



Cagliari
WG F Workshop „Flash Floods and Pluvial Flooding“
May 2010

STORM RAINFALL DETECTION AND FORECASTING – THE CZECH EXPERIENCE

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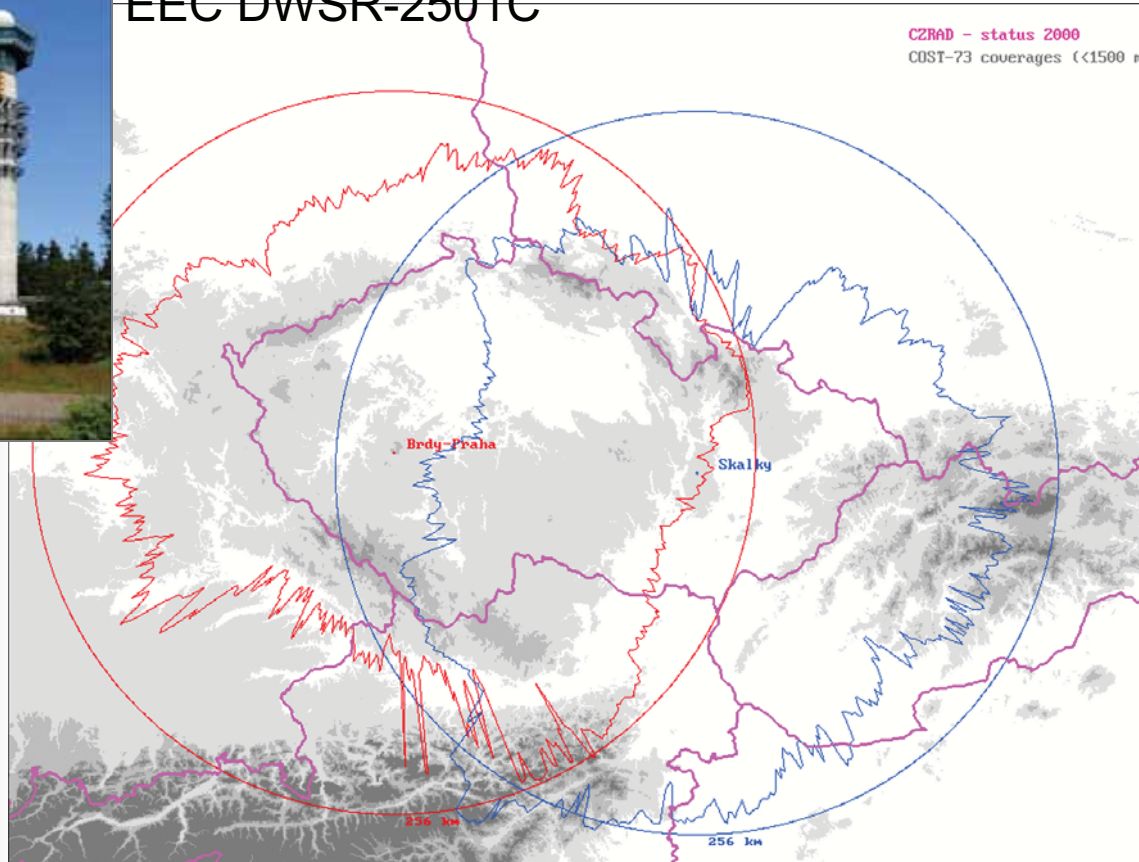
OUTLINE

- **Meteorological radars and observation**
- **Example of June 2009 flash flood**
- **Nowcasting, WarnView and Flash Flood Guidance**

Meteorological radars and observation



EEC DWSR-2501C



$$Z = a \cdot R^b$$

Z (mm⁶/m³)
 R (mm/hr)
 $a = 200, b = 1,6$

Gematronic
METEOR 360AC



- 2 C-band Doppler Weather radars (1km, 10 - 5 min)
- covered whole territory of the Czech Republic and near surroundings

Meteorological radars and observation

Radar errors:

Hardware

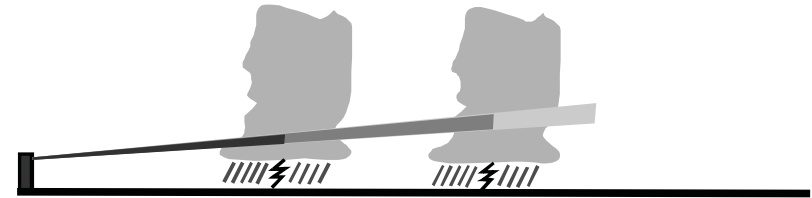
- calibration
- attenuation

Microphysics

- different size of rain drops
- snow / rain

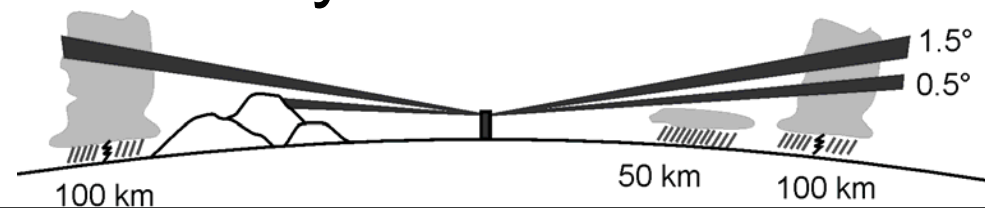
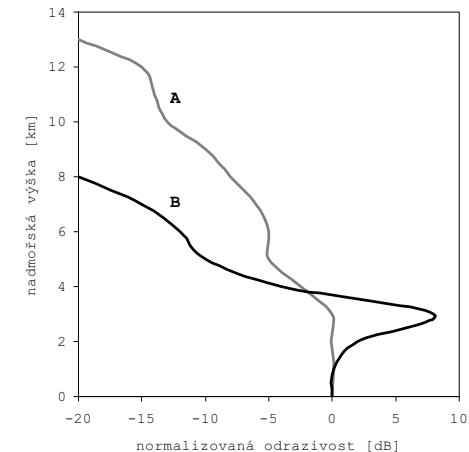
Sampling Geometry

- beam blockage
- vertical profile of reflectivity



$$729 * (1mm) = 1 * (3mm)$$

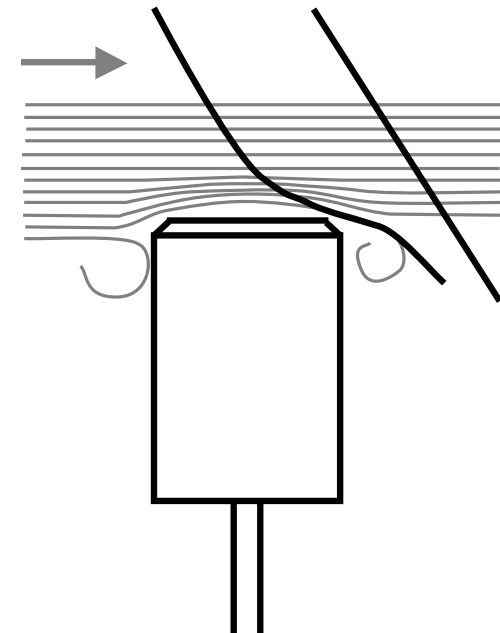
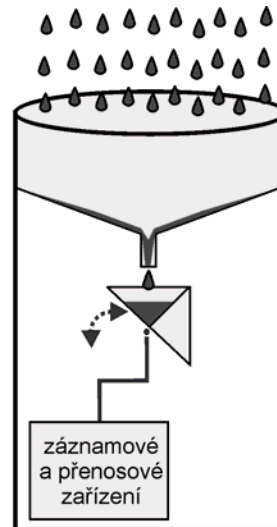
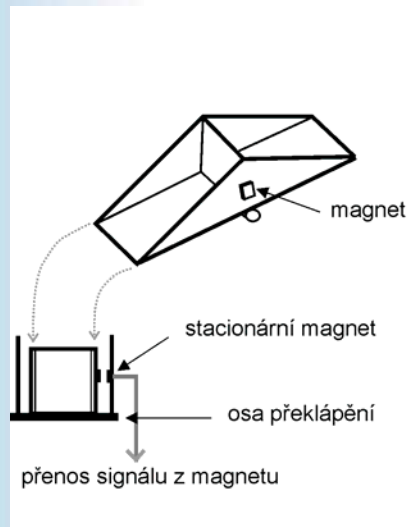
$$382 = 14 \quad [mm^3]$$



Meteorological radars and observation

Automatic rain gauges (250)

- GPRS
- 10 min
- „precise“ point measurement



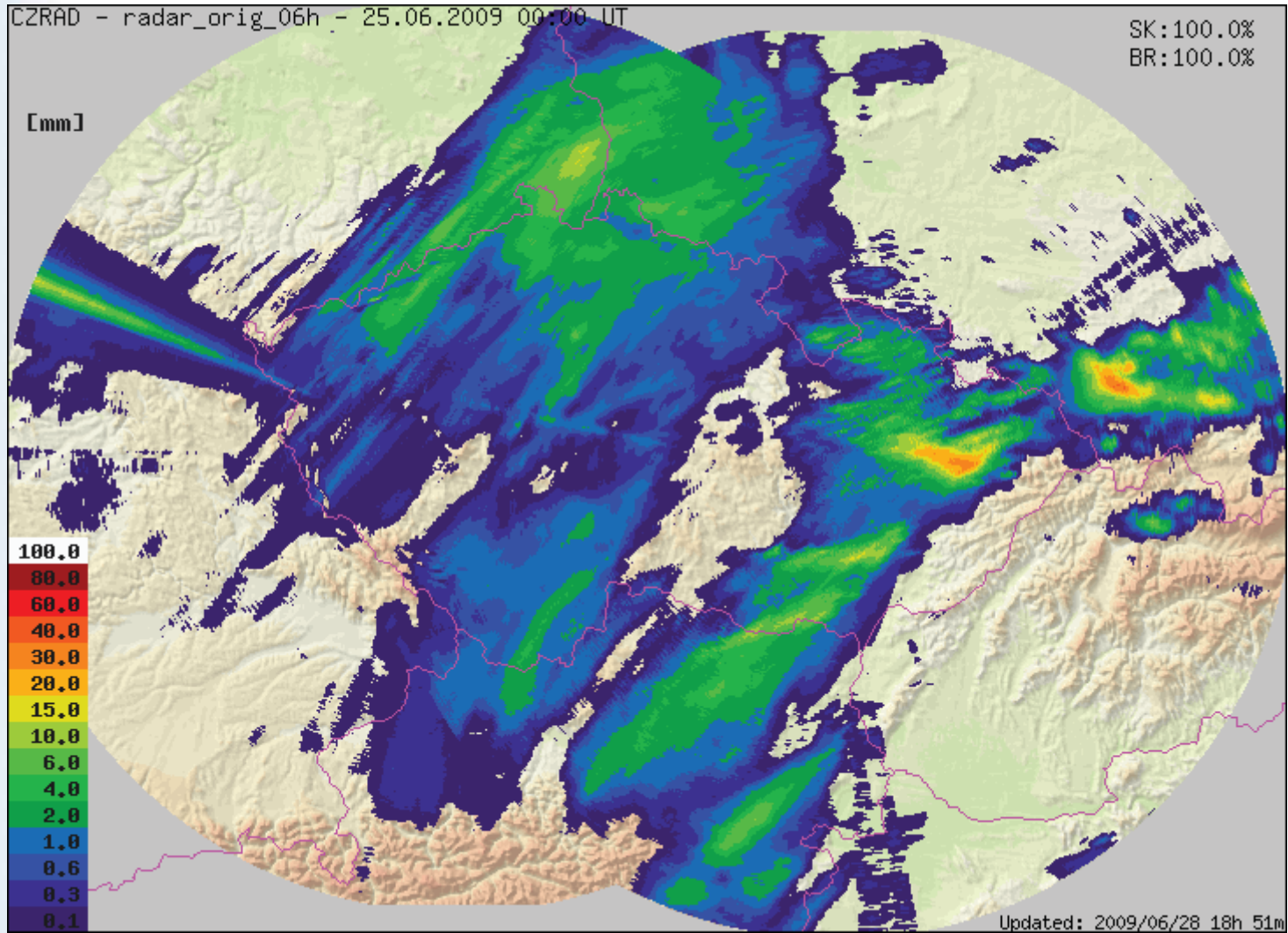


Meteorological radars and observation

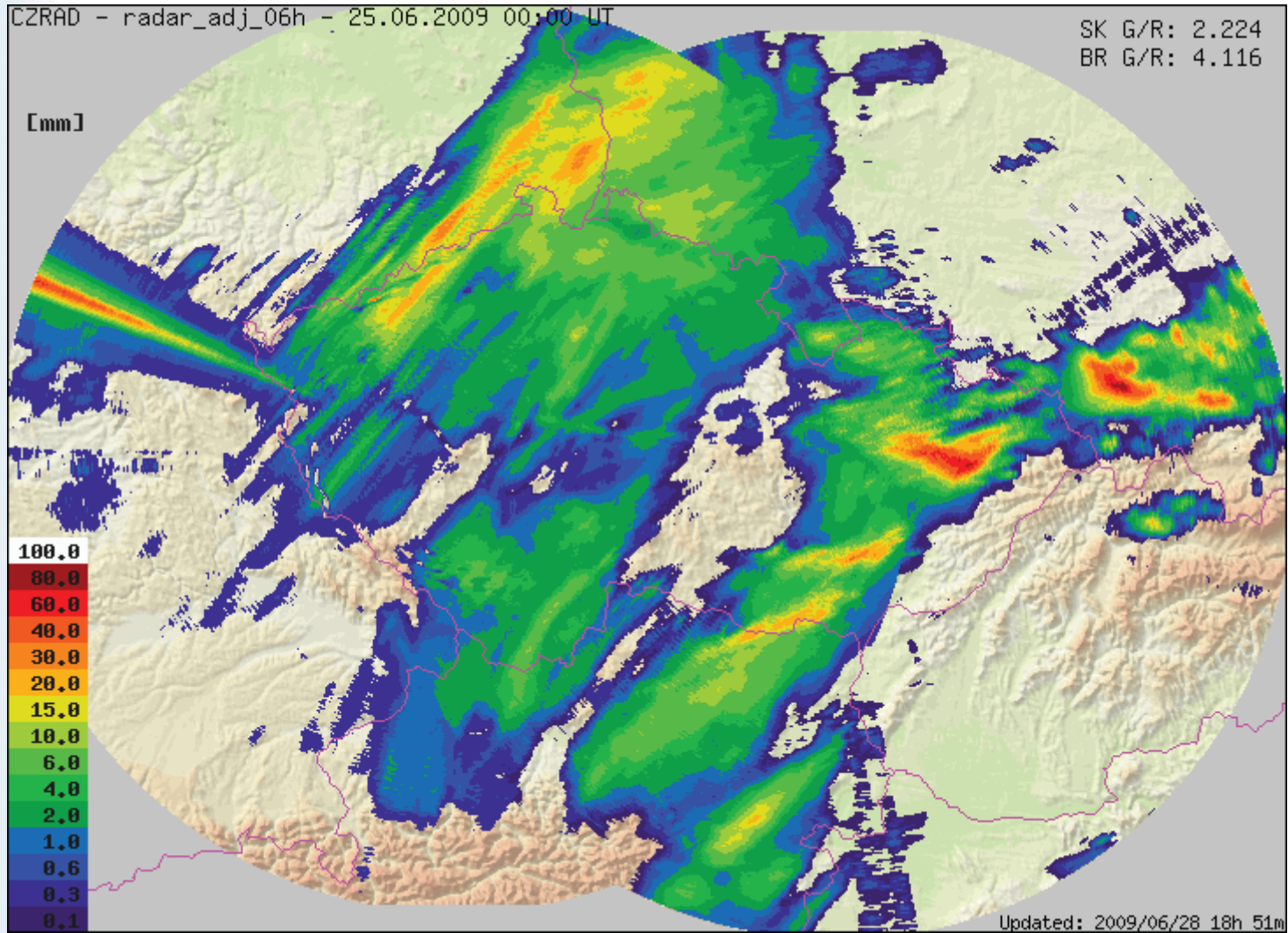
Radar – rain gauge combination product

- regression krigging
- (if radar <80% of time – rain gauge only)
- 1-, 3-, 6-, 24-h sum
- 20h moving average of error used

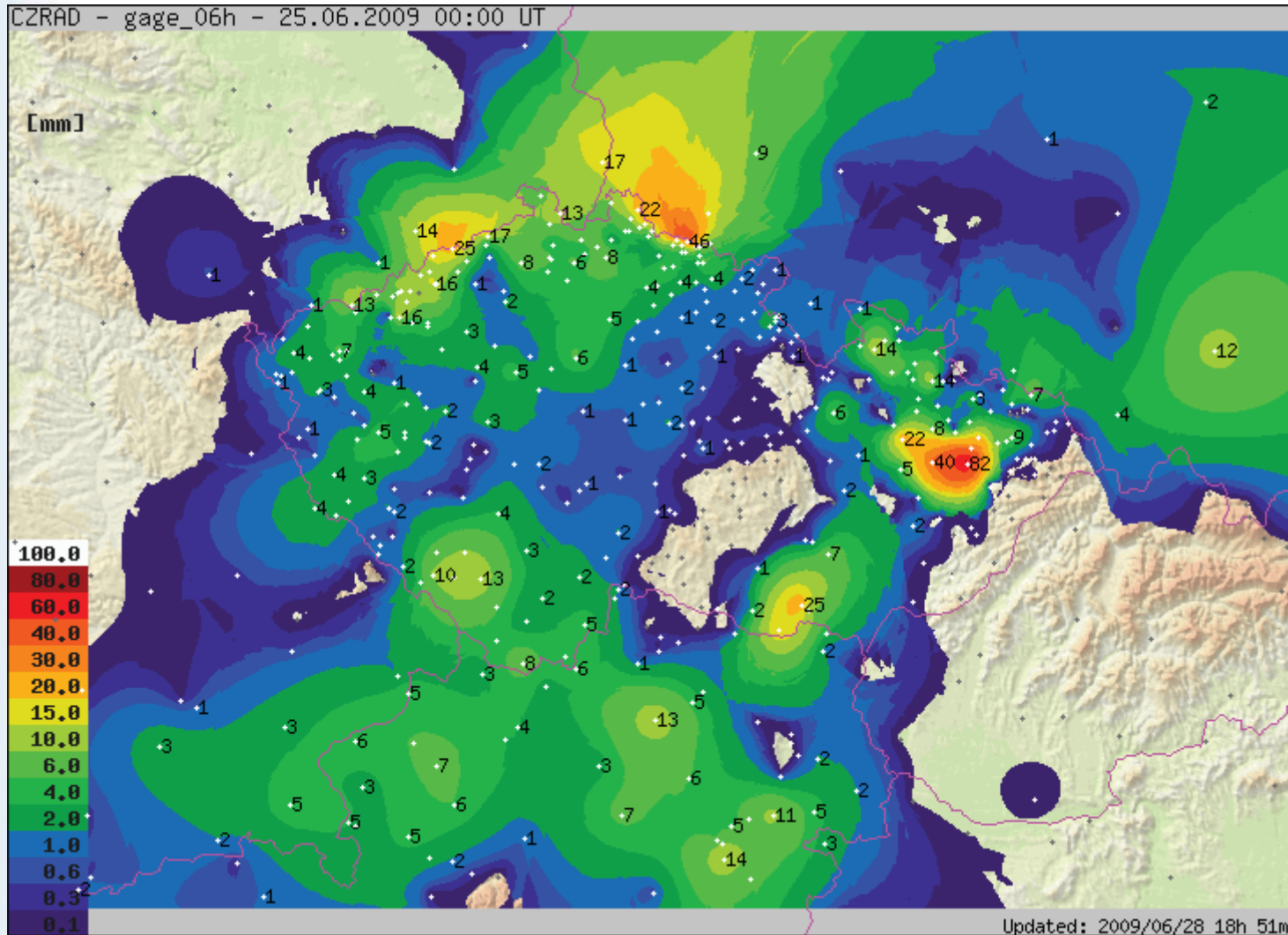
Meteorological radars and observation



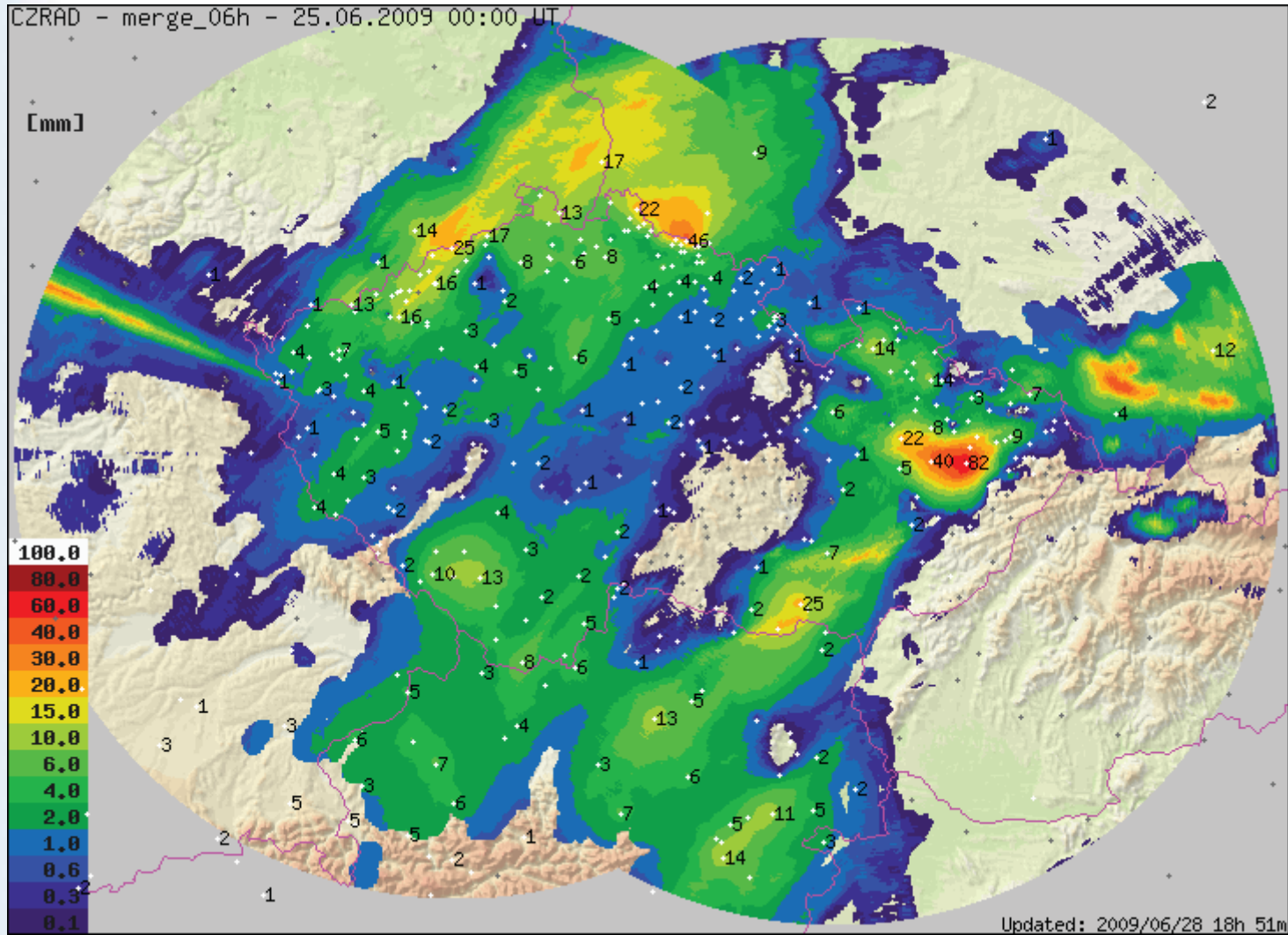
Meteorological radars and observation



Meteorological radars and observation

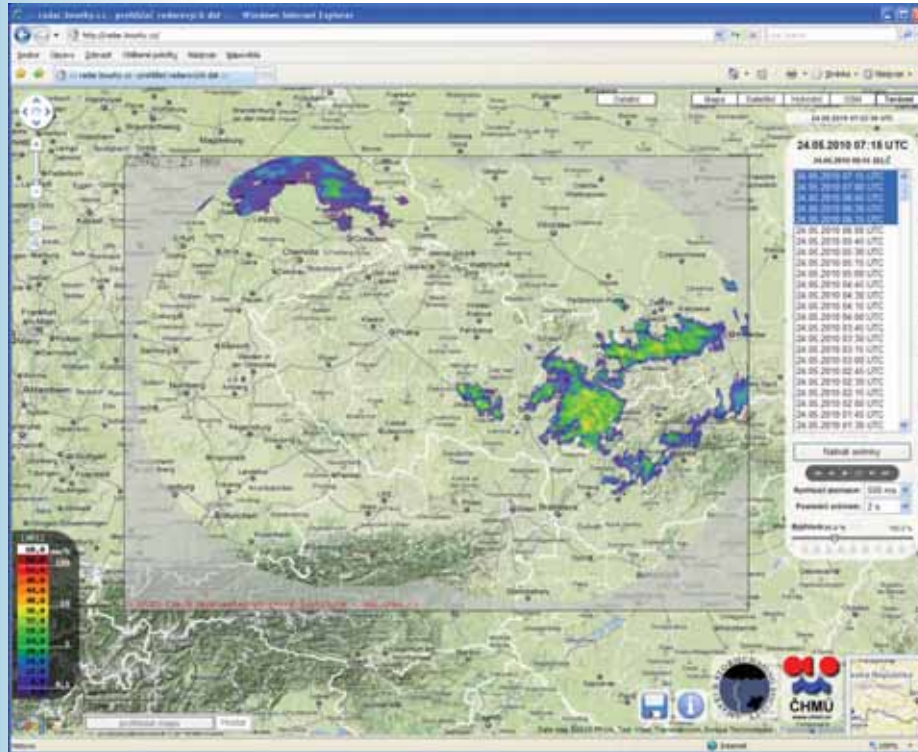


Meteorological radars and observation

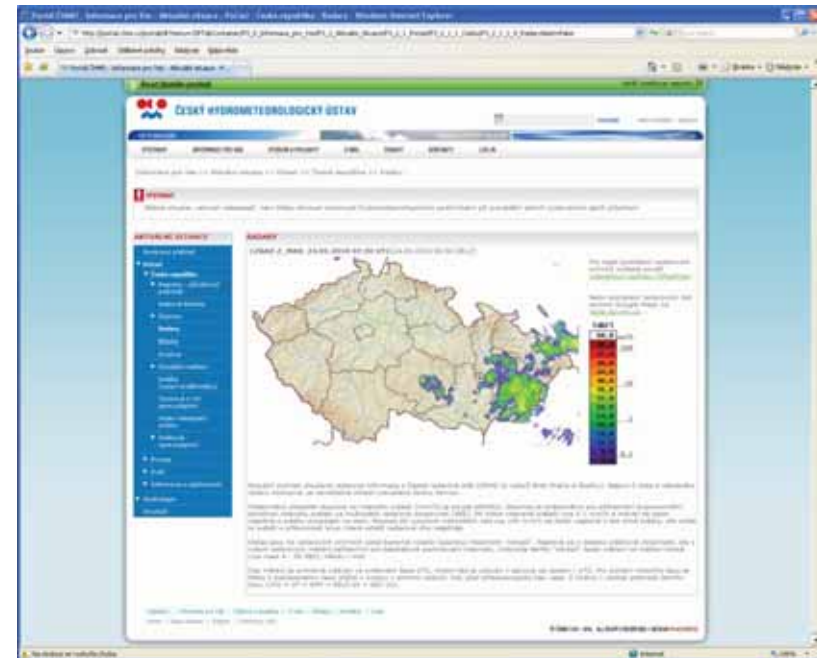




Data for public



<http://radar.bourky.cz>
<http://www.chmi.cz>





Data for public

ČHMÚ HPPS - Aktuální informace hydrologické předpovědní služby - Windows Internet Explorer

http://hydro.chmi.cz/hpps/hpps_act_rain.php

Soubor Úprav Zobrazit Obilžené položky Nástroje Odpověď

ČHMÚ HPPS - Aktuální informace hydrologické předpo...

HLÁSNÁ A PŘEDPověDNÍ POVODŇOVÁ SLUŽBA

Český hydrometeorologický ústav

Výstrahy a zprávy Aktuální informace Dokumenty HPPS Okolní státy Počasí Odkazy

ČHMÚ HPPS - Aktuální informace hydrologické předpovědní služby

Kraj: Pobočka ČHMÚ: Ucelená povodí ČR: 24.05.2010 LSEC

Vhled

Hodinnové úhrny srážek ze srážkoměrných stanic ČHMÚ

Zpět na : Srážky na území ČR - kombinace radarového odhadu a pozemních srážkoměrů

Stanice	m.m.m.	0	1	2	3	4	5	6	7	S24 8-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	S24
Luční bouda	1413	0	0	0	0	4	0,7	0,5	0	5,4	0	0															5,2
Šerák	1328	0	0	0	0,1	0	0	1	0	2,3	0,4	0,2															1,7
Lysá hora	1324	0	0	0	0	0	0	0,1	0	1,2	1	0															1,1
Labská bouda	1315	0	0,1	0	0,8	7	0,2	0,6	0,2	12	0	0															8,9
Churáňov	1118	0	0	0	0	0	0	0	0	0	0	0															0
Dvoračky	1115	0	0	0	0,1	0,8	0,8	0,6	0,5	3,9	0,4																3,2
Pálpova Huť	1102	0	0	0	0	0	0	0	0	0,5	0																0
Pomezní boudy	1050	0	3	3	0	4	0,5	0,9	0	11,5	0																11,4
Na Kneipě	990	0	0	0	0,3	5	0,2	0,5	0	9	0																6
Smědava - U Jeřábu	903	0	0	0	3	4	0,2	0,2	0	12,6	0																7,4
Prácheň	880	0	0	0	0	0	0	0	0	0	0																0
Hojsova Stráž	867	0	0	0	0	0	0	0	0	0	0	0															0
Jizerka	858	0	0	0	0	4	0,3	0,3	0	5,8	0	0															4,6
Milešovka	833	0	0	0	0	0	0	2	3	5																	5
Pec pod Sněžkou	816	0	0	0	0	11	0,7	0,2	0,1	12	0	0															12
Nová Louka	780	0	0	0	0	0,5	0,5	0,5	0,4	3,6	0,4																2,3
Bedřichov	777	0	0	0	0	5	0,1	5	0,8	12	0	0															10,9
Desná-Souš	772	0	0	0	0	6	0,2	0,7	0,1	8,1	0	0															7
Železná Ruda	763	0	0	0	0	0	0	0	0	0	0																0
Červená u L.	750	0,1	0	0	0	0	0,1	0	2	3,4	0,1	0,9															3,2
Pohorská Ves	750	0	0	0	0	0	0	0	0	0	0																0
Tisovka	749	0	0	0	0	0	0	0	0	0	0																0
Přimda	742	0	0	0	0	0	0	0	0	0	0																0
Černá v Polumaví	739	0	0	0	0	0	0	0	0	0,2	0	0															0
Svratouch	737	0	0	0	0	0	0,2	0	0	0,2	2	0,8															3
Nová Ves v Horách	725	0	0	0	0	0	0,2	0	0	0,2	0	0															0,2
Nedvězí	722	0	0	0	0	0	0	0,9	4	5	0,7	0															5,6
Čáslav	708	0	0	0	0	0	0	0	0	0	0																0
Bezděbrv	698	0	0	0	0	0	0	0	0	0	0																0
Mariánské Lázně	691	0	0	0	0	0	0	0	0	0	0																0

Přehled srážek ve stanici Lysá hora

Adresa stanice: Lysá hora
 Povodí: Lysá hora
 Účet a rozdělovací poměry: 1324
 Meteorologická výška [m.n.m.]: 1324

Posledních 24 hodin - srážky [mm]

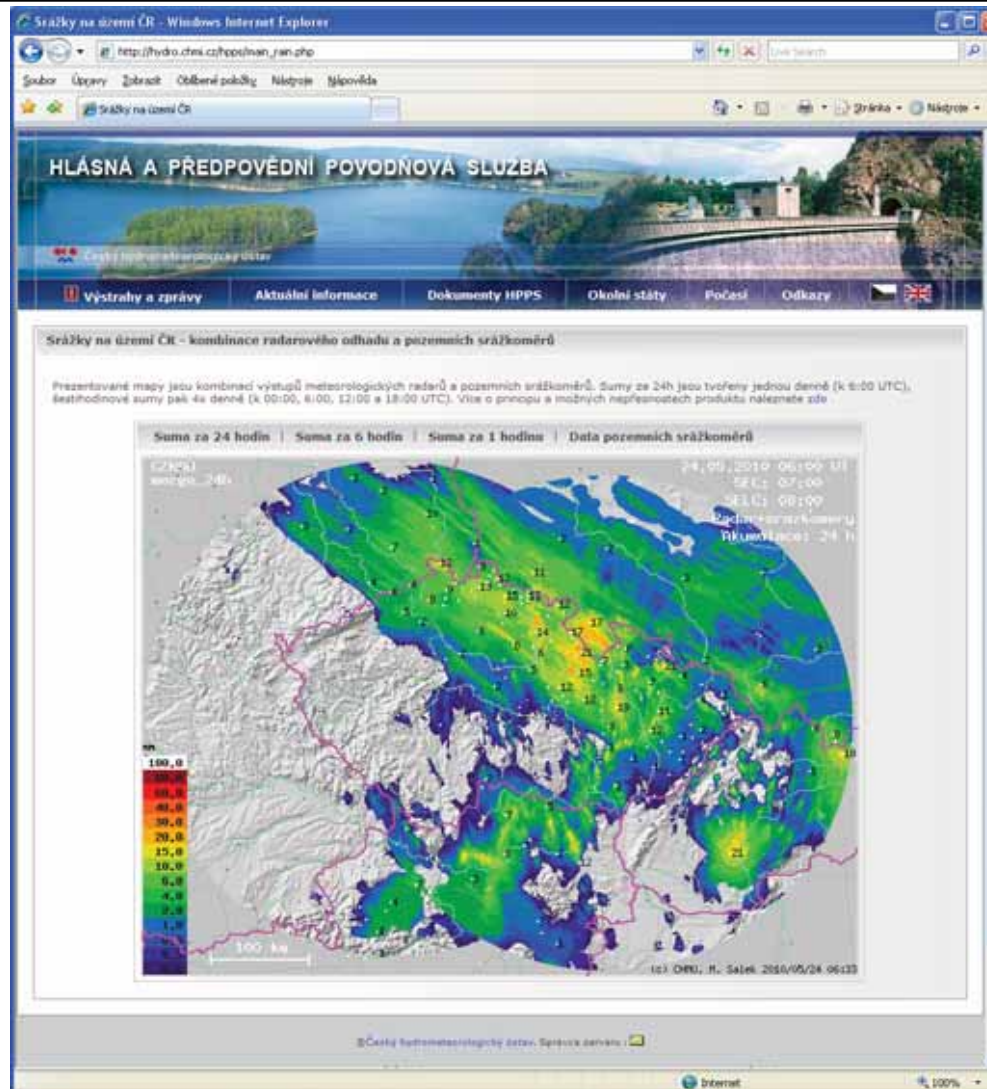
Srážky [mm]

AP50 [mm]

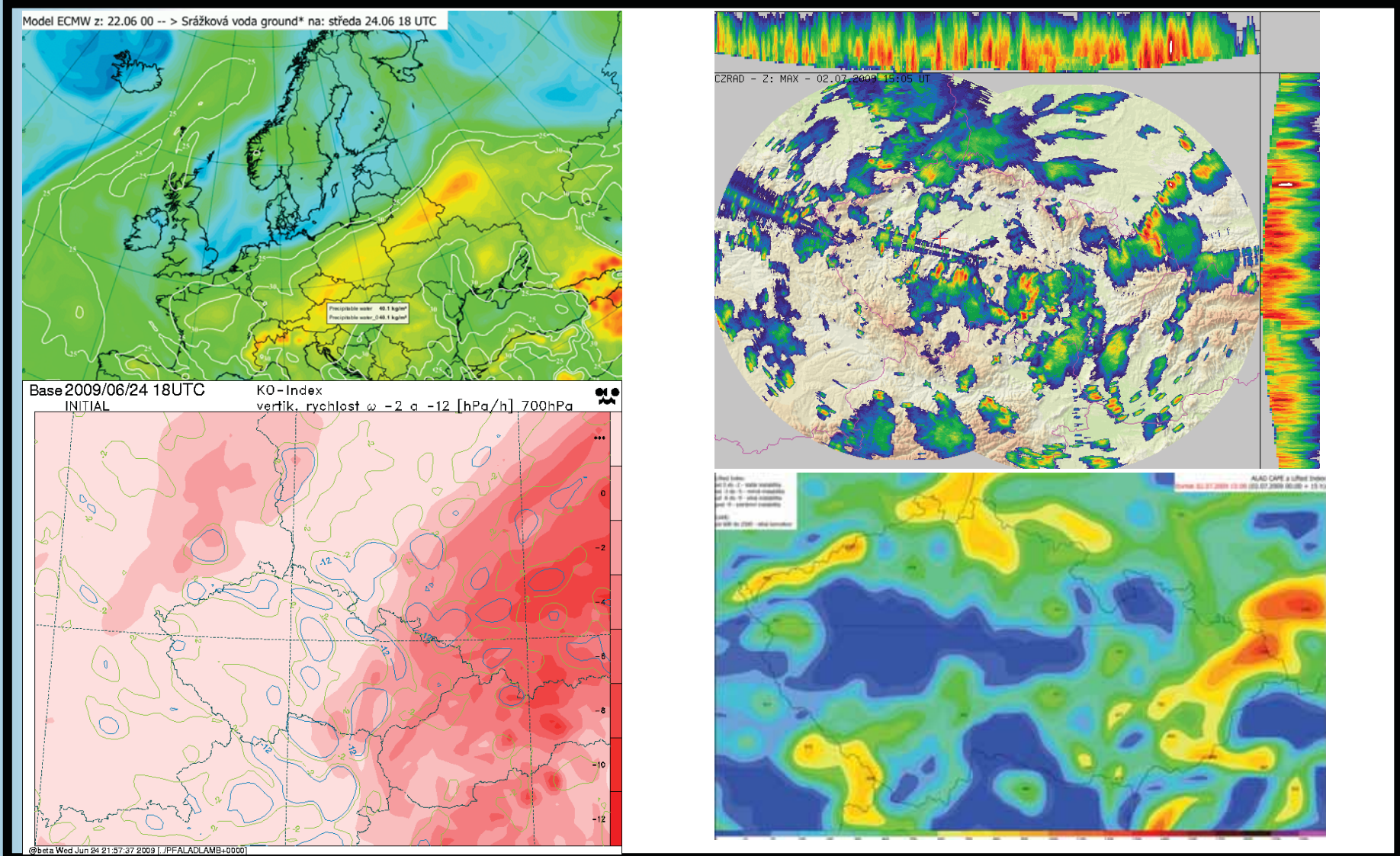
Stanice	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Suma 8-7	Suma 8-23	
14.05.2010																											1,1
15.05.2010																											1,1
16.05.2010																											18,8
17.05.2010																											12,2
18.05.2010																											4,2
19.05.2010																											10,8
20.05.2010																											8,6

<http://hydro.chmi.cz>

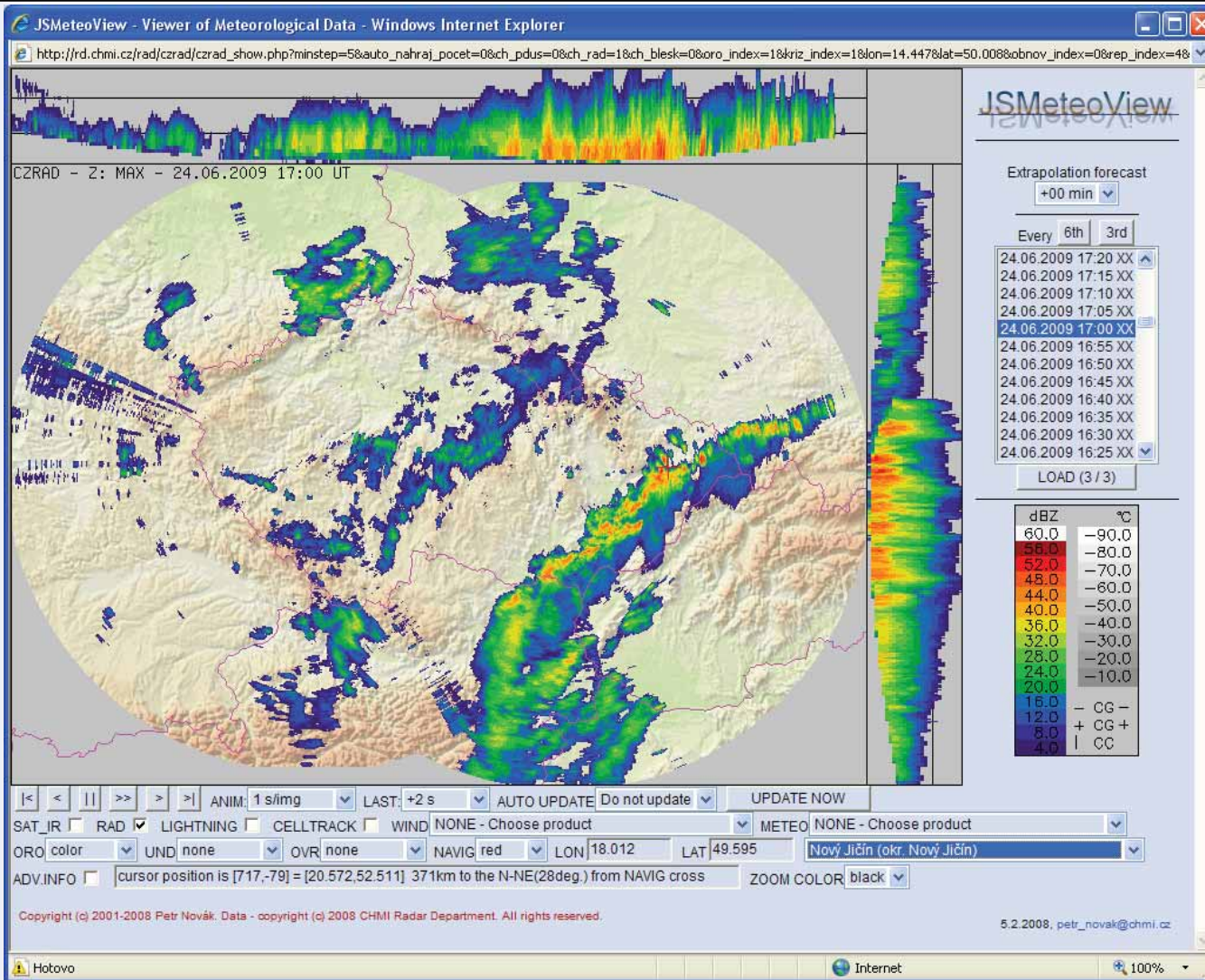
Data for public



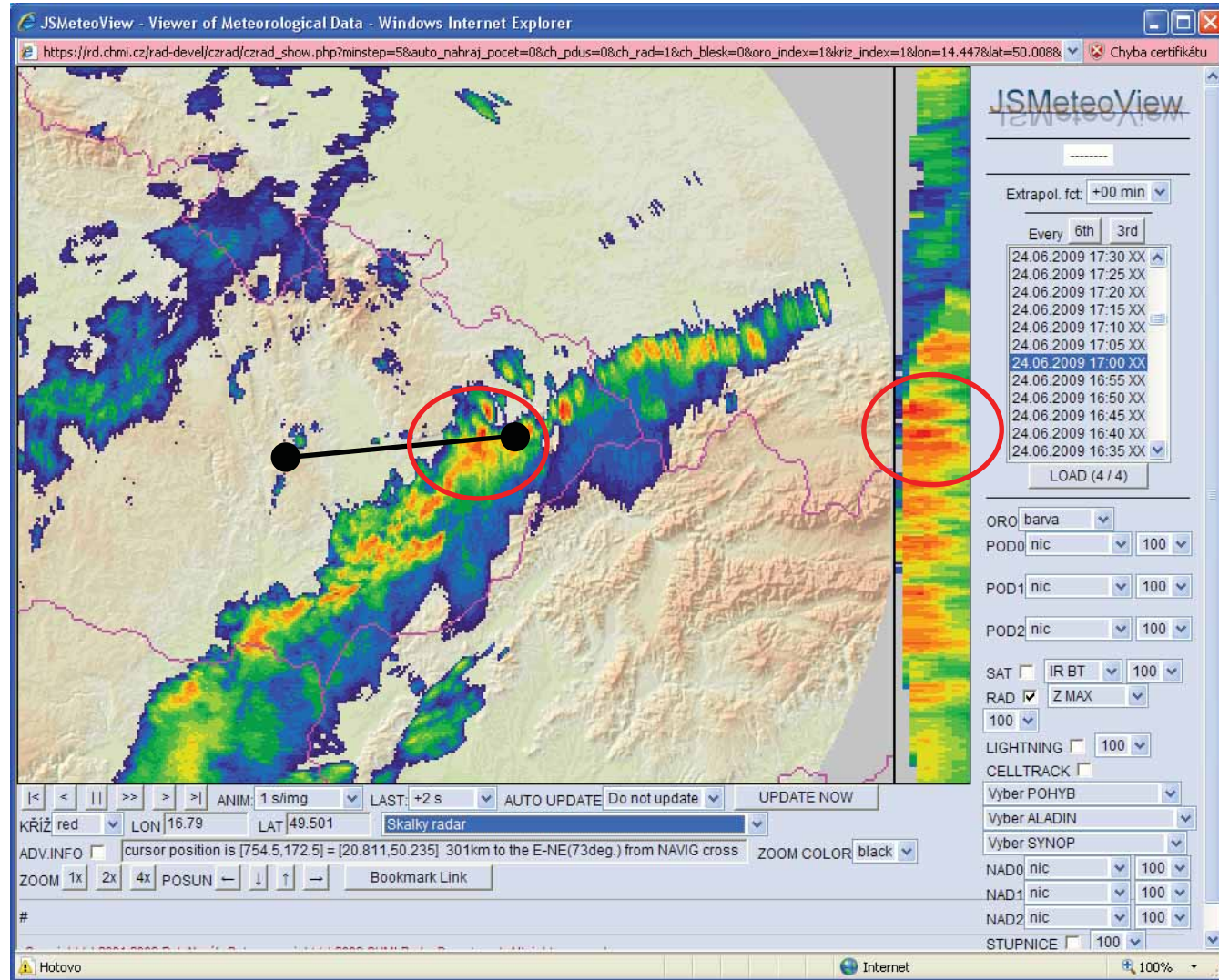
June 24th, July 2nd 2009



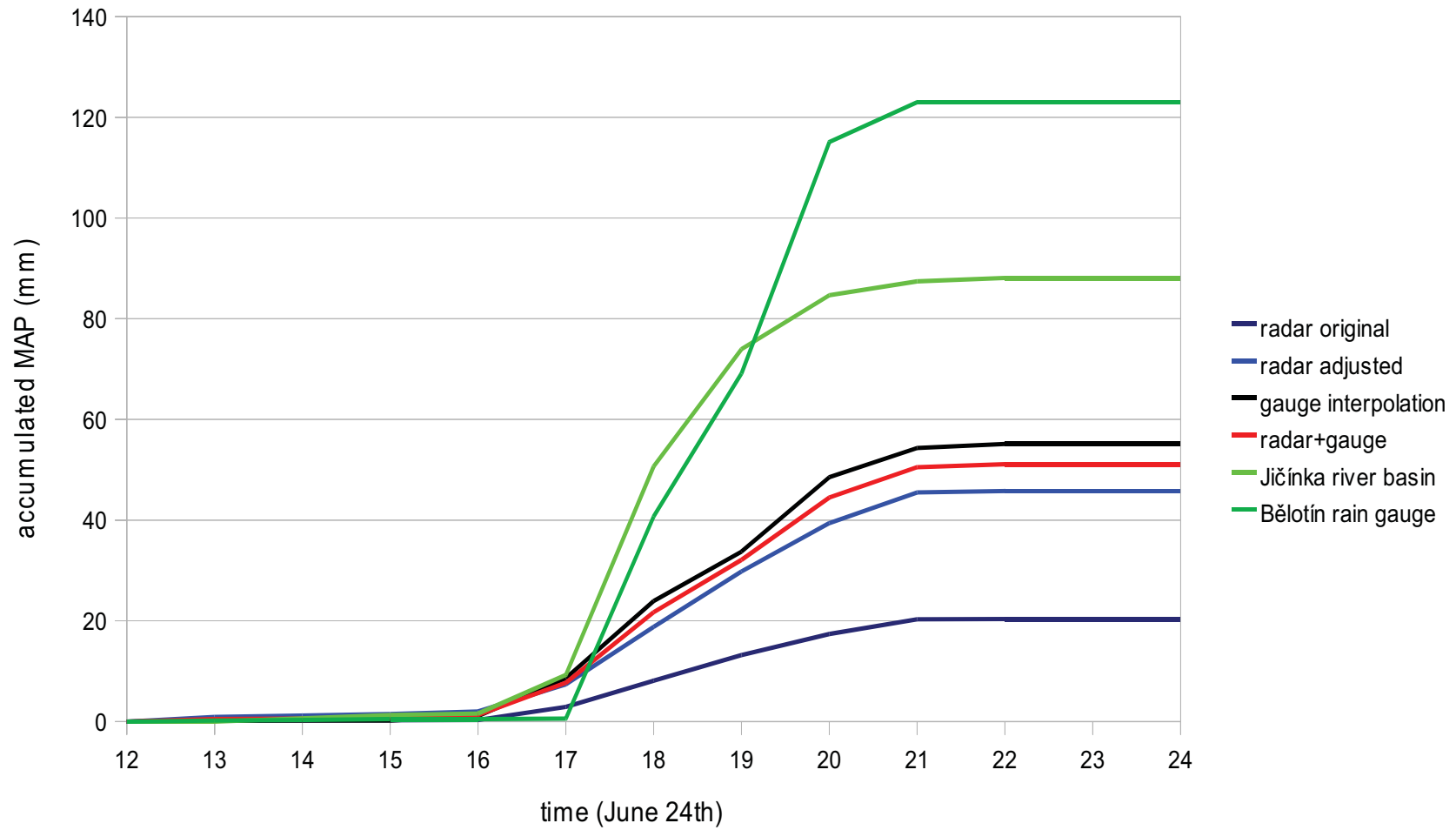
June 24th 2009



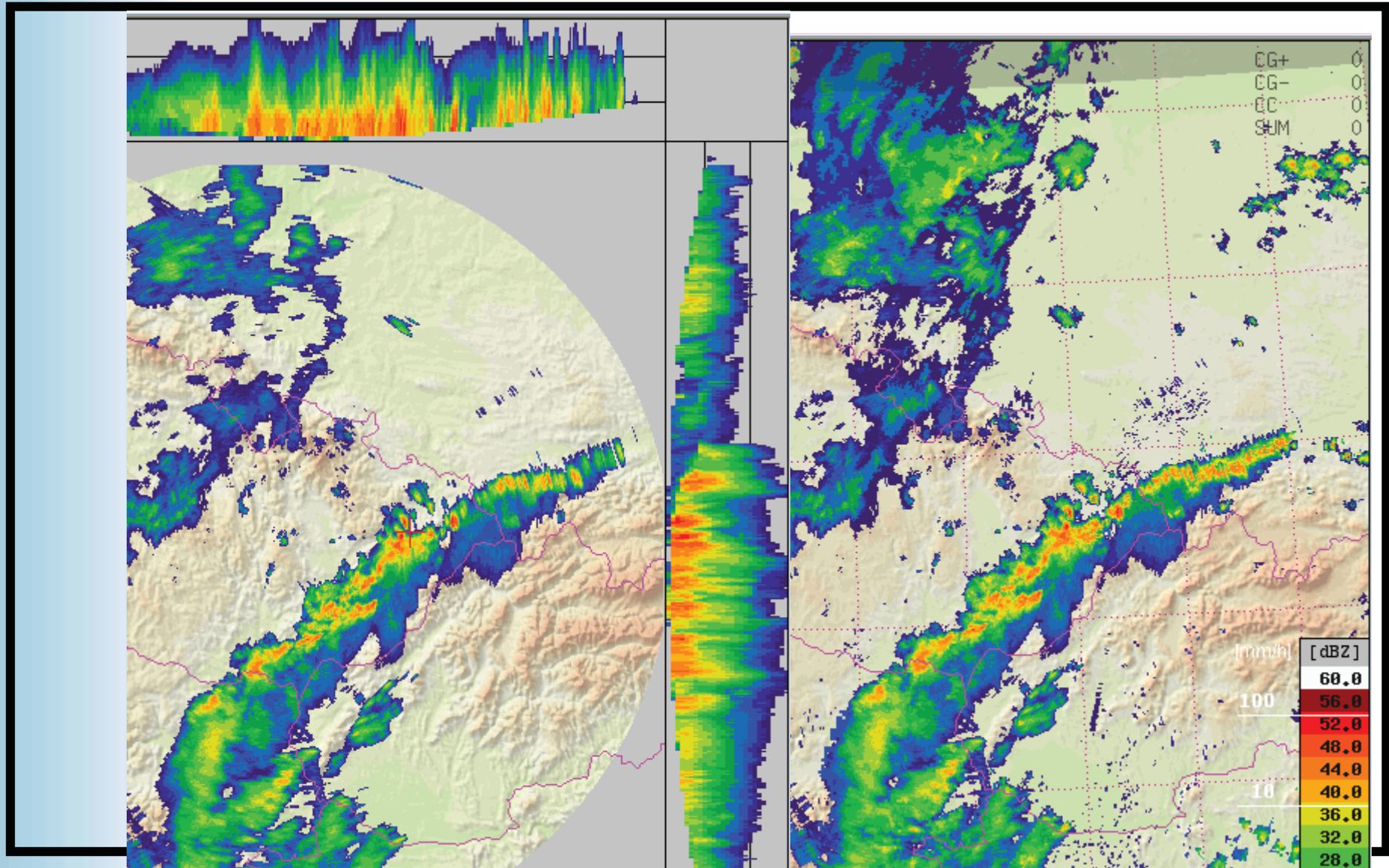
June 24th 2009



June 24th 2009



June 24th 2009



Nowcasting etc.

- Short term forecast (90 minutes in CZ)
- Radar echo extrapolation (COTREC, NWP)
- Doesn't create new cells, doesn't change intensity



Forecast +60 min

- Cotrec Aladin
- Persistence True

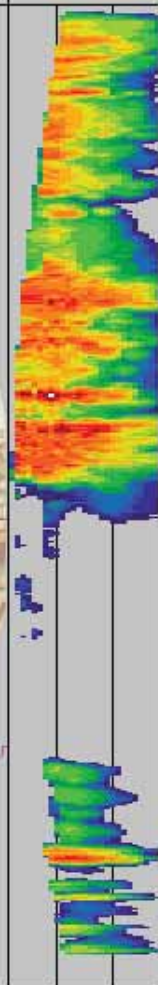
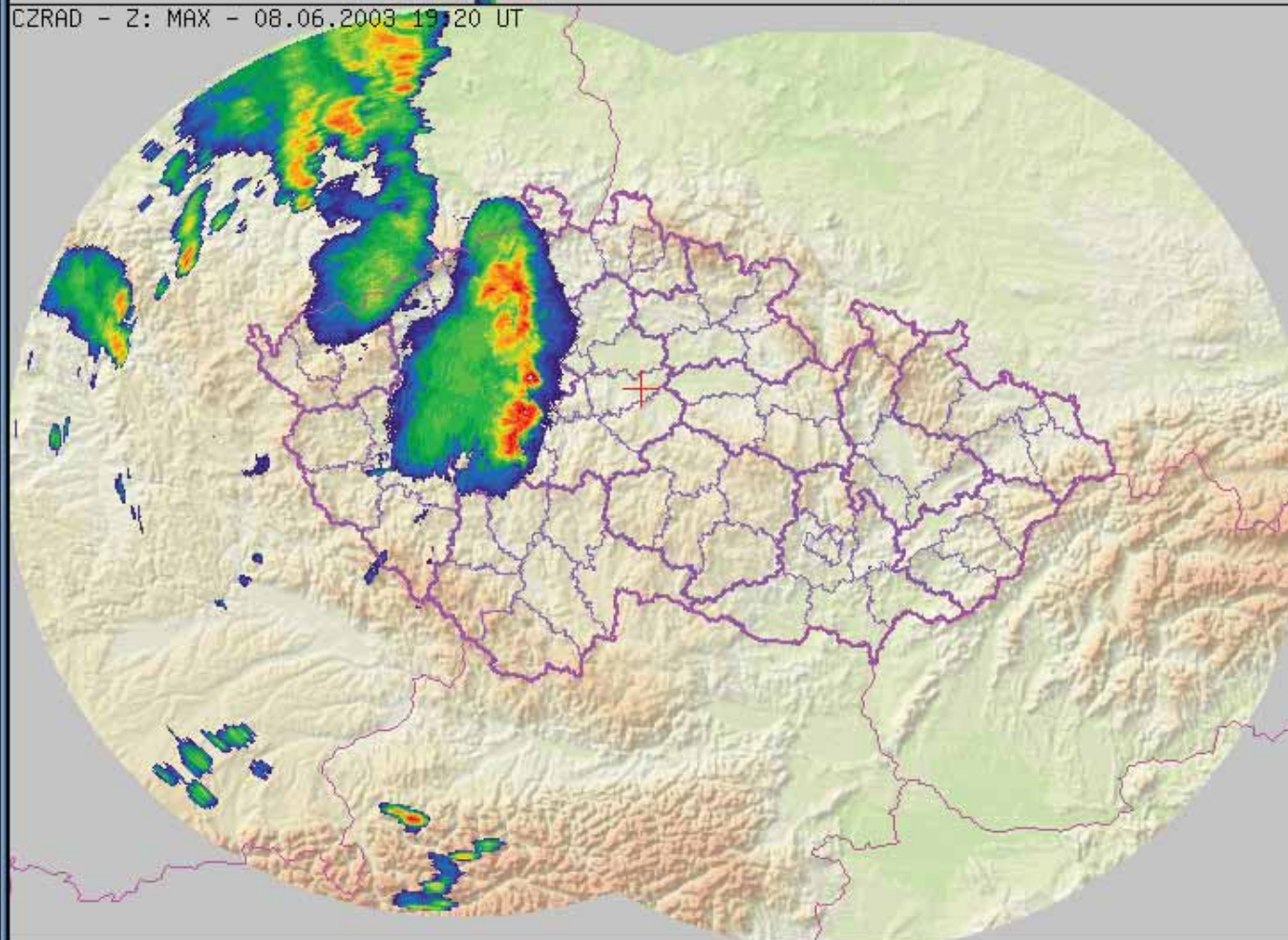
Every 6th 3rd

- 08.06.2003 19:40 CA ▲
- 08.06.2003 19:30 CA
- 08.06.2003 19:20 CA
- 08.06.2003 19:10 CA
- 08.06.2003 19:00 CA
- 08.06.2003 18:50 CA
- 08.06.2003 18:40 CA
- 08.06.2003 18:30 CA
- 08.06.2003 18:20 CA
- 08.06.2003 18:10 CA
- 08.06.2003 18:00 CA
- 08.06.2003 17:50 CA ▼

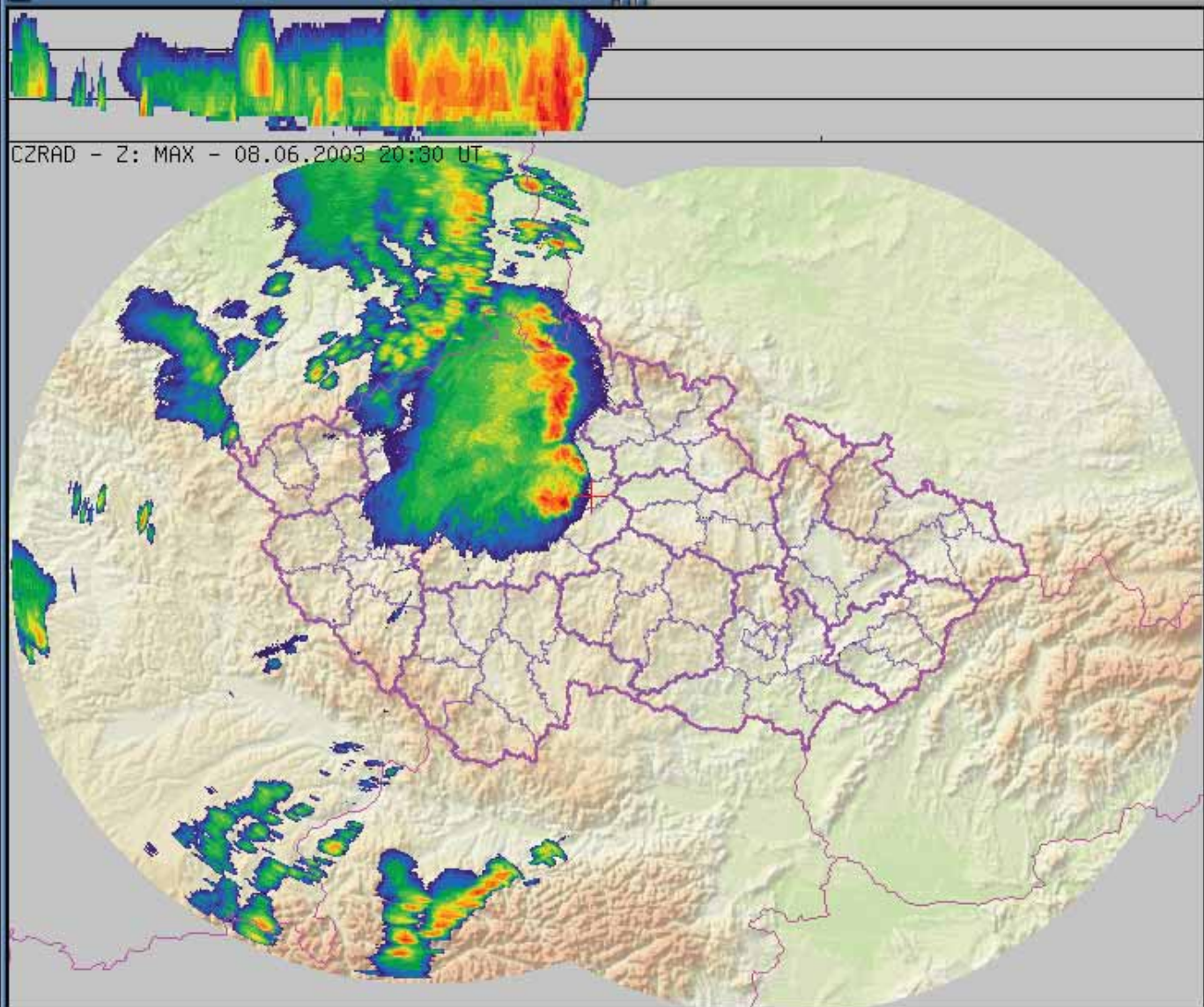
LOAD (48 / 48)



CZRAD - Z: MAX - 08.06.2003 19:20 UT



[<] [<<] [||] [>>] [>] [>] ANIM: 1 s/img [v] LAST: +2 s [v] AUTO UPDATE Do not update [v]
 PDUS [] RAD [x] LIGHTNING [] WIND [] METEO none [v]
 ORO col [v] UND dist+reg [v] OVR none [v] NAVIG red [v] LON 15.202 LAT 50.028 Kolin (okr. Kolin) [v]
 cursor position is [18,76] = [10.384,51.209] ZOOM COLOR black [v]

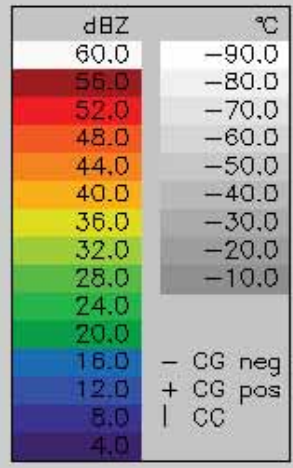


Forecast

Cotrec Aladin
 Persistence True

Every

- 08.06.2003 19:40 CA ▲
- 08.06.2003 19:30 CA
- 08.06.2003 19:20 CA
- 08.06.2003 19:10 CA
- 08.06.2003 19:00 CA
- 08.06.2003 18:50 CA
- 08.06.2003 18:40 CA
- 08.06.2003 18:30 CA
- 08.06.2003 18:20 CA
- 08.06.2003 18:10 CA
- 08.06.2003 18:00 CA
- 08.06.2003 17:50 CA ▼

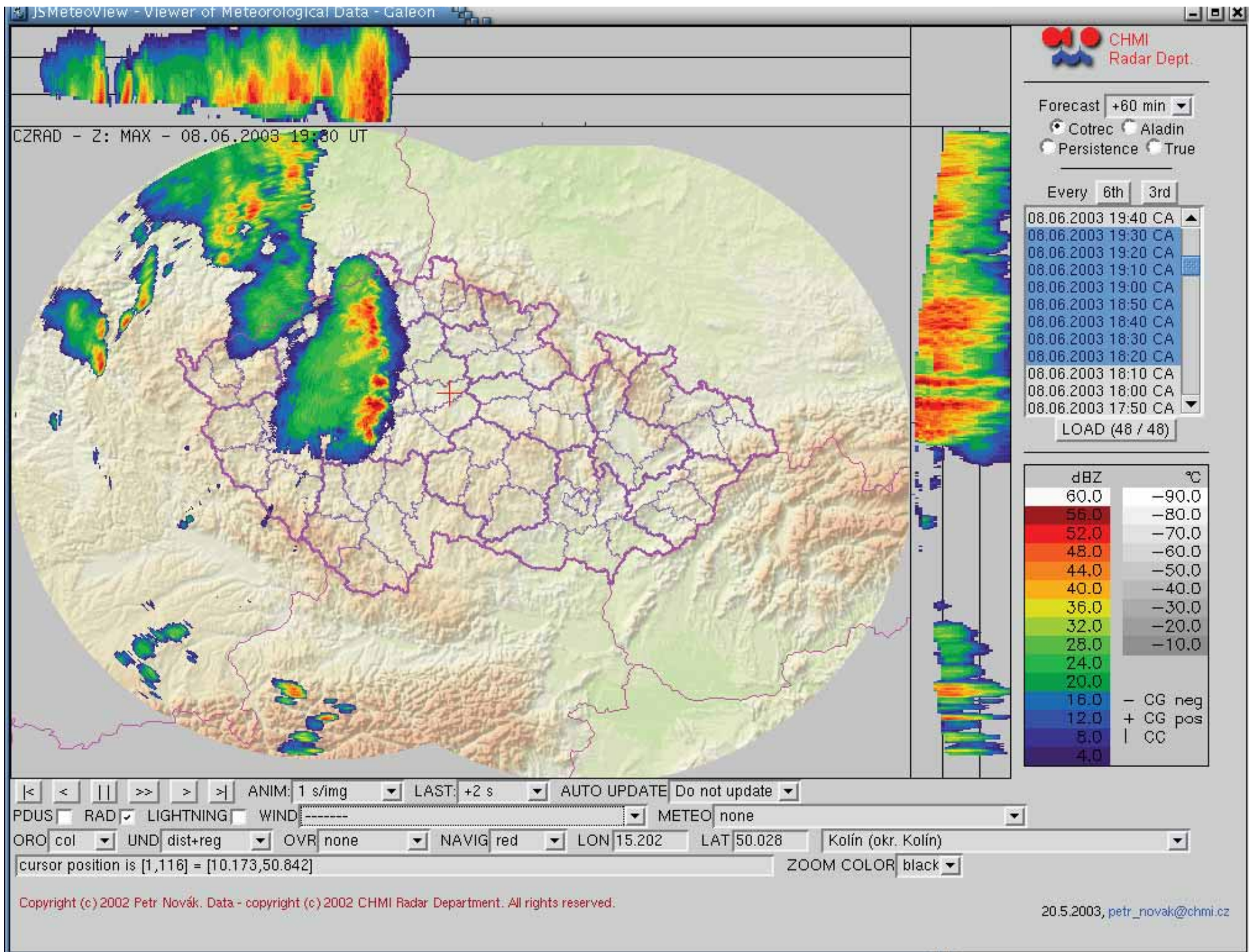


ANIM: 1 s/img LAST: +2 s AUTO UPDATE Do not update

PDUS RAD LIGHTNING WIND none METEO none

ORO col UND dist+reg OVR none NAVIG red LON 15.202 LAT 50.028 Kolin (okr. Kolin)

cursor position is [0,125] = [10.167,50.76] ZOOM COLOR black





Forecast +60 min

- Cotrec Aladin
- Persistence True

Every 6th 3rd

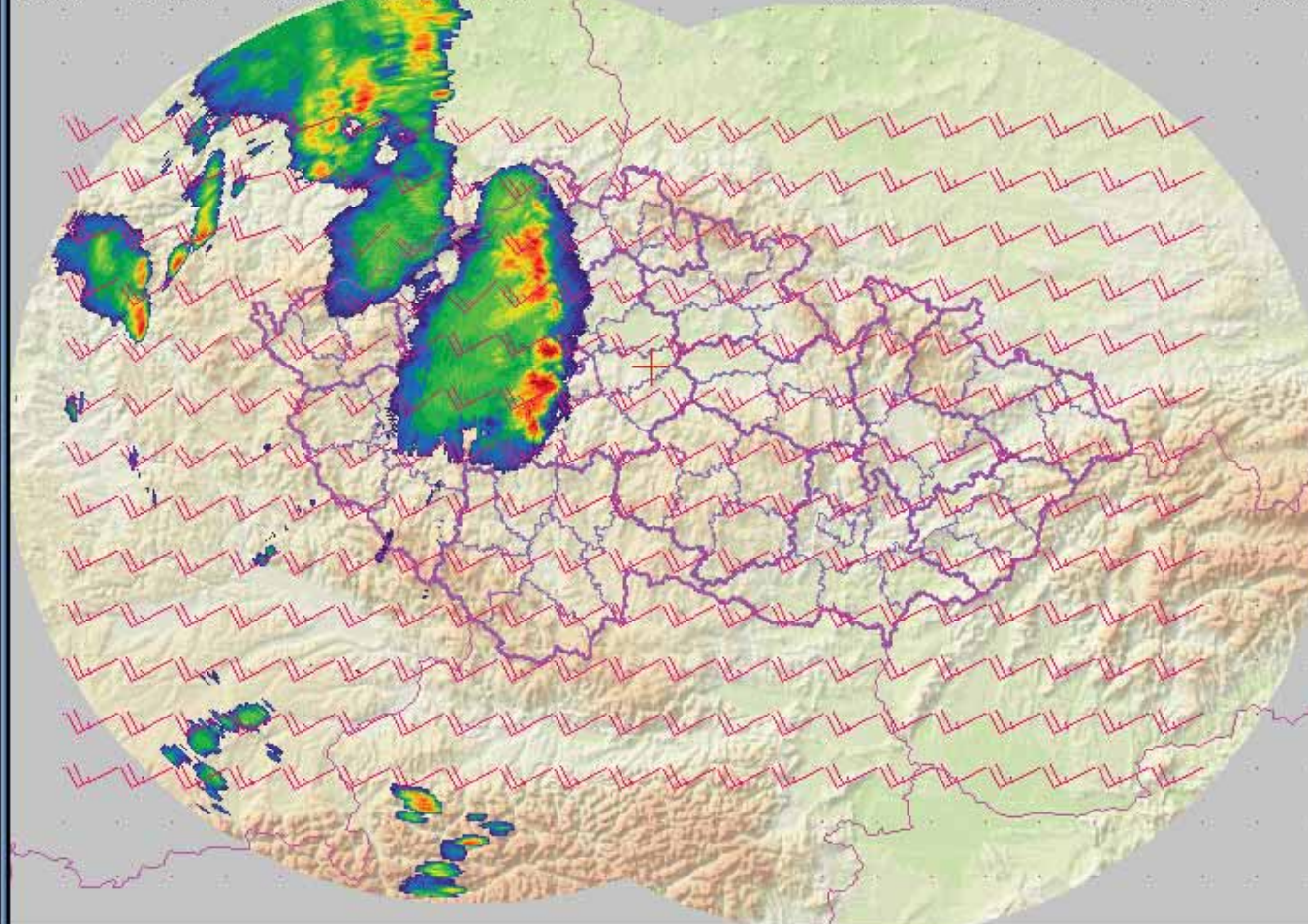
- 08.06.2003 19:40 CA ▲
- 08.06.2003 19:30 CA
- 08.06.2003 19:20 CA
- 08.06.2003 19:10 CA
- 08.06.2003 19:00 CA
- 08.06.2003 18:50 CA
- 08.06.2003 18:40 CA
- 08.06.2003 18:30 CA
- 08.06.2003 18:20 CA
- 08.06.2003 18:10 CA
- 08.06.2003 18:00 CA
- 08.06.2003 17:50 CA ▼

LOAD (48 / 48)



CZRAD - Z: MAX - 08.06.2003 19:30 UT

COTREC - 08.06.2003 19:30 UT +00hr



< << || >> > ANIM: 1 s/img LAST: +2 s AUTO UPDATE Do not update

PDUS RAD LIGHTNING WIND Cotrec wind field - 08.06.2003 19:30 METEO none

ORO col UND dist+reg OVR none NAVIG red LON 15.202 LAT 50.028 Kolin (okr. Kolin)

cursor position is [22,93] = [10.454,51.058] ZOOM COLOR black

Forecast

Cotrec Aladin
 Persistence True

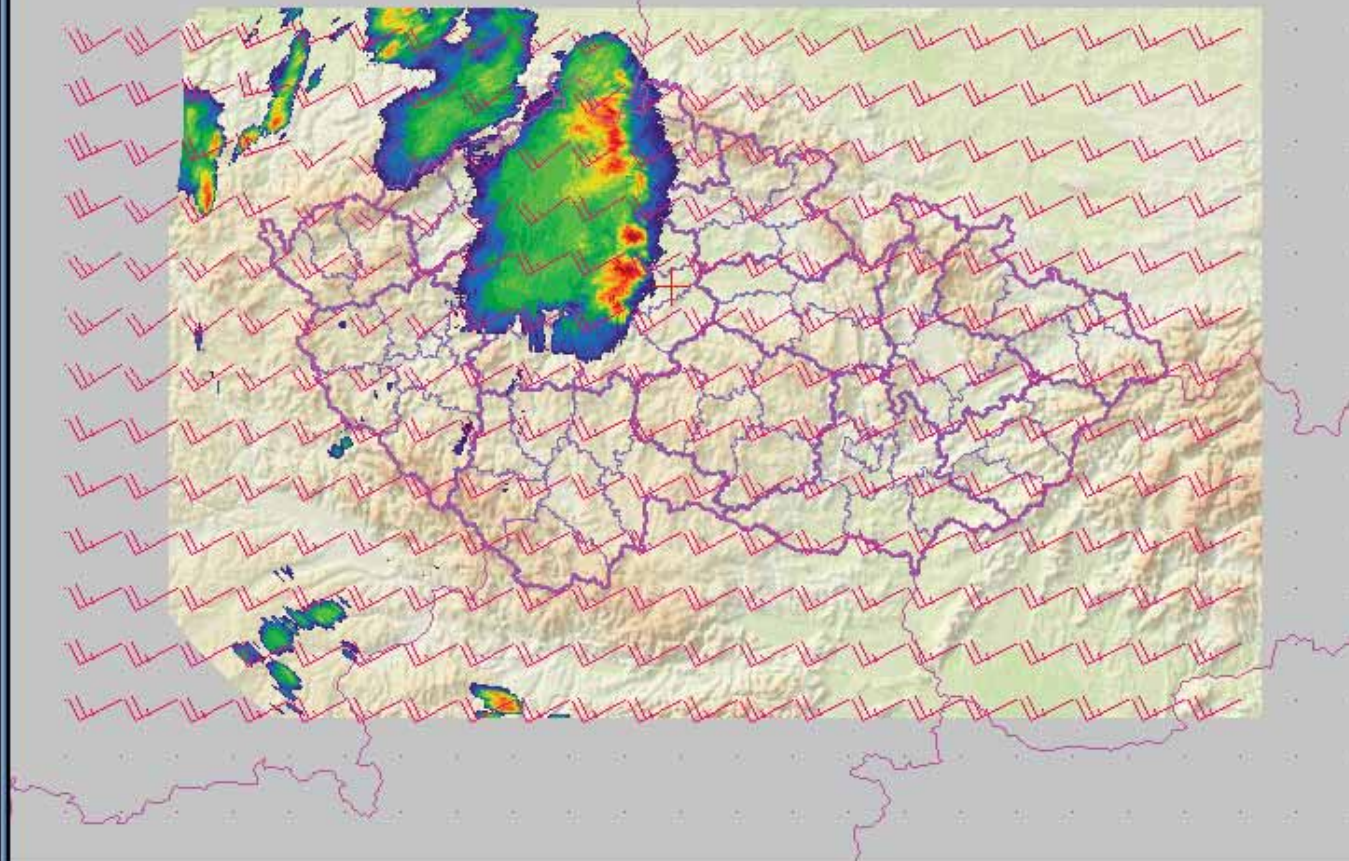
Every

- 08.06.2003 19:40 CA ▲
- 08.06.2003 19:30 CA
- 08.06.2003 19:20 CA
- 08.06.2003 19:10 CA
- 08.06.2003 19:00 CA
- 08.06.2003 18:50 CA
- 08.06.2003 18:40 CA
- 08.06.2003 18:30 CA
- 08.06.2003 18:20 CA
- 08.06.2003 18:10 CA
- 08.06.2003 18:00 CA
- 08.06.2003 17:50 CA ▼

LOAD (48 / 48)



CZRAD - Z: cotrec fct +60min - 08.06.2003 20:30 UT COTREC - 08.06.2003 19:30 UT +00hr



ANIM: 1 s/img LAST: +2 s AUTO UPDATE Do not update

PDUS RAD LIGHTNING WIND Cotrec wind field - 08.06.2003 19:30 METEO none

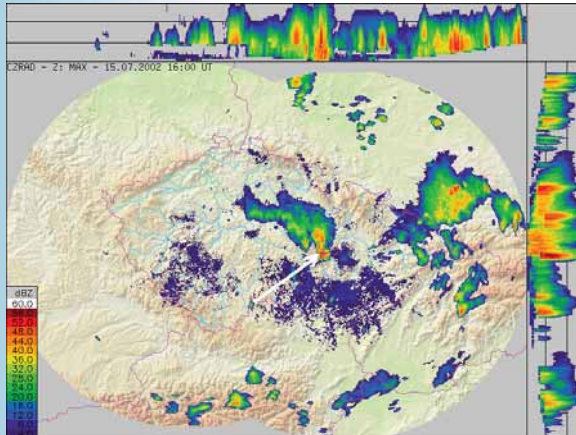
ORO col UND dist+reg OVR none NAVIG red LON 15.202 LAT 50.028 Kolin (okr. Kolin)

cursor position is [11,69] = [10.278,51.268] ZOOM COLOR black

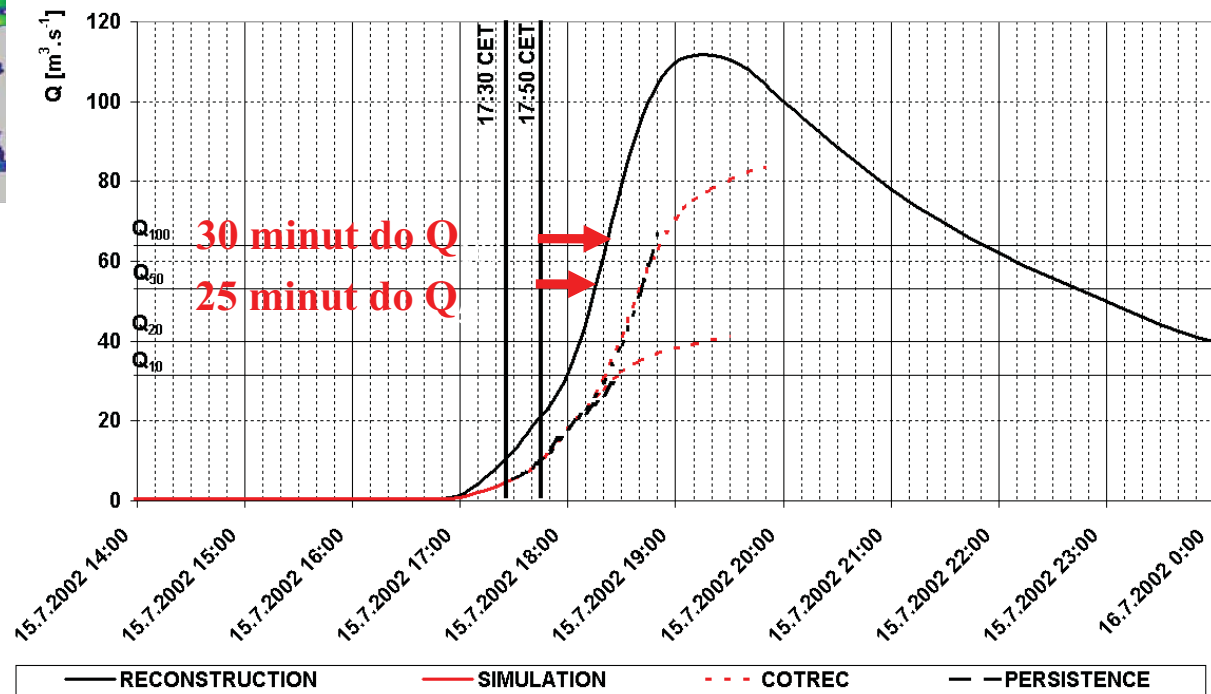
Study

Šálek, Březková, Novák (2006) NHESS

Hodonínka 2002



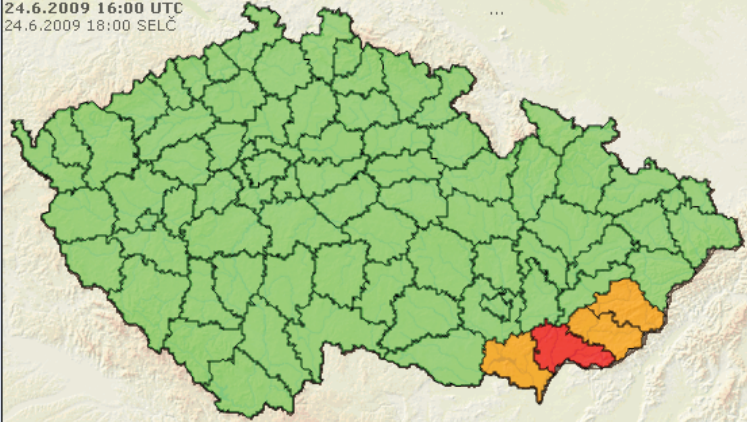
Discharge forecast at Štěpánov, 17:30 and 17:50 CET



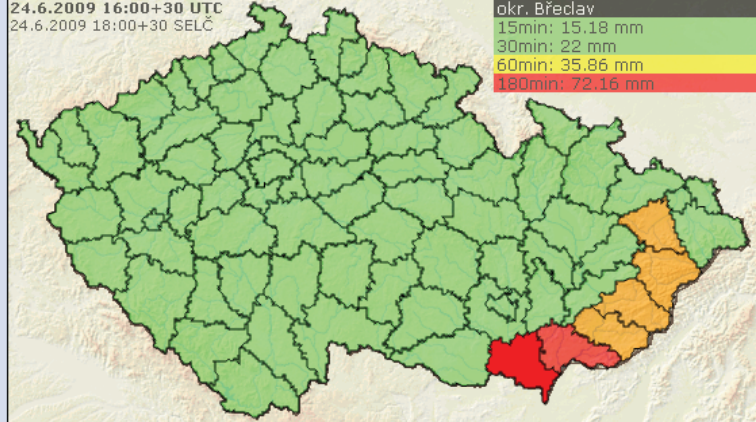
WarnView

JSWarnView - Sledování překročení srážkových úhrnů z adjustovaných radarových odhadů automaticky aktualizovat každých

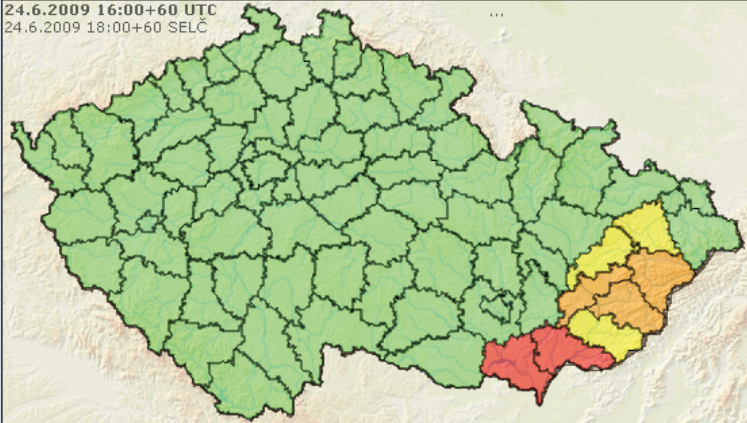
24.6.2009 16:00 UTC
24.6.2009 18:00 SELČ



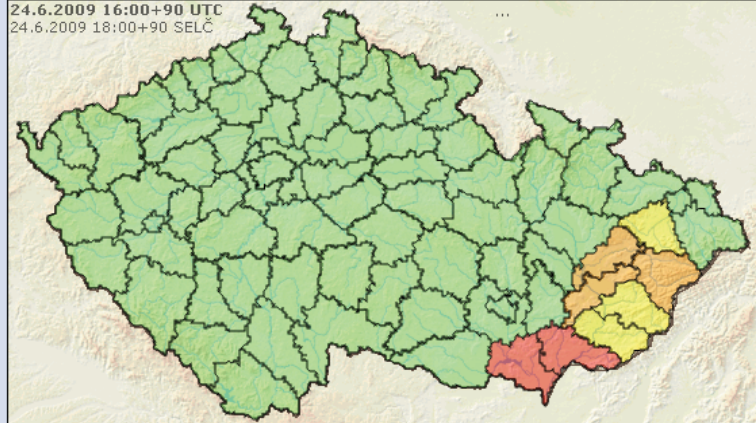
24.6.2009 16:00+30 UTC
24.6.2009 18:00+30 SELČ



24.6.2009 16:00+60 UTC
24.6.2009 18:00+60 SELČ



24.6.2009 16:00+90 UTC
24.6.2009 18:00+90 SELČ



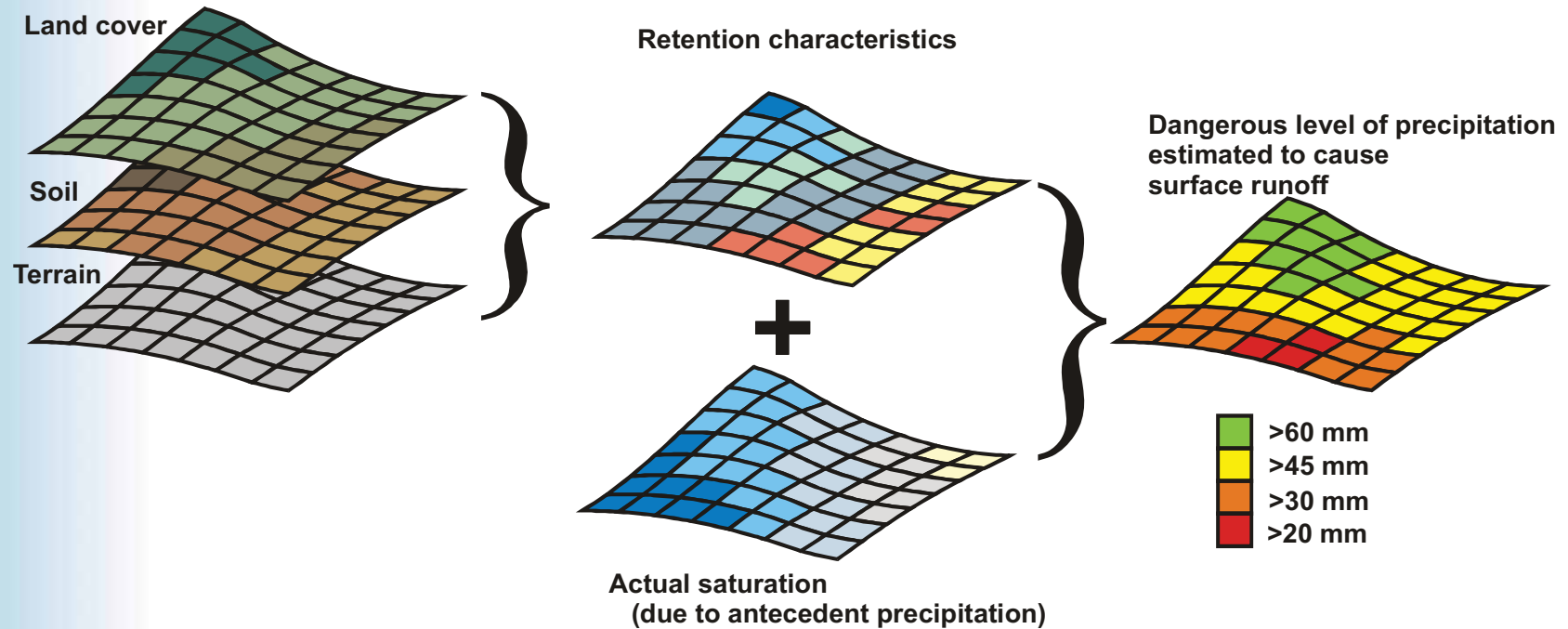
<20mm/15min a zároveň
<25mm/30min a zároveň
<30mm/60min a zároveň
<40mm/180min

≥20mm/15min nebo
≥25mm/30min nebo
≥30mm/60min nebo
≥40mm/180min

≥25mm/15min nebo
≥30mm/30min nebo
≥40mm/60min nebo
≥50mm/180min

≥30mm/15min nebo
≥40mm/30min nebo
≥50mm/60min nebo
≥70mm/180min

FFG



CZ

- CN and its update due to 30days precipitation.
- dangerous precipitation limit
- real time response estimate (HEC-HMS)

Flash Flood Guidance - National Weather Service

www.srh.noaa.gov

National Weather Service Flash Flood Guidance

News Organization Search Enter Search here GO

National Weather Service
Regional Map
3 Hour Flash Flood Guidance
Updated November 4, 2009 8:45 AM CST

Puerto Rico

Zoom in on Individual States Zoom in on River Forecast Centers

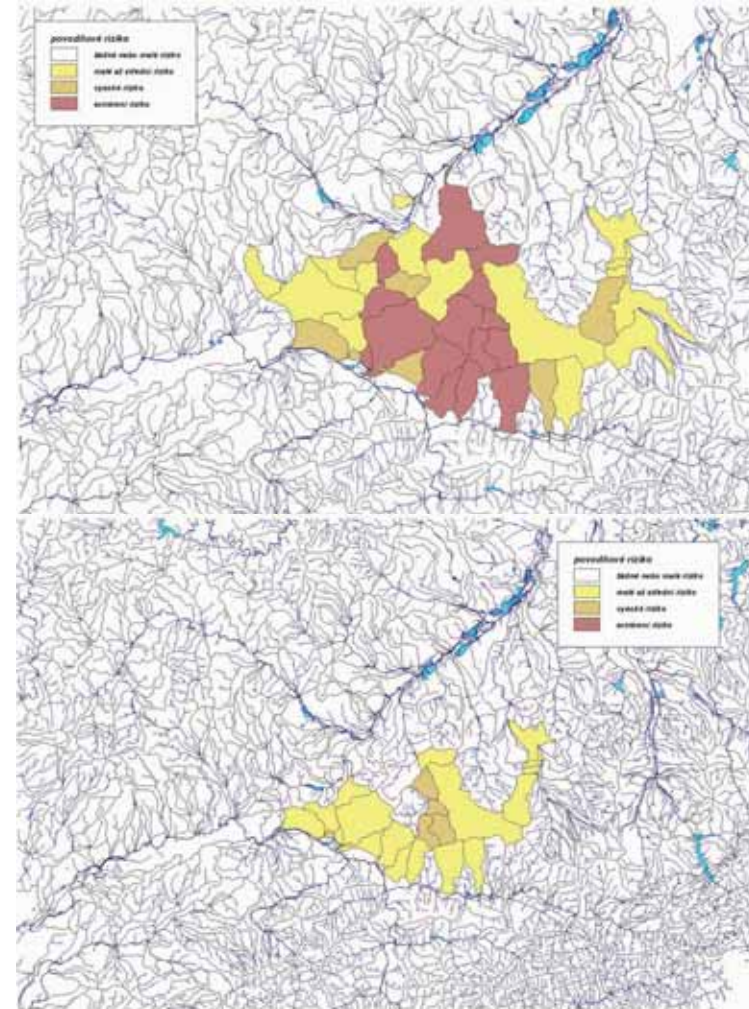
Select the product: 3 Hour Flash Flood Guidance

Choose a location to zoom in on, or click on the image: East and Central U.S.

View text versions of the state flash flood guidance values: Alabama View Text Product

Download data for GIS applications: Download DBF File

About Flash Flood Guidance:
National Weather Service (NWS) River Forecast Centers routinely issue Flash Flood Guidance throughout the day for every county in their area. The river forecast centers determine 1- 3- and 6-hour flash flood guidance values for all counties, and 12- and 24-hour values for parts of the eastern United States. The NWS Weather Forecast Offices use this guidance when issuing flash flood watches and warnings to the public.



Conclusion

CEE is vulnerable to flash floods.

- Small basins
- Fast development

Radars and other products and tools are used to monitor and warn on flash floods.



**Cagliari Workshop
May 2010**

**THANK YOU FOR YOUR
ATTENTION**

Jan Danhelka

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