

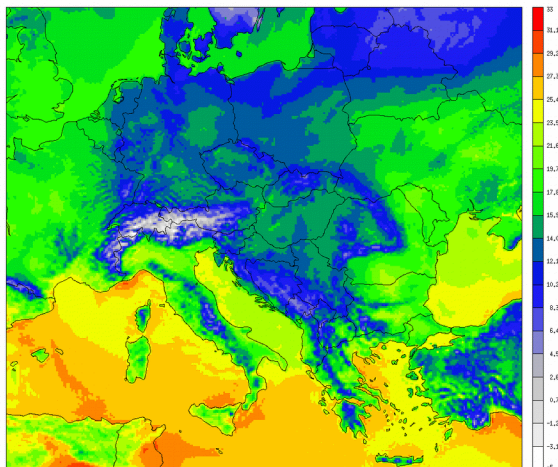
Data Assimilation in SHMU 2016

Estimation of work on DA alphabetically:

Martin Bellus	0.25m [only SHMU] Not inculing work in Wien on LAEF assim.	implementation of 3DVAR from Wien (LAEF)
Maria Derkova	0.5 m	ALARO - canari on CY40T1
Michal Nestiak	2.5 m Not including 15 days EUMETSAT satellite training	ALARO 3DVar, AROME 3DVar effort, SODA, preparing local OBS, QC, some radars work
Viktor Tarjani	3.5 m	offline Surfex
Jozef Vivoda	1.5 m	Compiling, technical implementation ALARO 3DVAR, basic tests SODA, AROME 3DVAR effort

HPC01 - AIX

CLTEMPORURE
2016-08-16 00:00 Initialized



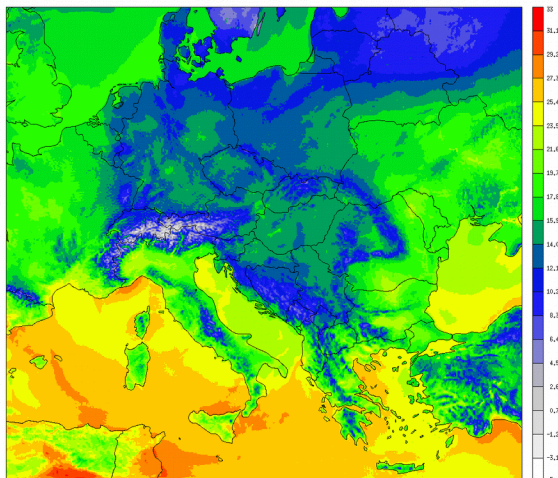
ALARO-0 9km

CY36T1_bf10

[2013-01-07 ...]

Forecaster office, Hydrology, Aviation
forecaster office
public website

CLTEMPORURE
2016-08-16 00:00 Initialized



ALARO-0 4.5km

CY38T1bf03

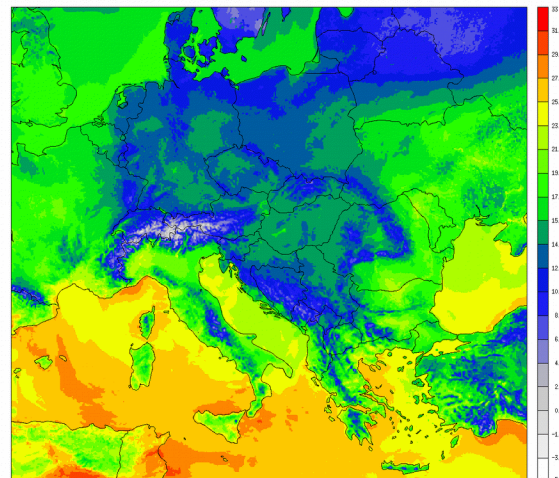
[2014-11-05 ...]

Replaced by oper45km
Input for hydrology models
Background for wind, T2m INCA2
[1km]

Background for wind INCA2 [100m]

HPC02 - LINUX

CLTEMPORURE
2016-08-16 00:00 Initialized



ALARO-1 4.5km

CY40T1_bf06*

[05-08-2016]

Forecaster office, Hydrology,
Aviation forecaster office,
Energy Companies

Only Volunteer meteorologist have access

ALARO 3DVar 4.5km

2016-02 Jozef Vivoda [2w]

3DVAR - local technical implementation of ALARO which running on CHMU same resolution, domain, B-Matrix

2016-05 M. Bellus and A. Trojakova (Wien) - LAEF

SCRIPT TO PERFORM UPPER-AIR FIELDS ANALYSIS USING
3DVAR CONFIGURATION - SCREENING (e002) and minimization (e131)

2016-06 M.Bellus [1w] - continue work in Bratislava on LAEF 3DVAR

Also Martin write article for MWR about LAEF (CANARI)

2016-05 Jozef Vivoda [2w]

3DVAR - local technical implementation of 3DVAR ALARO-0 scripts from Martin Bellus

ALARO 3DVar (still use B-Matrix from CHMU thx)

Diagnostic JO-table (JOT) MINIMISATION JOB T0215 NCONF= 131 NSIM4D= 0 NU

=====

Obstype 1 === SYNOP, Land stations and ships

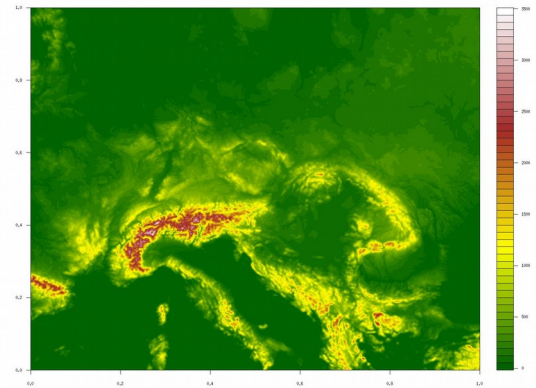
Codetype	Variable	DataCount	Jo_Costfunction	JO/n	ObsErr	BgErr
11	=== SYNOP Land Manual Report					
H2		12	5.815815571530	0.48	0.100E+00	0.120E+05
Z		13	2.950811488490	0.23	0.785E+02	0.674E+07
T2		14	6.114640791713	0.44	0.140E+01	0.100E+06
14	=== SYNOP Land Automatic Report					
H2		991	341.5411457614	0.34	0.100E+00	0.120E+05
Z		952	138.1124541309	0.15	0.785E+02	0.930E+07
T2		1298	575.1980054781	0.44	0.140E+01	0.106E+06
24	=== SYNOP Automatic SHIP Report					
U		52	19.87133081172	0.38	0.270E+01	0.210E+06
Z		55	23.10678240646	0.42	0.785E+02	0.144E+08
T2		57	27.99998124420	0.49	0.140E+01	0.123E+06

ObsType 1 Total: 3444 1140.710967685 0.33

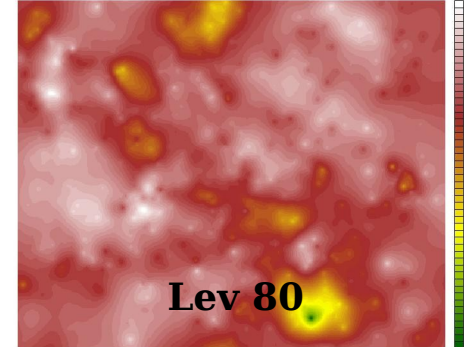
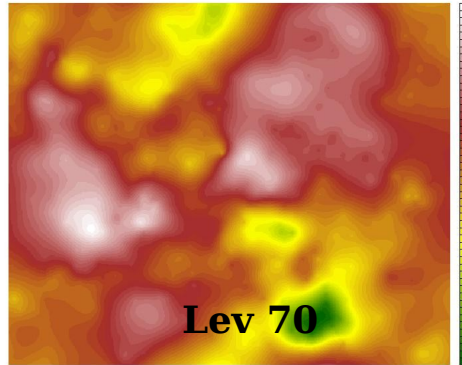
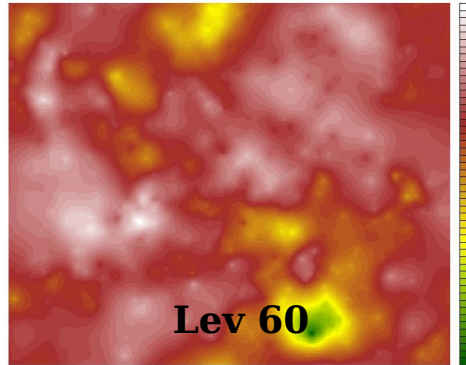
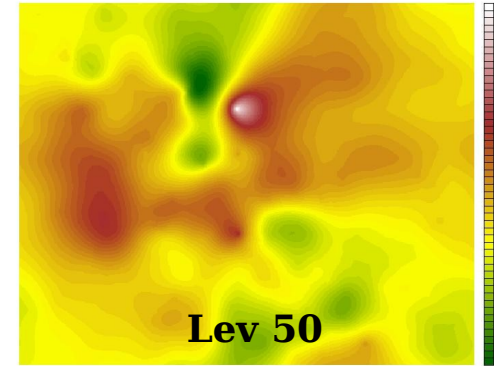
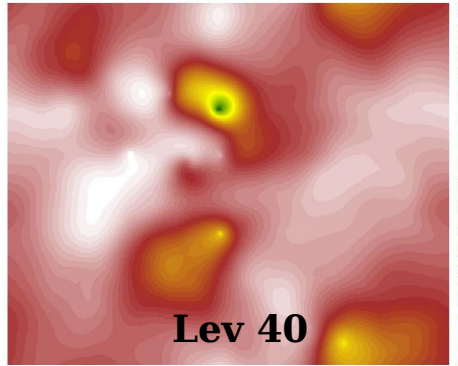
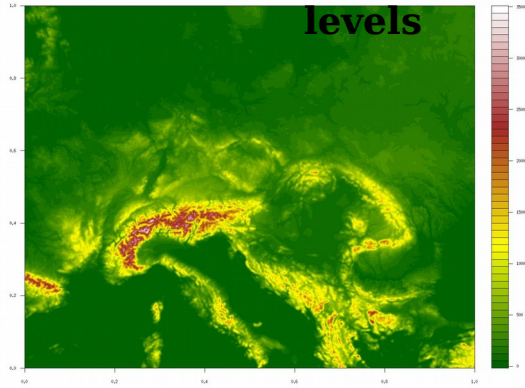
Obstype 5 === TEMP, Radiosondes

Codetype	Variable	DataCount	Jo_Costfunction	JO/n	ObsErr
35	=== TEMP Land Report				
BgErr	U	488	790.9965280979	1.62	0.225E+01
0.301E+06	T	259	492.7933776570	1.90	0.981E+00
0.122E+06	Q	143	164.1422077612	1.15	0.944E-03
0.677E+02					

ObsType 5 Total: 890 1447.932113516 1.63



ALARO 3DVar - temperature diff on



AROME [2.5km 489x289 63lev]

5A.TEMPERATURE
2006/02/24 09:00 Initializant

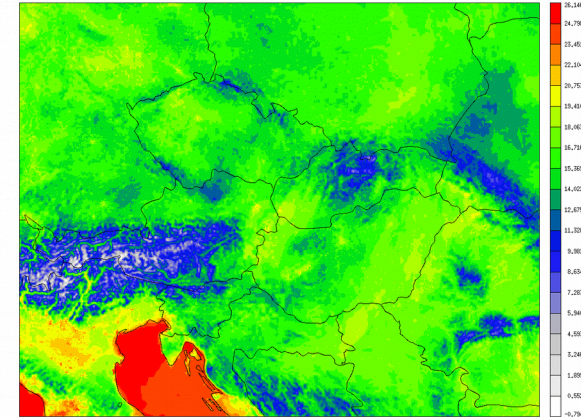
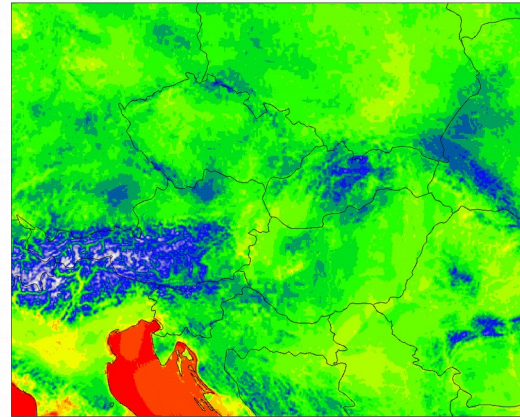
0L.TEMPERATURE
2006/02/24 09:00 Initializant

Jozef Vivoda

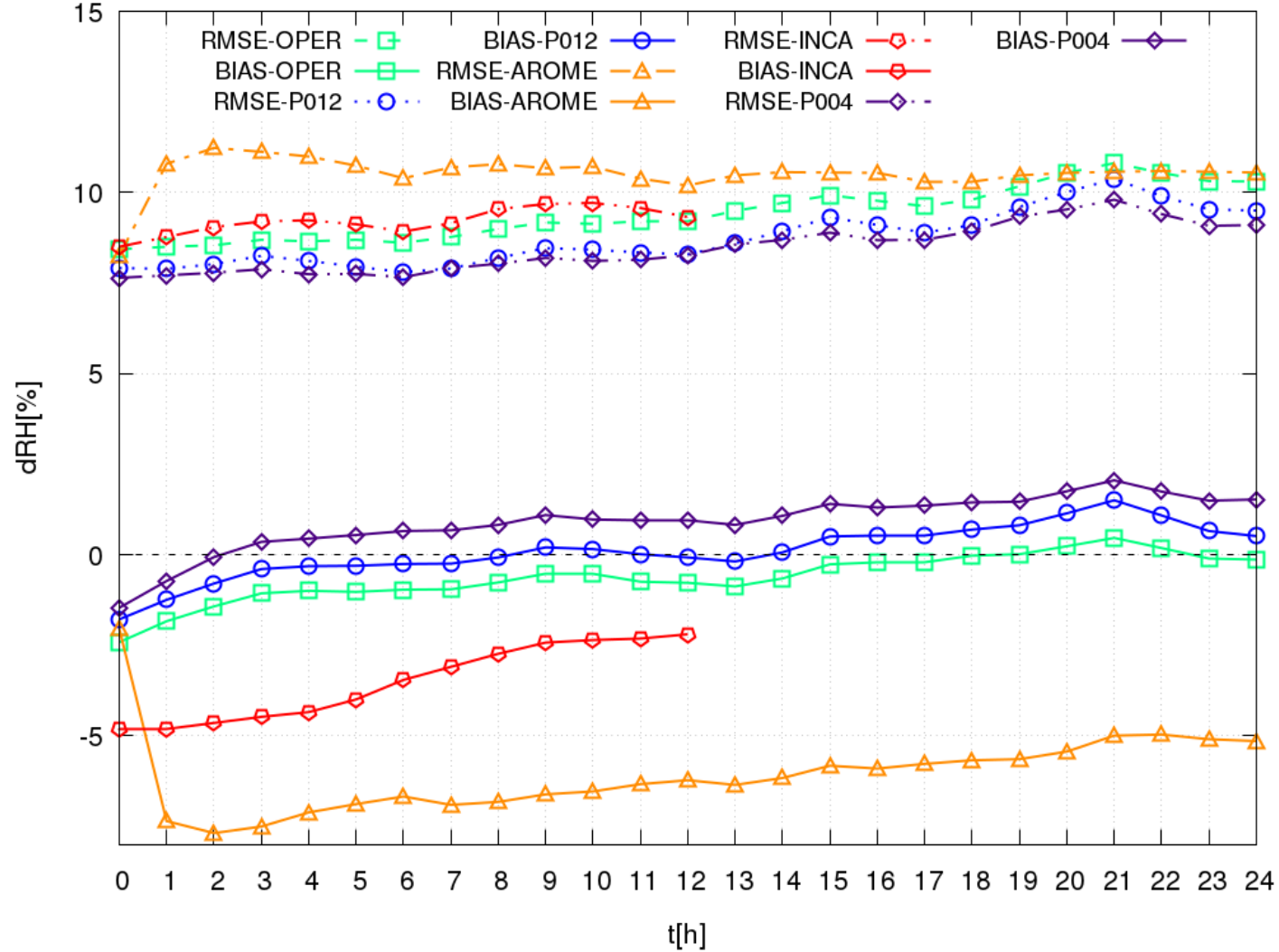
- local technical implementation
e923, e927, e001

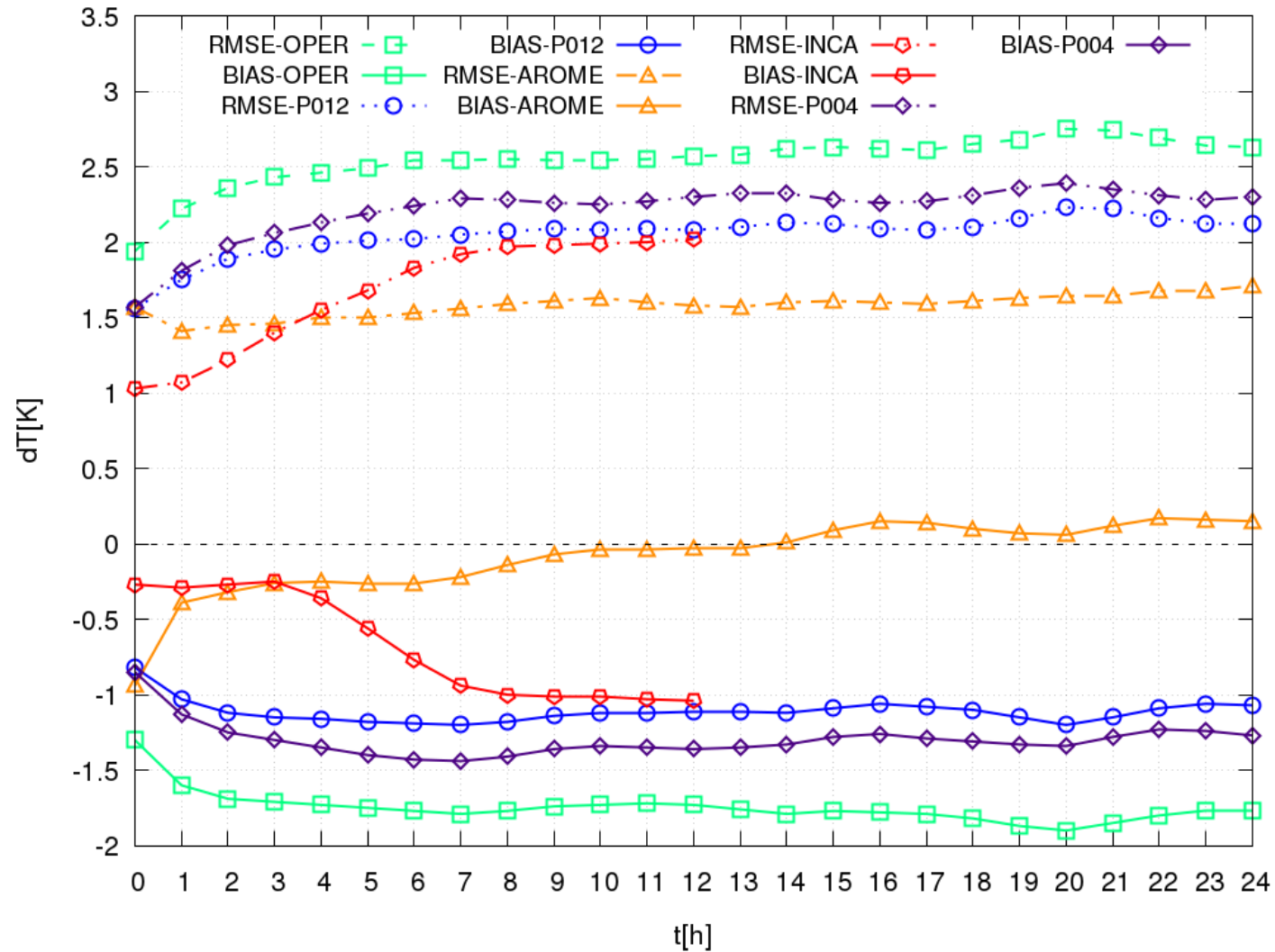
Jozef Vivoda, Michal Nestiak

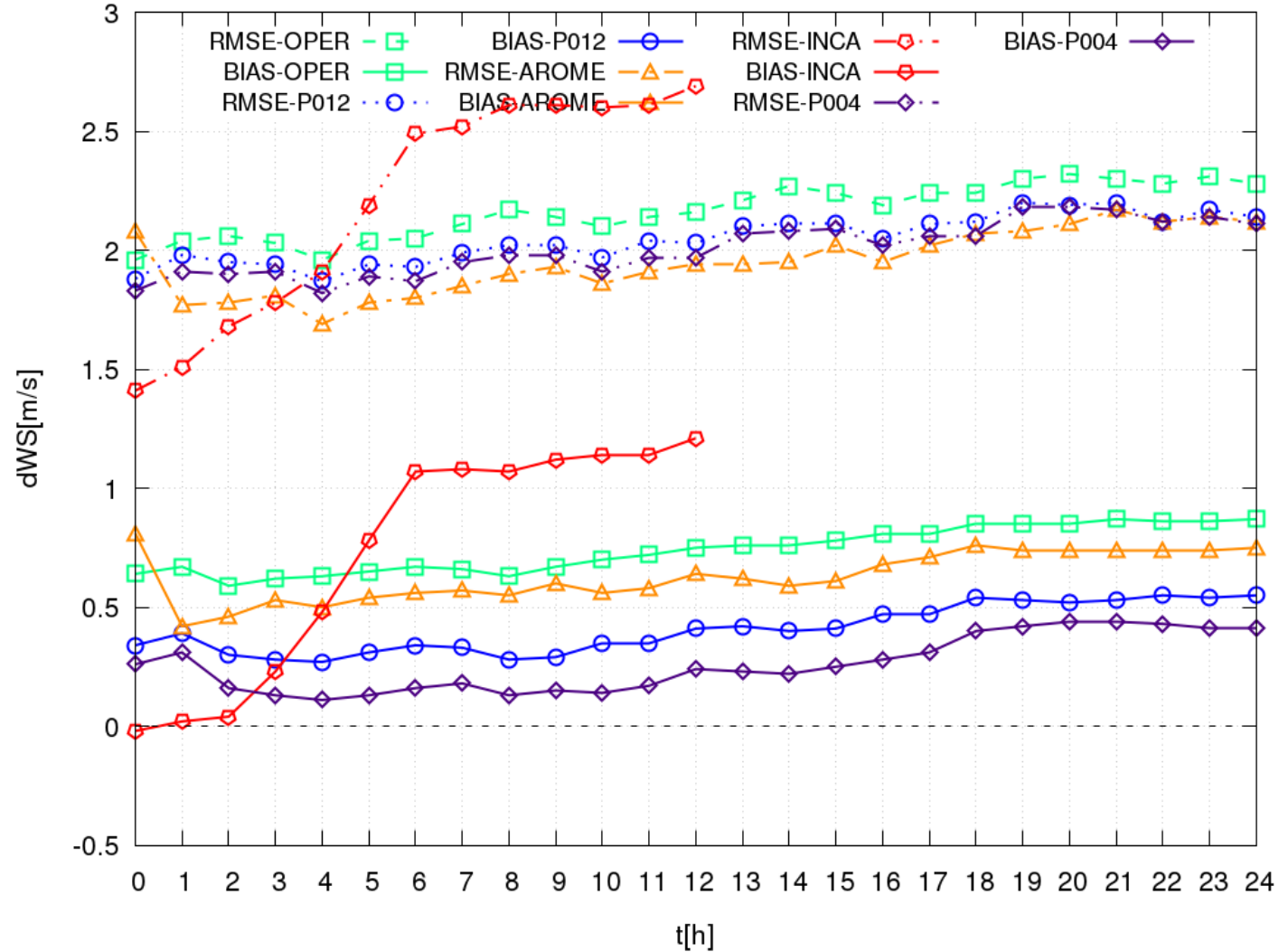
- implementation of 3DVar cycle 40
/still not functional, also need
validation, testing/



Thx CHMU for tarball Alenka Trojakova (ALARO + work in Wien with Martin Bellus)
Thx OMSZ for tarball Mate Mile 2015/10/27 /scratch/ms/hu/hu8/arome_hu.tgz





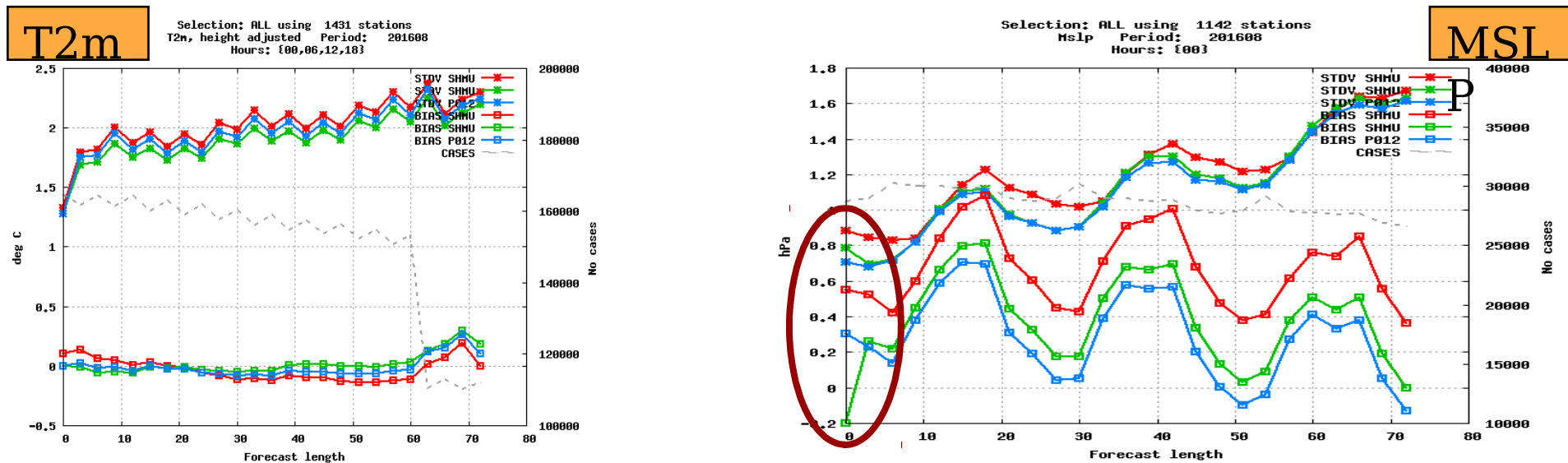


Validation & verification

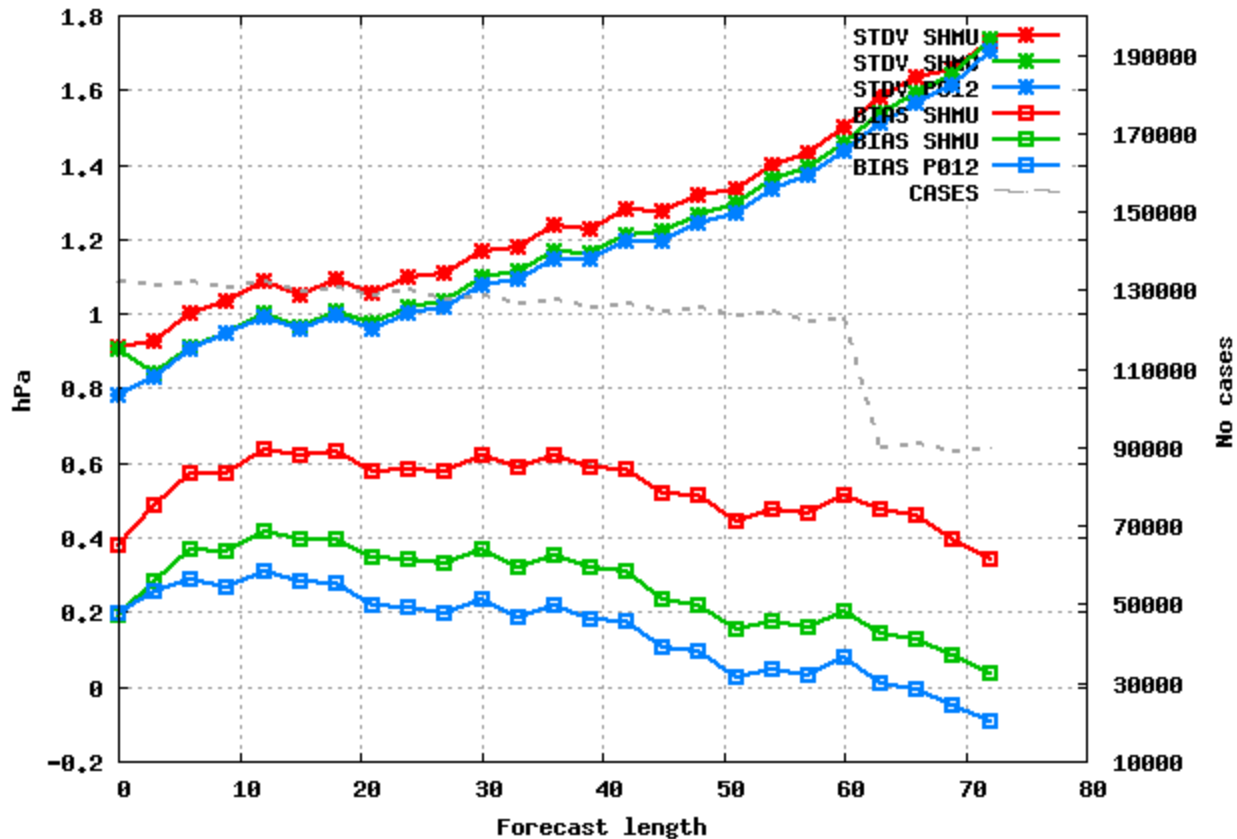
ALARO-1 scores with respect to **OPER** and **ALARO-0**

HARMONIE verification tool: 1 month of August 2016, whole SHMU domain

ALARO-1 MSLP scores, possible problem with initialization? T2m generally better for all parameters (illustrated by T2m)



Selection: ALL using 1146 stations
 Mslp Period: 201608
 Hours: {00,06,12,18}



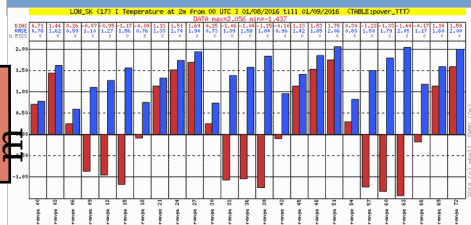
Validation & verification

1 month of August 2016, local verification against SYNOP stations

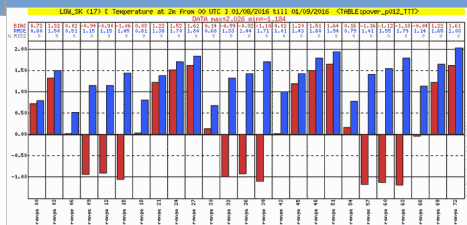
Generally better. PB with wind speed if mountain stations are included.

1Z
m

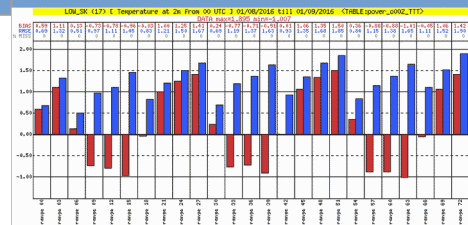
CY36T1 OPER



CY38T1 ALARO-0

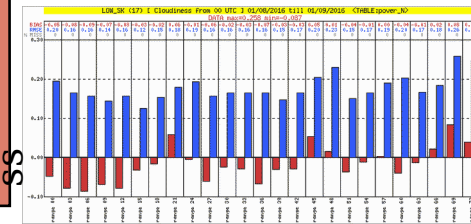


CY40T1 ALARO-1

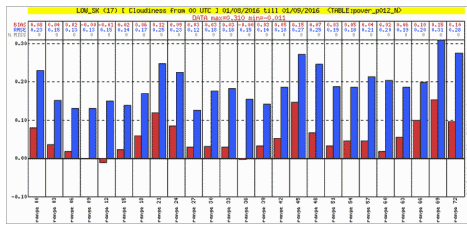


Clouds
SS

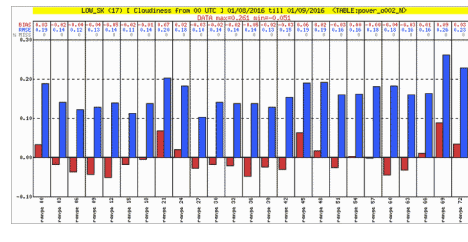
CY36T1 OPER



CY38T1 ALARO-0

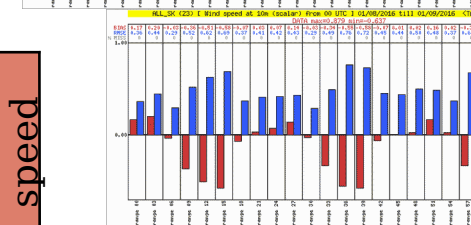


CY40T1 ALARO-1

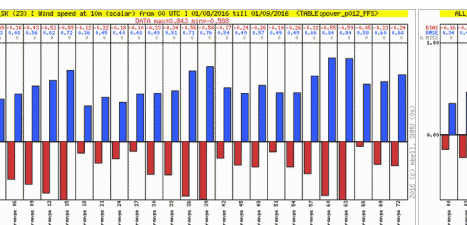


wind
speed

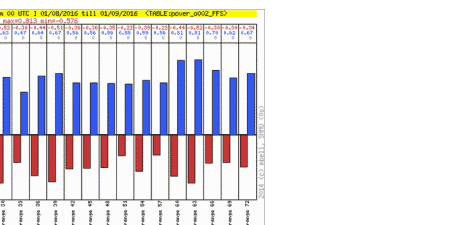
CY36T1 OPER



CY38T1 ALARO-0



CY40T1 ALARO-1



201601 - 201608 Viktor Tarjani - SURFEX - background model is ALARO-1 (hpcdev02:oper)

Idea: use aladin field and correct it using INCA analysis fields (precip) and prepare new snow analyse

Prepare initial state grib prep.lfi

```
/users/nwp120/app/grib4prep/bin/grib4prep.py
in : /data/nwp/p012/icmsh/shmu/prod/ICMSHSHMU+rng [ALARO-0 38T1 4.5km]
```

```
/users/nwp002/pack/40t1_apps.01.MPIGNU493.x/bin/MASTERODB -vmeteo -maladin -ePREP -c001 -aeul -t1. -ft0 -procs 8
CFPPHY(1)=SURFTEMPERATURE, !! Surface temperature (K)
CFPPHY(2)=PROFTEMPERATURE, !! Deep soil temperature (K)
CFPPHY(3)=SURFRESERV.EAU, !! Surface soil wetness
CFPPHY(4)=PROFRESERV.EAU, !! Deep soil wetness
CFPPHY(5)=PROFRESERV.GLACE, !! Frozen deep soil wetness
CFPPHY(6)=SURFRESERV.GLACE, !! Frozen superficial soil wetness
CFPPHY(7)=SURFRESERV.NEIGE, !! Snow depth
CFPPHY(8)=SURFPROP.ARGILE, !! Percentage of clay within soil
CFPPHY(9)=SURFPROP.SABLE, !! Percentage of sand within soil
CFPPHY(10)=SURFEPAIS.SOL, !! Soil depth
CFPPHY(11)=SURFGEOPOTENTIEL, !! Output grid-point geopotential (g*h)
CFPPHY(12)=SURFIND.TERREMER, !! Land/sea mask
CFPPHY(13)=SEASURFTEMPERATU, !! Sea surface temperature (K)
```

```
out : gl_grib_api -c PFPREPSHMU+0000 -o PFPREPSHMU+0000.grib
grib_set -s centre=85 PFPREPSHMU+0000.grib GRIB4PREP {input for surfex prep - initialize surfex schemes}
```

#####

GRIB4PREP -> prep -> [prep.lfi](#)

[Prep.lfi](#) + [pgd.lfi](#) (ECOCLIMAP2) + **FORCING.nc** -> offline Surfex 7.3 (40T1) -> SFXOUT.lfi {final state}



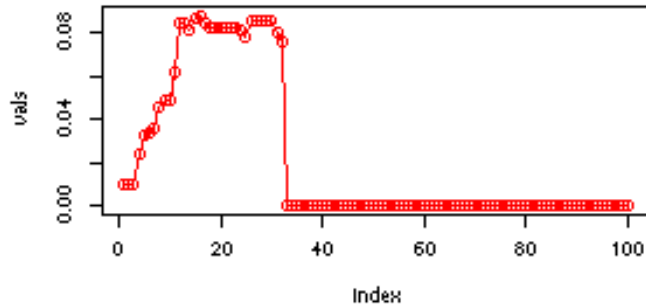
[/users/nwp120/devel/surfex/inca4surfex/inca4surfex.py](#)

- TA - INCA2 T2m
- QA - recalculated INCA2 RH to specific humidity
- PS - ALARO-1 (hpcdev02:oper)
- RAIN - inca2 prec
- SNOW -
- WIND -
- DIR -

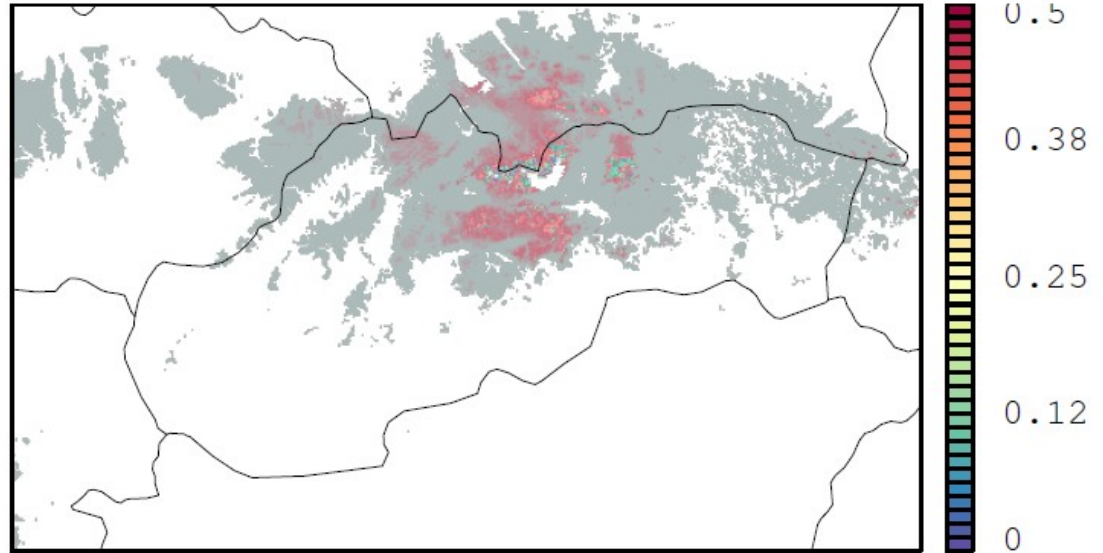
- ISBA_DIAGNOSTICS.OUT.nc
- ISBA_PROGNOSTIC.OUT.nc
- SURF_ATM_DIAGNOSTICS.OUT.nc
- SURF_ATM.OUT.nc
- TEB_CANOPY.OUT.nc
- TEB_DIAGNOSTICS.OUT.nc
- TEB_PROGNOSTIC.OUT.nc
- WATFLUX_DIAGNOSTICS.OUT.nc
- WATFLUX_PROGNOSTIC.OUT.nc

SURFEX - last winter snow experiments

Snow depth on Lomnický štít
using SURFEX.
Hours since 2015-11-14 12 UTC



Snow height



Snow cover depth driven by INCA2 prec + INCA2 prec.type
2015-11-11 12:00 UTC

**20160201 - 20160212 Jozef Vivoda [2w], Viktor Tarjani[2w],
Michal Nestiak[2w]**

Surfex Offline Data Assimilation test-experiment
-consultations and scripts from [Trygve Aspeli](#)

/data/users/nwp103/soda/surfex_8.0/

... some testing, compiling, testing,



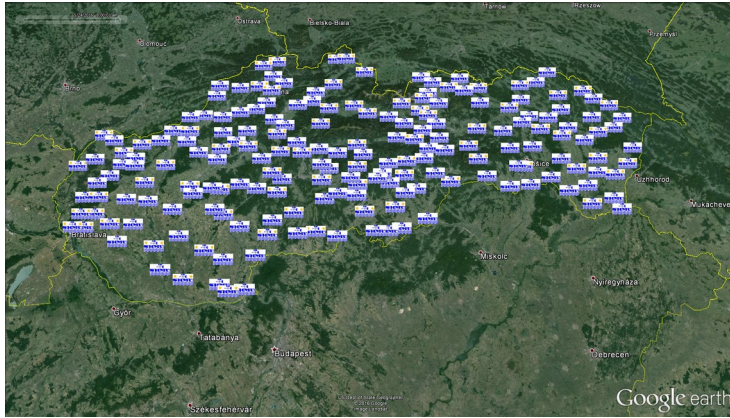
[SODA_testdata.tgz](#)

... some testing, compiling, testing,
.... more testing ...

.... more testing ... not usable results **but no free time**



Preparing obs-file from additional automatic station for local assimilation



Actual program for preparing OBS use adapted OULAN and require pressure measurement

- Temporary we use 6h for estimate atm. pressure on station but it is a right way?
- We are able to prepare obsfile directly, but dont know all consequences (any advice?? thx)

```

1 20160913 00000 synop
2 48.471 20.103 42118 0 215 999999.0 999999.0 16.5 999999.0 999999 999999 999999
3 49.193 19.196 42052 0 454 999999.0 999999.0 13.0 999999.0 999999 999999 999999
4 48.973 20.404 42123 0 536 999999.0 999999.0 13.2 999999.0 999999 999999 999999
5 48.139 18.086 42014 0 122 999999.0 999999.0 18.9 999999.0 999999 999999 999999
6 48.711 18.124 42016 0 270 999999.0 999999.0 14.4 999999.0 999999 999999 999999
7 49.046 21.329 42131 0 273 999999.0 999999.0 12.5 999999.0 999999 999999 999999
8 48.929 21.056 42128 0 545 999999.0 999999.0 14.7 999999.0 999999 999999 999999
9 48.871 20.967 42126 0 345 999999.0 999999.0 13.0 999999.0 999999 999999 999999
10 48.973 18.809 42055 0 480 999999.0 999999.0 14.1 999999.0 999999 999999 999999
11 48.599 19.886 42113 0 344 999999.0 999999.0 14.5 999999.0 999999 999999 999999
12 48.945 19.432 42048 0 1025 999999.0 999999.0 12.4 999999.0 999999 999999 999999
13 48.714 20.279 42106 0 423 999999.0 999999.0 14.2 999999.0 999999 999999 999999
...
118 49.214 18.424 42060 0 362 999999.0 999999.0 12.5 999999.0 999999 999999 999999
119 48.446 19.656 42080 0 269 999999.0 999999.0 999999.0 999999.0 999999 999999 999999
120 49.400 21.573 42096 0 350 999999.0 999999.0 12.7 999999.0 999999 999999 999999
121 48.304 20.304 42111 0 152 999999.0 999999.0 14.0 999999.0 999999 999999 999999
    
```

Nice additional informations to CANARI, but ...

INCA2 [100m] wind, wind gust for airports

us Changing Weather

search place:

Zadajte dopyt

selected file: /

WS_FC_INCA.grb

content filter:

time (1) 0

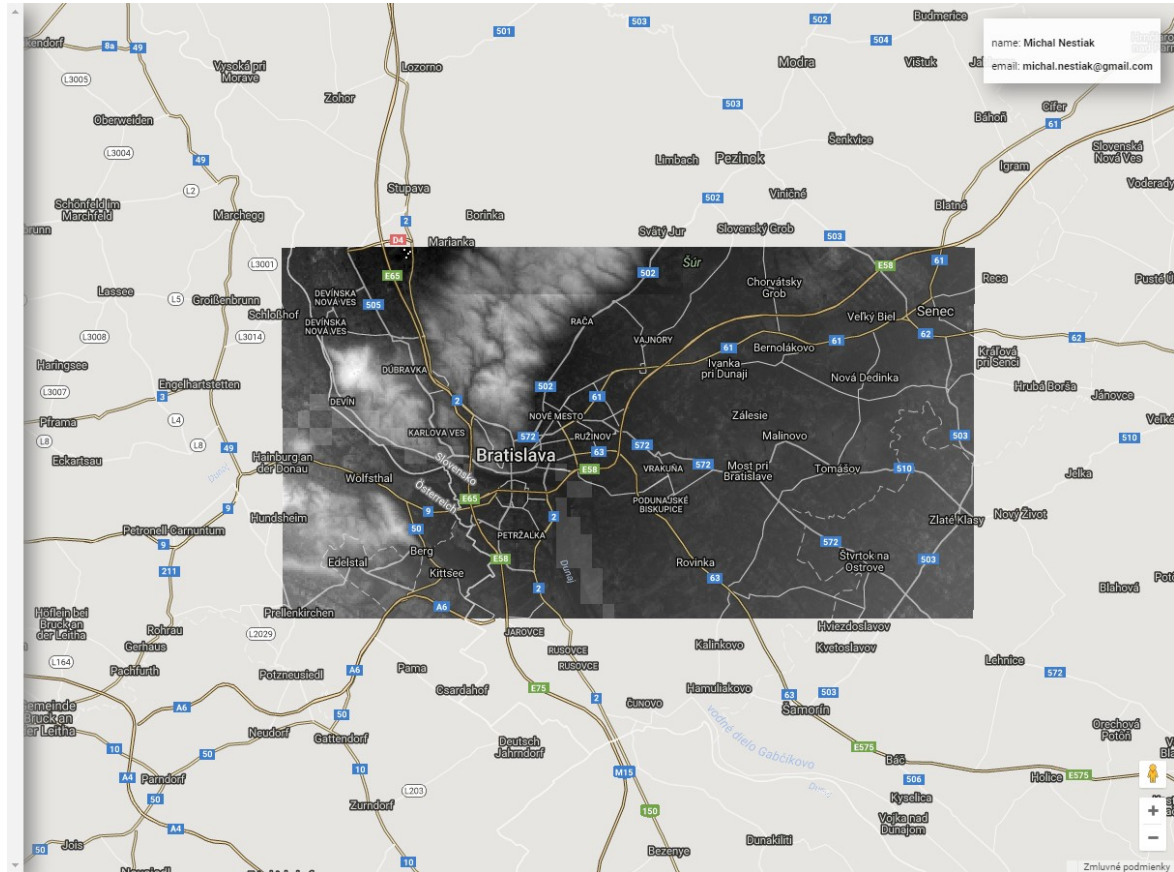
level (1) 10

date (1) 20160920

name (1) 10 metre wind speed

step (13) 10

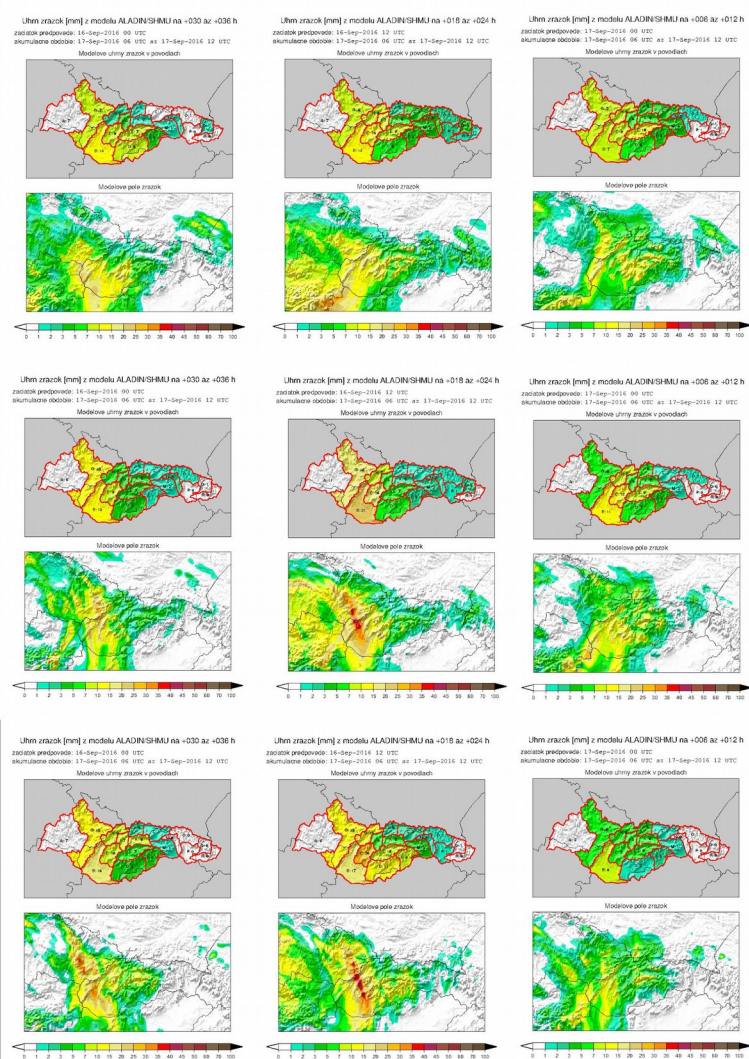
refresh dir refresh map



ALARO-0 (9km/36T1) vs ALARO-0 (4.5km/38T1) vs ALARO-1 (4.5km/40T1)

Problems may appear anywhere :)

- Use in operative hydrology
- Already somehow calibrated hydro model
- Not so flexible changes (need long period re-calibration data 10years)

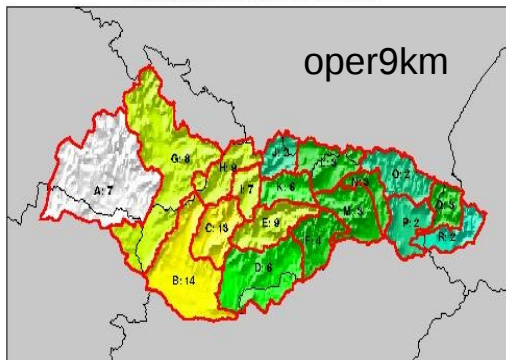


Uhrn zrazok [mm] z modelu ALADIN/SHMU na +018 az +024 h

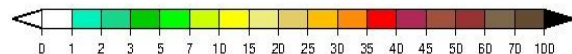
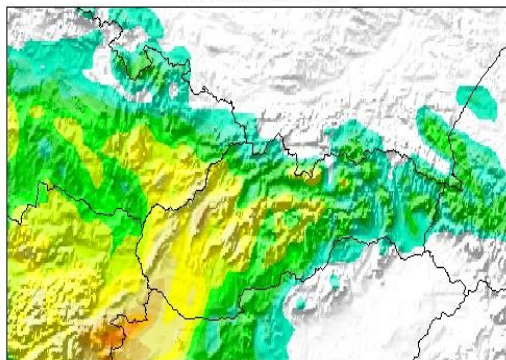
zaciatok predpovede: 16-Sep-2016 12 UTC

akumulacne obdobie: 17-Sep-2016 06 UTC az 17-Sep-2016 12 UTC

Modelove uhrny zrazok v povodiach



Modelove pole zrazok

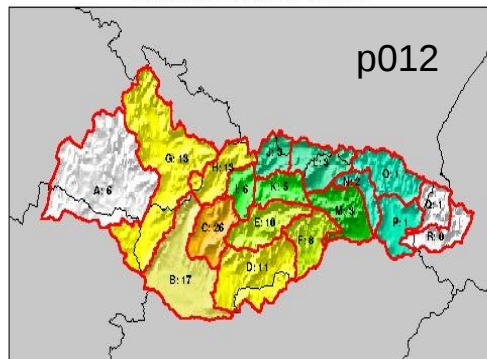


Uhrn zrazok [mm] z modelu ALADIN/SHMU na +018 az +024 h

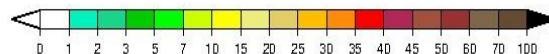
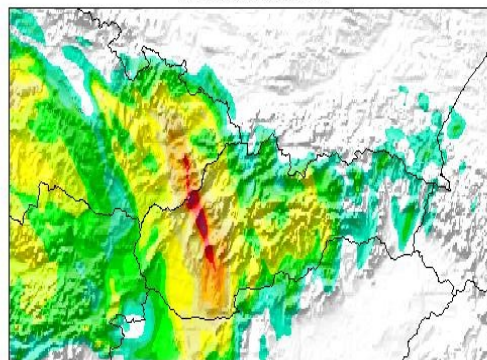
zaciatok predpovede: 16-Sep-2016 12 UTC

akumulacne obdobie: 17-Sep-2016 06 UTC az 17-Sep-2016 12 UTC

Modelove uhrny zrazok v povodiach



Modelove pole zrazok

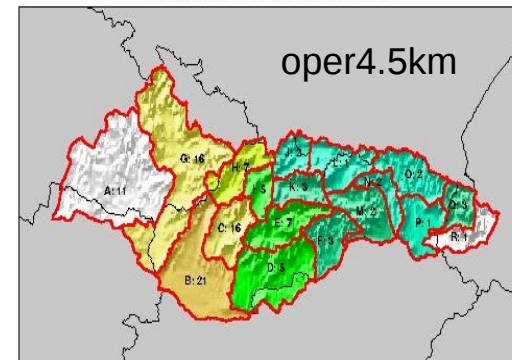


Uhrn zrazok [mm] z modelu ALADIN/SHMU na +018 az +024 h

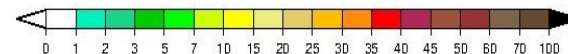
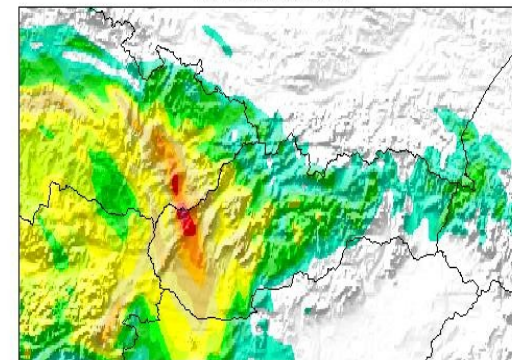
zaciatok predpovede: 16-Sep-2016 12 UTC

akumulacne obdobie: 17-Sep-2016 06 UTC az 17-Sep-2016 12 UTC

Modelove uhrny zrazok v povodiach



Modelove pole zrazok



Near future ...

Replace and switch off p012 on HPC1

Continue on validation and testing oper4.5km (HPC2)

Compute B-Matrix for oper4.5km domain (base on M.Bellus experience)

Surfex

Continue on 2.5km (?1km?) AROME 3DVar and surfex (stations, high resolution temp, radars, ???) /usage like hires analyse and nowcasting purpose each 1h or 3h /

Unfreeze works on SODA