Evaluation of the ALADIN/HU 3DVAR assimilation system

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Short history of the ALADIN/HU 3DVAR:

- Implementation (June 2000)
- Quasi-operational parallel suite (November 2002)
- Operational application (May 2005)

Contributions from quite a few colleagues in the Hungarian NWP team!

3DVAR suite

Regina Szoták *(impact studies)*
Roger Randriamampianina *(observations, impact studies)*
Gábor Radnóti *(assim cycle)*
László Kullmann *(AL28, scripts)*
Sándor Kertész *(ODB, scripts, assim cycle)*
András Horányi *(assim cycle)*
Gabriella Csima *(impact studies, subjective verification)*
Gergely Bölöni *(assim cycle, scripts, Jb)*
Miklós Balogh *(observations)*

Verification/validation

Gabriella Szépszó	Kornél Kolláth
Helga Tóth	István Ihász
Csilla Molnár	Tamás Hirs
Andrea Lőrincz	Edit Hágel

Overview of the talk

1. Main characteristics

3. Meteorological evaluation

5. Monitoring

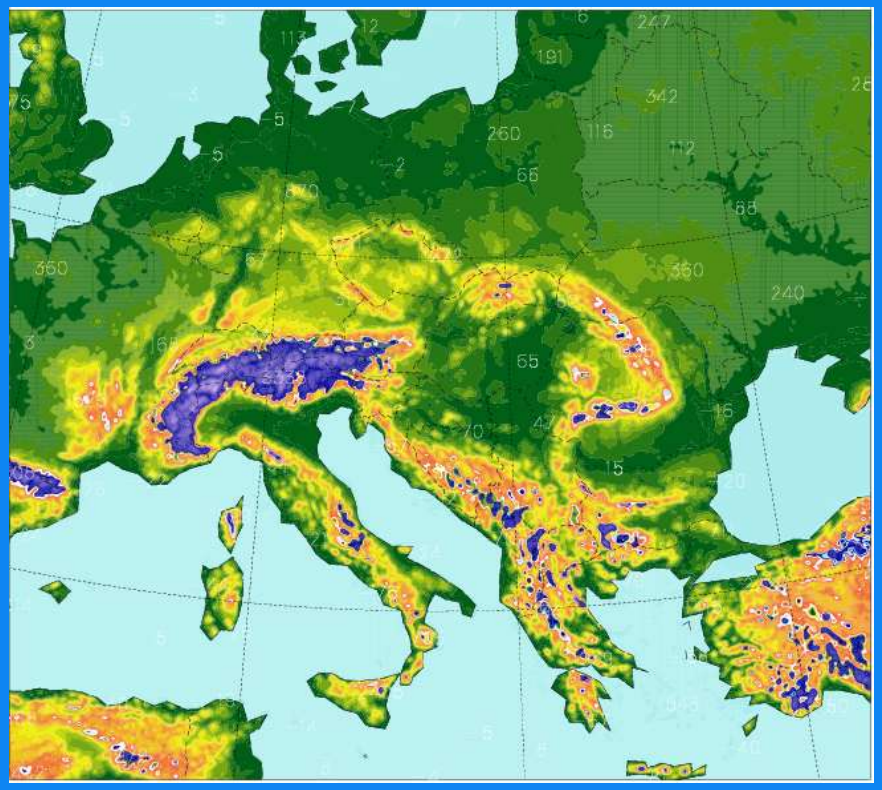
7. Future developments

… of the ALADIN/HU 3DVAR system

Main characteristics (1)

Basic characteristics:

- 6h 3DVAR assim. cycle
- 48h production
- linear grid
- dx ~ 8km
- 49 vertical levels
- AL28t3 / ODB28t3



Main characteristics (2)

Input observations:

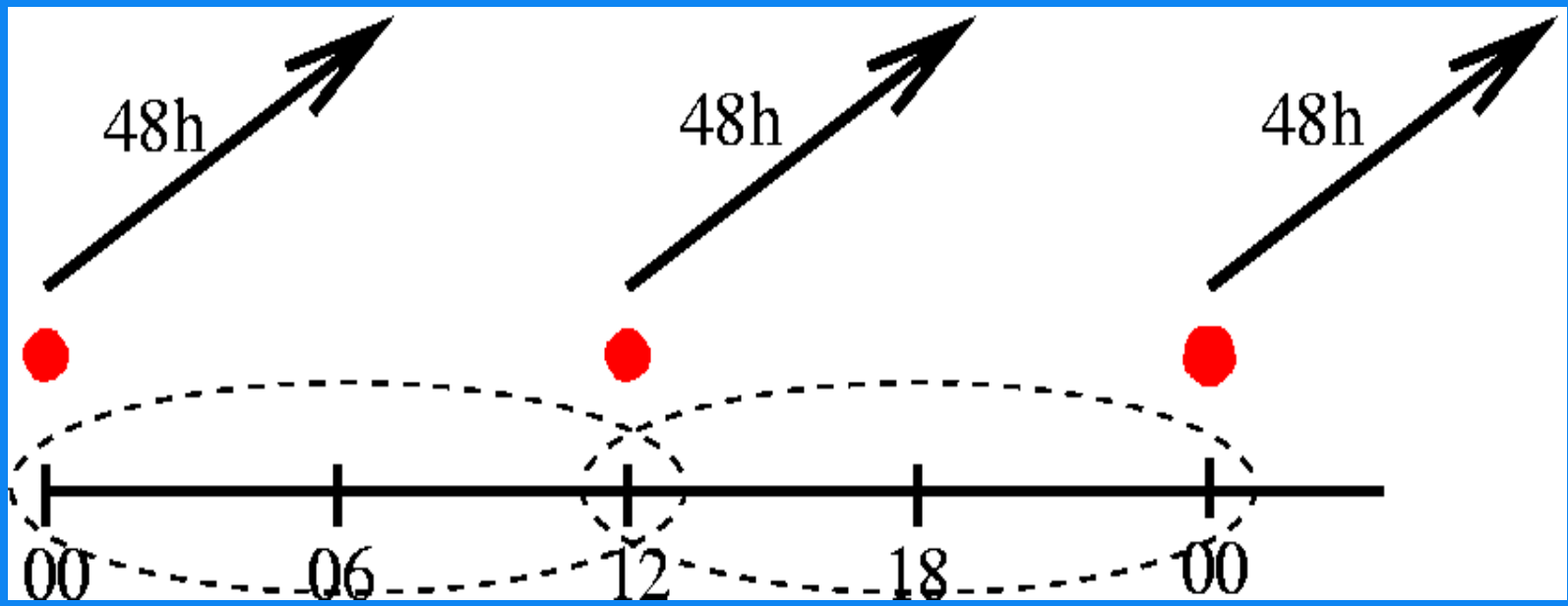
- SYNOP: surface pressure
- TEMP: temperature, wind, pressure, specific humidity
- ATOVS/AMSU-A radiances
- AMDAR aircraft reports: temperature, wind

All the observation types above are used in the ARPEGE assimilation system too, but in a somewhat worse resolution (except TEMPs)!

Main characteristics (3)

Assimilation cycle:

- 6h cycle (4 long + 2 short cut-off analysis per day)



- the cycle is coupled every 3hours (by the long cut-off ARPEGE analyses and the corresponding 3h forecasts)

Meteorological evaluation (1)

- **Objective scores** (Veral tool) → O-M average RMSE and BIAS

- **Subjective evaluation**: every day briefing together with forecasters → subjective quality scores (1-5)

- **Case studies**

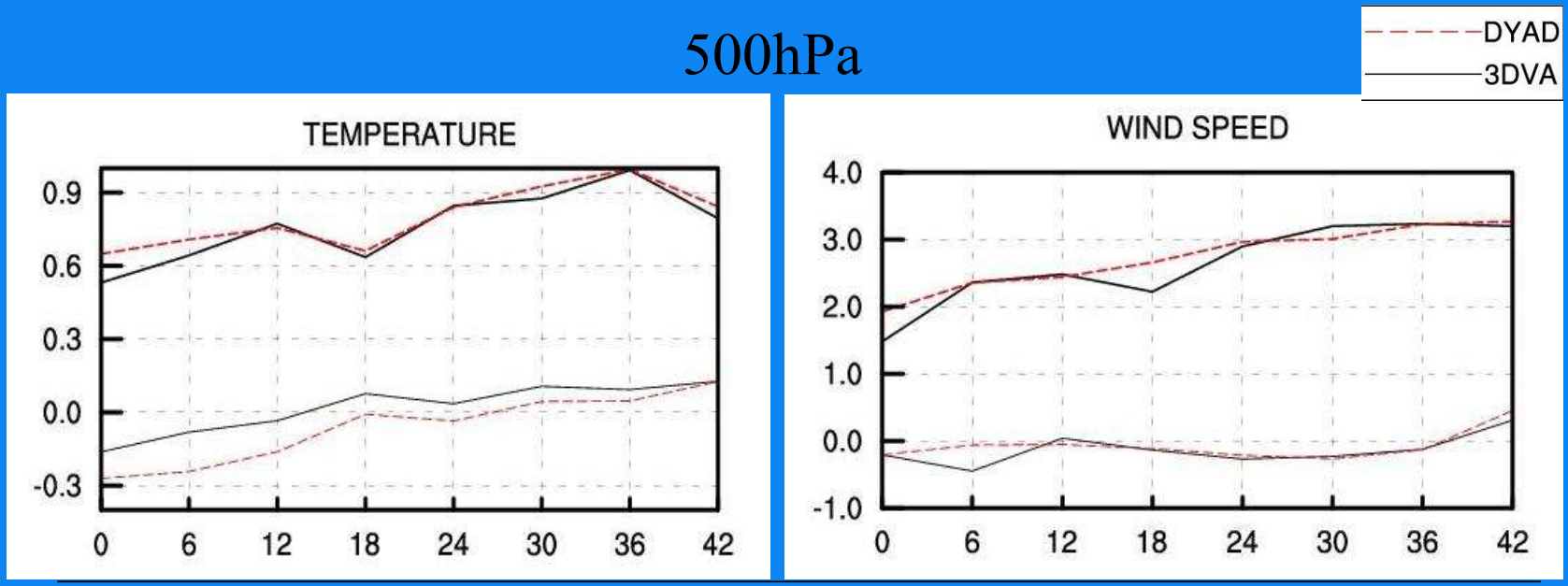
Meteorological evaluation (2)

Objective scores (vs. dynamical adaptation):

(test period: 22/03/2005–05/04/2005)

- *generally small improvement for temperature and wind*

500hPa

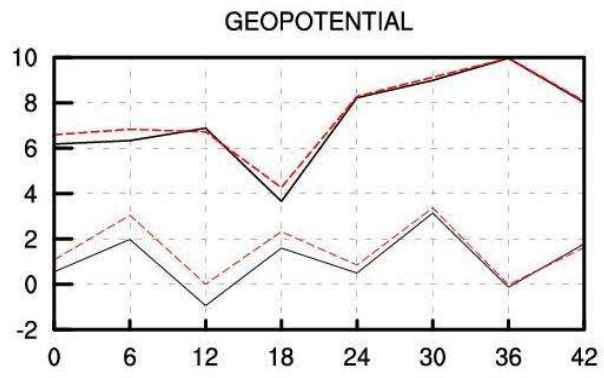


Meteorological evaluation (3)

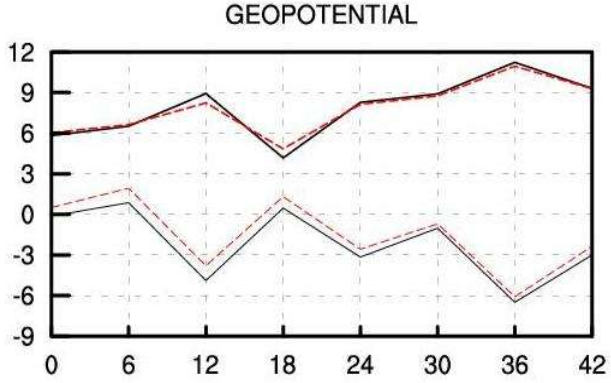
Objective scores (vs. dynamical adaptation):

- *neutral impact/improvement on high level's geopotential*
- *degradation in low level's geopotential and MSLP BIAS*

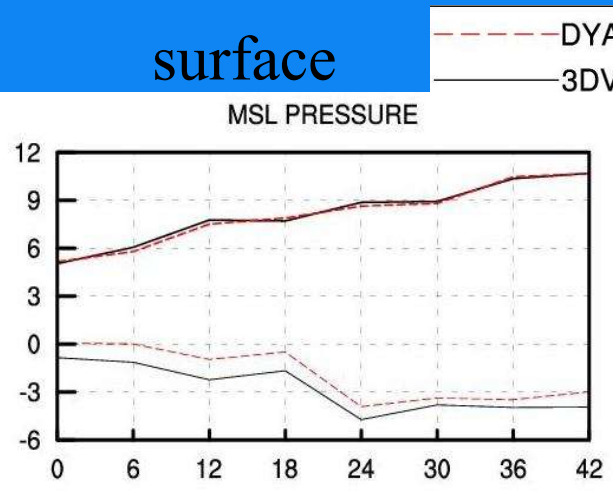
700hPa



1000hPa



surface

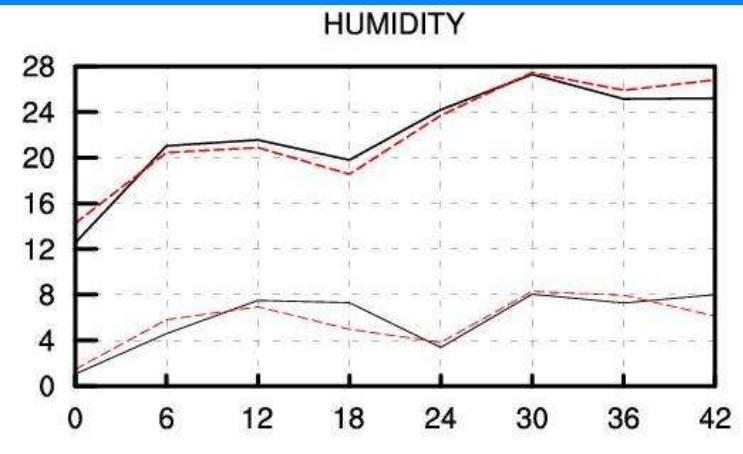


Meteorological evaluation (4)

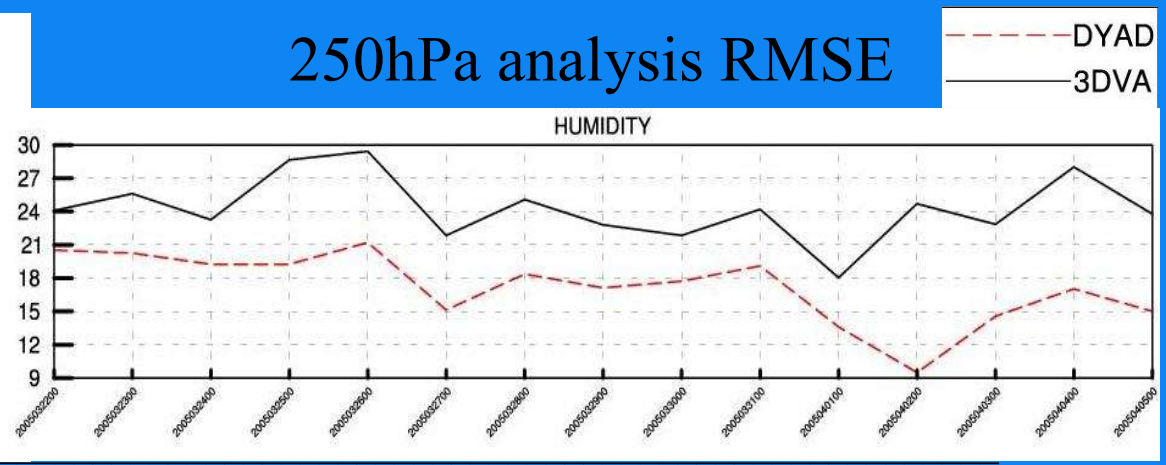
Objective scores (vs. dynamical adaptation):

- *mixed impact on humidity depending on forecast range on all tropospheric levels*
- *degradation on very high levels (250hPa)*

500hPa



250hPa analysis RMSE

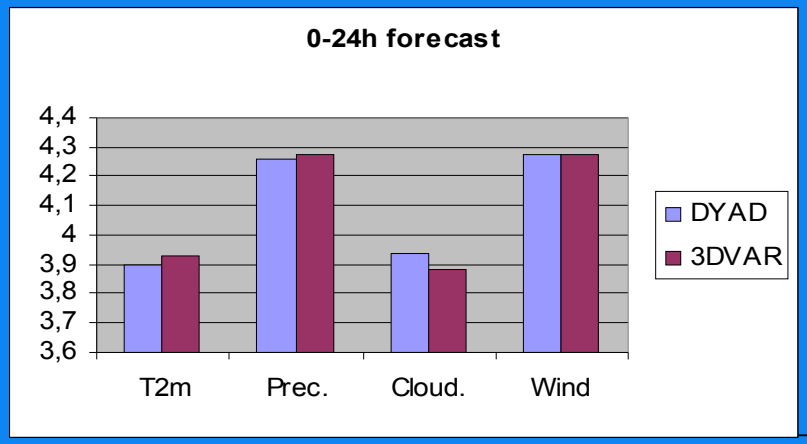


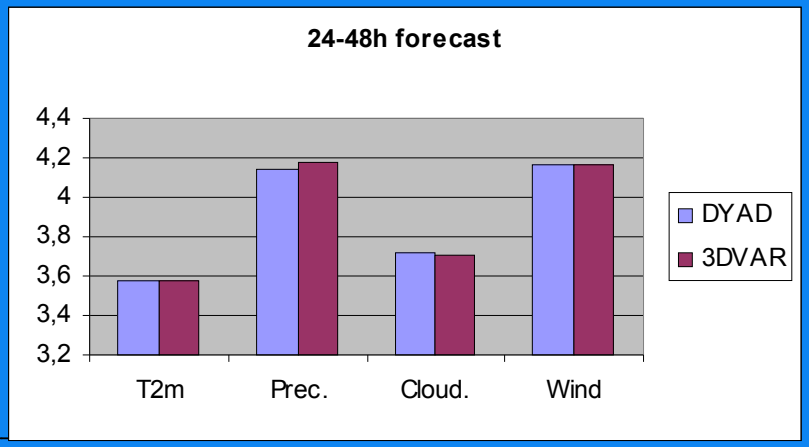
Meteorological evaluation (5)

Subjective scores (vs. dynamical adaptation):

(test period: 01/07/2004–31/12/2004)

- *improvement in T2m (0-24h)*
- *improvement in precipitation (0-48h)*
- *degradation (0-24h) / neutral impact (24-48h) in cloudiness*
- *neutral impact on wind*

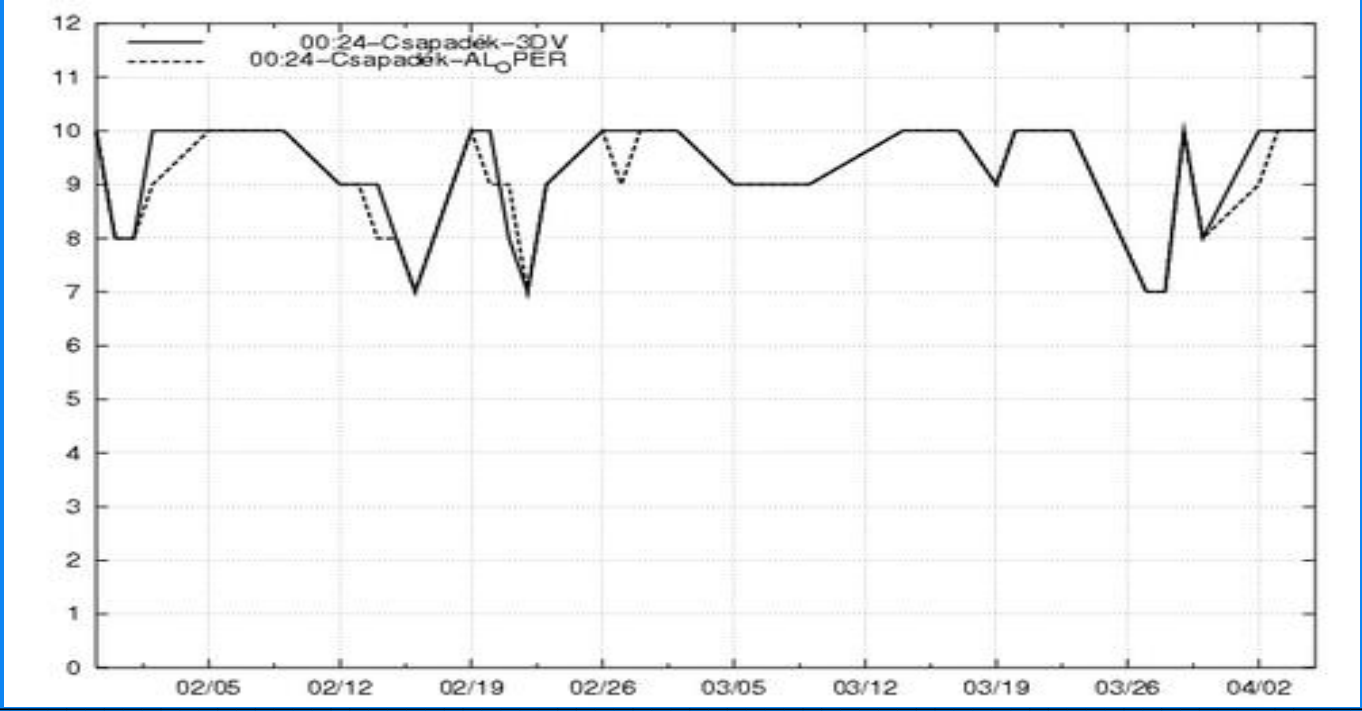


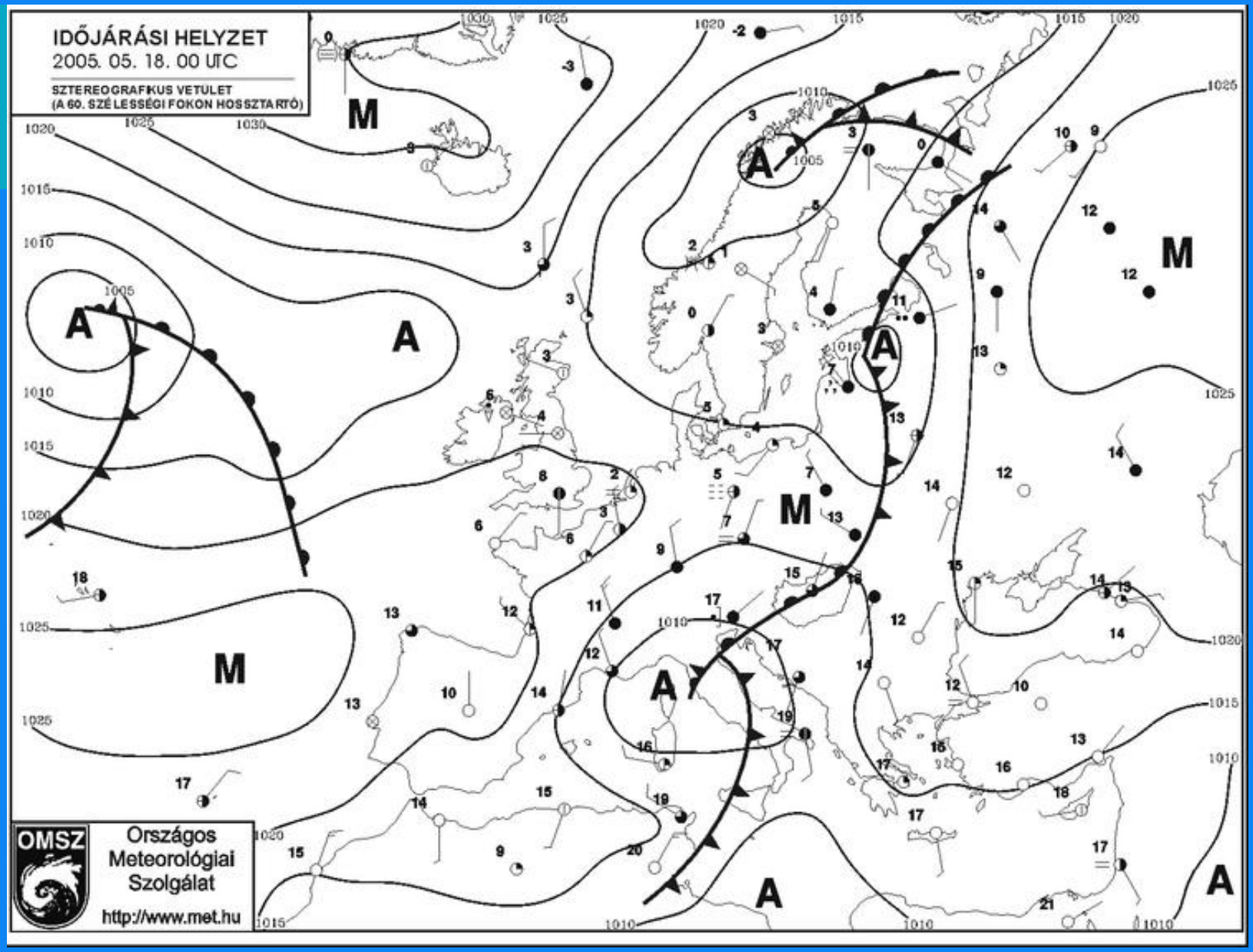


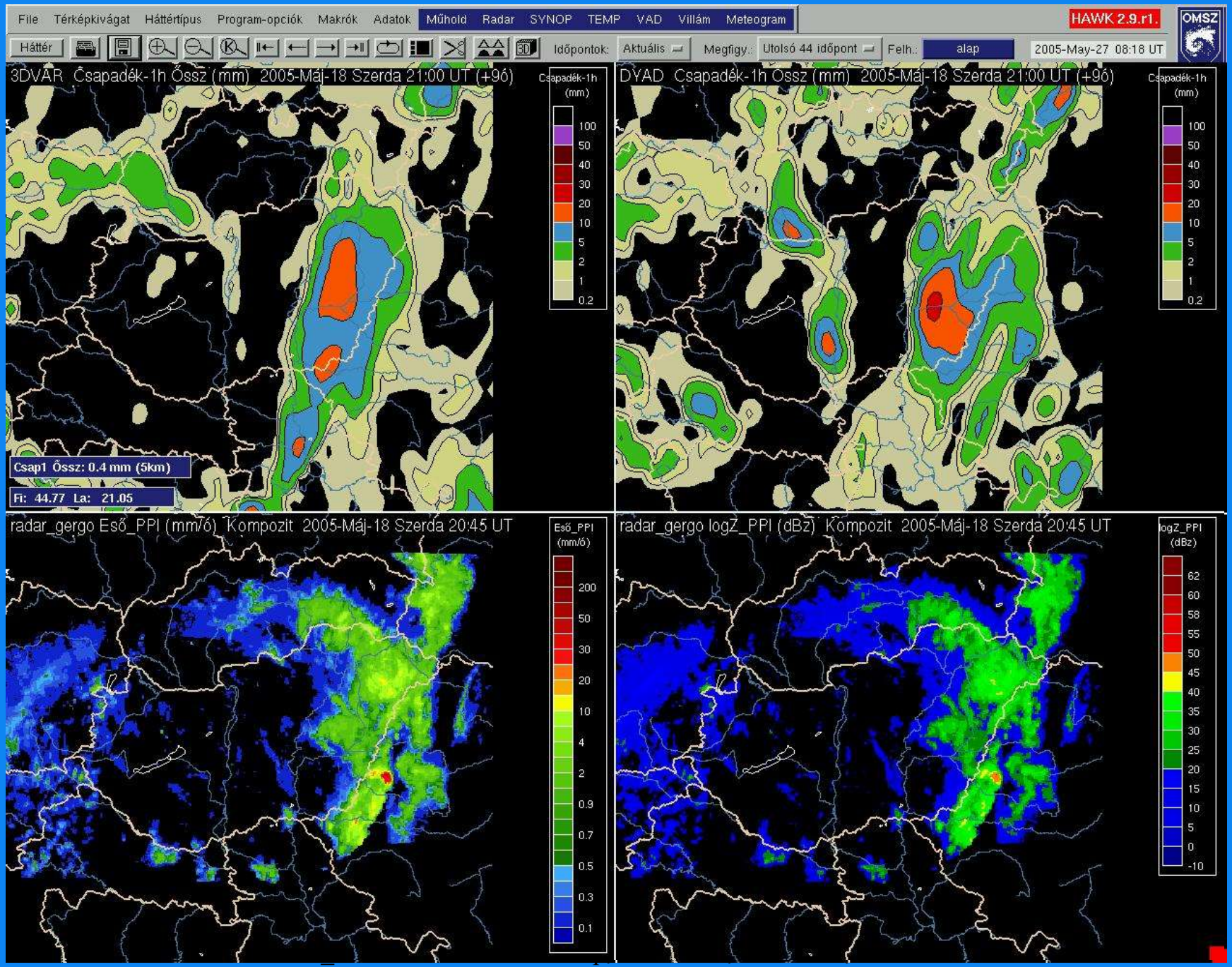
Meteorological evaluation (6)

Subjective scores (vs. dynamical adaptation):

- *time evolution of the (0-24h) precipitation scores*




IDŐJÁRÁSI HELYZET
2005. 05. 18. 00 UTC
SZTEREOGRAFIKUS VETÜLET
(A 60. SZÉLESSÉGI FOKON HOSSZTARTÓ)
OMSZ
Országos
Meteorológiai
Szolgálat
http://www.met.hu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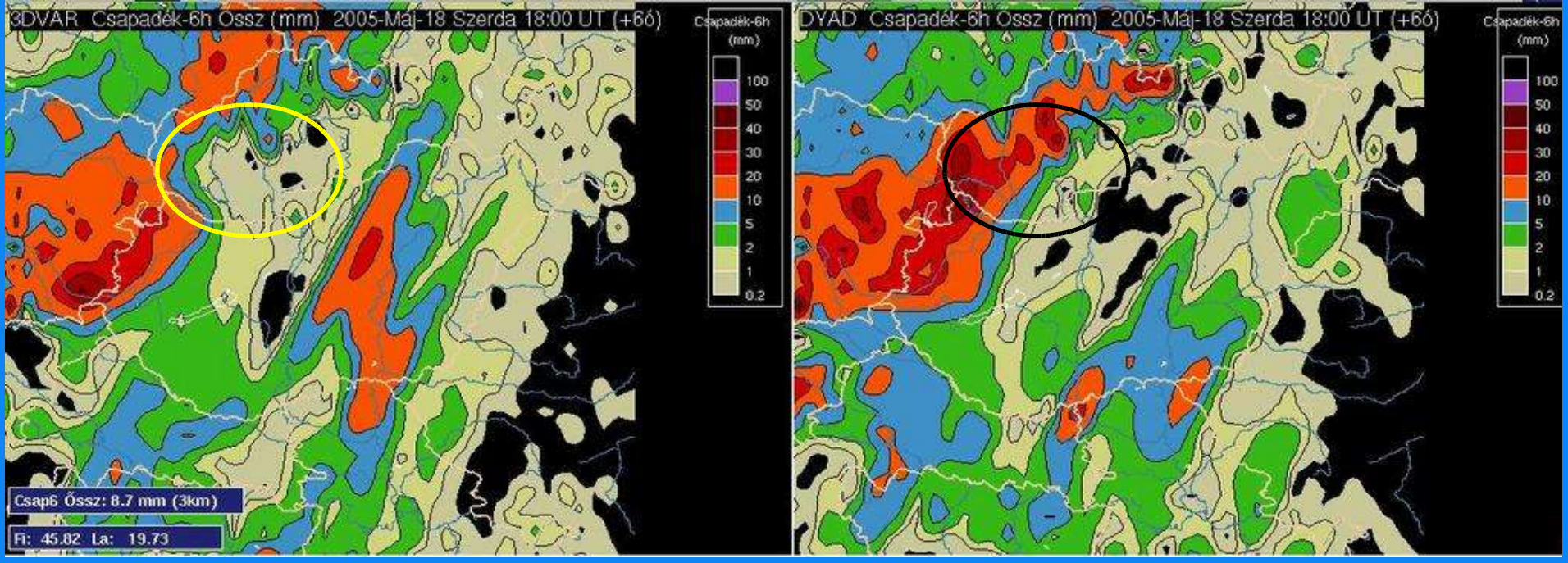
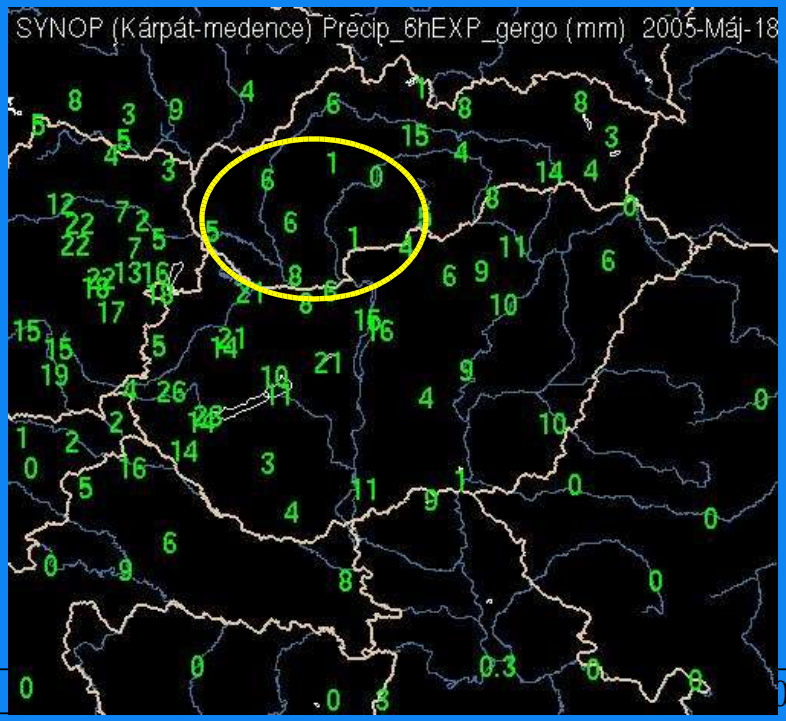
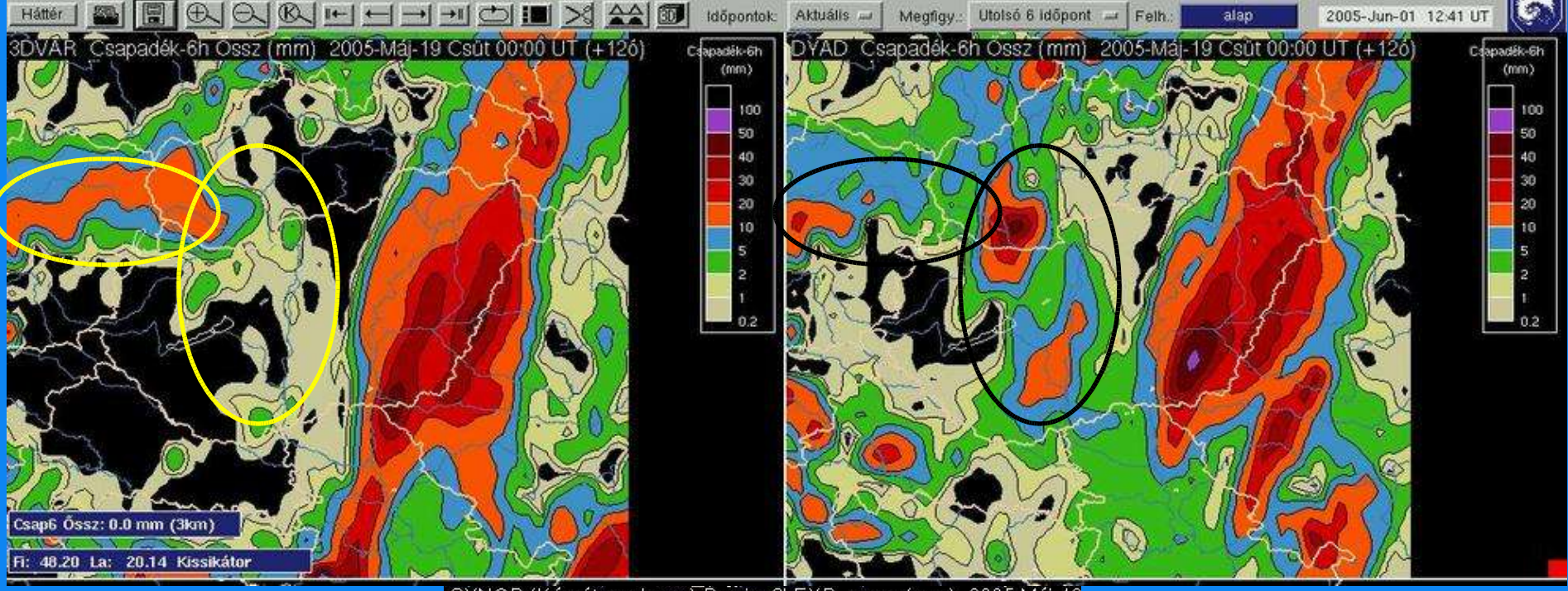
HAWK 2.9.r1.
OMSZ
Háttér
Időpontok: Aktuális
Megfigy.: Utolsó 44 időpont
Felh.: alap
2005-May-27 08:18 UT
3DVAR Csapadék-1h Össz (mm) 2005-Máj-18 Szerda 21:00 UT (+9ó)
Csapadék-1h (mm)
100
50
40
30
20
10
5
2
1
0.2
Csap1 Össz: 0.4 mm (5km)
Fi: 44.77 La: 21.05
DVAD Csapadék-1h Össz (mm) 2005-Máj-18 Szerda 21:00 UT (+9ó)
Csapadék-1h (mm)
100
50
40
30
20
10
5
2
1
0.2
radar_gergo Eső_PPI (mm/ó) Kompozit 2005-Máj-18 Szerda 20:45 UT
Eső_PPI (mm/ó)
200
50
30
20
10
4
2
0.9
0.7
0.5
0.3
0.1
radar_gergo logZ_PPI (dBz) Kompozit 2005-Máj-18 Szerda 20:45 UT
logZ_PPI (dBz)
62
60
58
55
50
45
40
35
30
25
20
15
10
5
0
-10

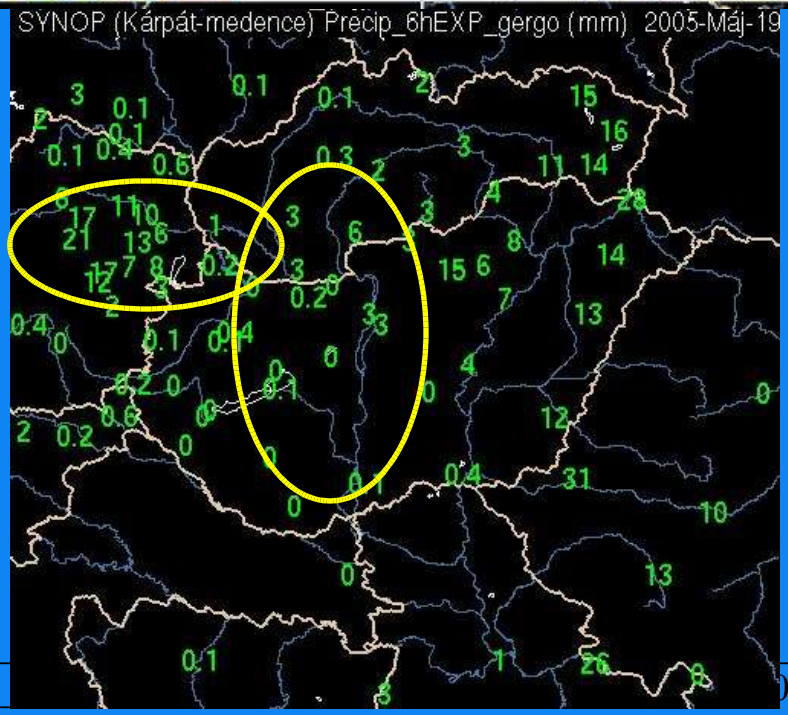




18/05/05 18 UTC

mm/6h





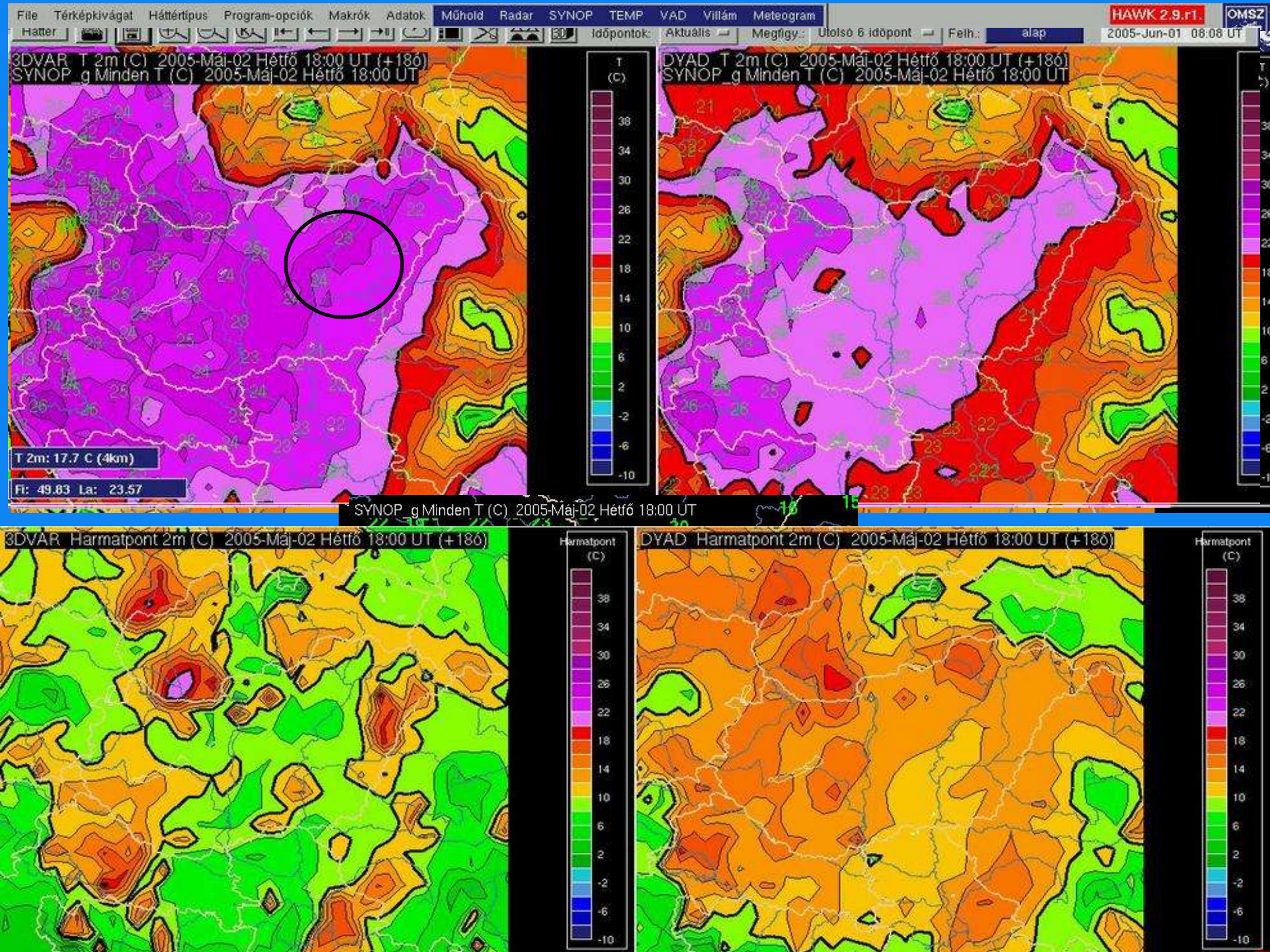
19/05/05 00 UTC

mm/6h

Meteorological evaluation (8)

Case study 02/05/2005 00 UTC:

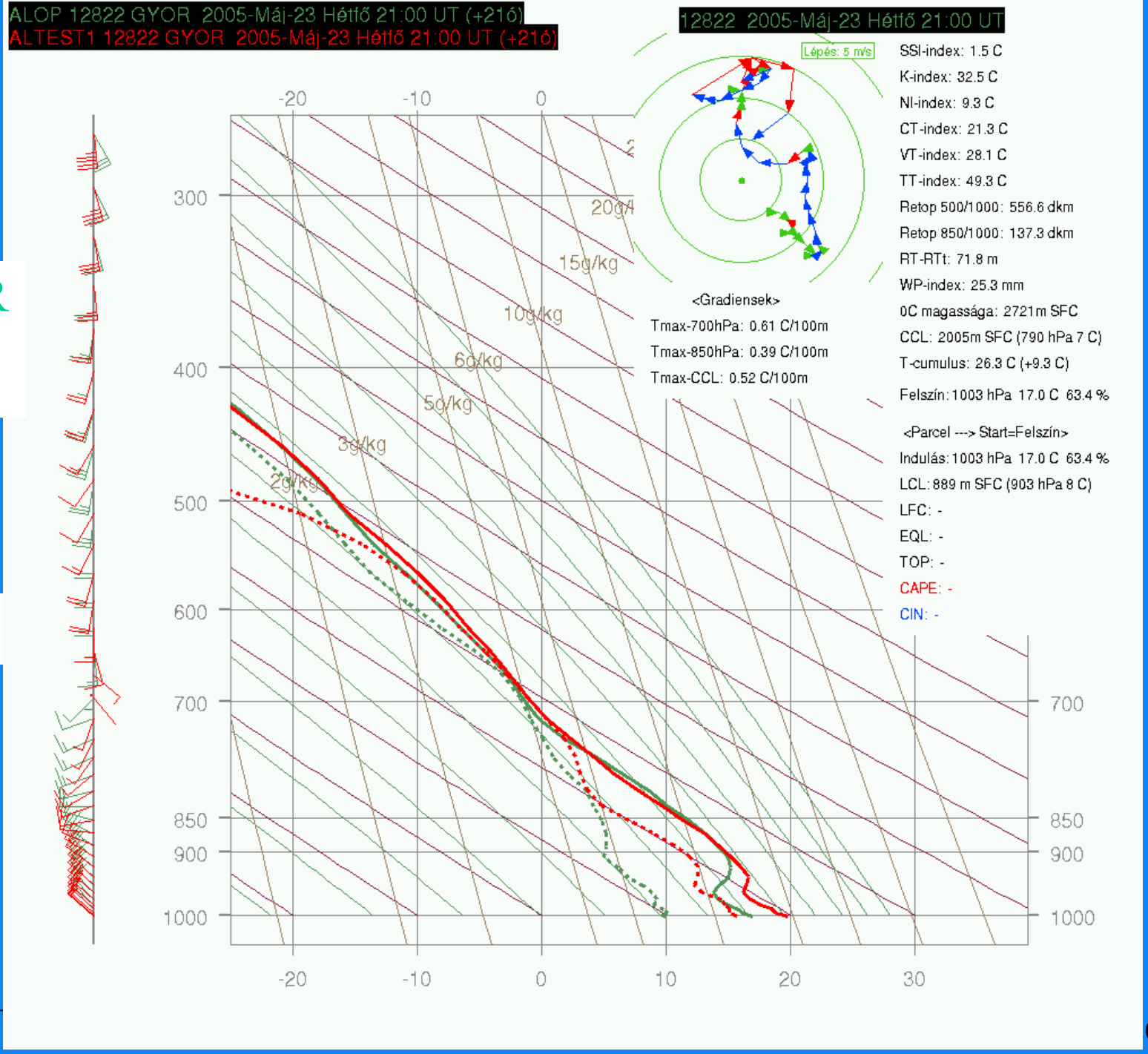
- High pressure system over Central Europe, fronts only far away from Hungary
- clear sky
- intensive warming during the whole day


File Térképkivágat Háttértípus Program-opciók Makrók Adatok Műhold Radar SYNOP TEMP VAD Villám Meteogram
HAWK 2.9.r1.
OMSZ
Hatter
Időpontok: Aktuális
Megfigy.: Utolsó 6 időpont
Felh.: alap
2005-Jun-01 08:08 UT
3DVAR T 2m (C) 2005-Máj-02 Hétfő 18:00 UT (+18ó)
SYNOP_g Minden T (C) 2005-Máj-02 Hétfő 18:00 UT
T (C)
38
34
30
26
22
18
14
10
6
2
-2
-6
-10
T 2m: 17.7 C (4km)
Fi: 49.83 La: 23.57
DYAD T 2m (C) 2005-Máj-02 Hétfő 18:00 UT (+18ó)
SYNOP_g Minden T (C) 2005-Máj-02 Hétfő 18:00 UT
3DVAR Harmatpont 2m (C) 2005-Máj-02 Hétfő 18:00 UT (+18ó)
Harmatpont (C)
DYAD Harmatpont 2m (C) 2005-Máj-02 Hétfő 18:00 UT (+18ó)

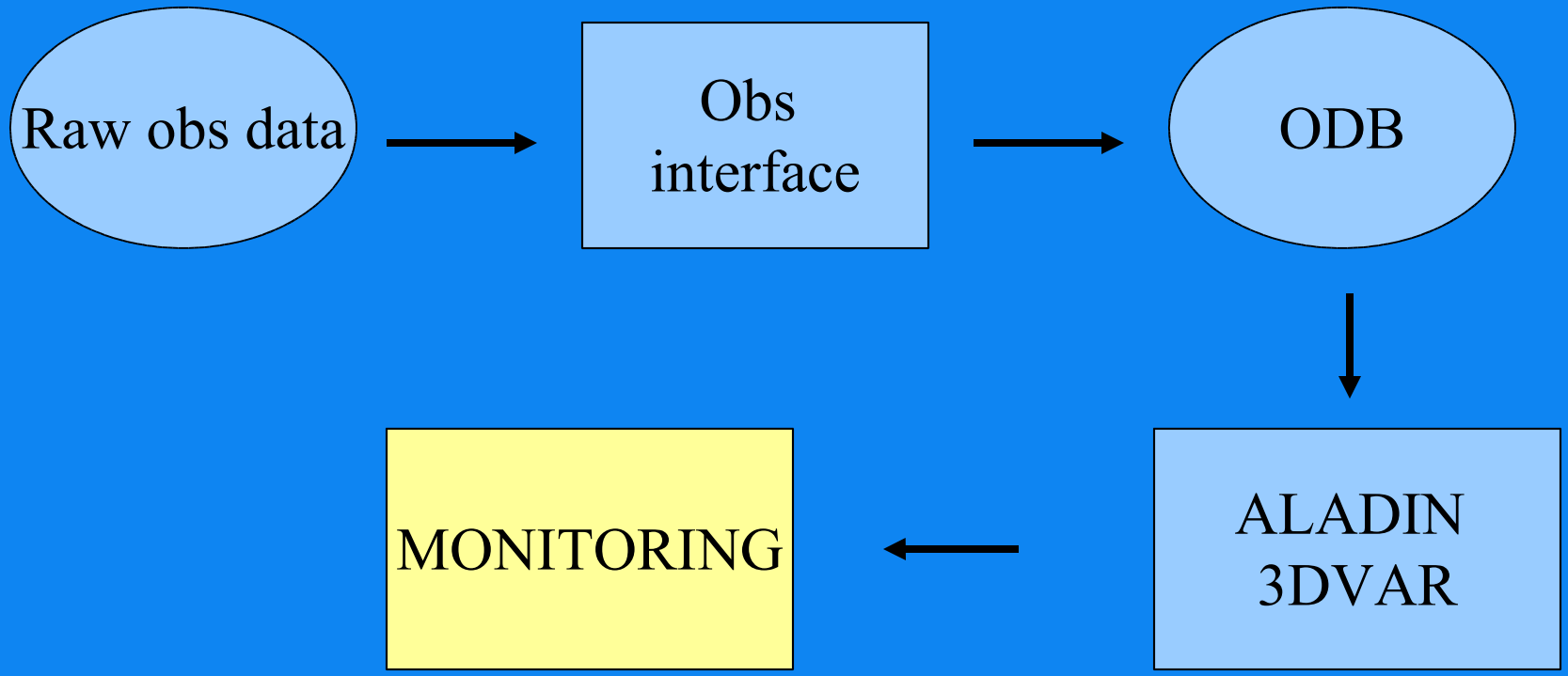
3DVAR

DYAD

+21h



Monitoring (0)



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Mozilla {Build ID: 2004092716}

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Back Forward Reload Stop http://pc2088.met.hu/monitor/start.html Search Print

Home Bookmarks

ALADIN 3DVAR Observation Monitor

Actual date: 2005 June 1

Selection:

Latest runs
Arbitrary runs
Latest period
Arbitrary period

Latest runs

tegnap 00 UTC

Mehet

Observations

SYNOP
Reports
T 2m
RHU 2m
U 10m
V 10m
Geo

TEMP
Reports
Stations
T
RHU
U
V
Geo

AIREP
Reports
T
U
V

SATOB
Reports
U
V

WPROF
Reports
Stations
U
V

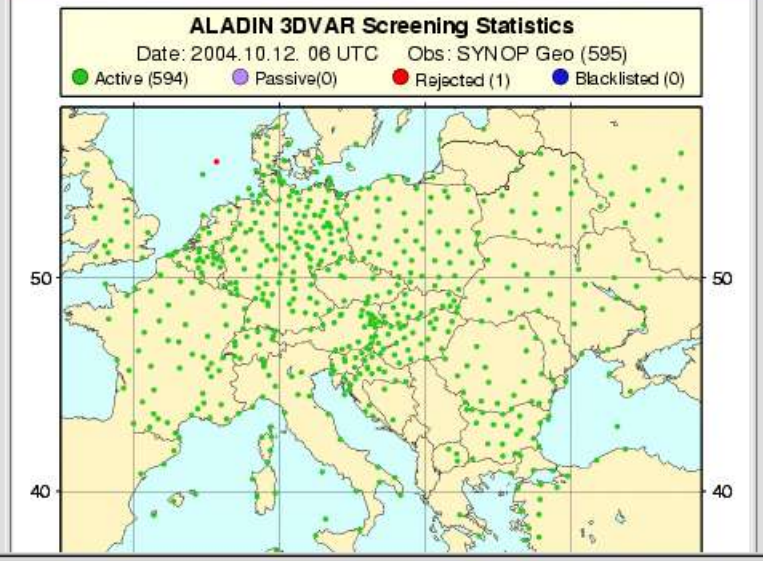
Synop Observations

Screening and analysis statistics

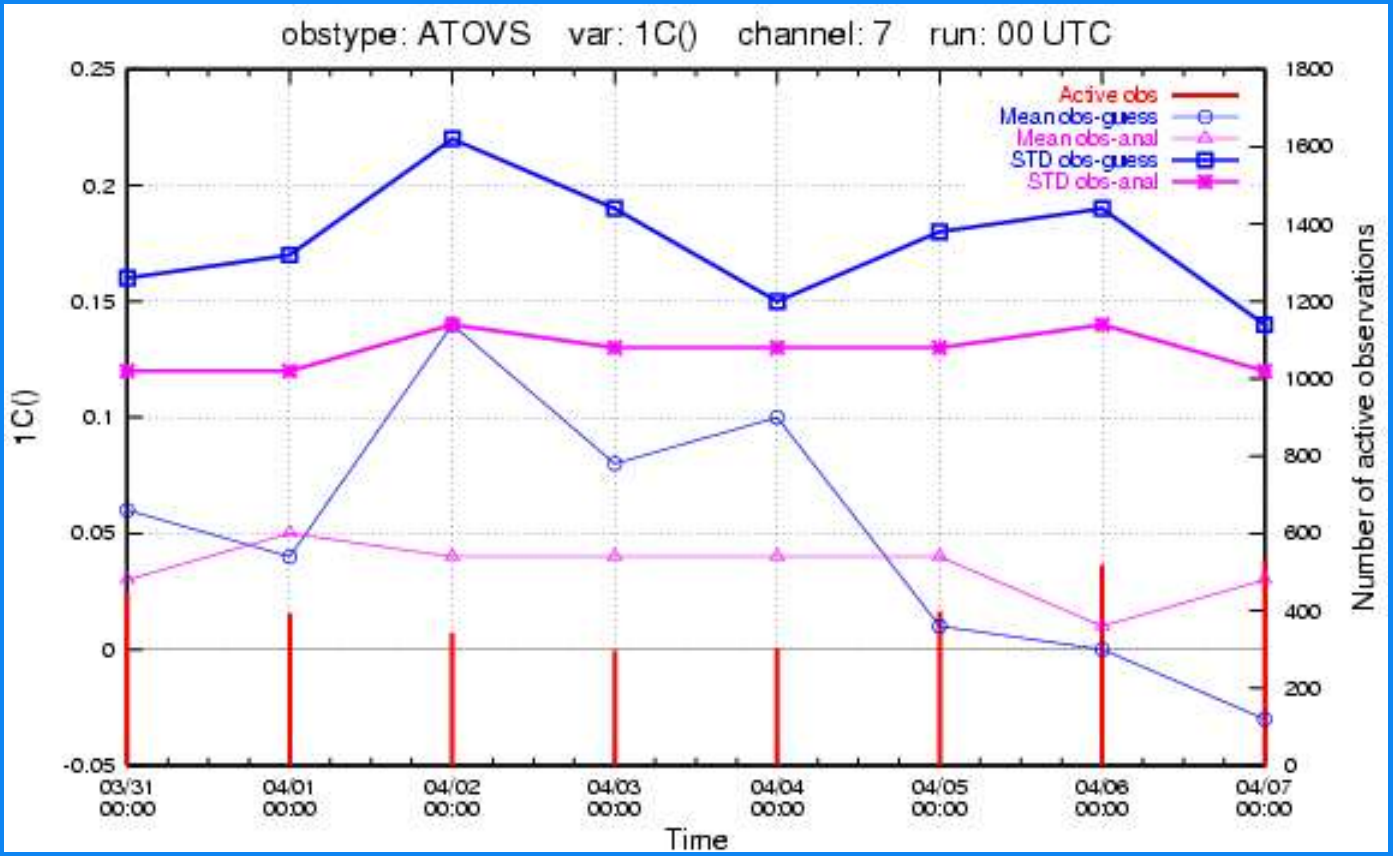
Var	Total	Active	Pass	Reject	Black	O-G Mean	O-A Mean,	O-G STD	O-A STD
Report	737	731	0	6	0	---	---	---	---
T	737	723	0	14	0	0.00	0.00	0.00	0.00
U	716	0	705	13	0	0.00	0.00	0.00	0.00
V	716	0	705	13	0	0.00	0.00	0.00	0.00
Geo	567	555	0	12	0	8.01	0.63	6.50	3.68
RHU	737	723	0	14	0	0.00	0.00	0.00	0.00

Location and status of SYNOP reports

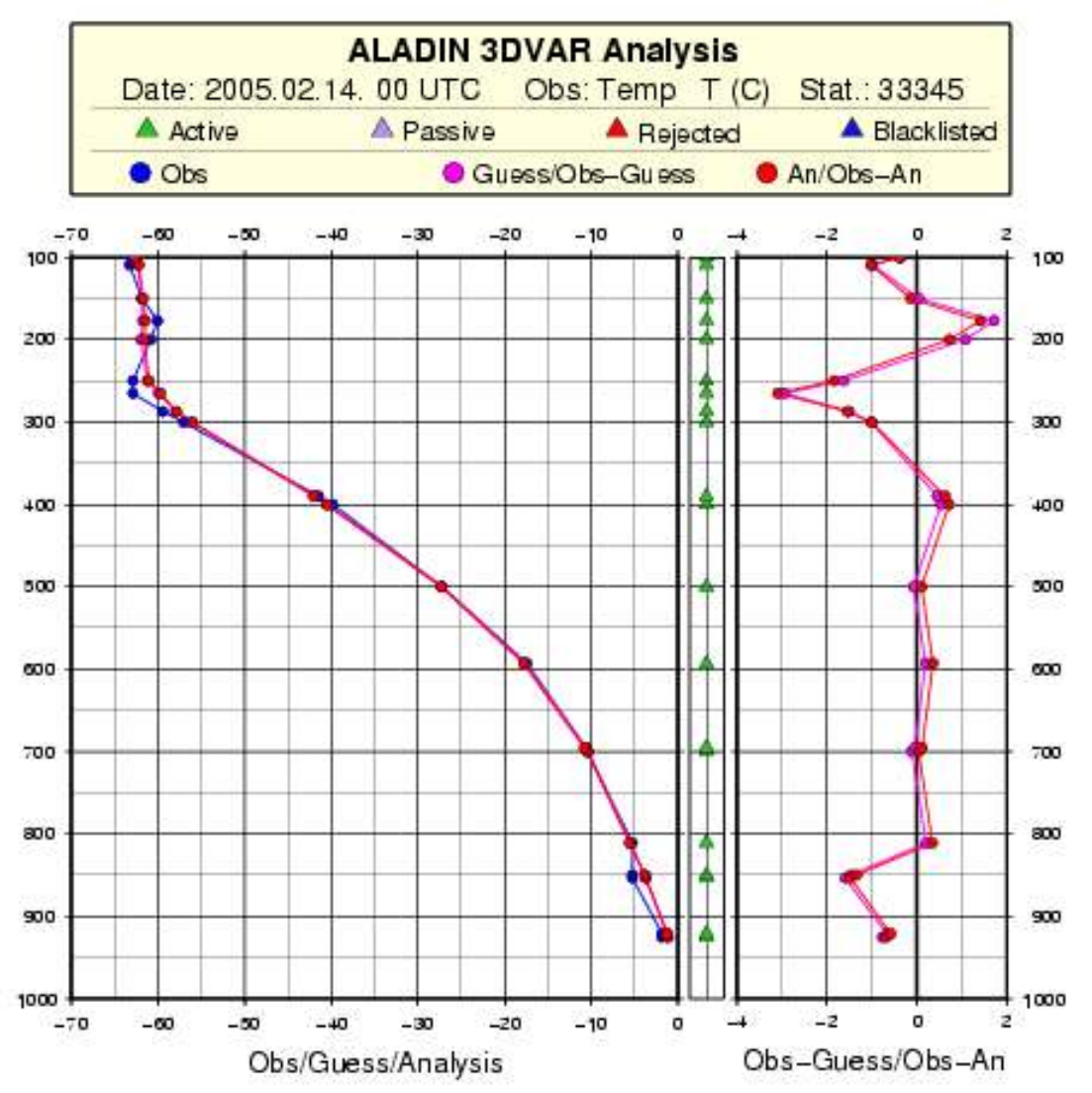
Status | Obs-Guess | Obs-Analysis | Analysis-Guess



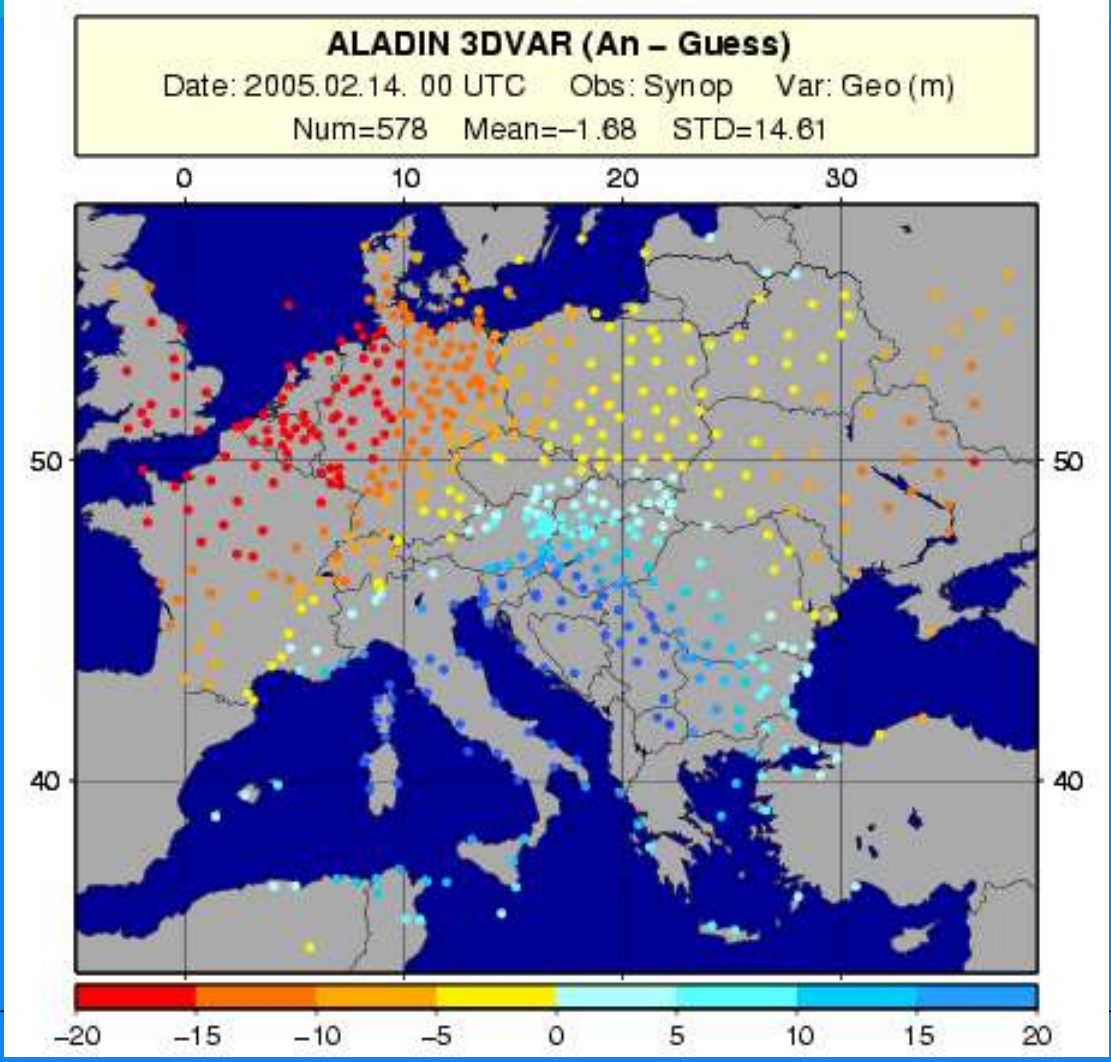
Monitoring (2)



Monitoring (3)



Monitoring (4)



Future developments

- use more observations (AMV, AMSU-B, SYNOP RH2m)
- humidity tunings *(Kristian Horvath's talk)*
- extensive impact studies of the observing network (EUMETNET/EUCOS)
- compute an ensemble B matrix *(Margarida Belo's talk)*
- follow the new ALADIN cycles (variational T2m, Jk term, use of SEVIRI radiances) *(Ludovic Auger's & Claude Fischer's talks)*

Many thanks…

… to everyone who was encouraging us with his/her help or with his/her ideas during the last 5 years!