



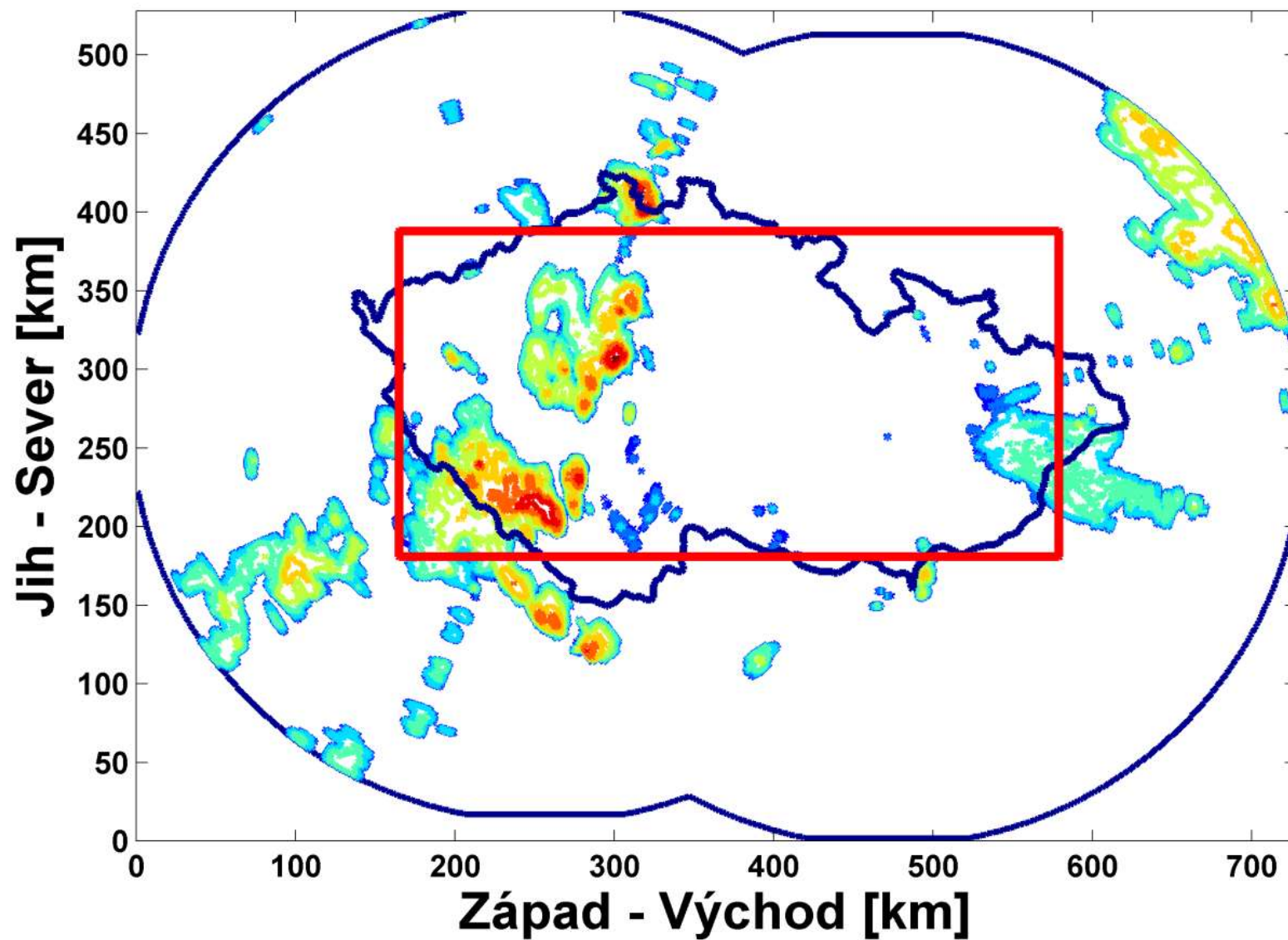
Jan Mejsnar

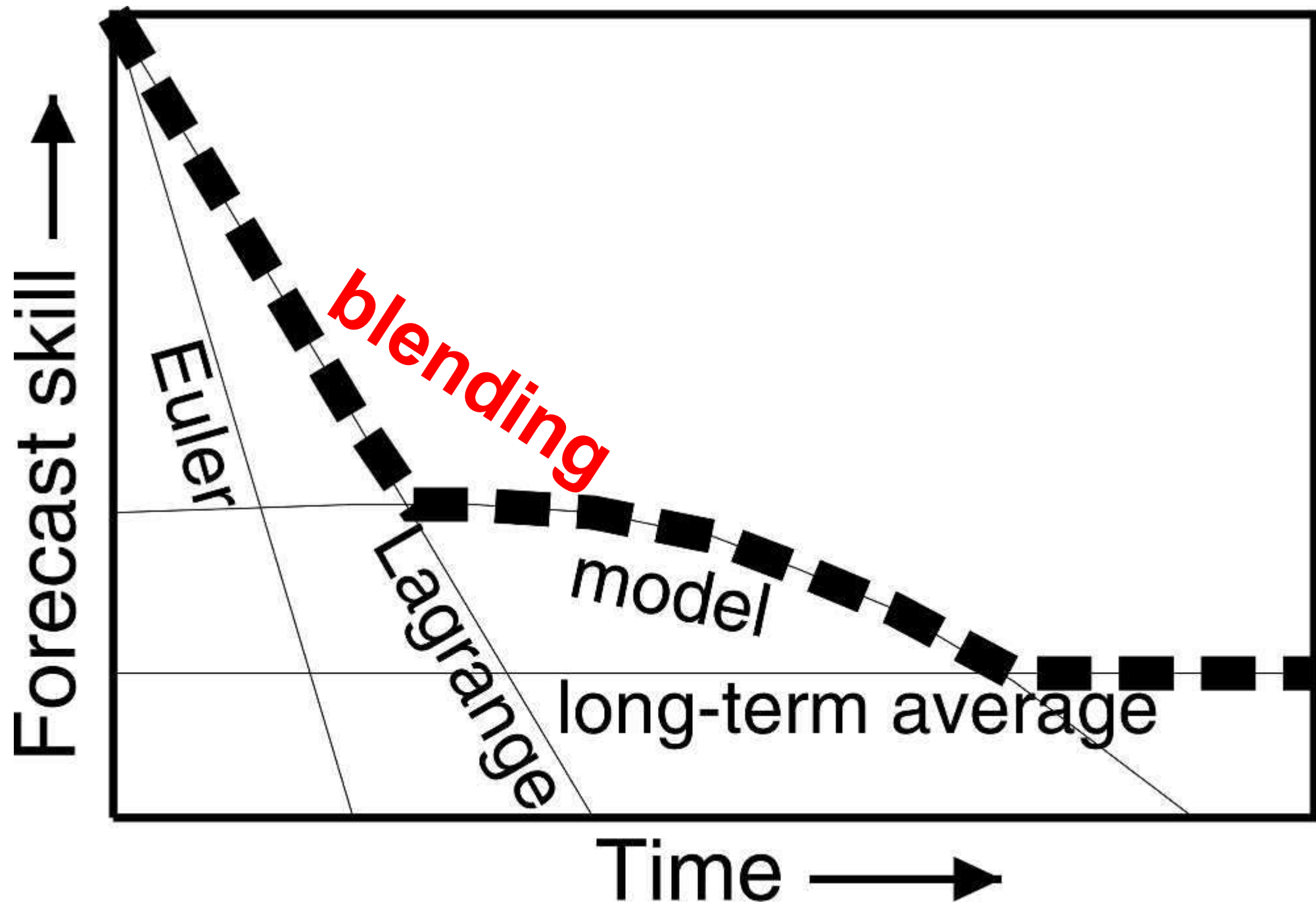
**Limity nowcastingu
srážek extrapolací
radarových odhadů
srážek**

14. Zář 2017, Deštné, ČMES

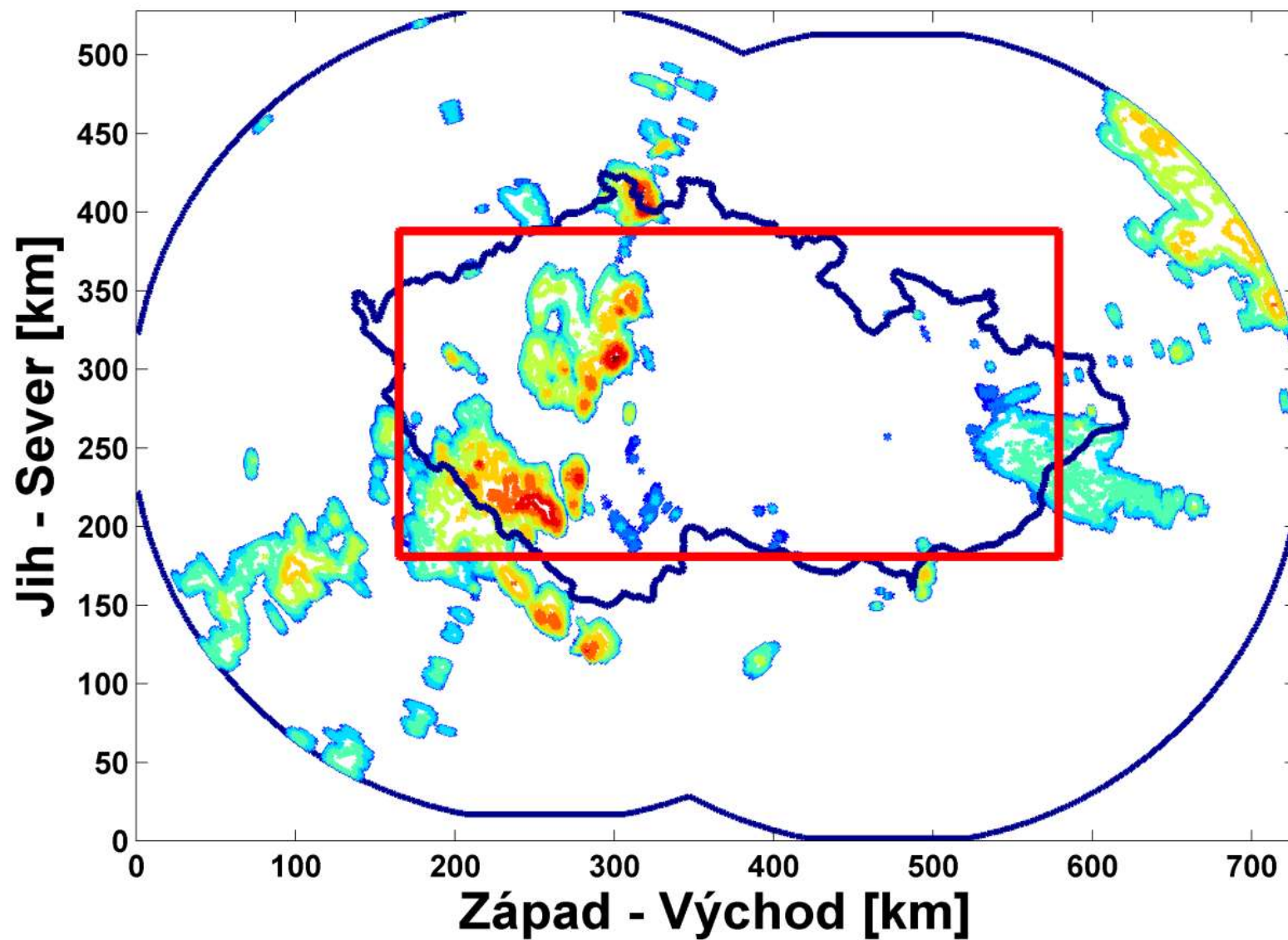
1/7 Úvod, motivace

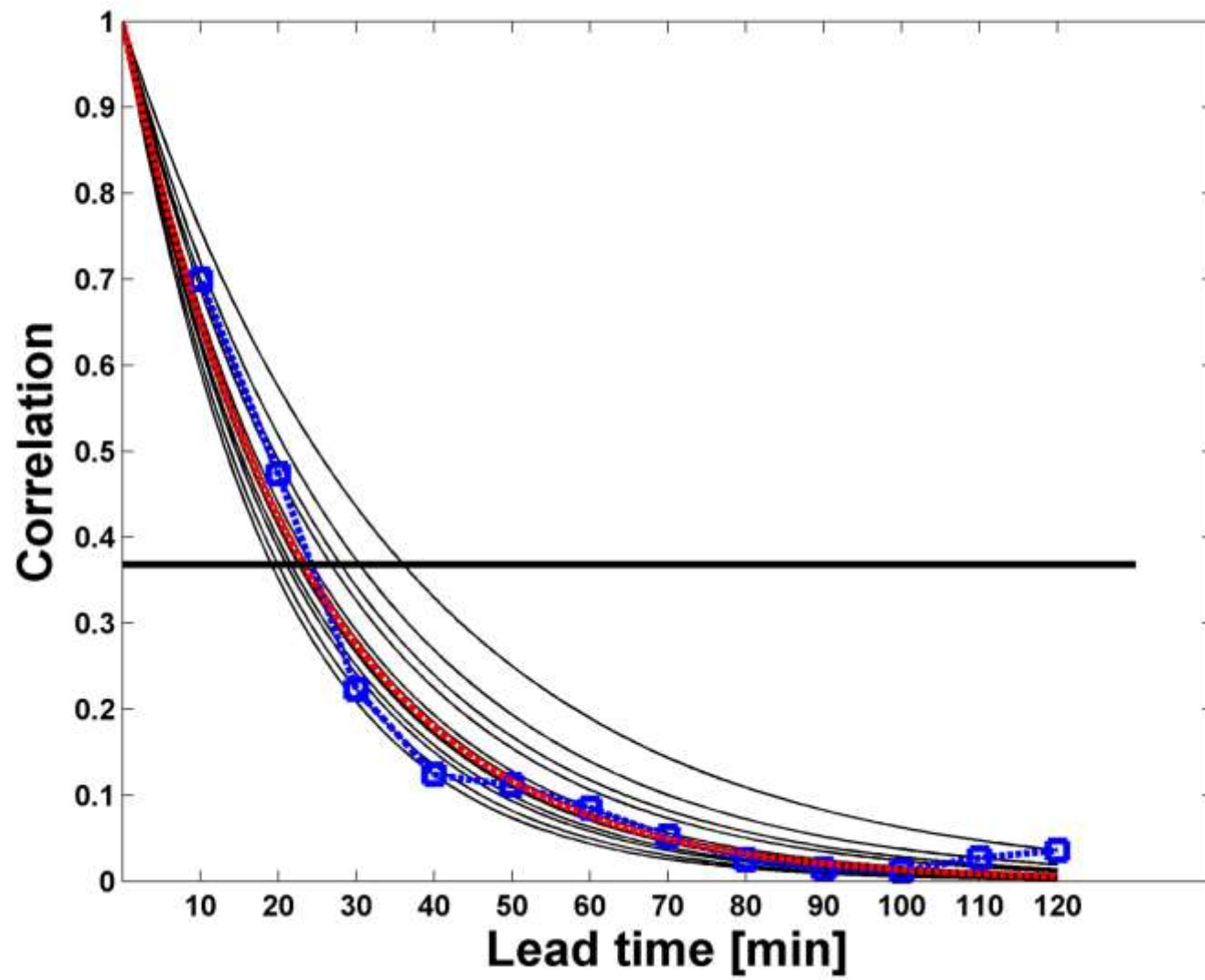
15.8.2010 19.05 UTC





15.8.2010 19.05 UTC



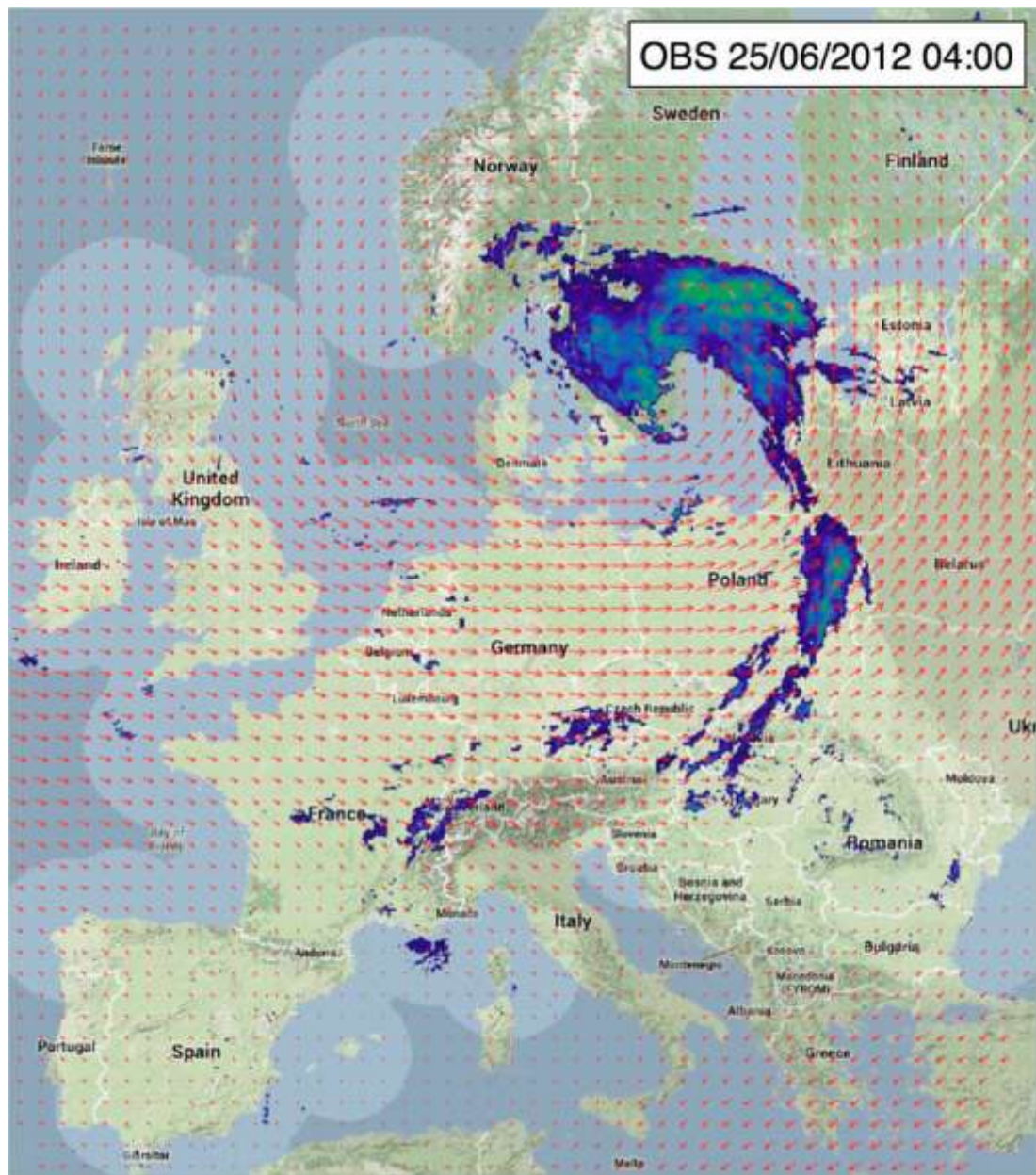




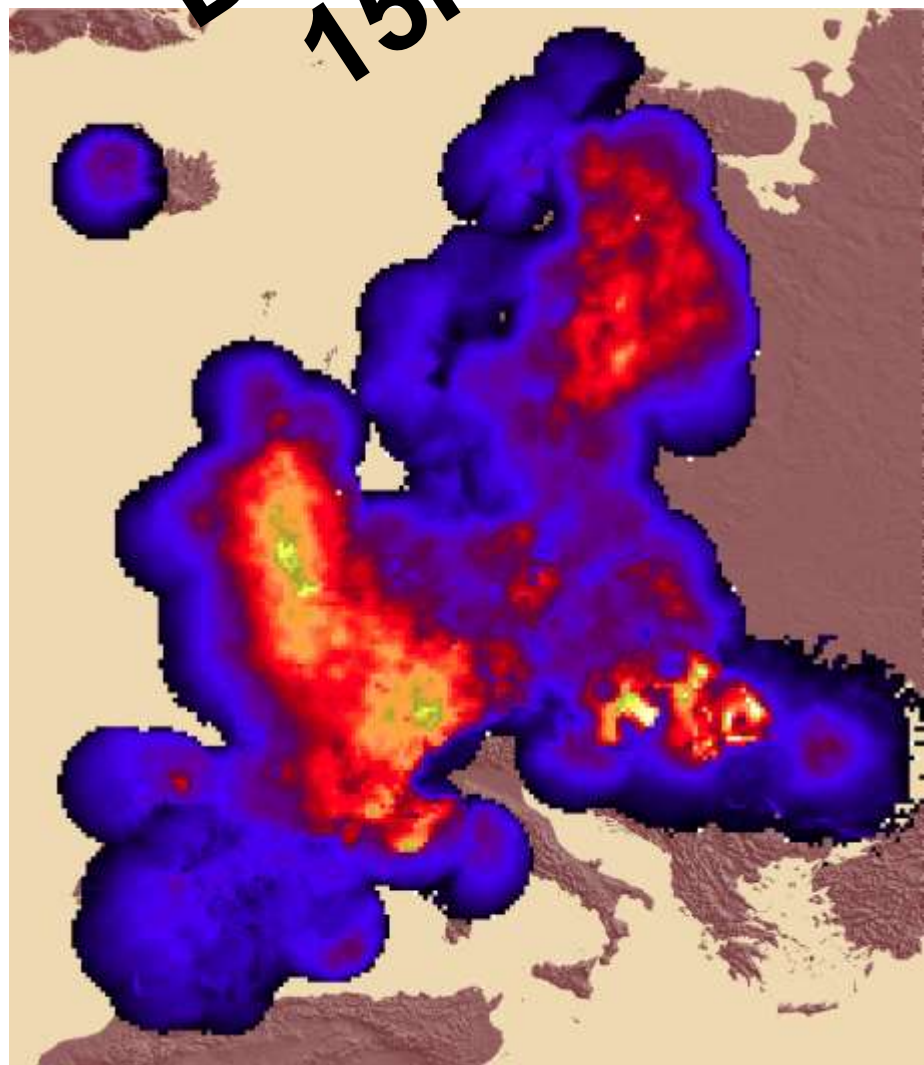
Radar EU

UNH free.net

FACEBOOK
RadarEu
To see more
RadarEu ve Facebooku (18. 181)
SPONZOR: [www.eu.radar.eu](#)



**DCT až
15h!**



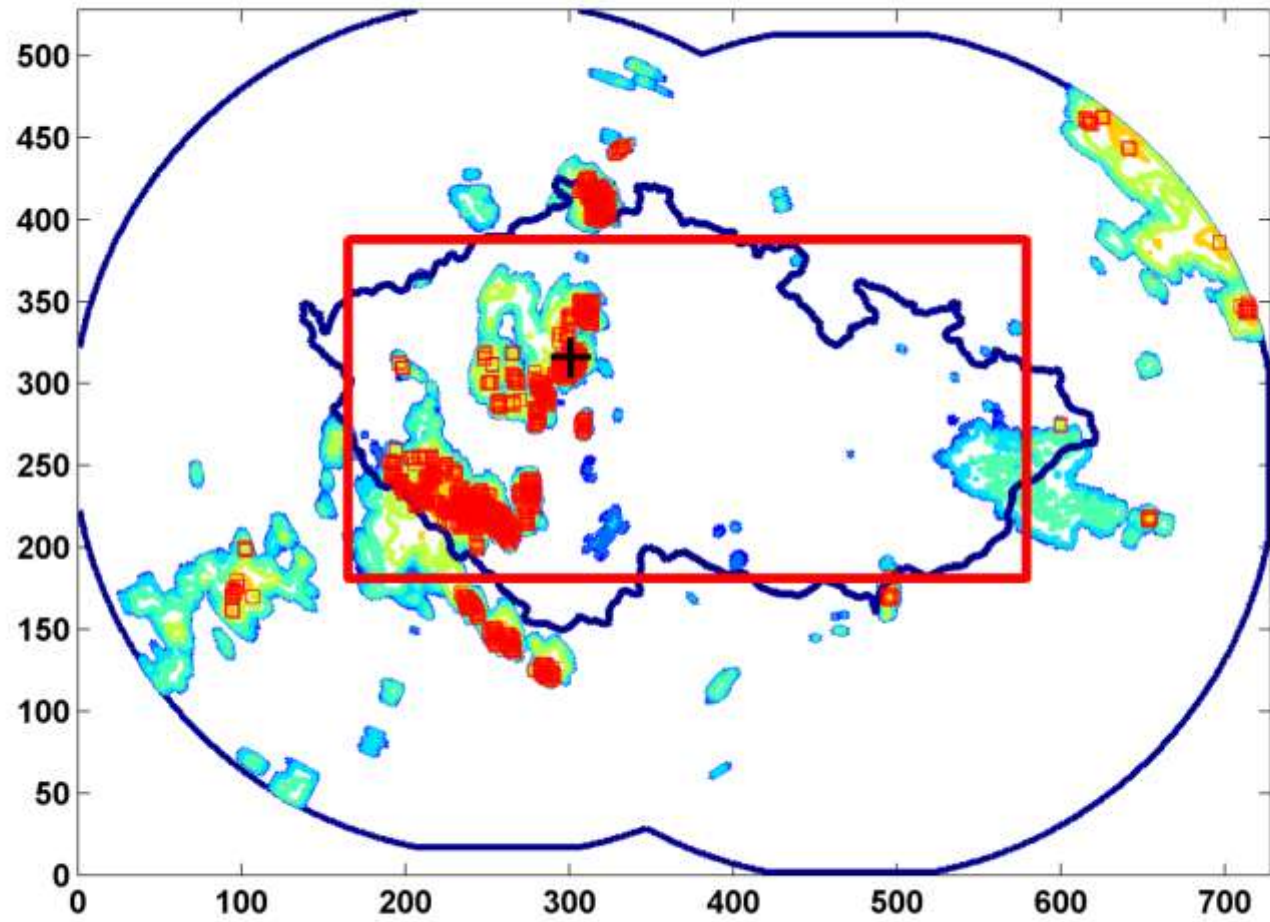
2/7 Data, výpočet DCT

- 0-2 h
- Radar **CAPPI2km**
- **Bez adjustace** daty srážkoměrů
- Časový krok 10 min
- 20 letních měsíců
- Tj. 88128 termínů
- Použito jen **37526** s nadlimitní \emptyset srážkou










- Pohybové pole **COTREC**
- **Extrapolace na 120 minut**
- **$Z = 200R^{1.6}$**
- Persistence
- **15.8.2010 SW**
- **06/07 2009 E**
- **05/2010 NE 120+**

3/7 Charakteristiky atmosféry







15.8.2010 19.10 UTC



Všeobecné char.

| | | |
|---|--|----------------|
|  Intenzita srážek [mm/h] | Průměrná intenzita srážek v oblasti | 0.01-0.08-0.49 |
|  Prům. rychlost [m/s] | Průměrná rychlost pohybového pole v oblasti | 2.6-8.8-16.5 |
|  Podíl >0.5mm/h [%] | Podíl oblasti s danými nadprahovými srážkami | 0.5-3.7-22.7 |
|  Po >2mm/h / Po >0mm/h [%] | Podíl dvou podílů s danými nadprahovými srážkami | 0.3-8.1-27.6 |
|  Synoptický typ | | |
|  Přechod fronty | Typ fronty, její intenzita a směr jejího postupu | |
|  Směr pohybového pole | Průměrný úhel pohybového pole | 0-360 |
|  Hodina [UTC] | | 0-24 |
|  Měsíc | | 5-9 |

Char. konvekce

| | | |
|--|---|----------------|
|  Počet jader | Počet konvektivních jader (bez jader 1km ² a 2 km ²) | 2-15-51 |
|  Plocha jader [%] | Podíl oblasti s konvektivními jádry | 0.01-0.26-1.79 |
|  Intenzita jader [mm/h] | Průměrná intenzita srážek v bodech všech jader | 2.1-5.1-14.3 |
|  Podíl srážek v jádrech [%] | Podíl srážek v jádrech na celkových srážkách | 1-21-73 |
|  Podíl >20mm/h [%] | Podíl oblasti s danými nadprahovými srážkami | 0-0-0.25 |
|  Po >10mm/h / P >2mm/h [%] | Podíl dvou podílů s danými nadprahovými srážkami | 0-2-28 |

Trendy

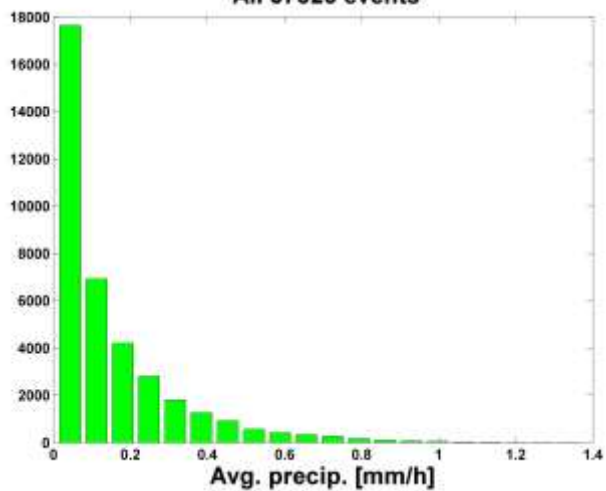
| | | |
|------------------------|---|-----|
| Trend intenzity srážek | Trend průměrné intenzity srážek z posledních 3 polí | 1-5 |
| Trend rychlosti | Trend rychlosti z posledních 3 pohybových polí | 1-5 |
| Trend předpovědí | Trend posledních 3 hodnot korelací předpovědí | 1-5 |
| Trend počtu jader | Trend počtu jader v posledních 3 polích odrazivosti | 1-5 |

Verifikační char.

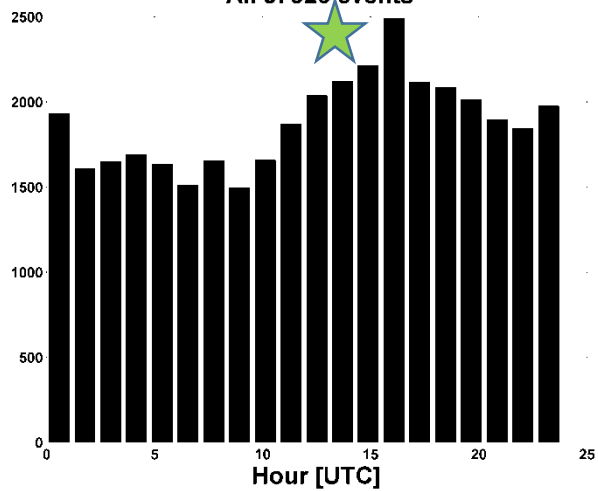
| | | |
|--------------------|---|----------------|
| DCT [minuty] | Dekorelační čas, korelace klesne pod 1/e (více v textu) | 15-38-104 |
| DCT PER [minuty] | To samé, jen předpovědi jsou založeny na persistenci | 11-24-85 |
| +DCT [minuty] | Zlepšení (zhoršení) proti persistenci (DCT – DCT PER) | (-11)-11-47 |
| +DCT/DCT *100[%] | Míra zlepšení (zhoršení) | (-35)-31-69 |
| CSI 1 mm (30 min.) | Critical success index, práh 1mm, předpověď na 30min. | 0.01-0.22-0.49 |
| Sqrt (30 min.) | Střední kvadratická chyba, předpověď na 30. min. | 0.1-0.5-2.8 |

Percentily
5-50-95
DCT 45 min.
+DCT 13 min.

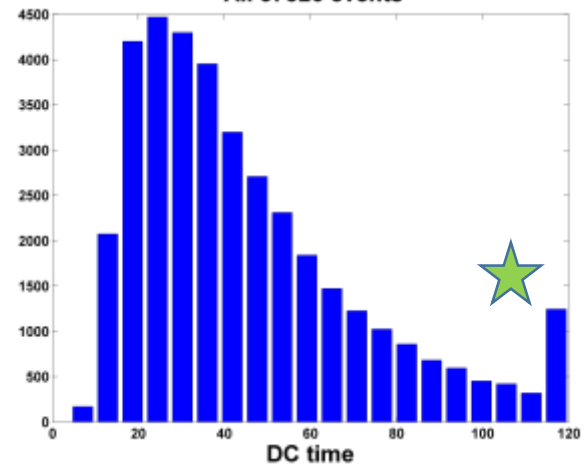
All 37526 events



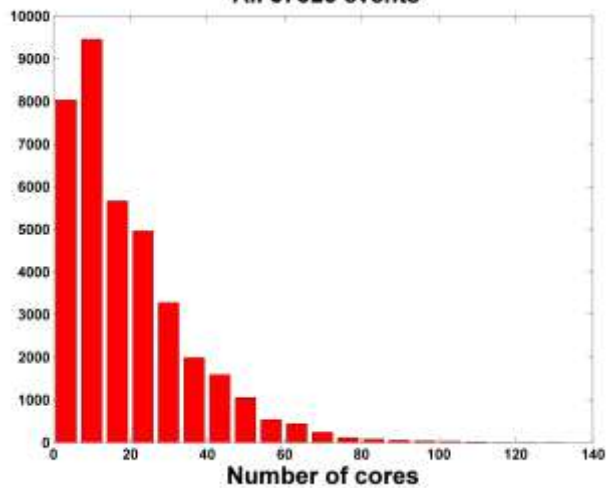
All 37526 events



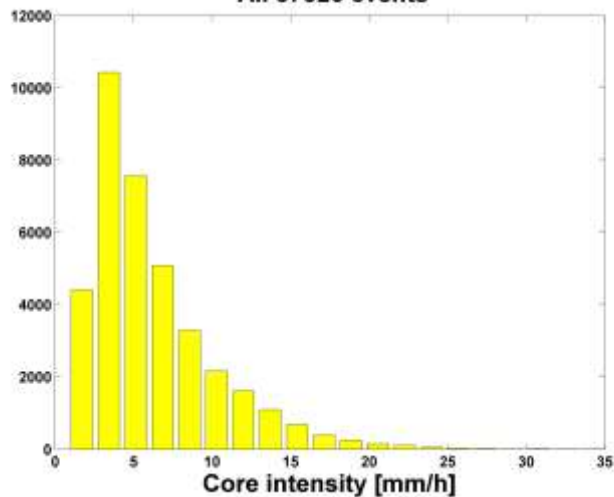
All 37526 events



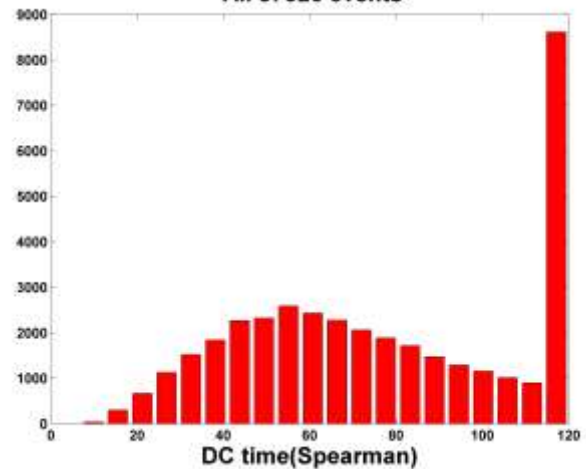
All 37526 events



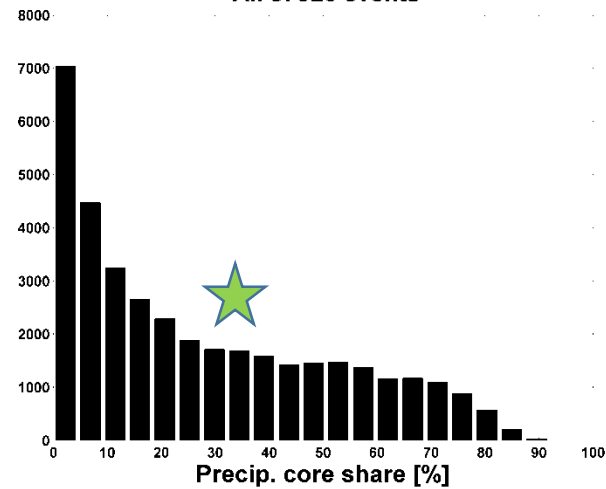
All 37526 events



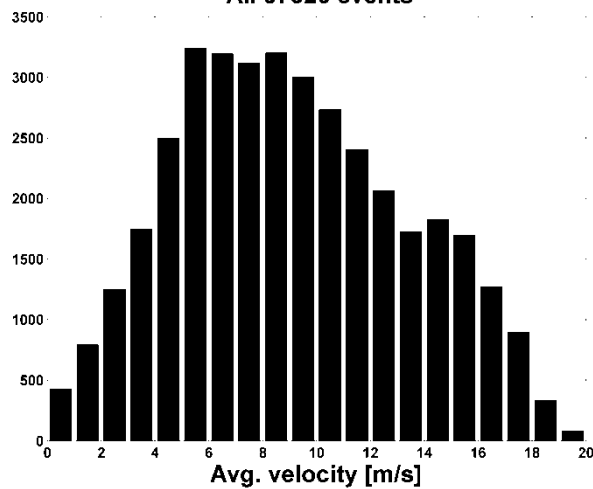
All 37526 events



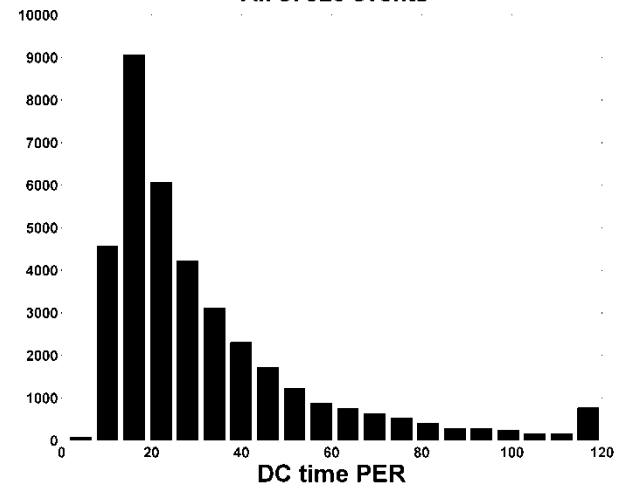
All 37526 events



All 37526 events



All 37526 events



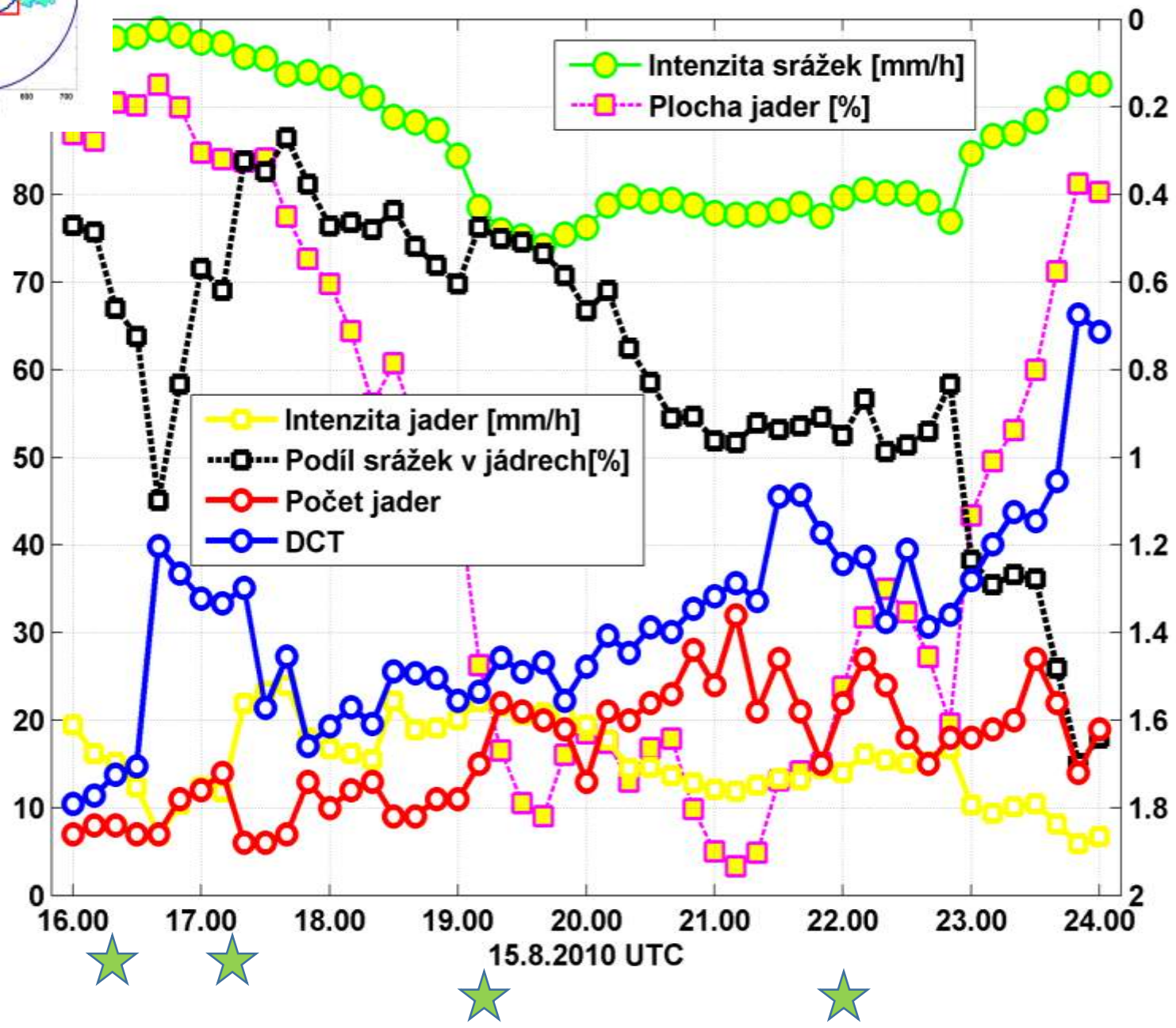
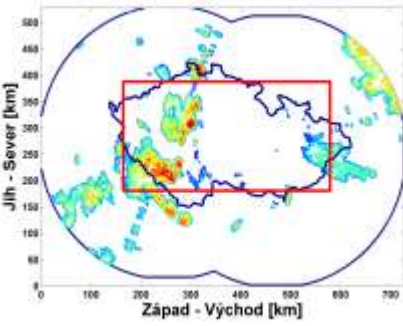
4/7 DCT v závislosti na charakteristikách atmosféry

Obecná závislost 2009-2012 (37526)

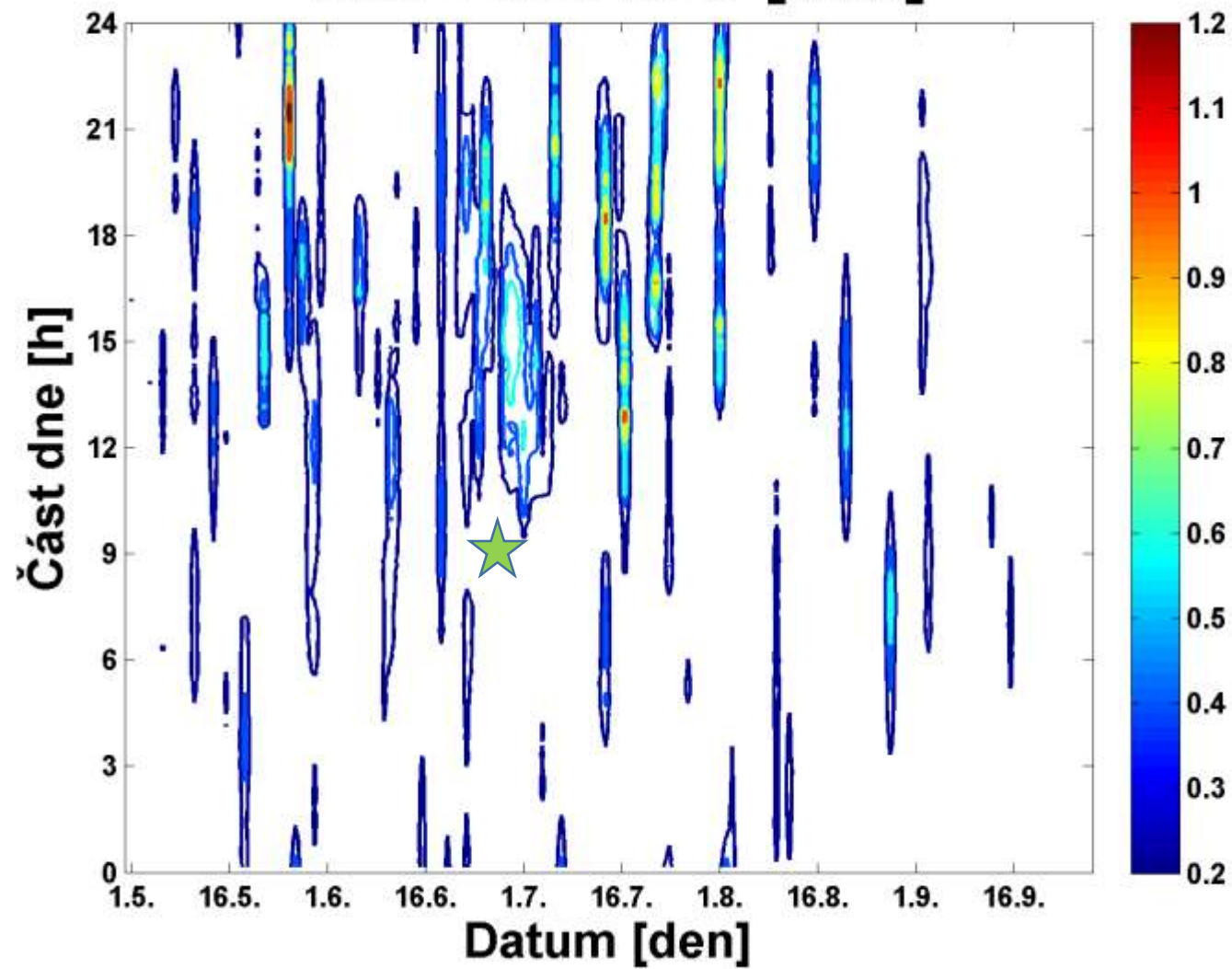
| | DCT | R1 | +DCT | DCT | R2 | +DCT | DCT | R3 | +DCT |
|-----------------------------|------|----------|------|------|----------|------|------|-----------|------|
| Trend počtu jader | 45.2 | Sestupný | 13.3 | 46.6 | Stabilní | 13.6 | 45.3 | Vzestupný | 13.8 |
| Trend rychlosti | 43.2 | Sestupný | 11.9 | 46.8 | Stabilní | 13.6 | 44.5 | Vzestupný | 13.5 |
| Trend srážek | 45.7 | Sestupný | 12.5 | 42.1 | Stabilní | 12.1 | 48.1 | Vzestupný | 15 |
| Trend předpovědi | 43.4 | Sestupný | 11.6 | 44.1 | Stabilní | 12.9 | 49.3 | Vzestupný | 15.4 |
| ★ Síla fronty | 28.7 | Slabá | 9.34 | 41.1 | Střední | 16.3 | 48.6 | Silná | 18.6 |
| ★ Typ fronty | 34.8 | Teplá | 6.03 | 37.9 | Studená | 14.9 | 46.8 | Okluzní | 20.3 |
| ★ Směr pohybového pole | 44.2 | SW | 15.4 | 44 | NW | 11.4 | 50.6 | E | 10 |
| Podíl>10mm/ Podíl>2mm | 55.6 | 0-5 | 15.4 | 31.7 | 5-20 | 11.2 | 23.4 | 20+ | 6.26 |
| Podíl>2mm/ Podíl>0mm | 50.8 | 0-5 | 12.1 | 43.6 | 5-20 | 14.2 | 37.9 | 20+ | 12.4 |
| Podíl>20mm [%] | 52.6 | -0.1 | 14.4 | 33.6 | .01-.08 | 12.2 | 29.4 | 0.08+ | 9.12 |
| Plocha jader [%] | 48.6 | -0.3 | 12.9 | 44.2 | .3-1 | 14.1 | 36.3 | 1+ | 12.2 |
| Podíl>0.5mm [%] | 35 | 0-2.5 | 10 | 45.1 | 2.5-10 | 14.9 | 64.1 | 10+ | 15.6 |
| Intenzita jader [mm/h] | 52.3 | 0-4 | 13.1 | 45.7 | 4-10 | 14.6 | 28.4 | 10+ | 8.91 |
| ★ Prům. rychlost [m/s] | 45 | 0-6 | 6.11 | 45.2 | 6-12 | 14.6 | 45.9 | 12+ | 17.8 |
| Počet jader | 42.4 | 0-10 | 10.9 | 46.2 | 10-30 | 14.3 | 48.2 | 30+ | 14.3 |
| Intenzita srážek [mm/h] | 37.3 | -0.05 | 11.3 | 46 | .05-.2 | 14.1 | 55.6 | 0.2+ | 14.4 |
| ★ Podíl srážek v jádrech[%] | 61.2 | 0-15 | 15.1 | 40 | 15-50 | 14.6 | 24.3 | 50-100 | 7.25 |
| ★ Hodina [UTC] | 55 | 0-8 | 17.2 | 37.2 | 8-16 | 9.36 | 45.3 | 16-24 | 13.6 |

5/7 Case studies

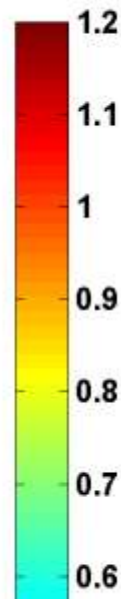
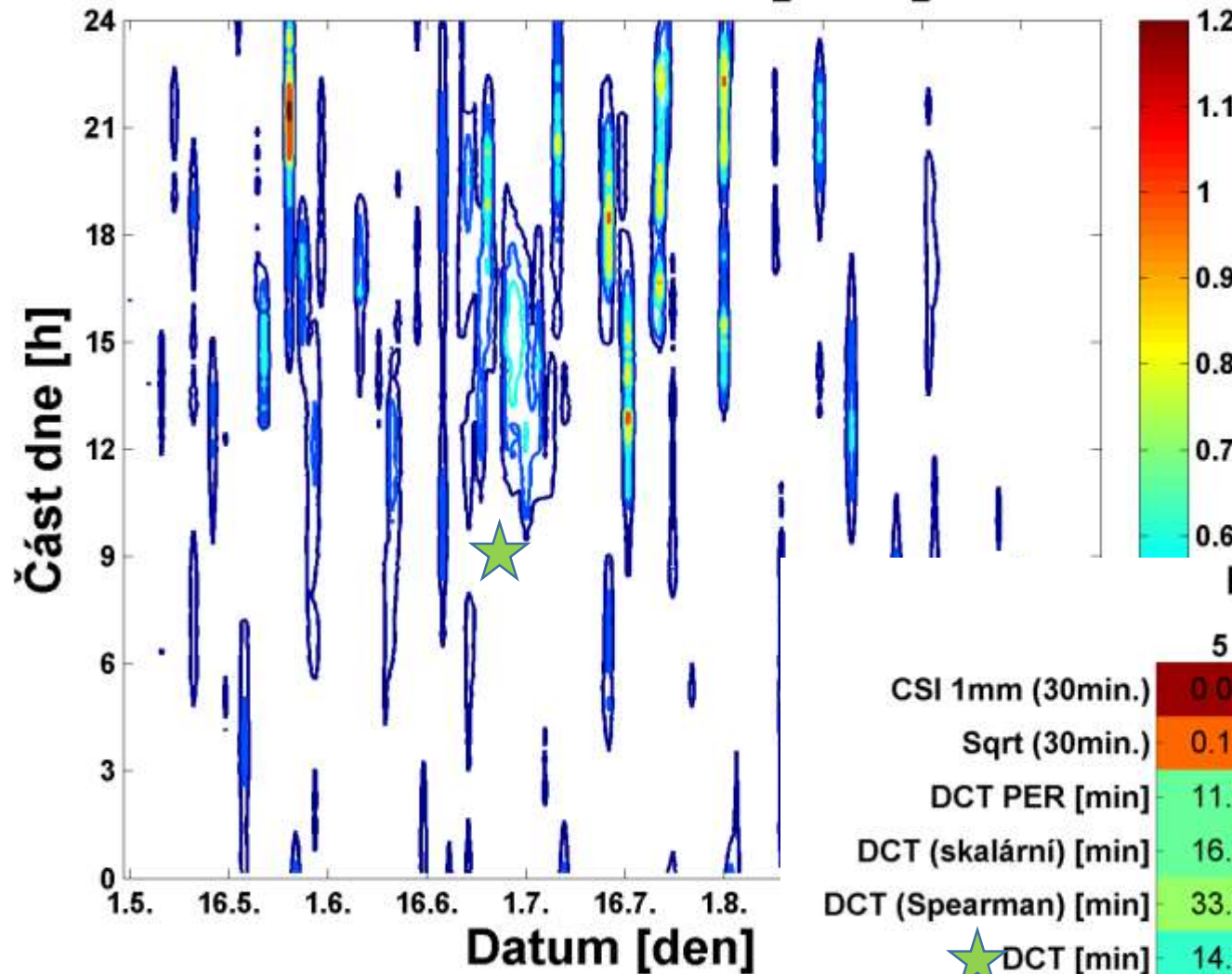
15.8.2010 19.05 UTC



1.5.-30.9.2009 [mm]



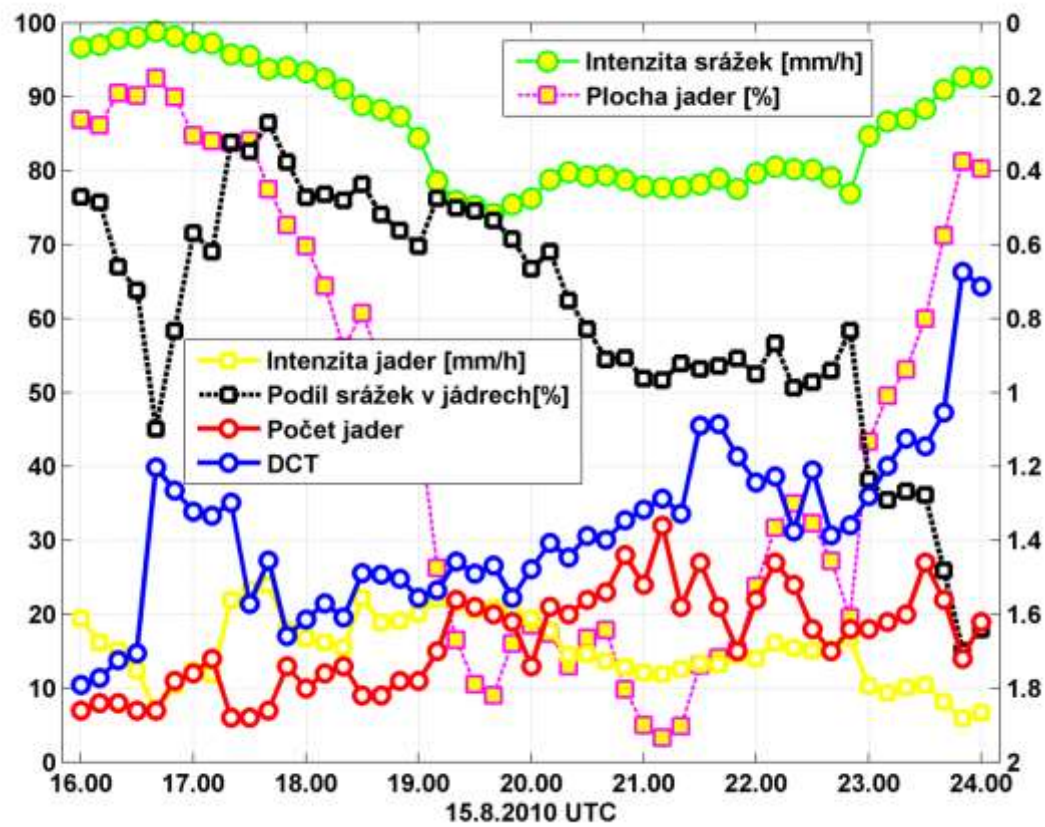
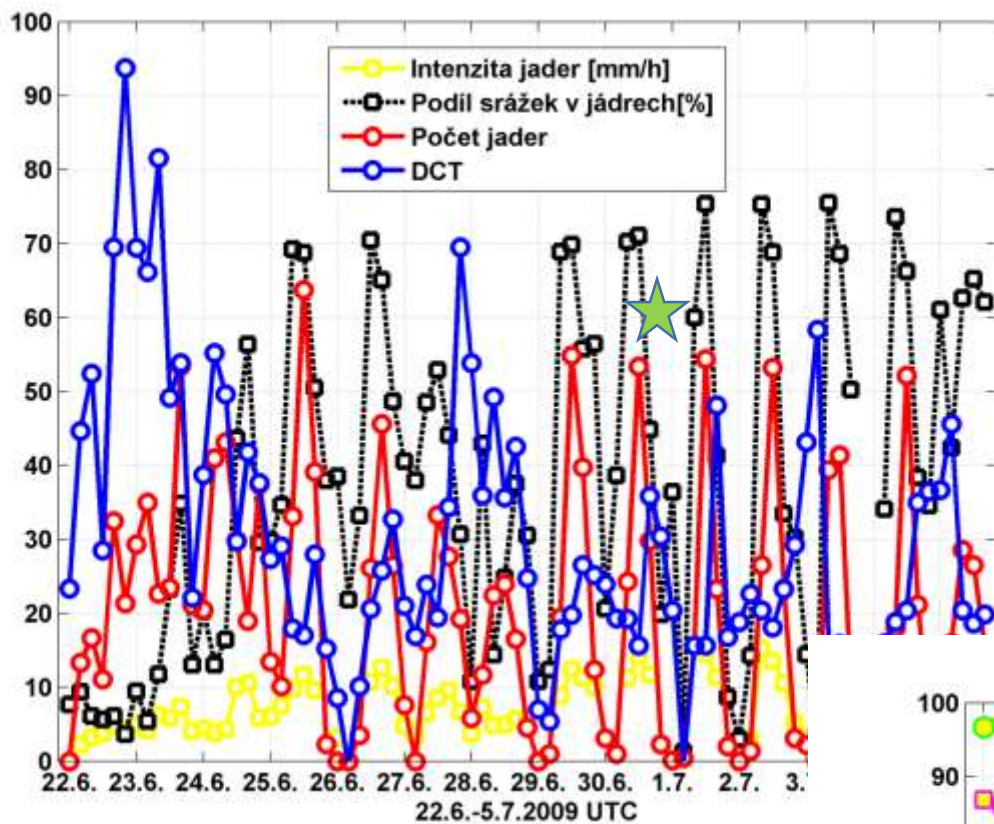
1.5.-30.9.2009 [mm]

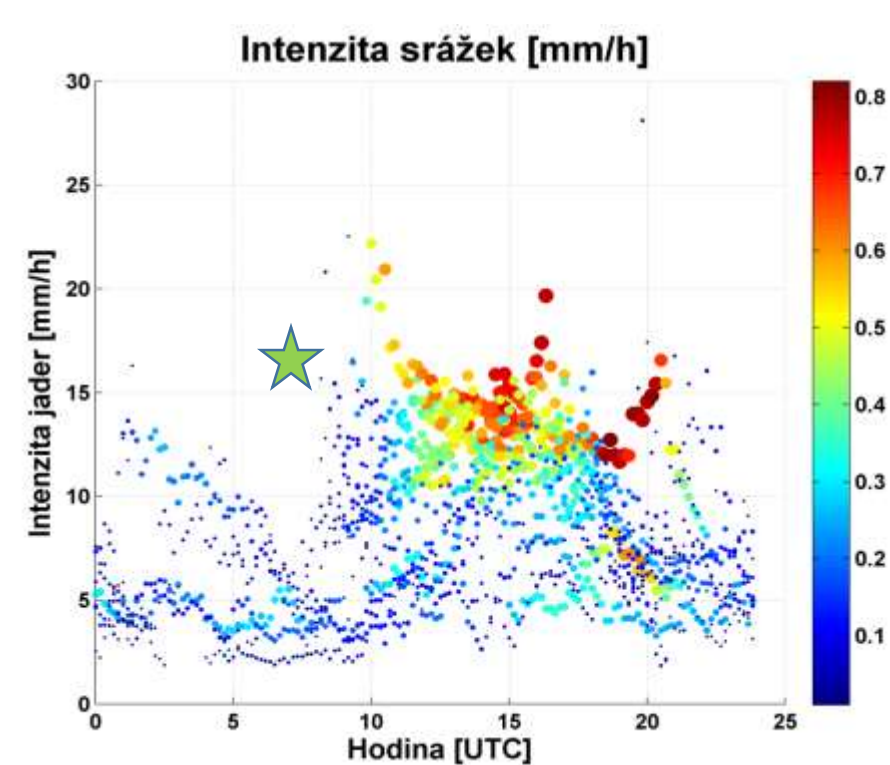
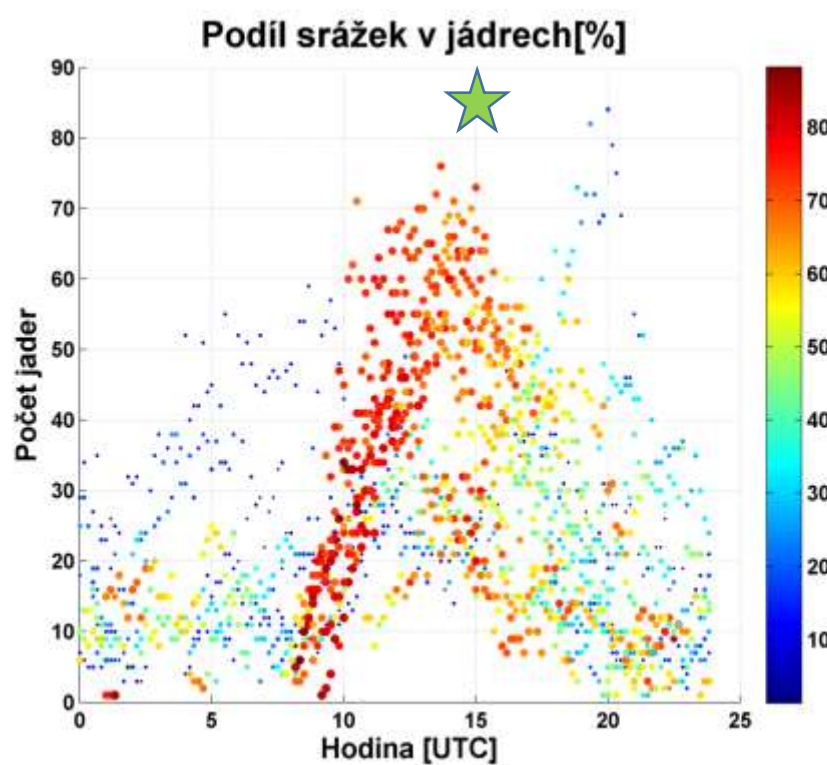
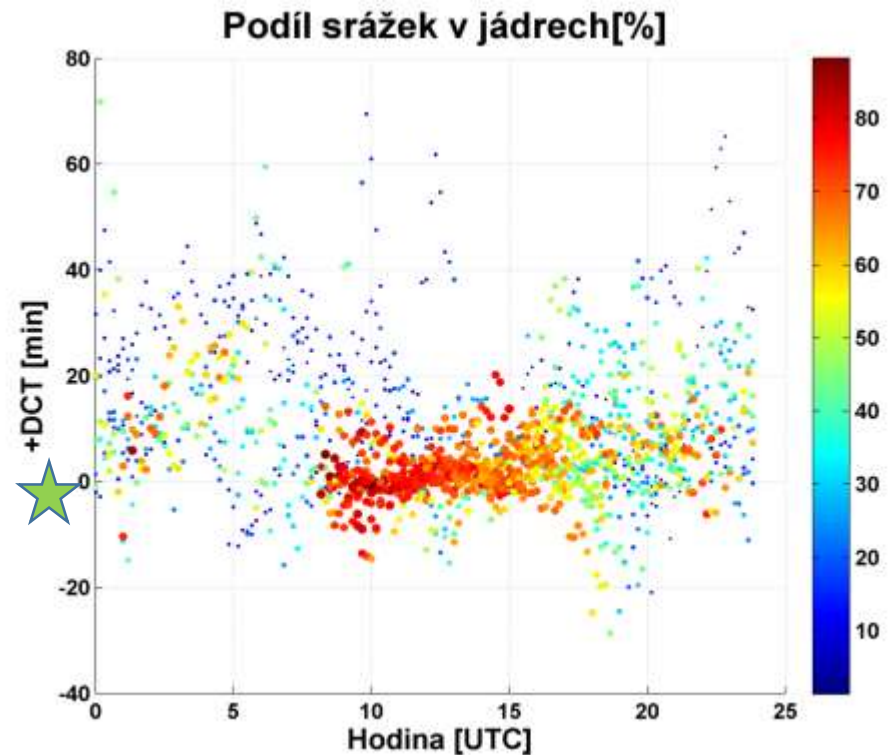
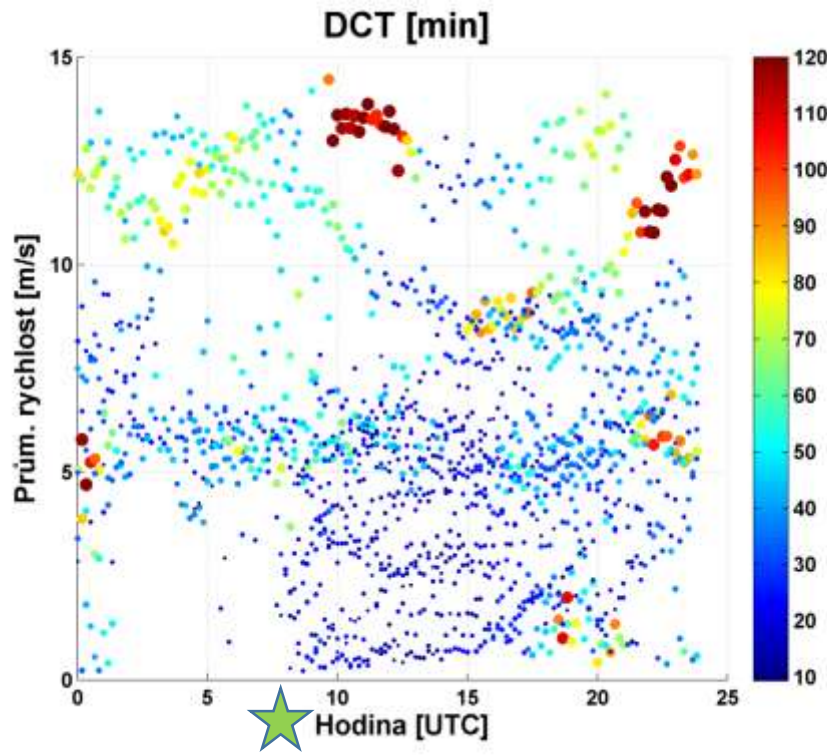


Případ 22.6.-5.7.2009 (1487)

| | 5 | 25 | 50 | 75 | 95 |
|----------------------------|------|------|------|------|------|
| CSI 1mm (30min.) | 0.07 | 0.17 | 0.24 | 0.32 | 0.47 |
| Sqrt (30min.) | 0.19 | 0.53 | 0.94 | 2.19 | 4.37 |
| DCT PER [min] | 11.7 | 15.4 | 21.7 | 32.3 | 61.6 |
| DCT (skalární) [min] | 16.7 | 22.3 | 30.9 | 48.4 | 97 |
| DCT (Spearman) [min] | 33.3 | 52.4 | 67.4 | 87 | 120 |
| ★ DCT [min] | 14.2 | 19.4 | 28.6 | 44.7 | 79 |
| Plocha jader [%] | 0.08 | 0.26 | 0.53 | 1.42 | 3.06 |
| Intenzita jader [mm/h] | 3.16 | 5.17 | 7.85 | 11.4 | 14.6 |
| Prům. rychlost [m/s] | 0.86 | 3.64 | 5.56 | 7.94 | 12.6 |
| Počet jader | 5 | 13 | 24 | 38 | 60 |
| Intenzita srážek [mm/h] | 0.01 | 0.05 | 0.15 | 0.29 | 0.59 |
| Podíl srážek v jádrech [%] | 5.23 | 22.4 | 46.2 | 65.9 | 76.7 |



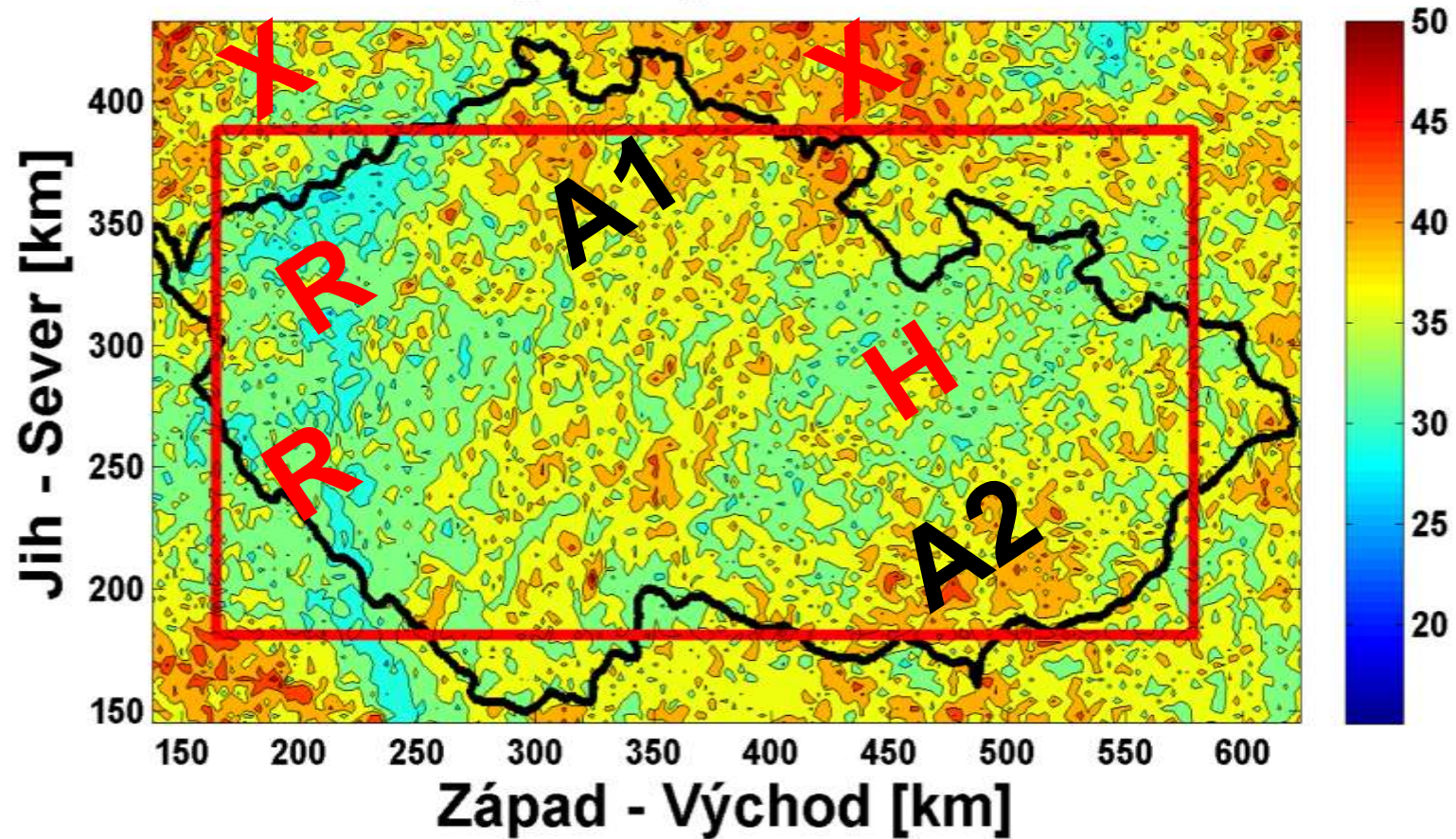




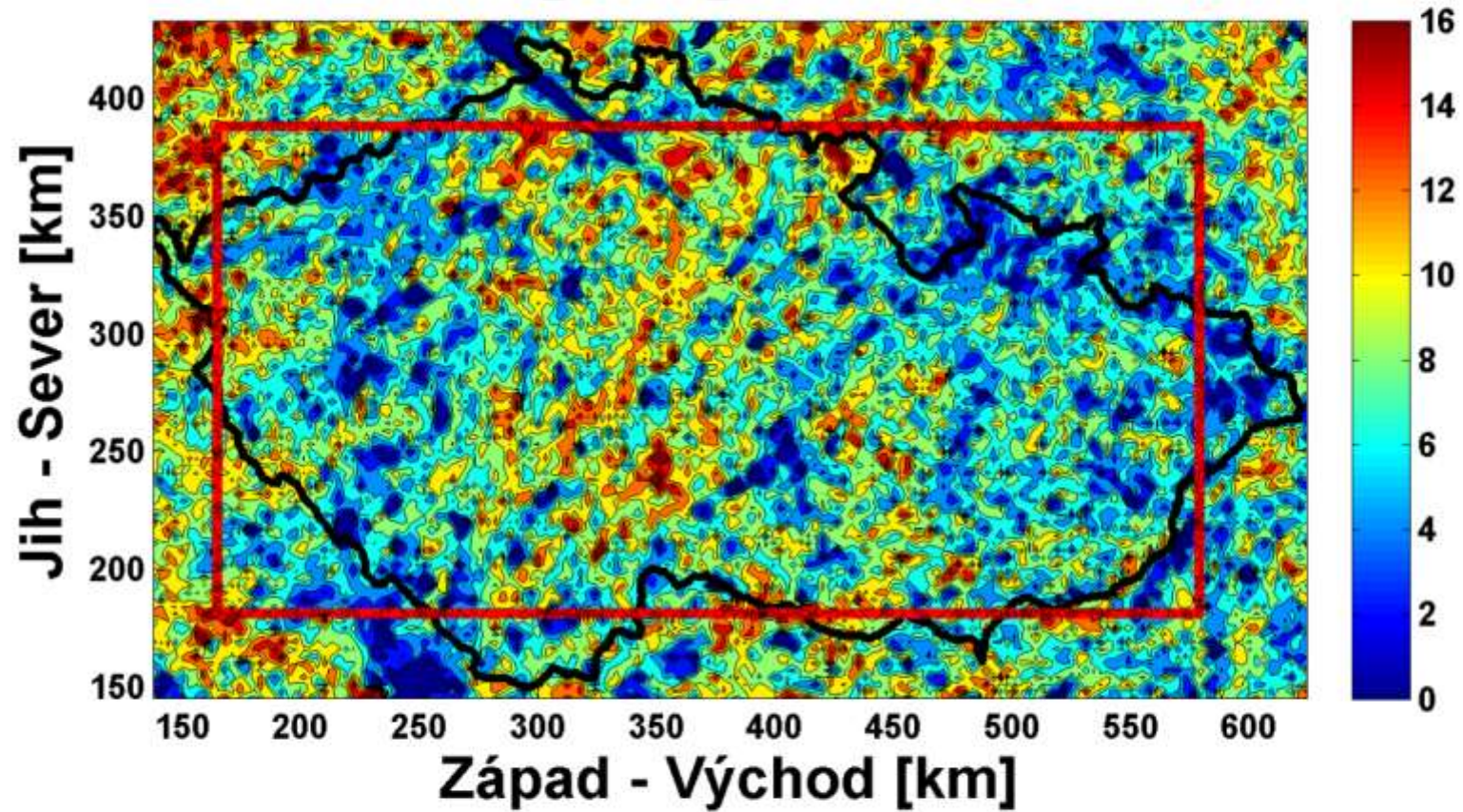
6/7 GDCT

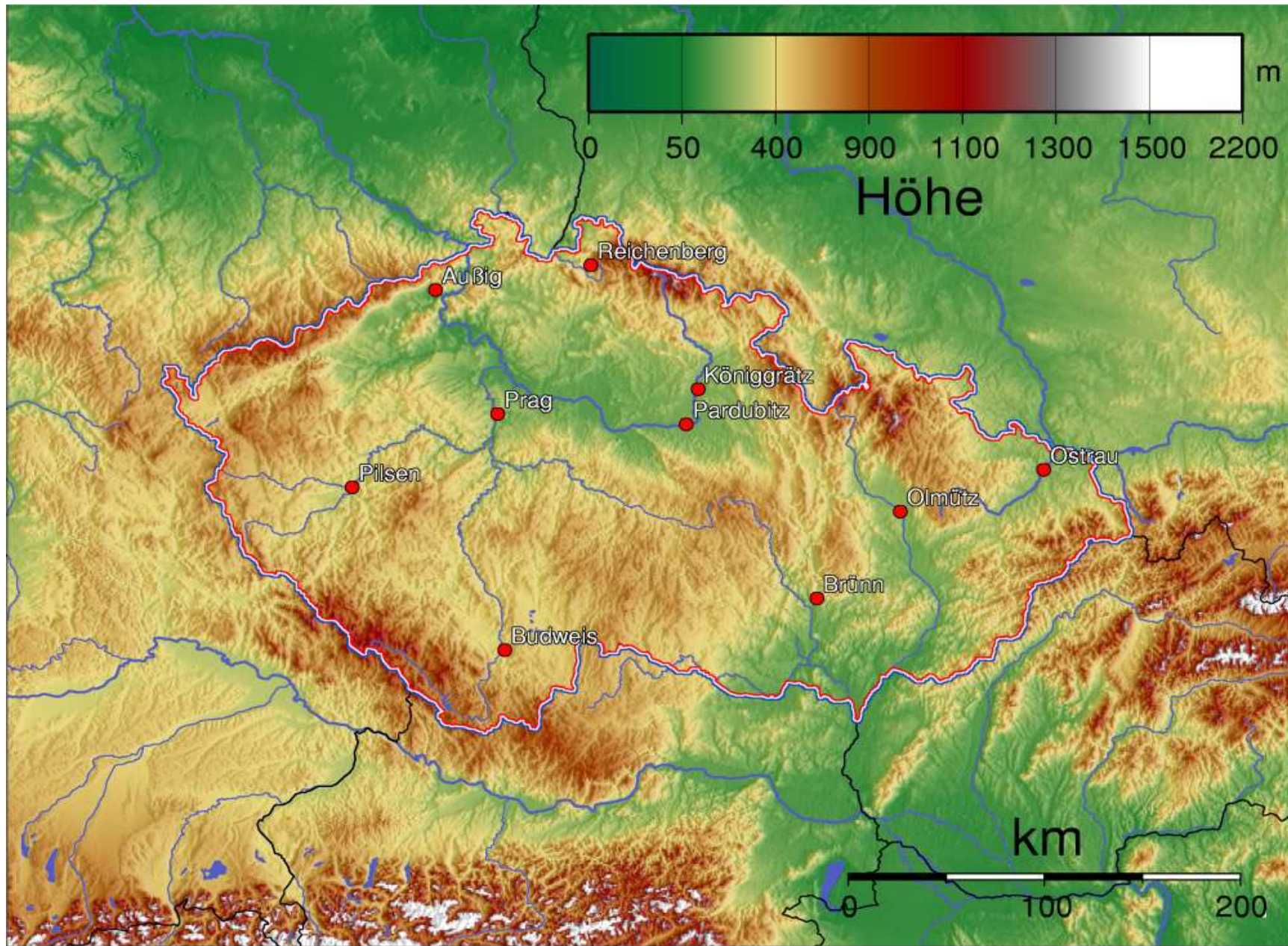


DCT [min] EXT90 ALL

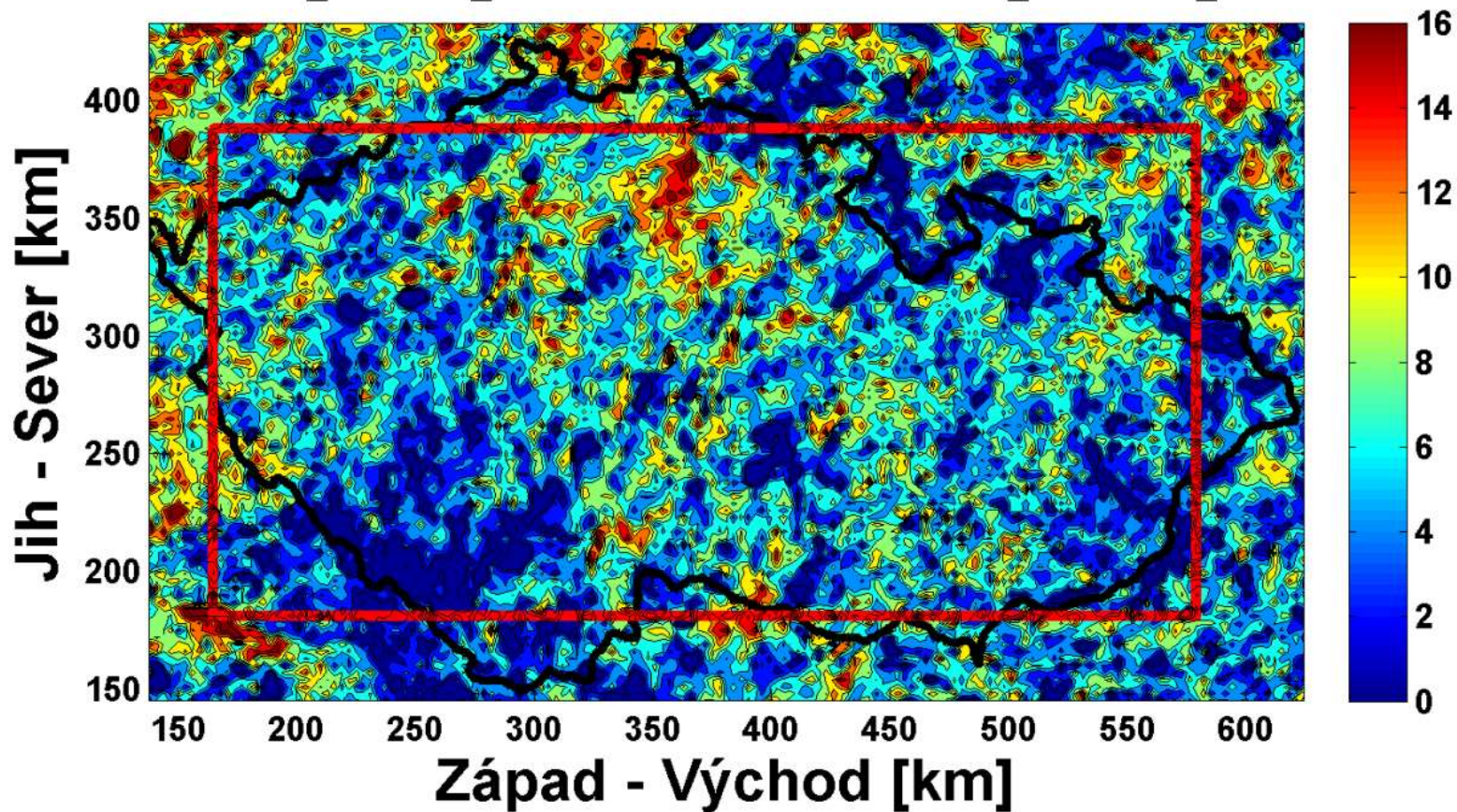


+DCT [min] EXT90 ALL

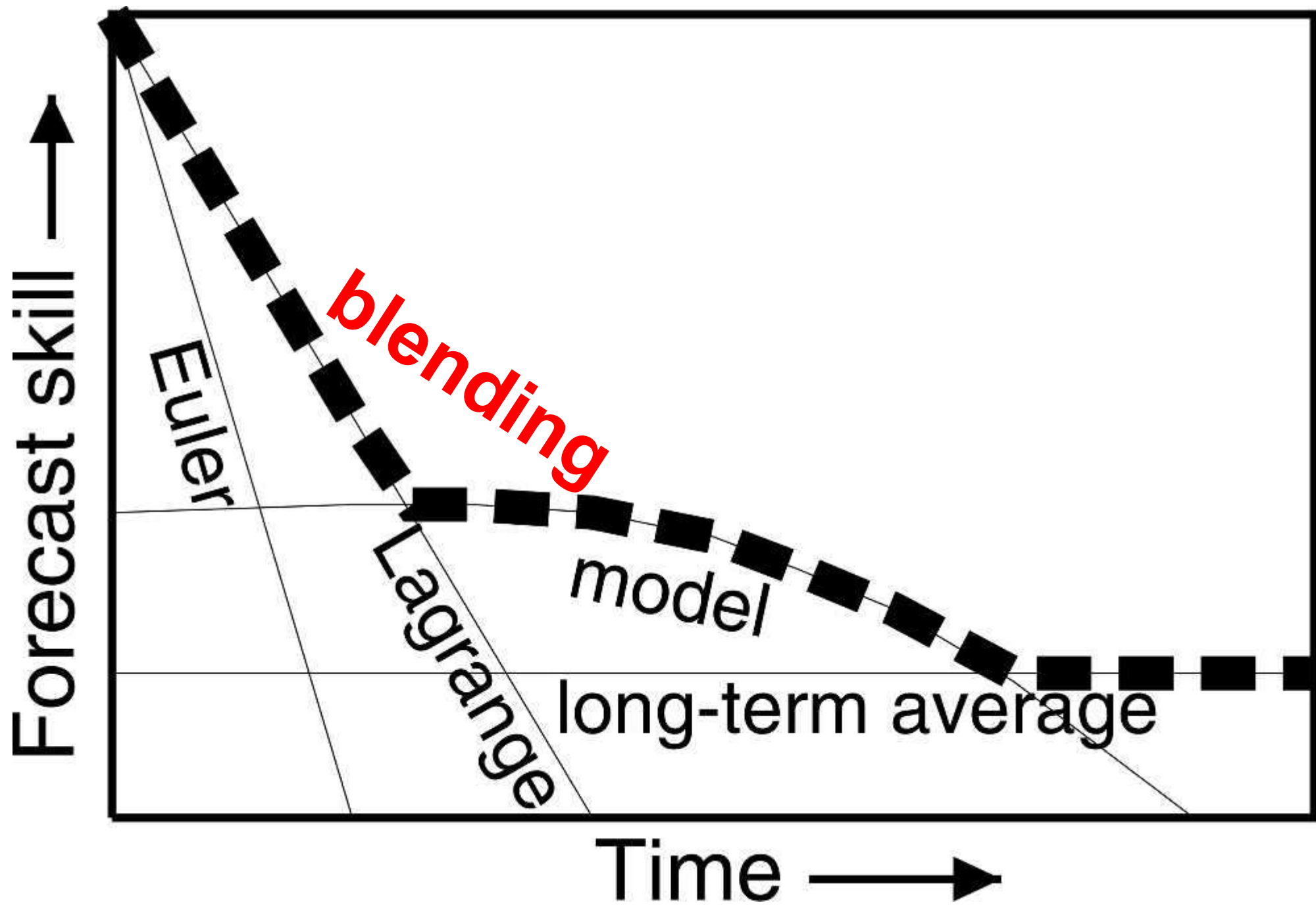


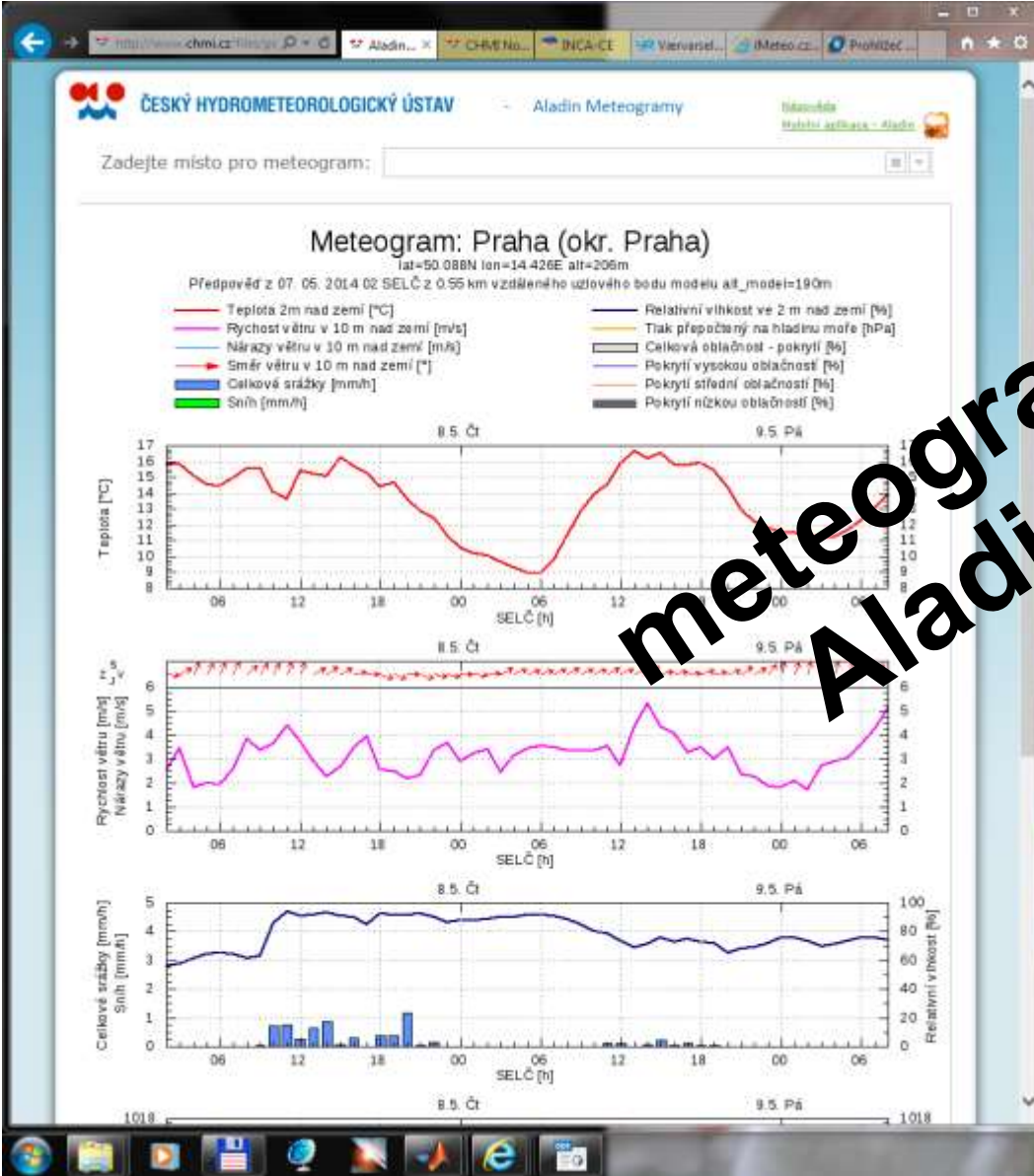


+DCT [min] EXT90 Hour [UTC] 8-16

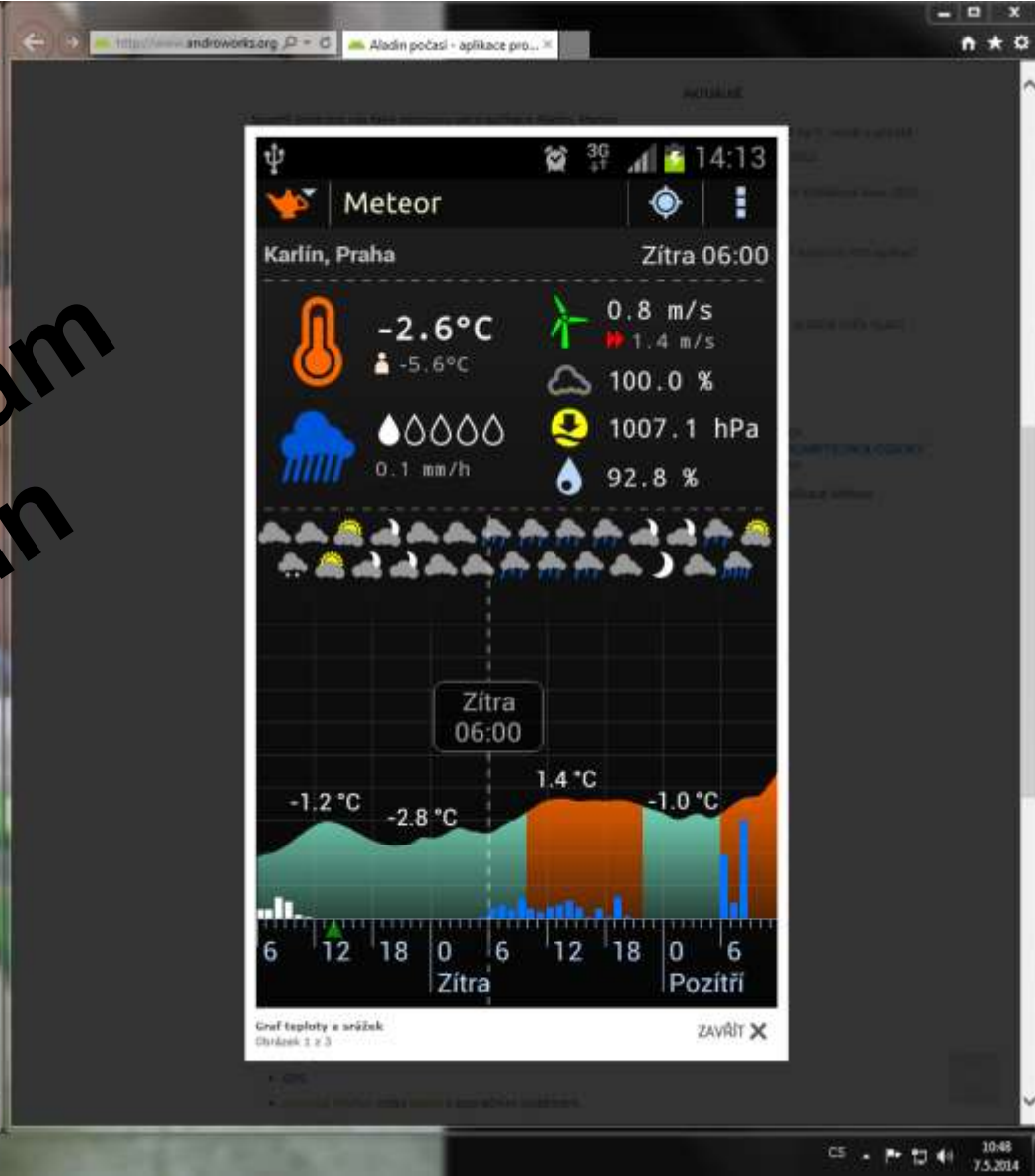


***7/7* Diskuze, možnosti**

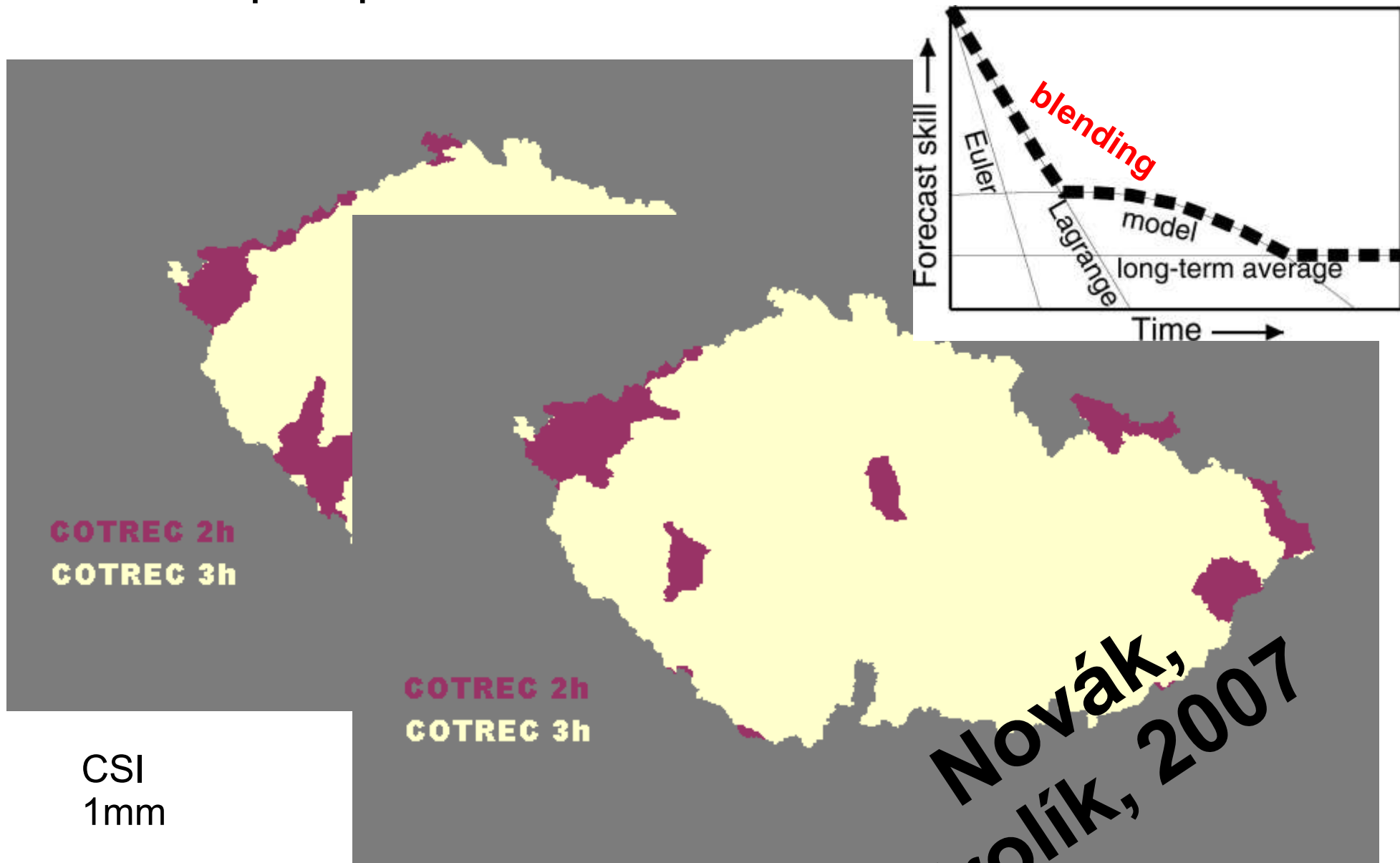




meteogram
Aladin



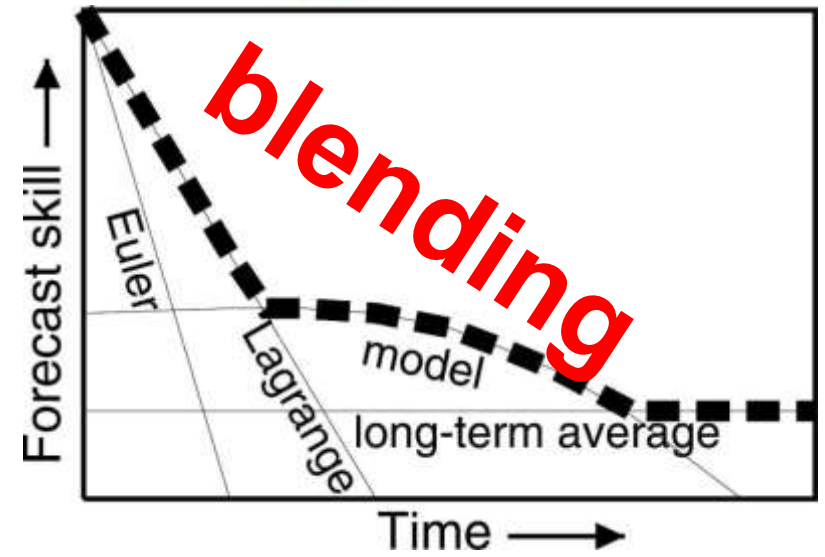
Porovnání 1h předpovědí srážek metodou COTREC s předpověďmi NWP modelu ALADIN



CSI
1mm

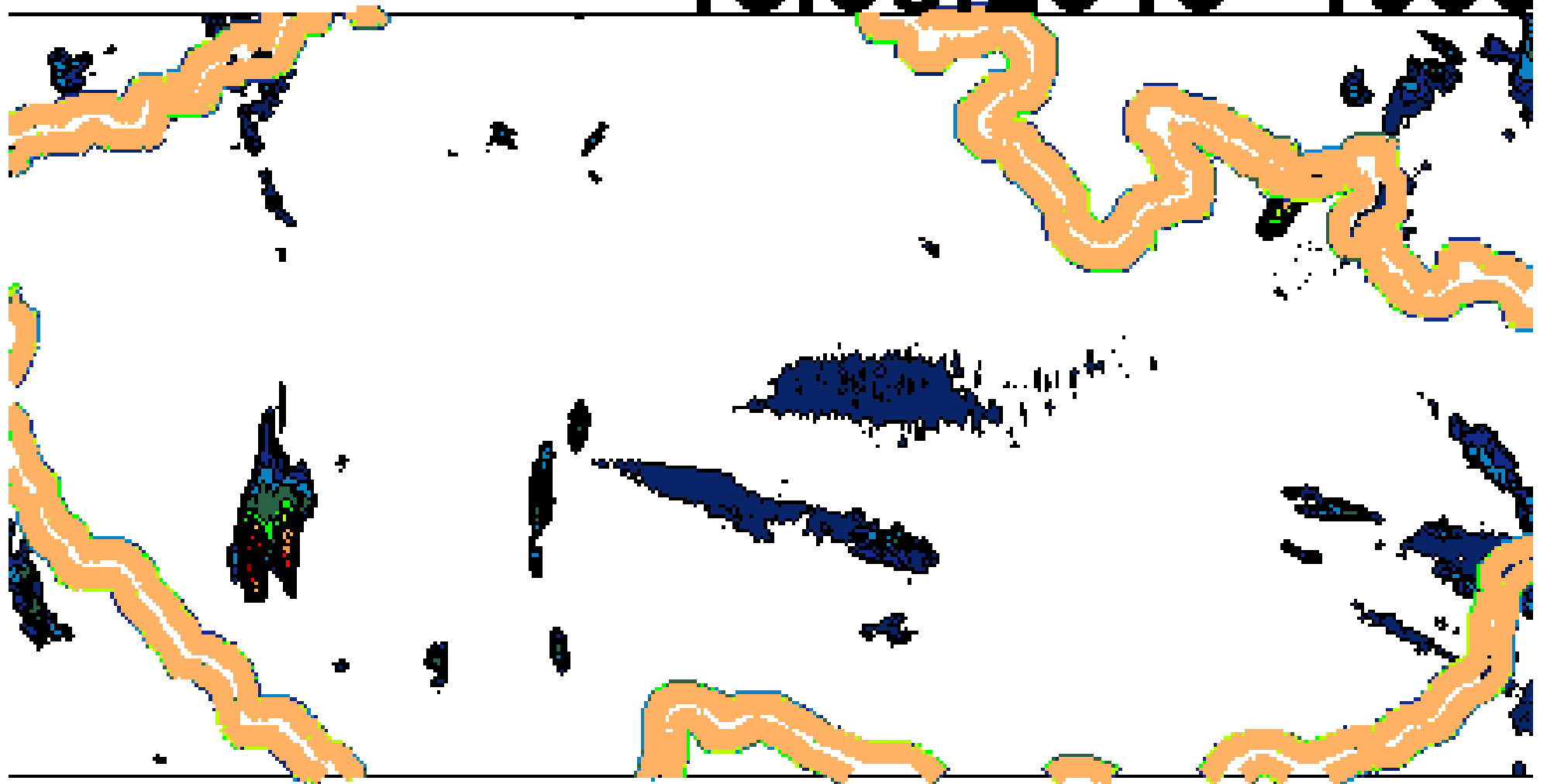
korelační koeficient

**Novák,
Frolík, 2007**

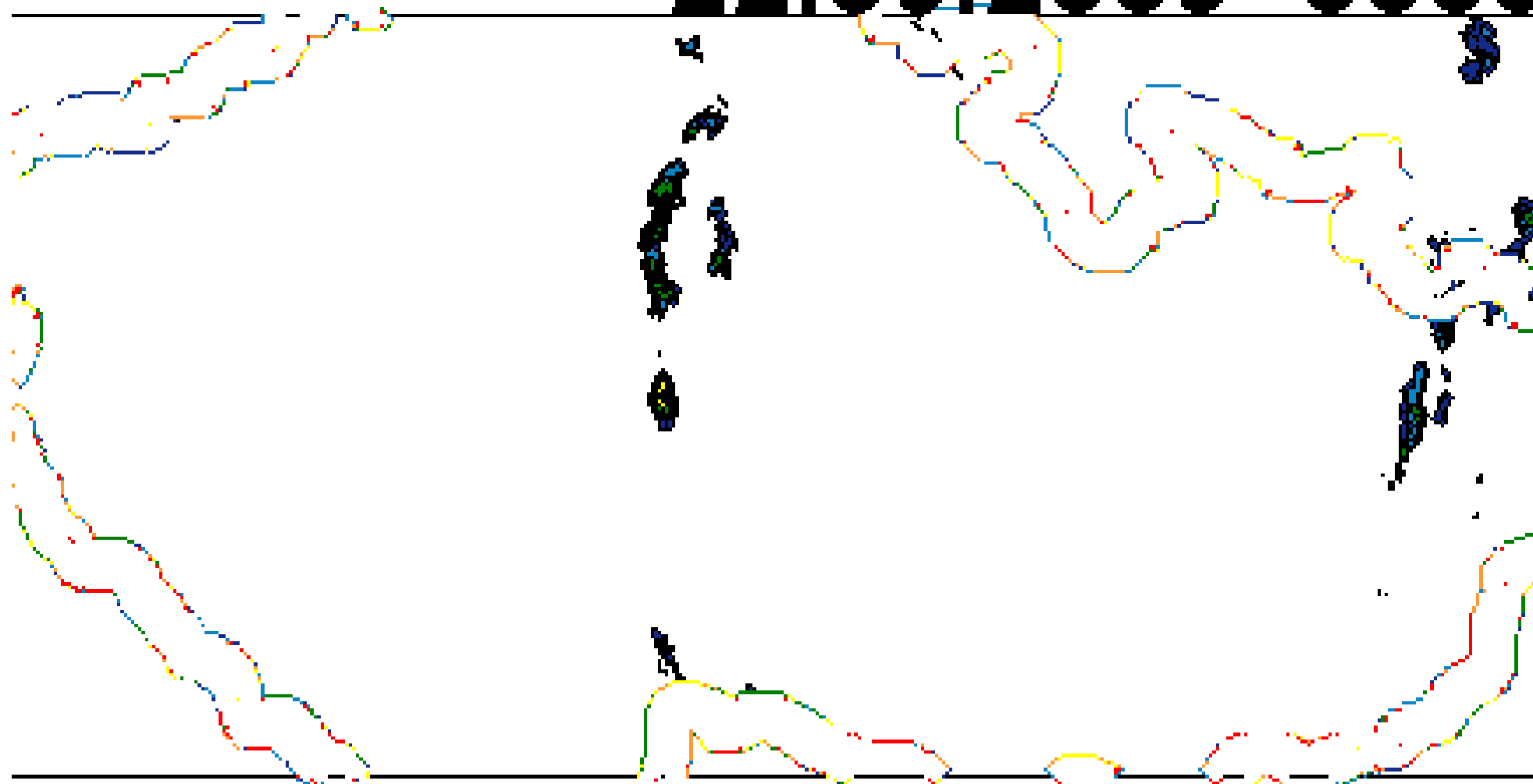


Děkuji za pozornost

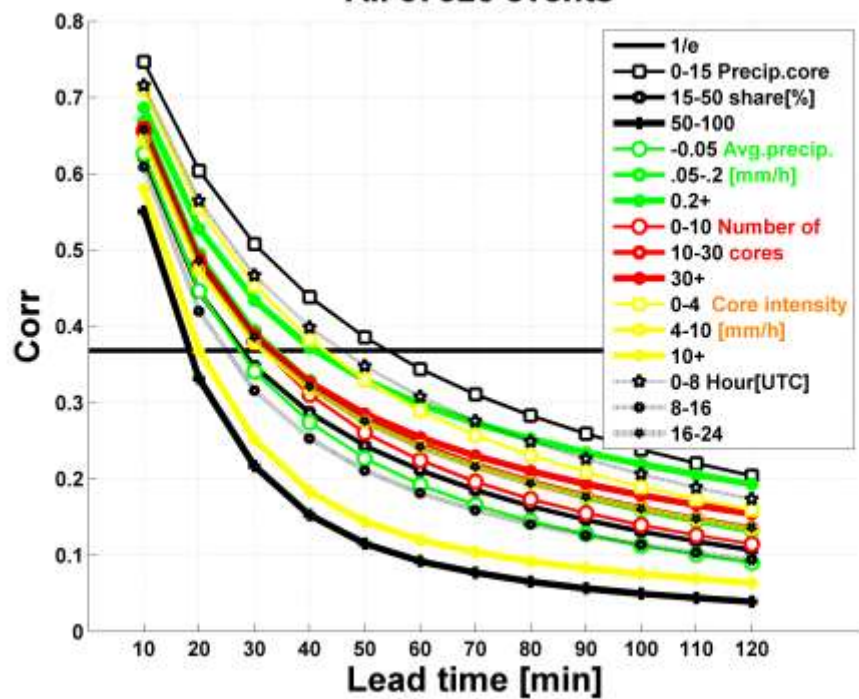
15.08.2010 1600



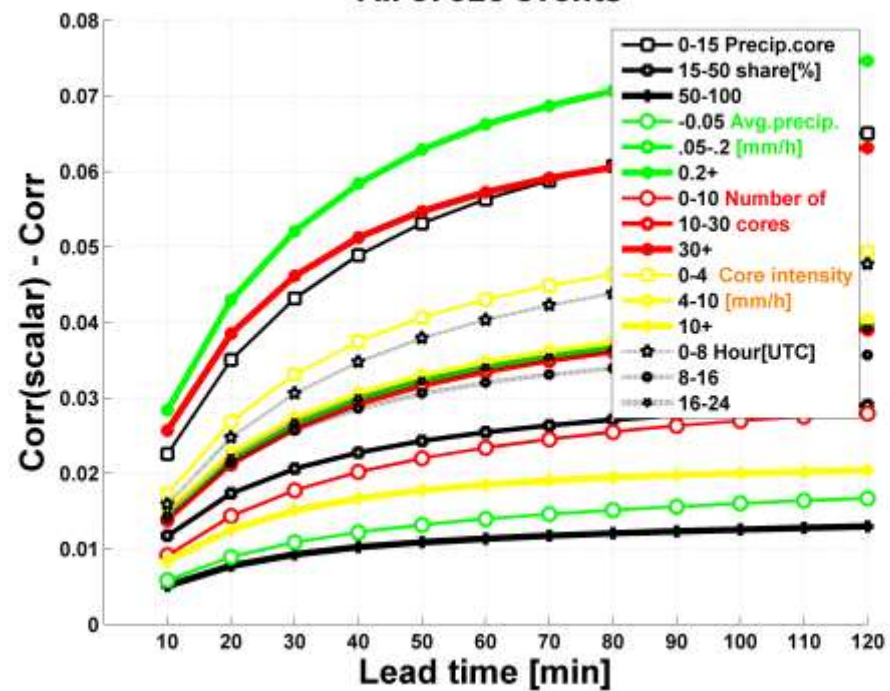
22.06.2009 0000



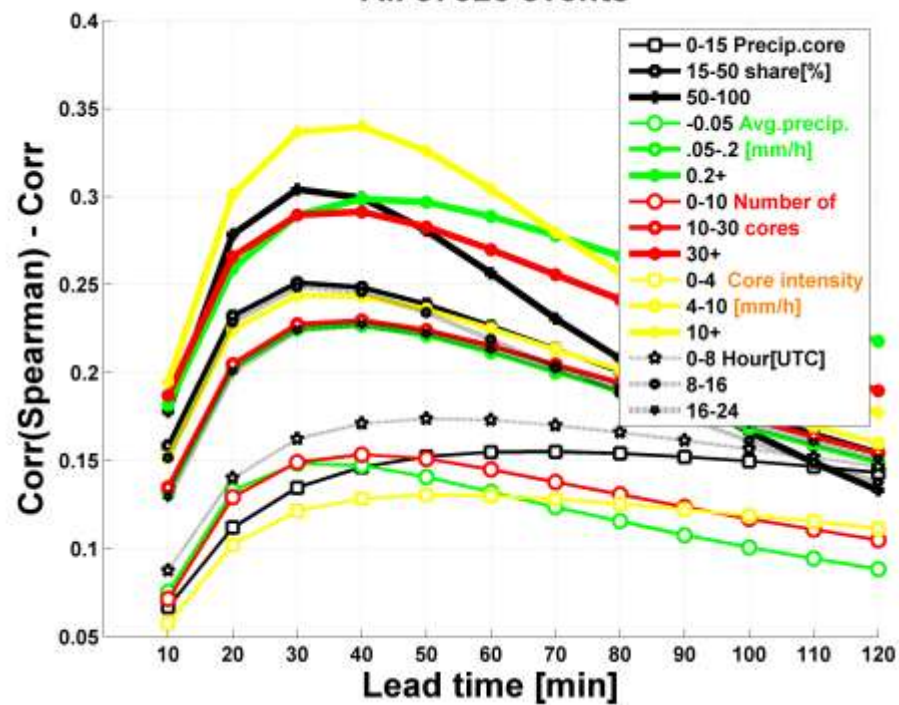
All 37526 events



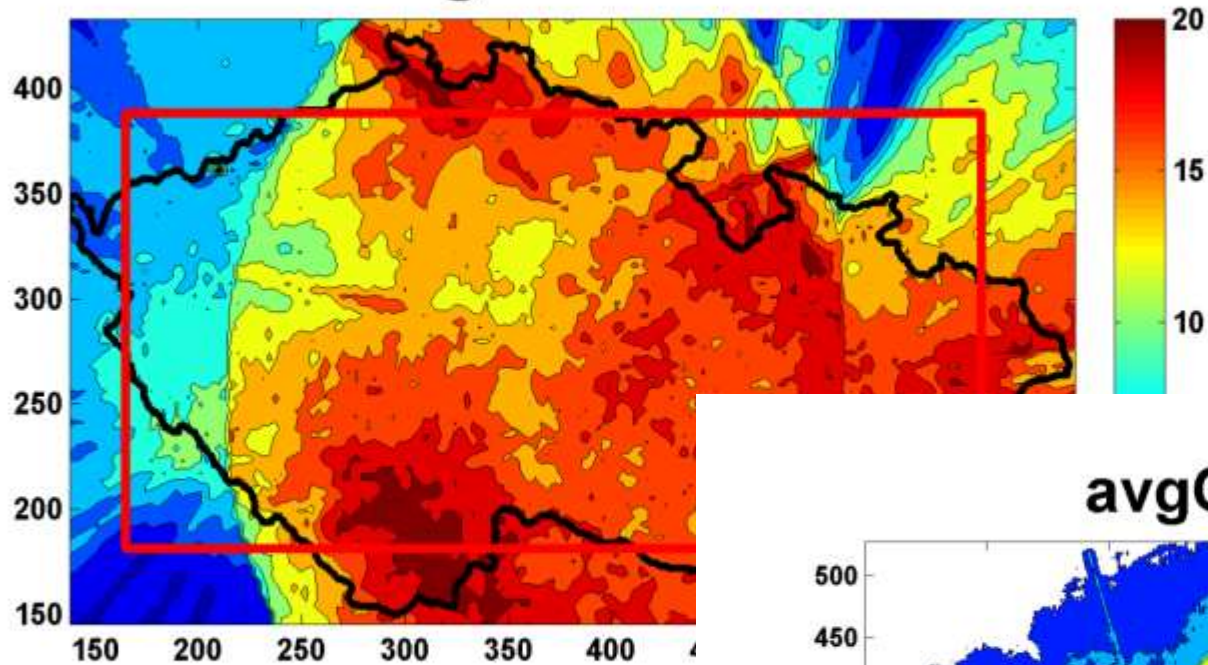
All 37526 events



All 37526 events

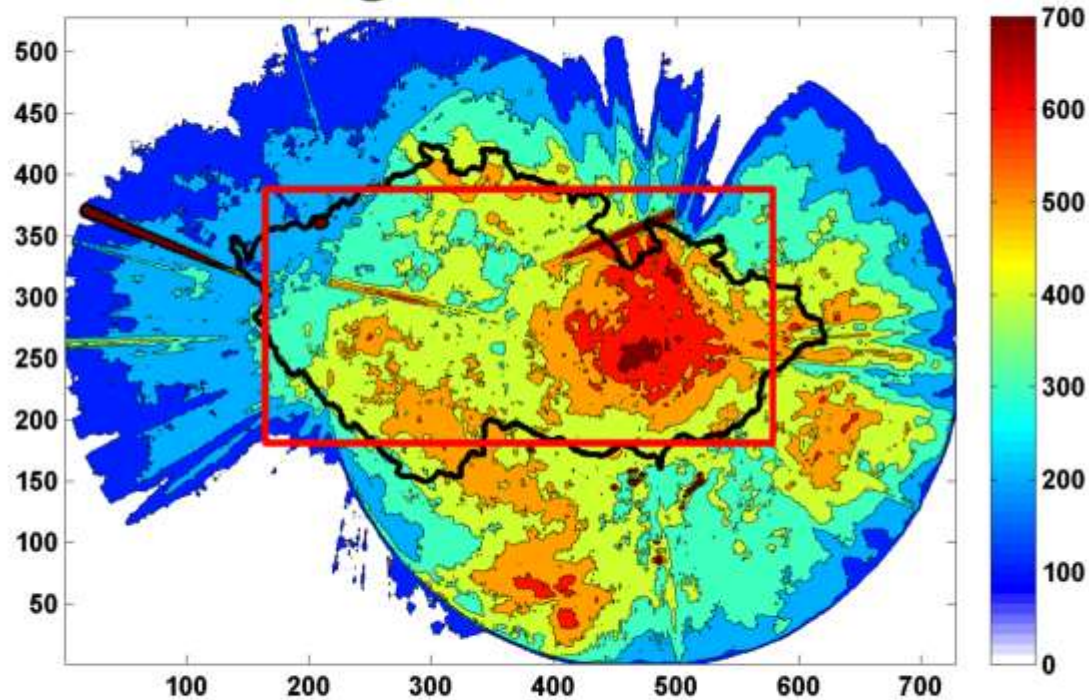


avgPRE ALL

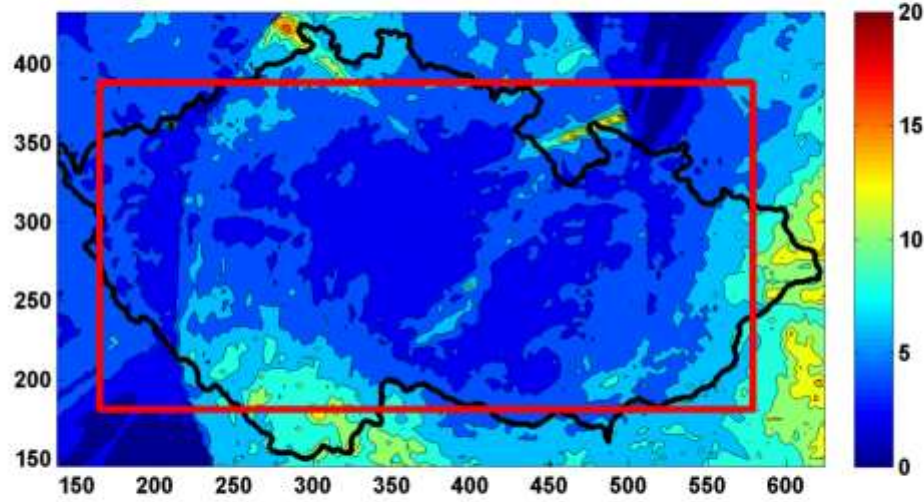


Ø srážky

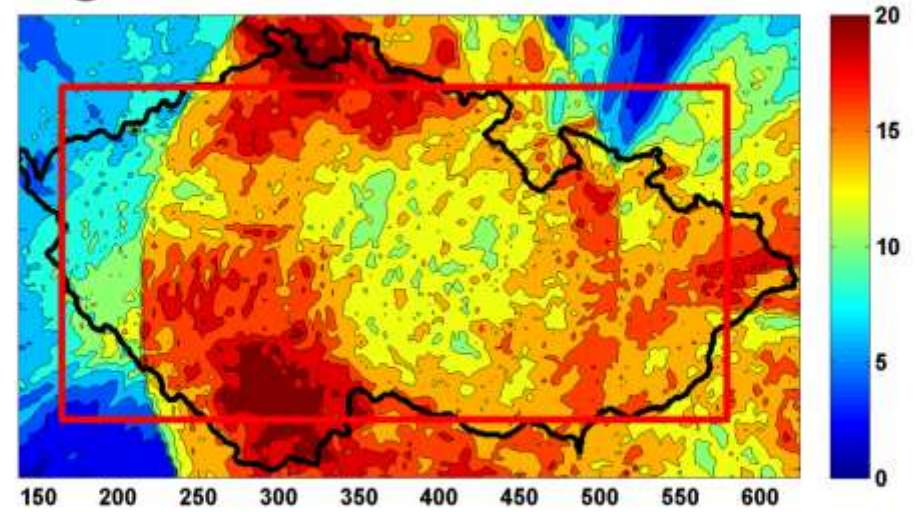
avgCELLS ALL



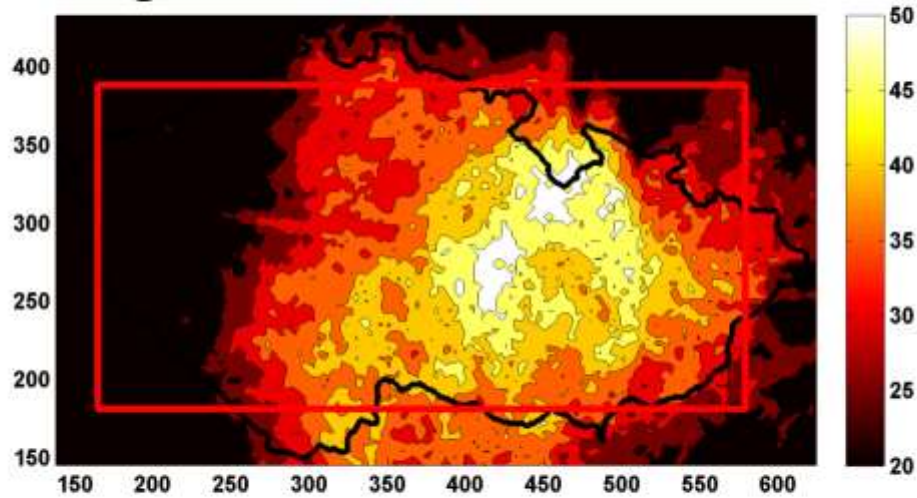
avgPRE Number of cores 0-10



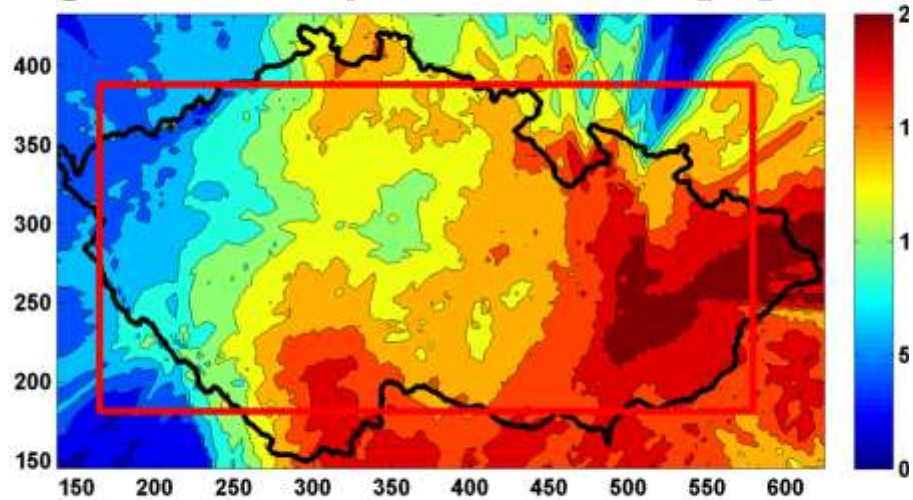
avgPRE Number of cores 10-30



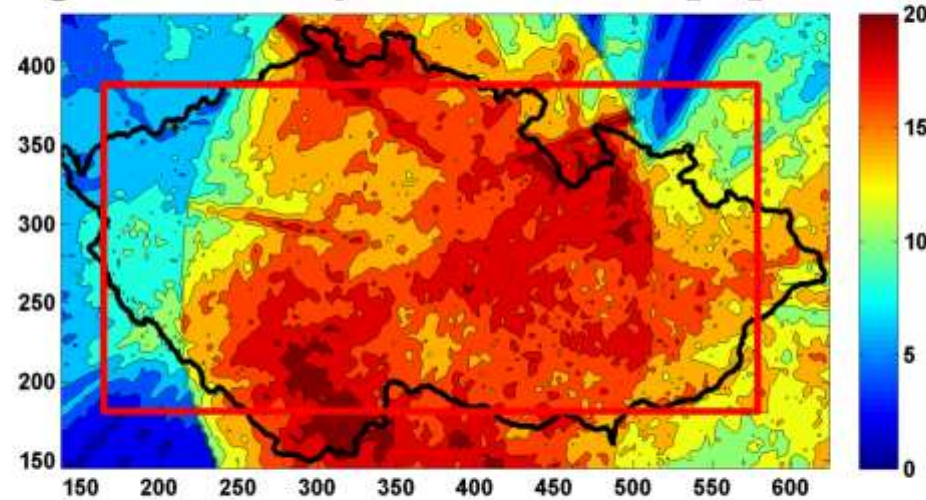
avgPRE Number of cores 30+



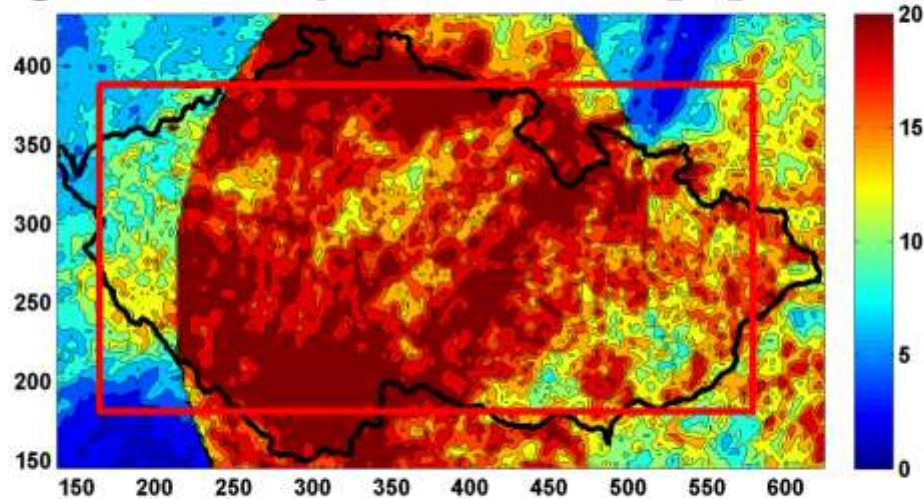
avgPRE Precip. core share [%] 0-15



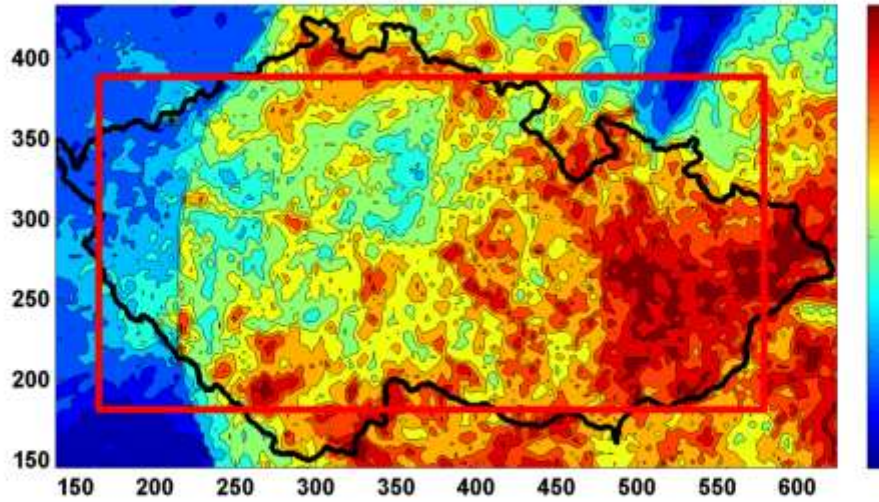
avgPRE Precip. core share [%] 15-50



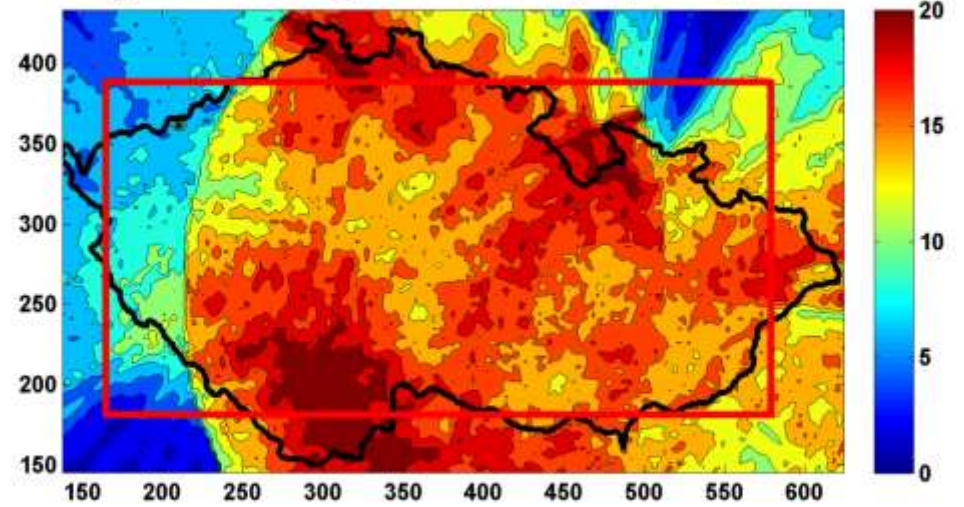
avgPRE Precip. core share [%] 50-100



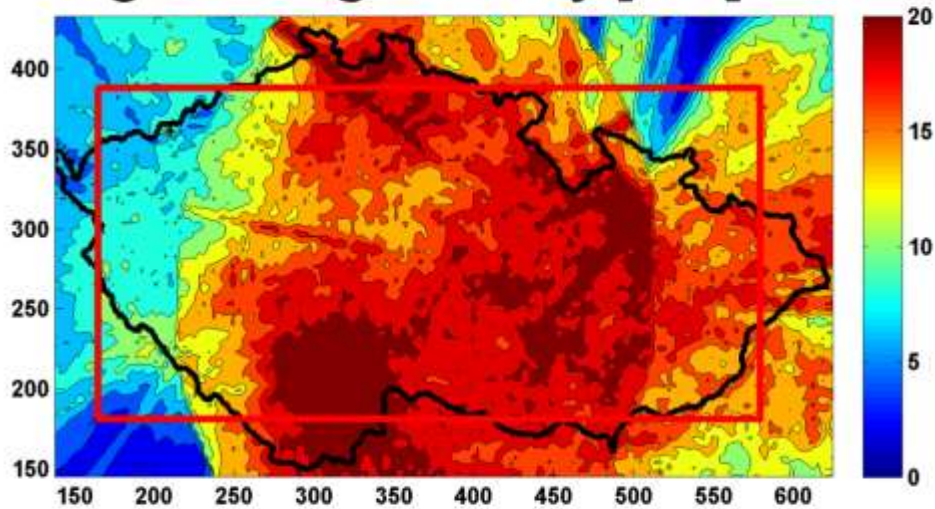
avgPRE Avg. velocity [m/s] 0-6



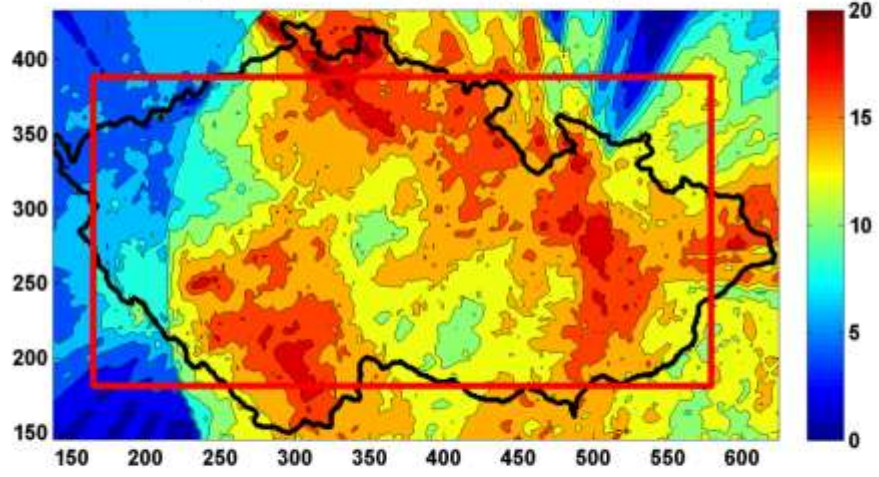
avgPRE Avg. velocity [m/s] 6-12



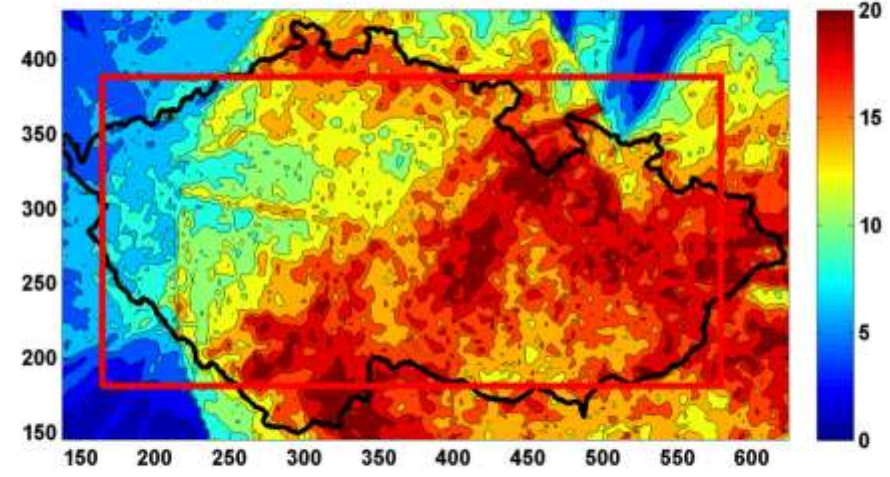
avgPRE Avg. velocity [m/s] 12+



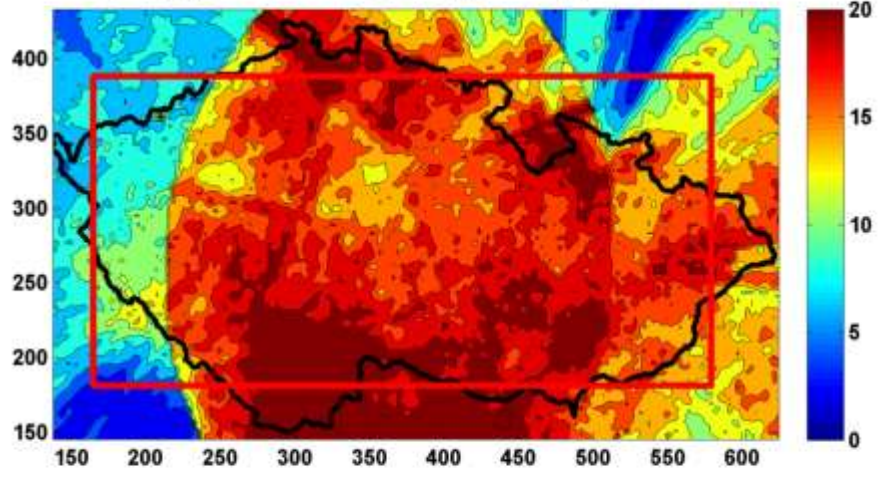
avgPRE Hour [UTC] 0-8



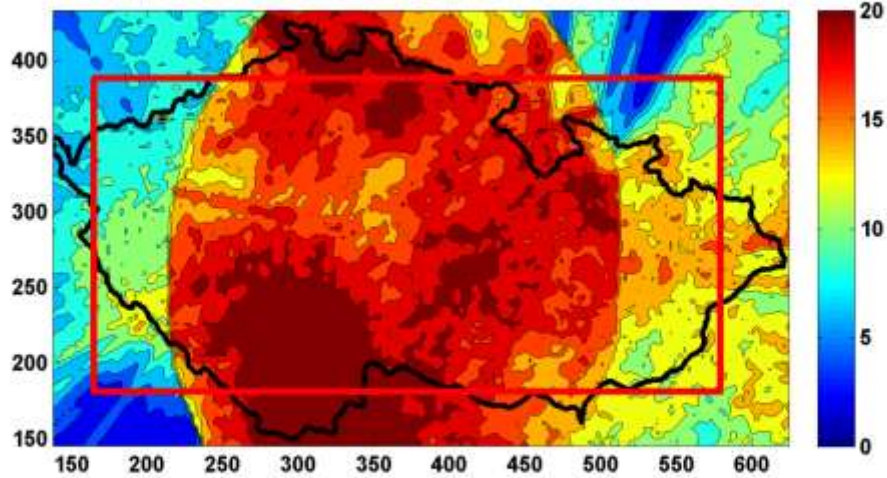
avgPRE Hour [UTC] 8-16



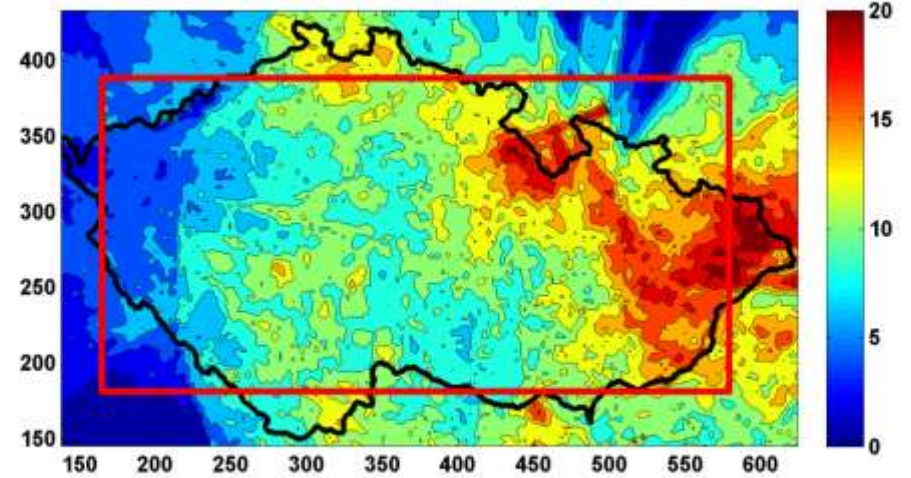
avgPRE Hour [UTC] 16-24



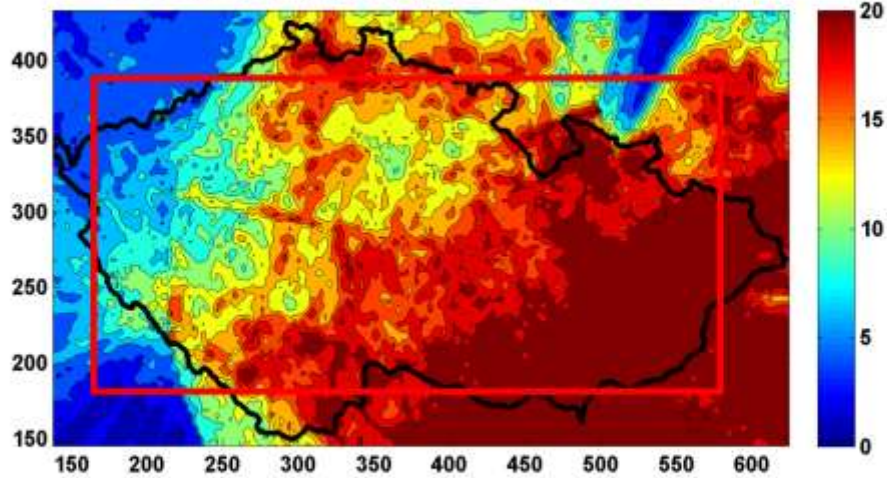
avgPRE Mot. field angle SW



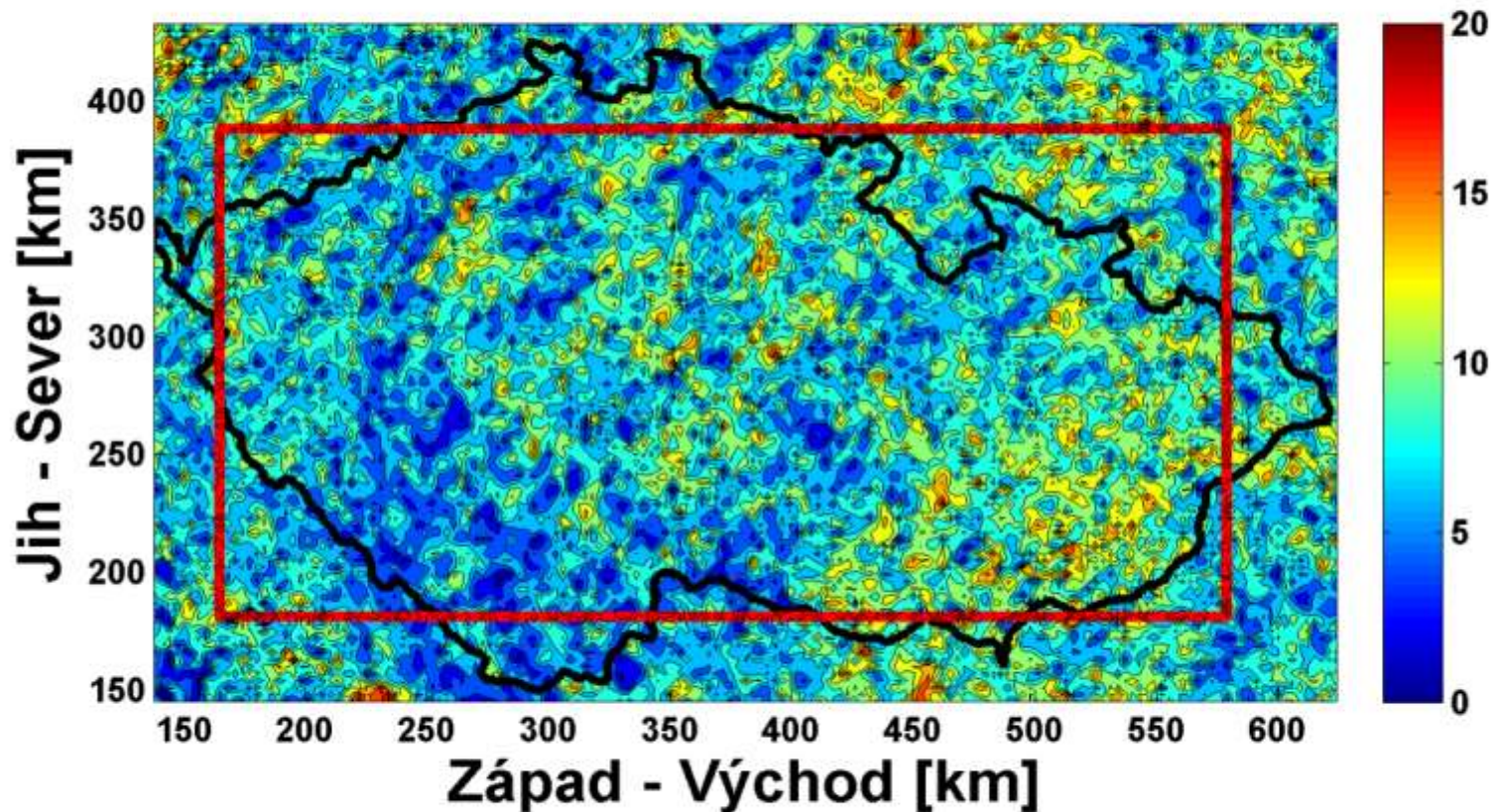
avgPRE Mot. field angle NW



avgPRE Mot. field angle E

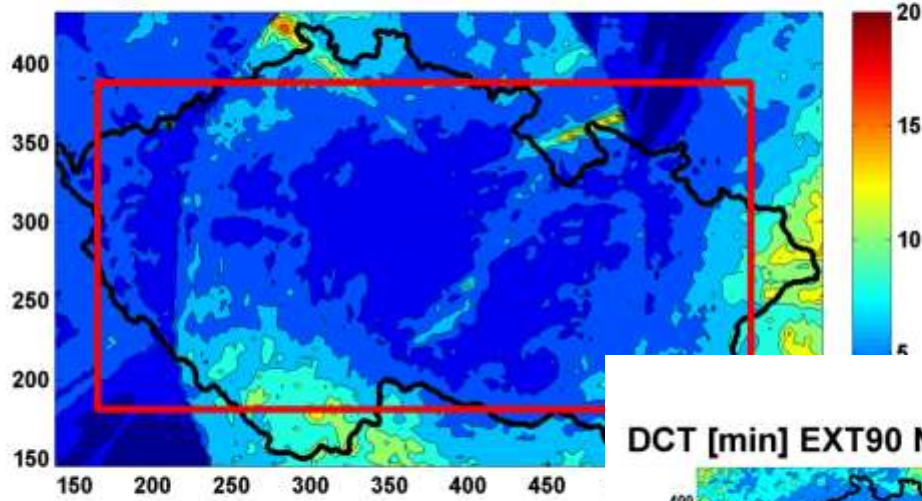


EXT120 60 [min] ALL

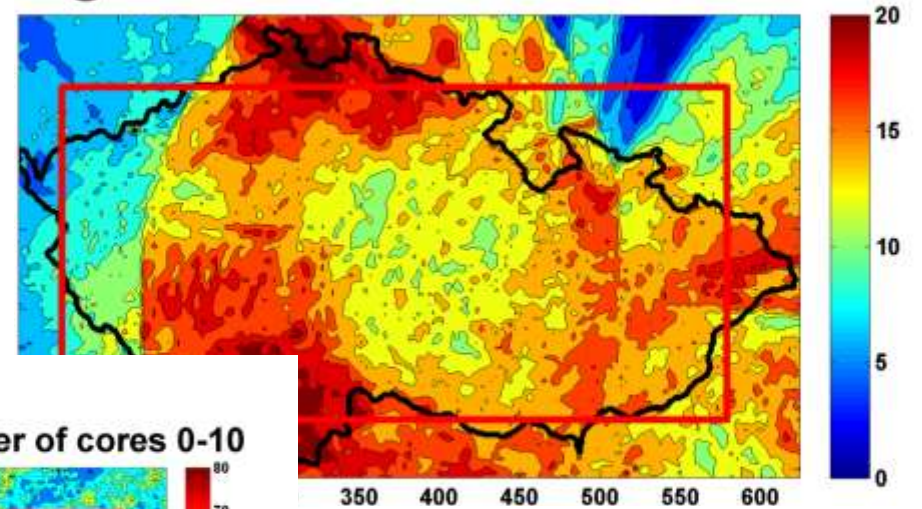


Rozdíl v GDCT při použití
extrapolace na 120 min. a 60 min.

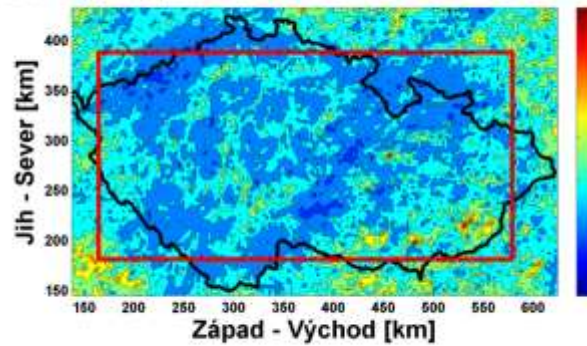
avgPRE Number of cores 0-10



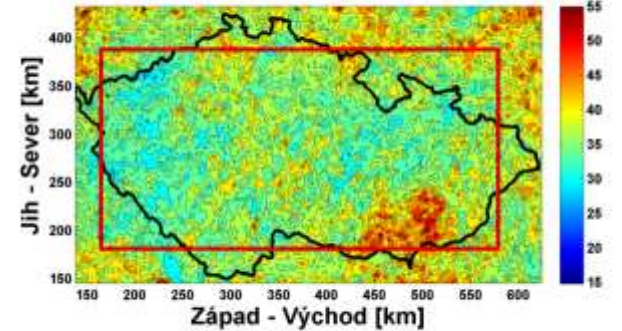
avgPRE Number of cores 10-30



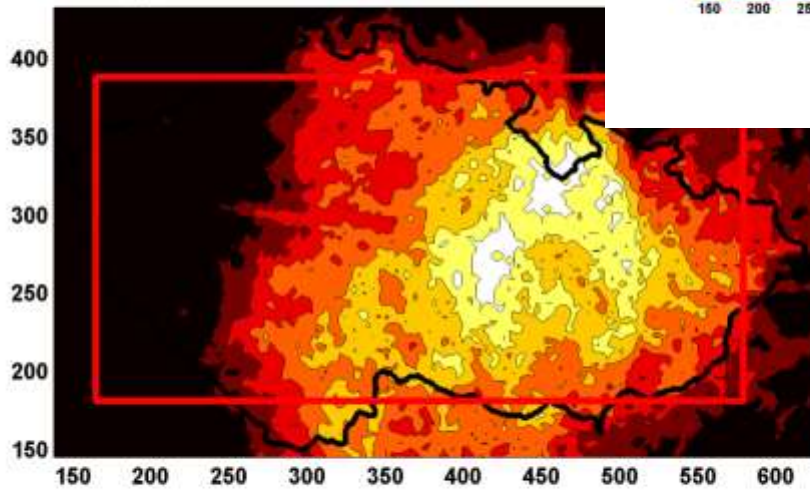
DCT [min] EXT90 Number of cores 0-10



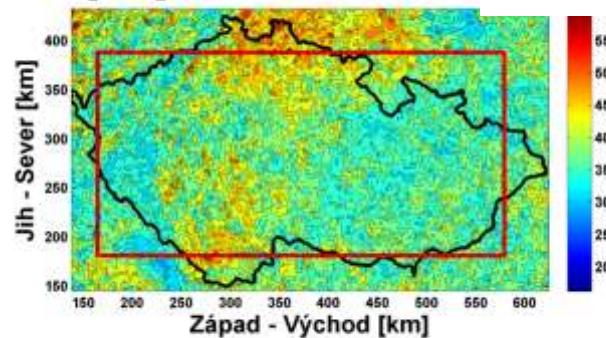
DCT [min] EXT90 Number of cores 10-30



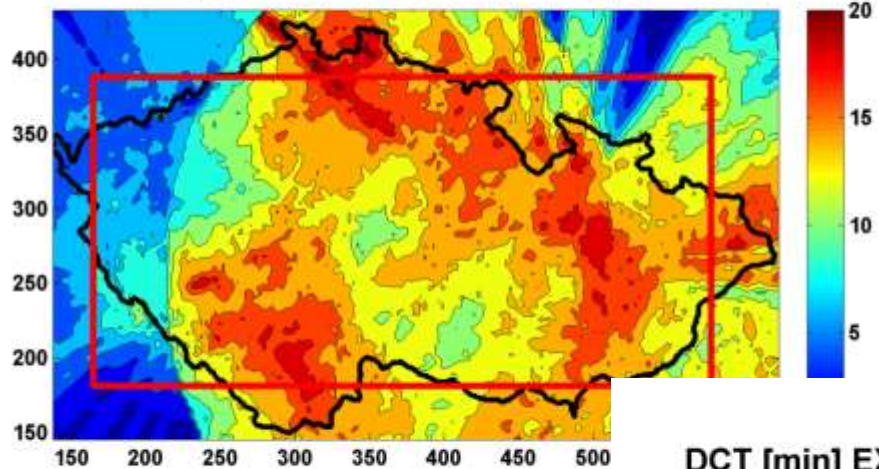
avgPRE Number of c



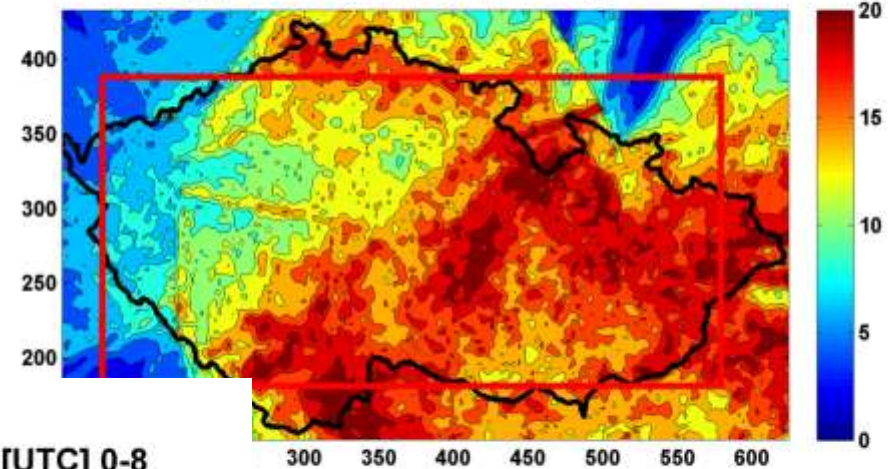
DCT [min] EXT90 Number of c



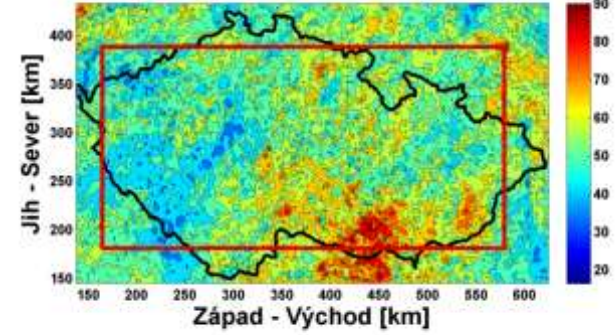
avgPRE Hour [UTC] 0-8



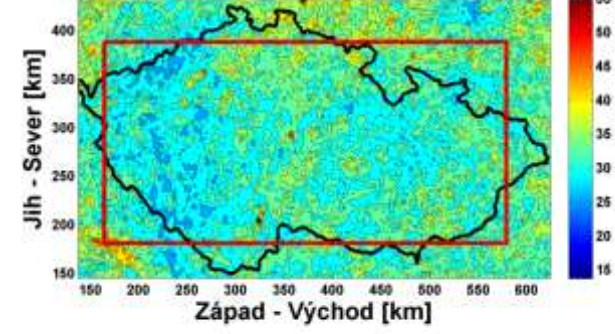
avgPRE Hour [UTC] 8-16



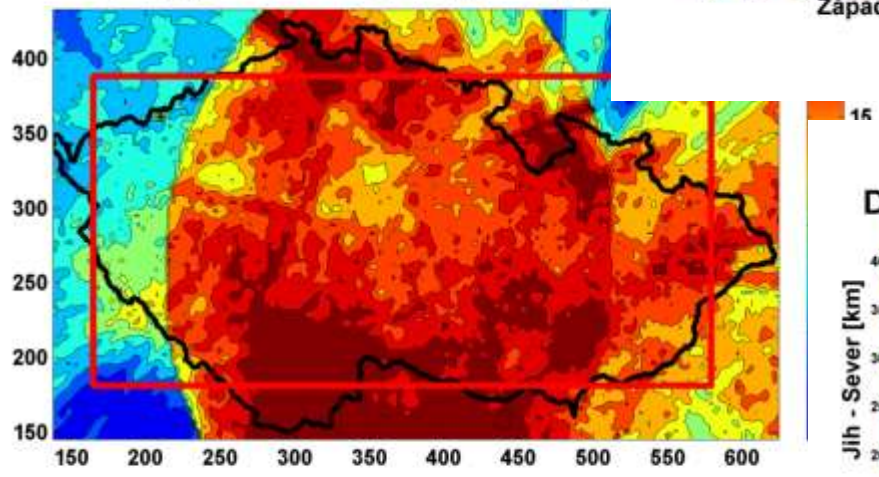
DCT [min] EXT90 Hour [UTC] 0-8



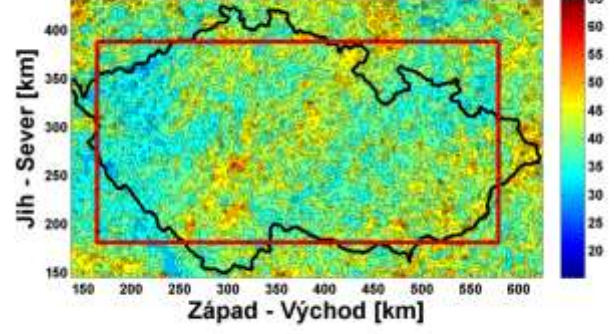
DCT [min] EXT90 Hour [UTC] 8-16



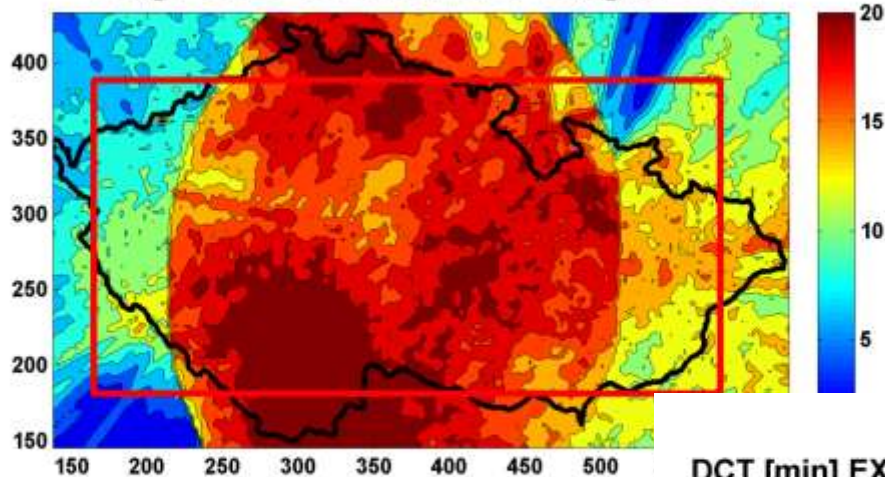
avgPRE Hour [UTC]



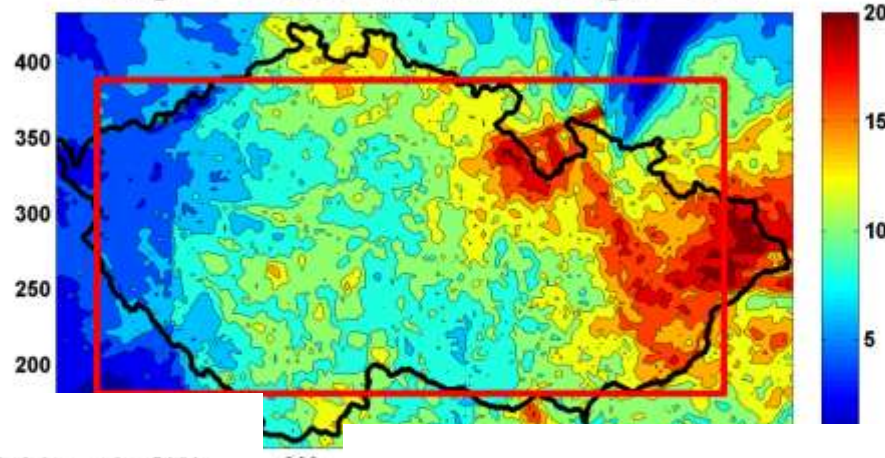
DCT [min] EXT90 Hour [UTC] 16-24



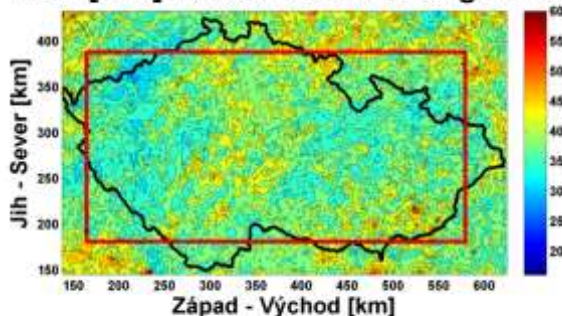
avgPRE Mot. field angle SW



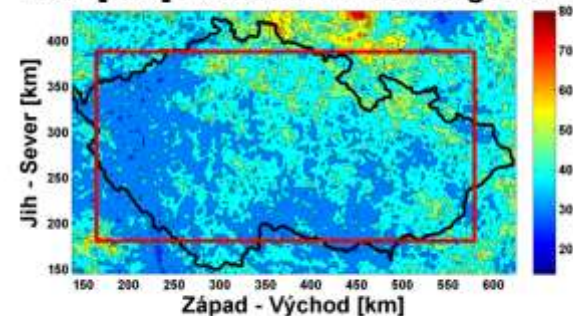
avgPRE Mot. field angle NW



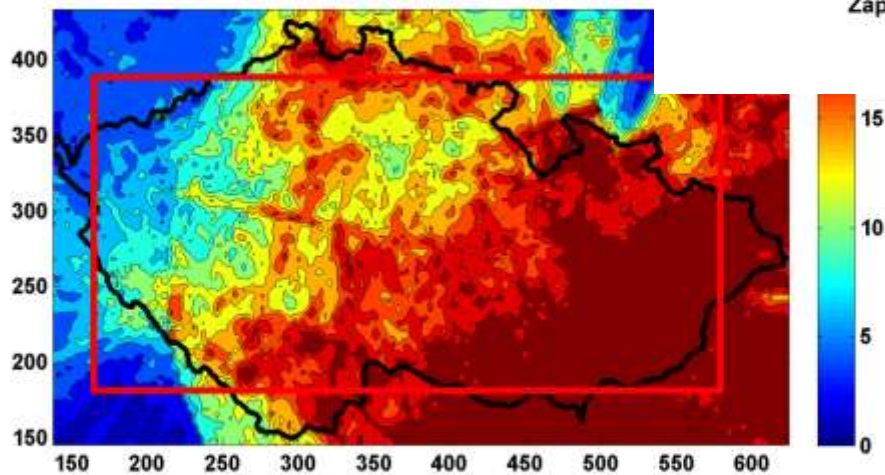
DCT [min] EXT90 Mot. field angle SW



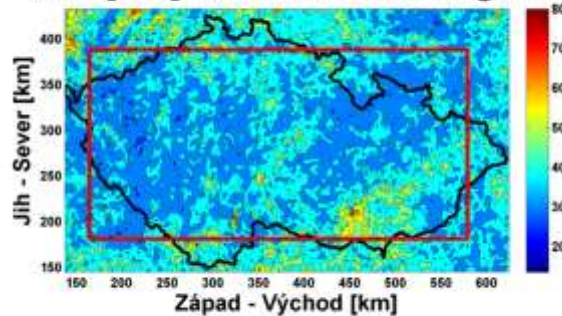
DCT [min] EXT90 Mot. field angle NW



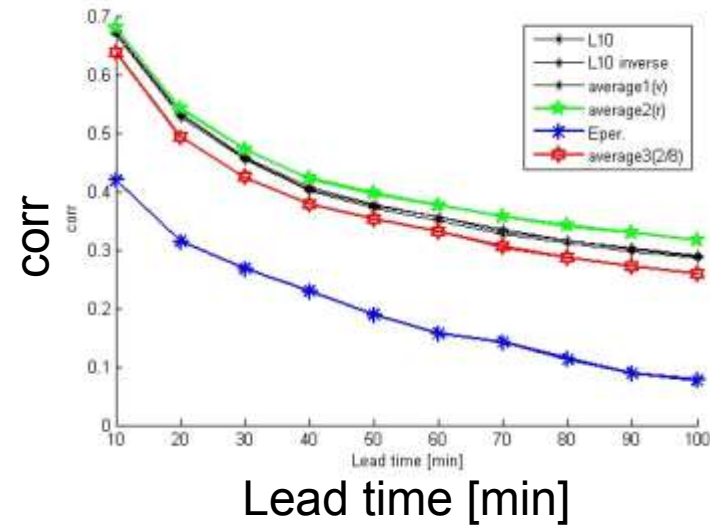
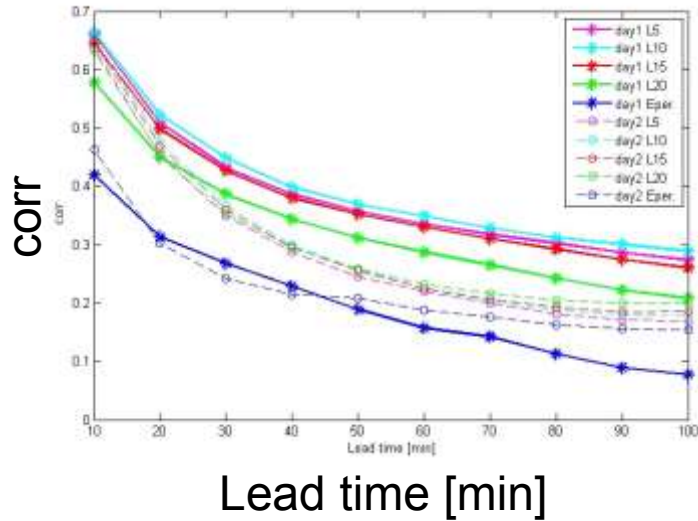
avgPRE Mot. field ang



DCT [min] EXT90 Mot. field angle E



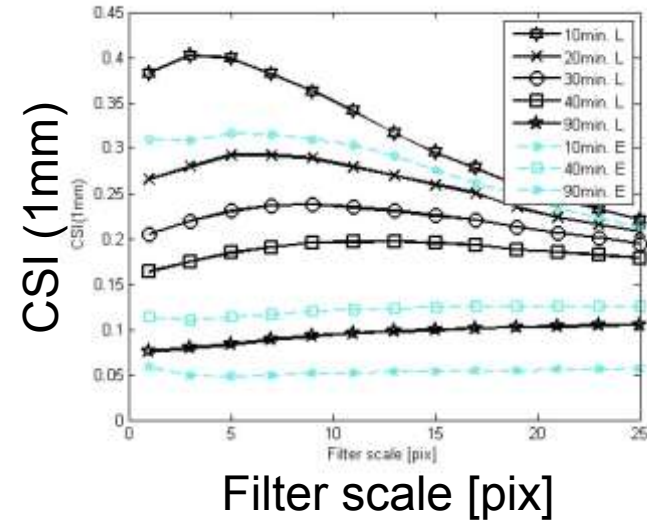
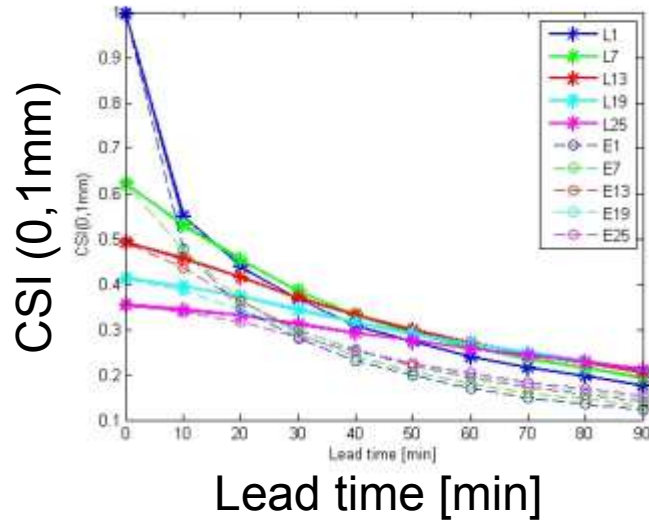
Vstupní radarová pole



dT
vstupních
radarů 5-
20 minut

Inverzní
COTREC,...

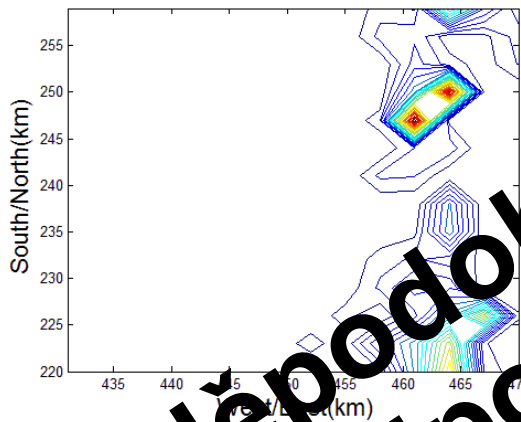
Output filtering



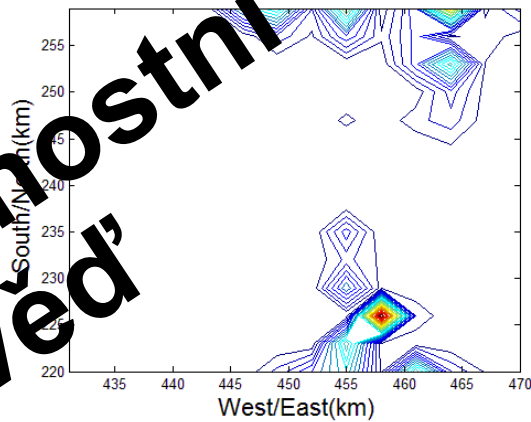
dx
Prostorové
hlazení
předpovědí

Ensemble

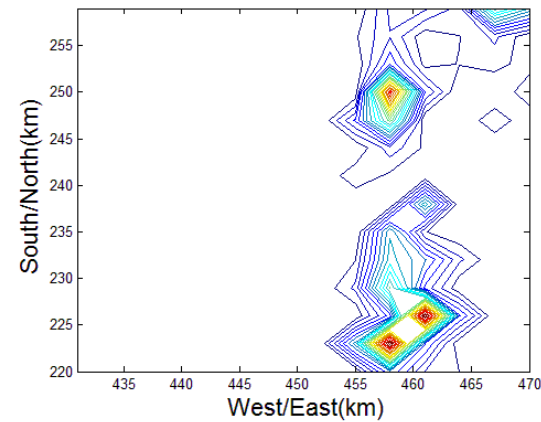
1. člen ensemble



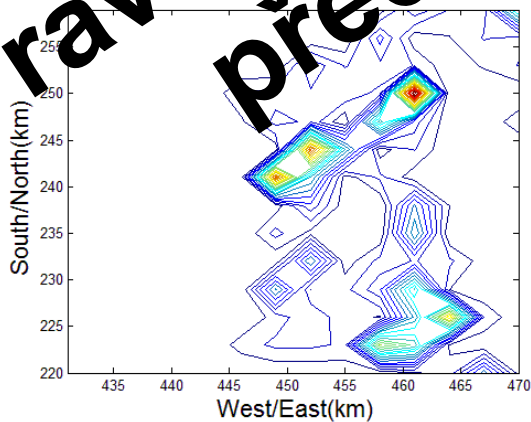
2. člen ensemble



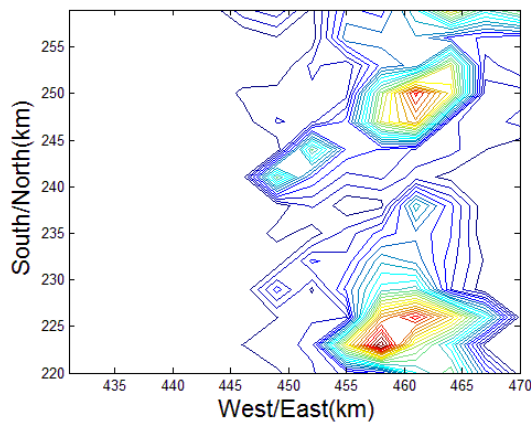
3. člen ensemble



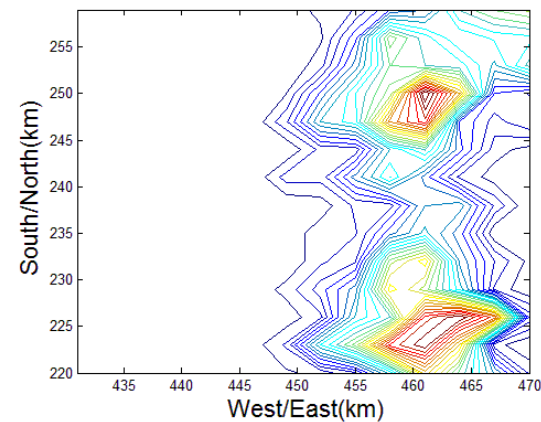
4. člen ensemble



MEAN 5 členů ensemble

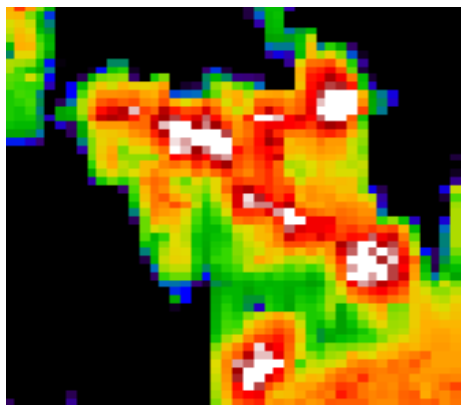


MEAN 50 členů ensemble

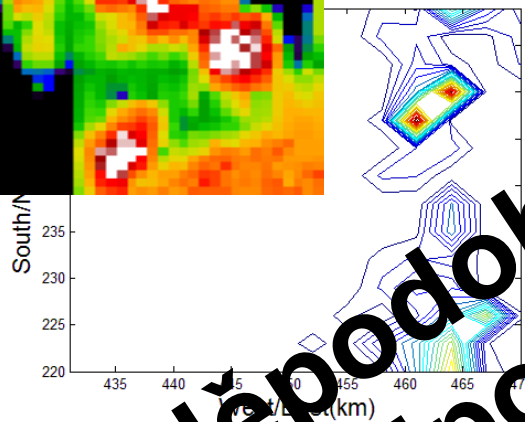


Pravděpodobnostní
předpověď

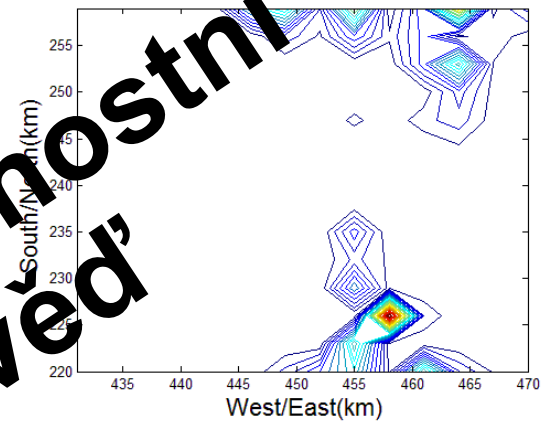
Ensemble



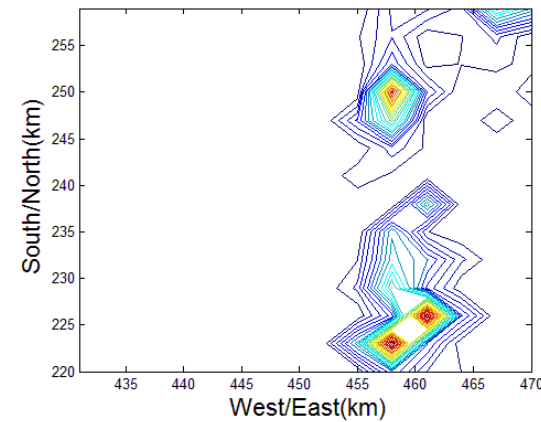
1. člen ensemblu



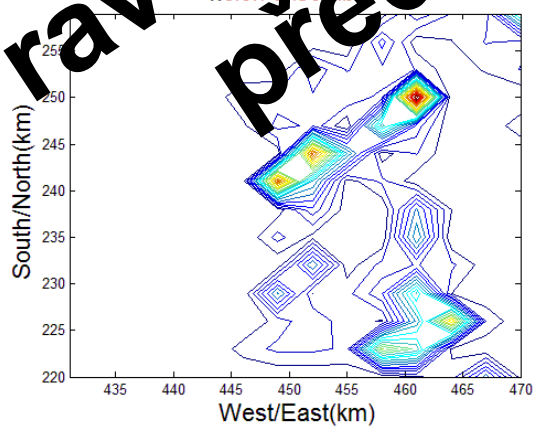
2. člen ensemblu



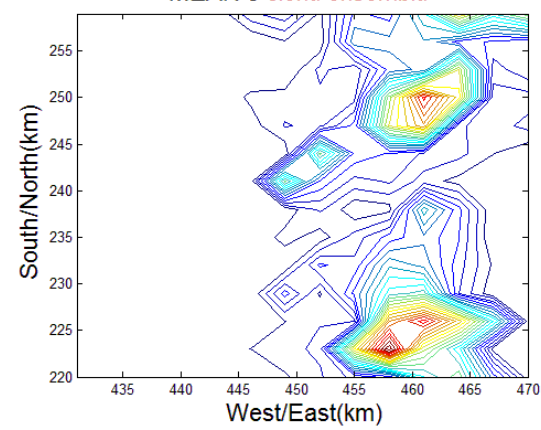
3. člen ensemblu



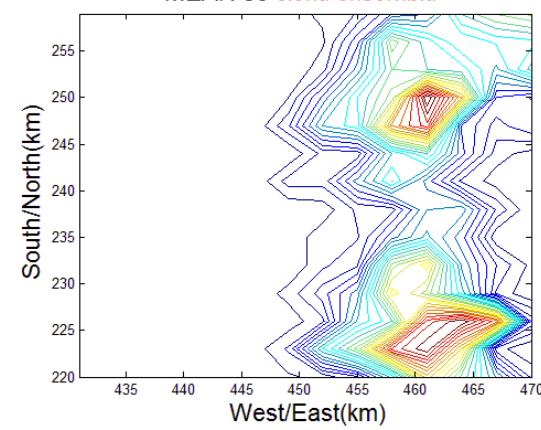
4. člen ensemblu



MEAN 5 členů ensemblu



MEAN 50 členů ensemblu



Pravděpodobnostní předpověď