stuttgart
Kirchheim
Strasbourg
Freudenstadt
Reutlingen
Ulm
Lahr
Colmar
Sigmaringen
Saarbruecken
Sarrebourg
St.Wendel
Kaisersl.
Klar-Oberst.
MAX (dBZ)
16:40 / 15-Jul-2007
FZK_Karlsruhe
70.0 dBZ
65.0 dBZ
60.0 dBZ
55.0 dBZ
50.0 dBZ
45.0 dBZ
40.0 dBZ
35.0 dBZ
30.0 dBZ
25.0 dBZ
20.0 dBZ
15.0 dBZ
10.0 dBZ
5.0 dBZ
0.0 dBZ
-5.0 dBZ
Pdf File: defcaz.max
Clutter Filter: None
Time sampling:0
PRF: 1153 Hz / 864 Hz
Range: 120 km
Height: 0.000 kmto 12.000 km
Hor Res: 0.500 km/pixel
Vert Res: 0.120 km/pixel
Data: Radar Data
FZK - IMK - TRO
Rainbow® Gematronik


15:00 UTC
12.0 km
0.0 km
Frankfurt
Mainz
Darmstadt
Wuerzburg
Worms
Ludwigshafen
Wiesloch
Landau
Karlsruhe
Eppingen
Steinheim
Pforzheim
Rastatt
Baden-Baden
Buehl
Stuttgart
Kirchheim
Strasbourg
Freudenstadt
Reutlingen
Ulm
Lahr
Colmar
Sigmaringen
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MAX (dBZ)
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FZK_Karlsruhe
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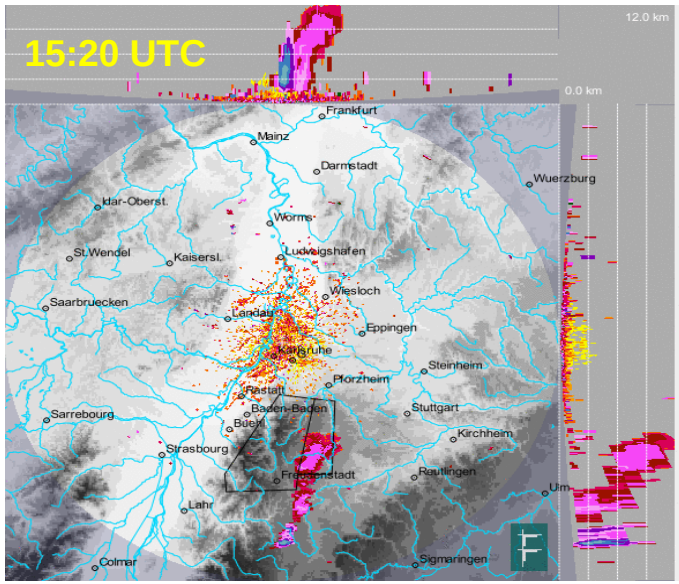
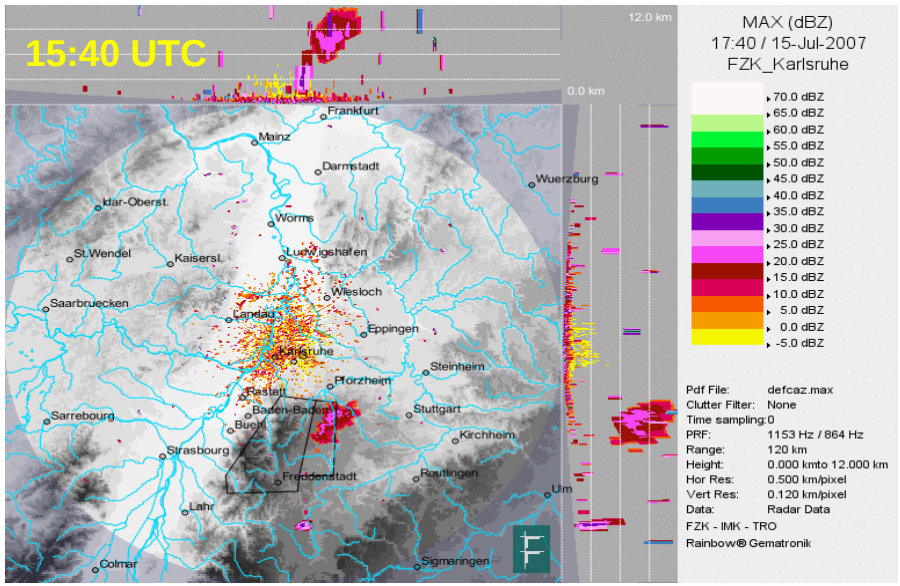
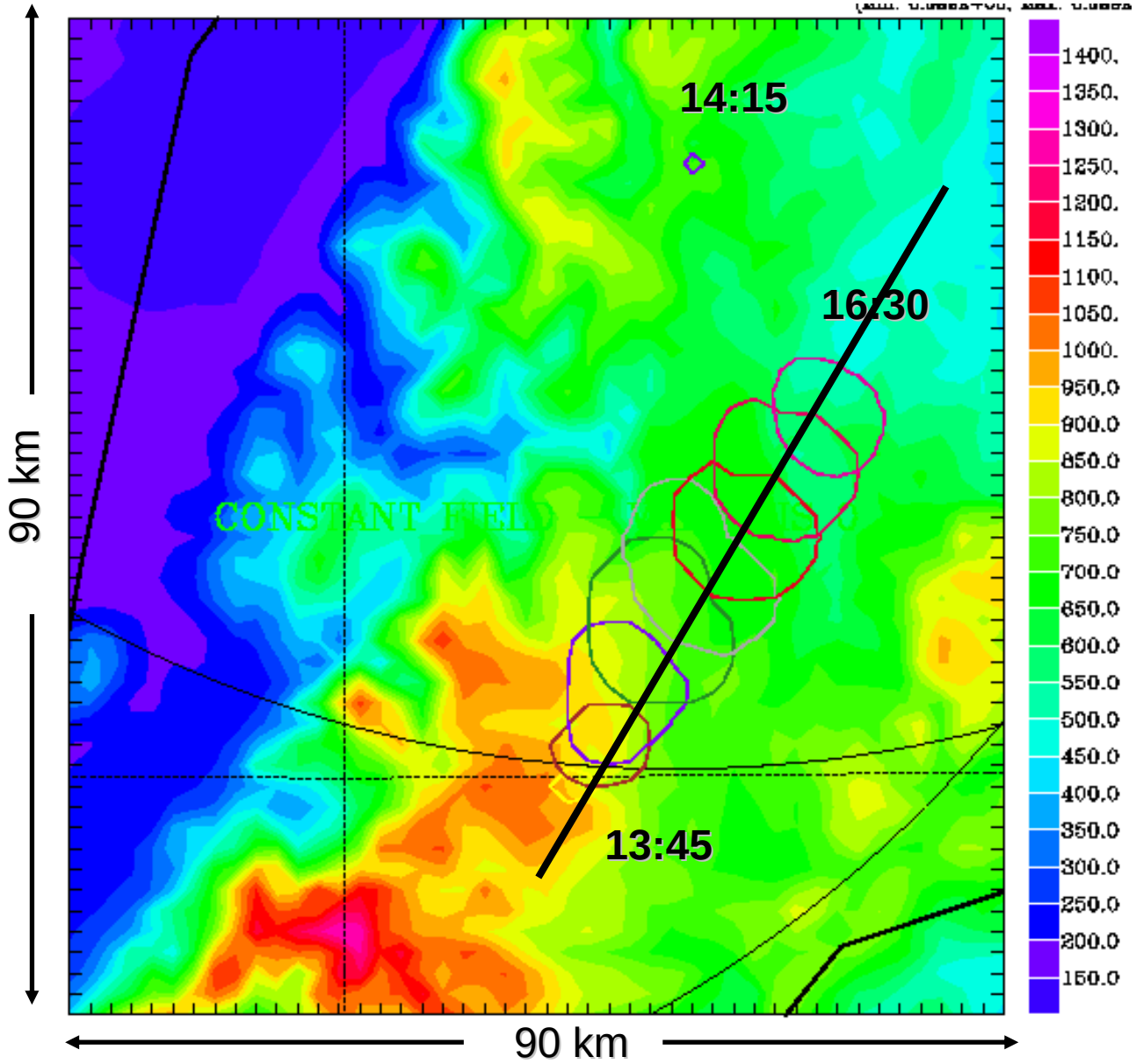
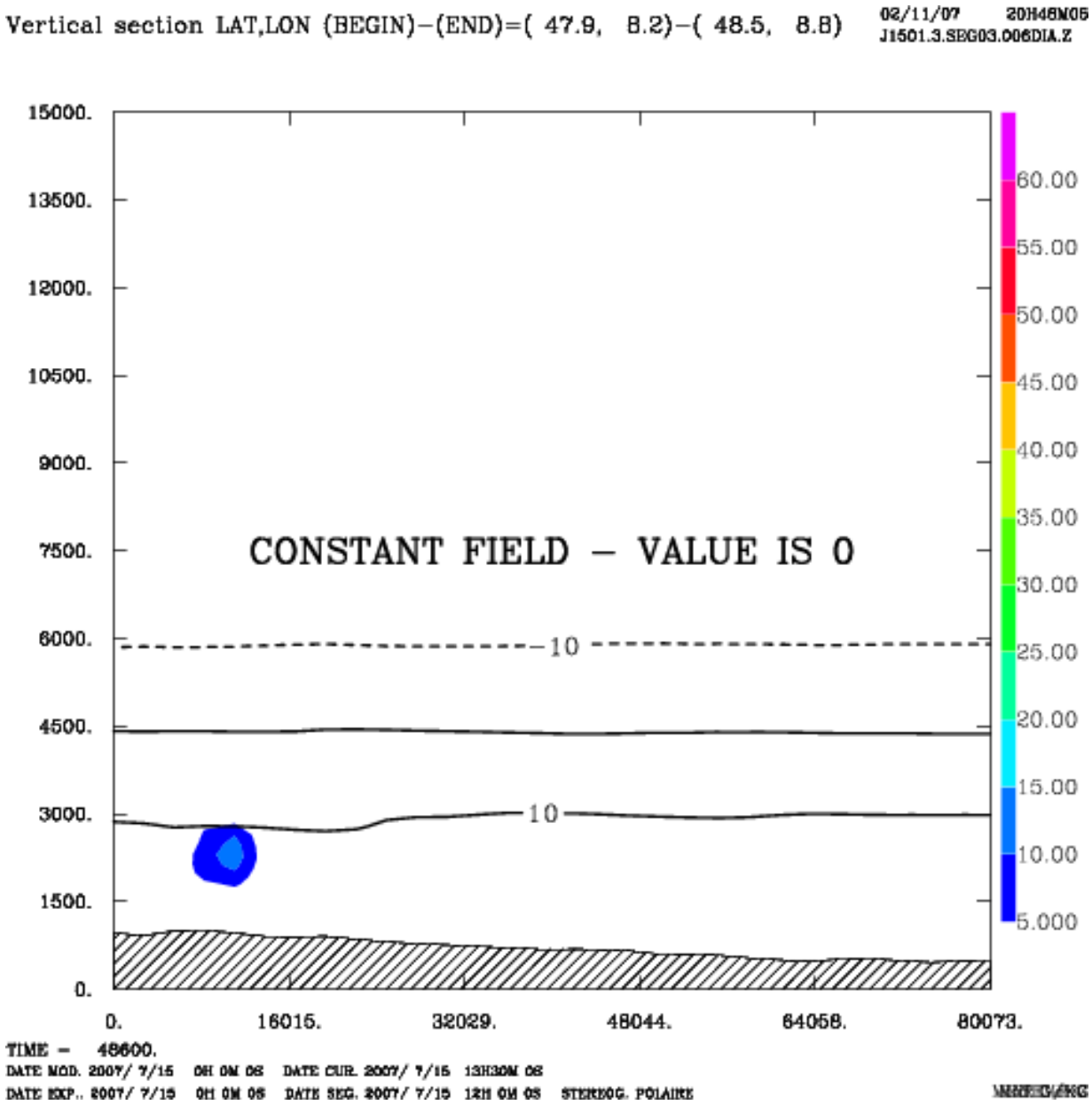
55.0 dBZ
50.0 dBZ
45.0 dBZ
40.0 dBZ
35.0 dBZ
30.0 dBZ
25.0 dBZ
20.0 dBZ
15.0 dBZ
10.0 dBZ
5.0 dBZ
0.0 dBZ
-5.0 dBZ
Pdf File: defcaz.max
Clutter Filter: None
Time sampling:0
PRF: 1153 Hz / 864 Hz
Range: 120 km
Height: 0.000 kmto 12.000 km
Hor Res: 0.500 km/pixel
Vert Res: 0.120 km/pixel
Data: Radar Data
FZK - IMK - TRO
Rainbow® Gematronik


15:20 UTC
12.0 km
0.0 km
Frankfurt
Mainz
Darmstadt
Wuerzburg
Worms
Ludwigshafen
Wiesloch
Landau
Karlsruhe
Eppingen
Steinheim
Pforzheim
Rastatt
Baden-Baden
Buehl
Stuttgart
Kirchheim
Strasbourg
Freudenstadt
Reutlingen
Ulm
Lahr
Colmar
Sigmaringen
Saarbruecken
Sarrebourg
St.Wendel
Kaisersl.
Klar-Oberst.
MAX (dBZ)
17:20 / 15-Jul-2007
FZK_Karlsruhe
70.0 dBZ
65.0 dBZ
60.0 dBZ
55.0 dBZ
50.0 dBZ
45.0 dBZ
40.0 dBZ
35.0 dBZ
30.0 dBZ
25.0 dBZ
20.0 dBZ
15.0 dBZ
10.0 dBZ
5.0 dBZ
0.0 dBZ
-5.0 dBZ
Pdf File: defcaz.max
Clutter Filter: None
Time sampling:0
PRF: 1153 Hz / 864 Hz
Range: 120 km
Height: 0.000 kmto 12.000 km
Hor Res: 0.500 km/pixel
Vert Res: 0.120 km/pixel
Data: Radar Data
FZK - IMK - TRO
Rainbow® Gematronik

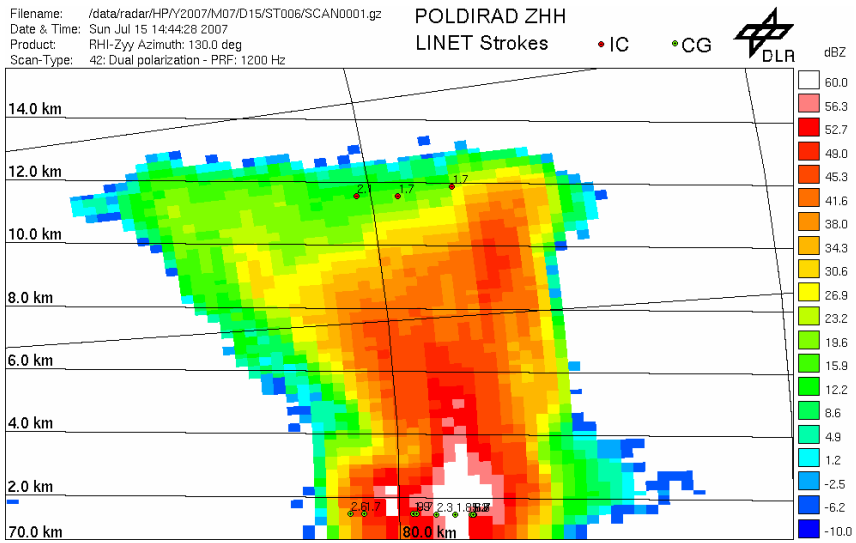

15:40 UTC
12.0 km
0.0 km
Frankfurt
Mainz
Darmstadt
Wuerzburg
Worms
Ludwigshafen
Wiesloch
Landau
Karlsruhe
Eppingen
Steinheim
Pforzheim
Rastatt
Baden-Baden
Buehl
Stuttgart
Kirchheim
Strasbourg
Freudenstadt
Reutlingen
Ulm
Lahr
Colmar
Sigmaringen
Saarbruecken
Sarrebourg
St.Wendel
Kaisersl.
Klar-Oberst.
MAX (dBZ)
17:40 / 15-Jul-2007
FZK_Karlsruhe
70.0 dBZ
65.0 dBZ
60.0 dBZ
55.0 dBZ
50.0 dBZ
45.0 dBZ
40.0 dBZ
35.0 dBZ
30.0 dBZ
25.0 dBZ
20.0 dBZ
15.0 dBZ
10.0 dBZ
5.0 dBZ
0.0 dBZ
-5.0 dBZ
Pdf File: defcaz.max
Clutter Filter: None
Time sampling:0
PRF: 1153 Hz / 864 Hz
Range: 120 km
Height: 0.000 kmto 12.000 km
Hor Res: 0.500 km/pixel
Vert Res: 0.120 km/pixel
Data: Radar Data
FZK - IMK - TRO
Rainbow® Gematronik

Time evolution of the 0.1mm precip. contour




Vertical section LAT,LON (BEGIN)-(END)=(47.9, 8.2)-(48.5, 8.8)
02/11/07 20H46M05
J1501.3.SEG03.006DIA.Z
15000.
13500.
12000.
10500.
9000.
7500.
6000.
4500.
3000.
1500.
0.
CONSTANT FIELD - VALUE IS 0
10
10
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.000
0.
16015.
32029.
48044.
64058.
80073.
TIME = 48600.
DATE MOD. 2007/ 7/15 0H 0M 0S DATE CUR. 2007/ 7/15 13H30M 0S
DATE EXP.. 2007/ 7/15 0H 0M 0S DATE SEG. 2007/ 7/15 12H 0M 0S STEREOG. POLAIRE

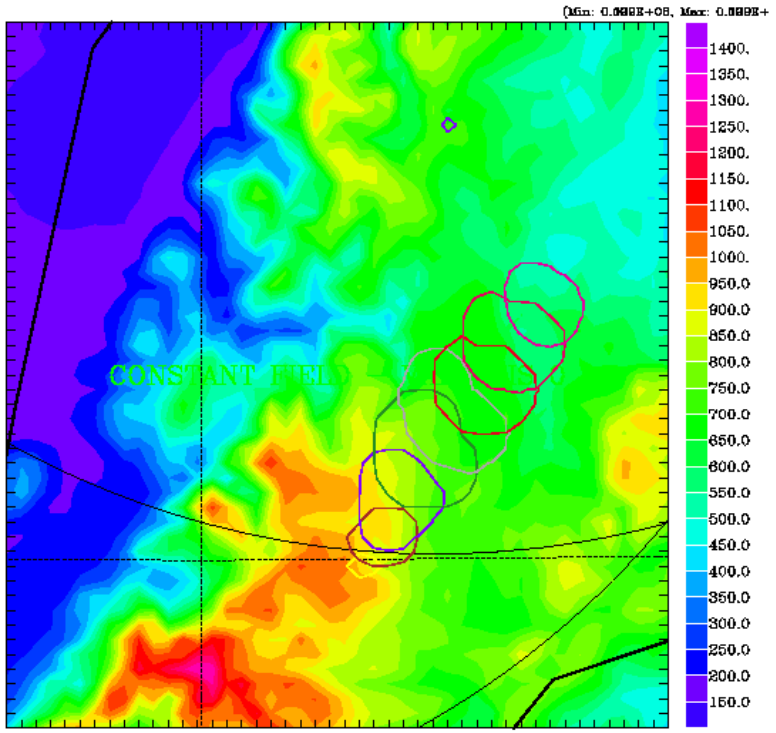
L’orage mono-cellulaire du 15 Juillet: Observations POLDIRAD



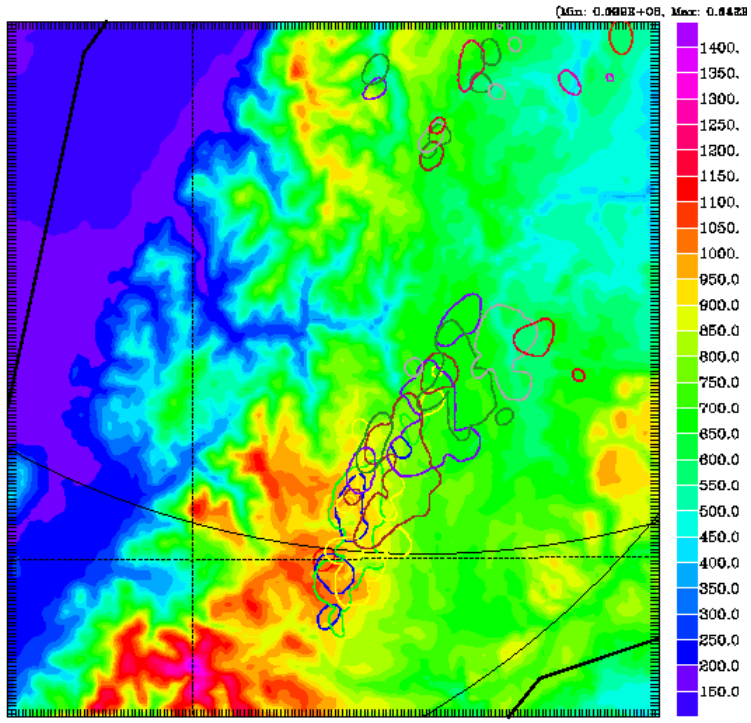
- **Reflectivity at 14.44 UTC and LINET cloud-to-ground (green) and intra-cloud (red) lightning during 10 min**
- **View of Isolated storm cell at 14.44 UTC as seen from POLDIRAD radar site**

M. Hagen, H. Höller (DLR)

Impact of horizontal resolution



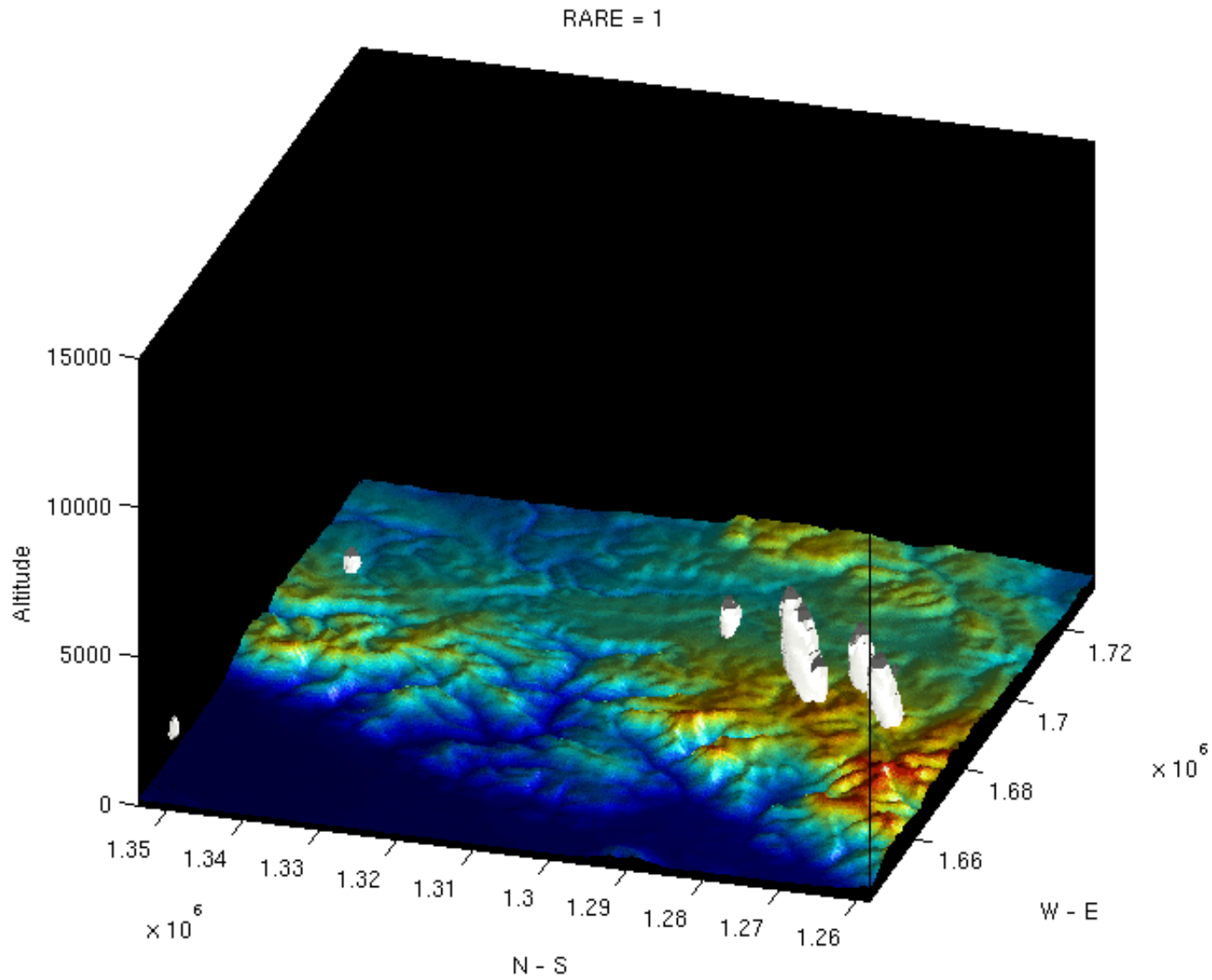
2 km resolution



500 m resolution

Preliminary conclusions

- All precipitation peaks well forecasted
- A trend to overestimation for Méso-NH
- Similar performance for AROME
- Not clear if ALADIN is outperformed
- A trend to underestimate high-level cloud
- …..
- An amazingly good forecast for an isolate storm


RARE = 1
15000
10000
5000
0
Altitude
1.35
1.34
1.33
1.32
1.31
1.3
1.29
1.28
1.27
1.26
x 10^6
N - S
1.72
1.7
1.68
1.66
x 10^6
W - E

Theta @ 1000m + Surface streamlines