RC LACE - Use of None-GTS data in ALADIN assimilation

Investigation of the use of non-GTS SYNOP reports in the ALADIN/HU CANARI + 3D-VAR system

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1. Introduction

This work starts from the conclusions of the work "Investigation of the use of non-GTS SYNOP reports in the ALADIN/HU 3D-VAR system" by Sandor Kertesz (May 2007). It was about comparing impact of sole use of SYNOP reports in GTS instead of using all avaible non-GTS SYNOP reports from LACE countries in data assimilation. At the time of the Kertesz's experiment, surface assimilation did not run in HMS. That was the reason why he used only 3DVar which is only for upper air assimilation. But SYNOP observations as z, T2, relative humidity are used in 3DVar too but only for upper fields. Surface fields from the ARPEGE analysis were copied into the ALADIN background. One of the conclusions of the work was that the results are better when CANARI or another type of surface assimilation is used, because the usage of SYNOP data is not optimal without it. That was the one of the reasons why was same experiment done with suface assimilation CANARI. We used the same 10-day period, for which LACE members provided data, and made experiments with CANARI and 3D-VAR.

2. Description of the experiments

Experimental period was from 10 to 20 May 2005. ALADIN CY30T1 was used, what is an important change with respect to previous experiment of Kertesz, who employed CY28T3.
Two sets of experiments were done.

LSHD - only GTS data
LSND - both GTS and non-GTS data.

In each experiment a 6 hour assimilation cycle with a ±3 hour observation window was used. We ran 48 hour model integrations starting at 00 and 12 UTC.
In the experiments were used SYNOP,TEMP,AIREP, AMV winds (from MSG), Wind profiler observations and NOAA AMSU-A and AMSU-B sensors.

For the CANARI in the experiments the following set of data was restricted.
SYNOP: Ps, T2m, RH2m, 10m Wind
TEMP: P, Wind, T, Q

3. Results

Verification was done against ARPEGE analysis. Impact of non-GTS data is not very clear. In geopotencial,small possitive impact is in 00 UTC run in lower levels (1000-400hPa). But also negative impact is in 12 UTC run in upper levels and more degradation at the end of the forecast for pressure levels 600-200hPa. In temperature, possitive impact is for 00 UTC run. In the wind field, the best impact is for 00 UTC run.In evolution of scores with forecast range we expect biggest impact on the start in lowest level, but no impact of Non-GTS data is possible to see there.

Bottom is possible to see that the difference between number of the lines in LSHD and LSND experiment obs file is not very big.

Date	diff	LSHD	LSND
20050511 00	113	484368	484481
20050511 12	128	505117	505245
20050512 00	121	500304	500425
20050512 12	125	548095	548220
20050513 00	144	515241	515385
20050513 12	128	524852	524980
20050514 00	125	456608	456733
20050514 12	127	528055	528182
20050515 00	123	423568	423691
20050515 12	127	474978	475105
20050516 00	123	380946	381069
20050516 12	125	573440	573565
20050517 00	120	410064	410184
20050517 12	128	559869	559997
20050518 00	122	420033	420155
20050518 12	129	540918	541047
20050519 00	122	273520	273642
20050519 12	128	316549	316677
20050520 00	129	452397	452526
20050520 12	128	539270	539398

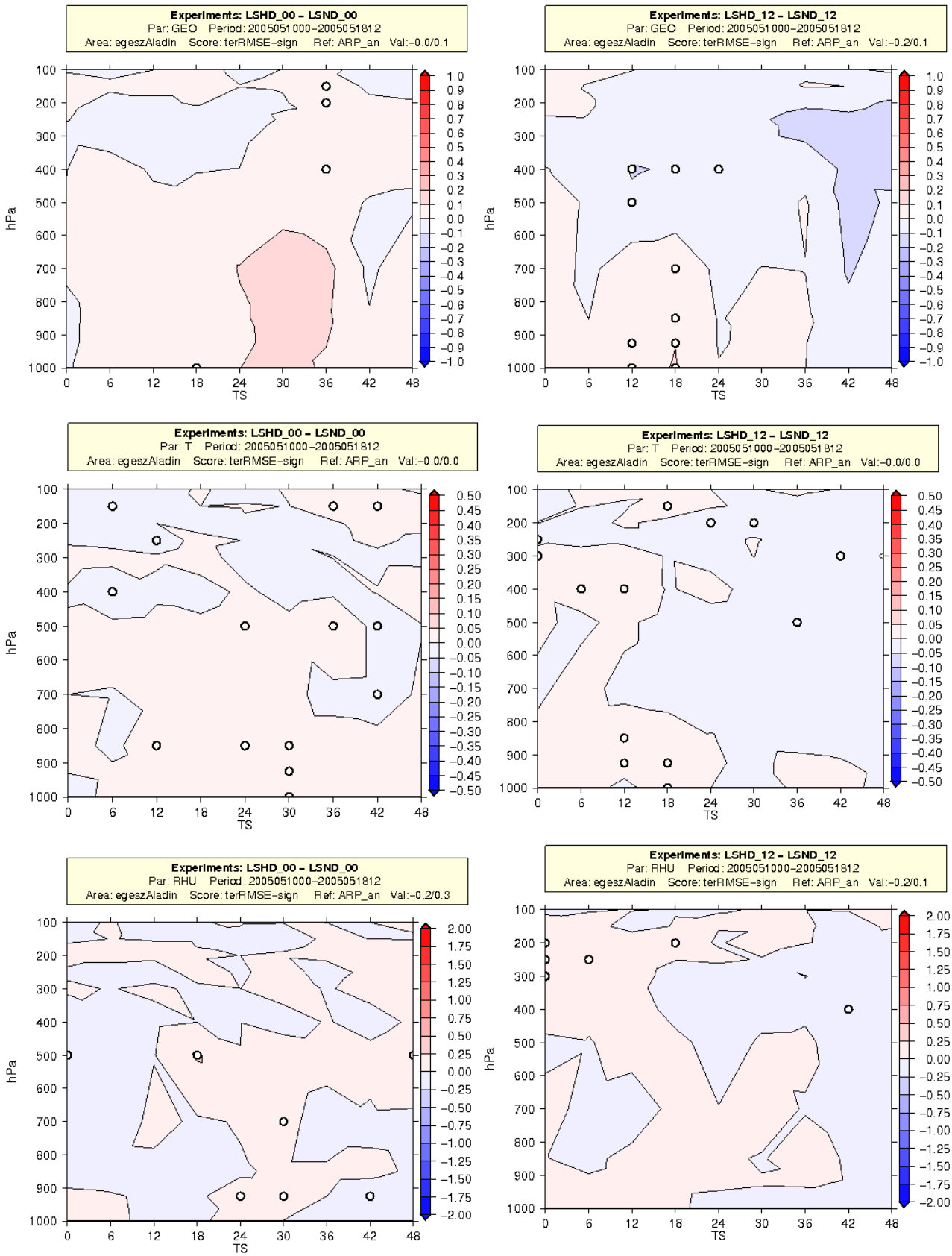


Fig.1: Verification against ARPEGE analysis: RMSE difference in geopotencial, temperature and relative humidity between forecast with only GTS data and also with local LACE Non-GTS data. Red is improvement and blue is degradation of forecast for the pressure level and time. White circles show that the difference is significant on a 90% confidence level.

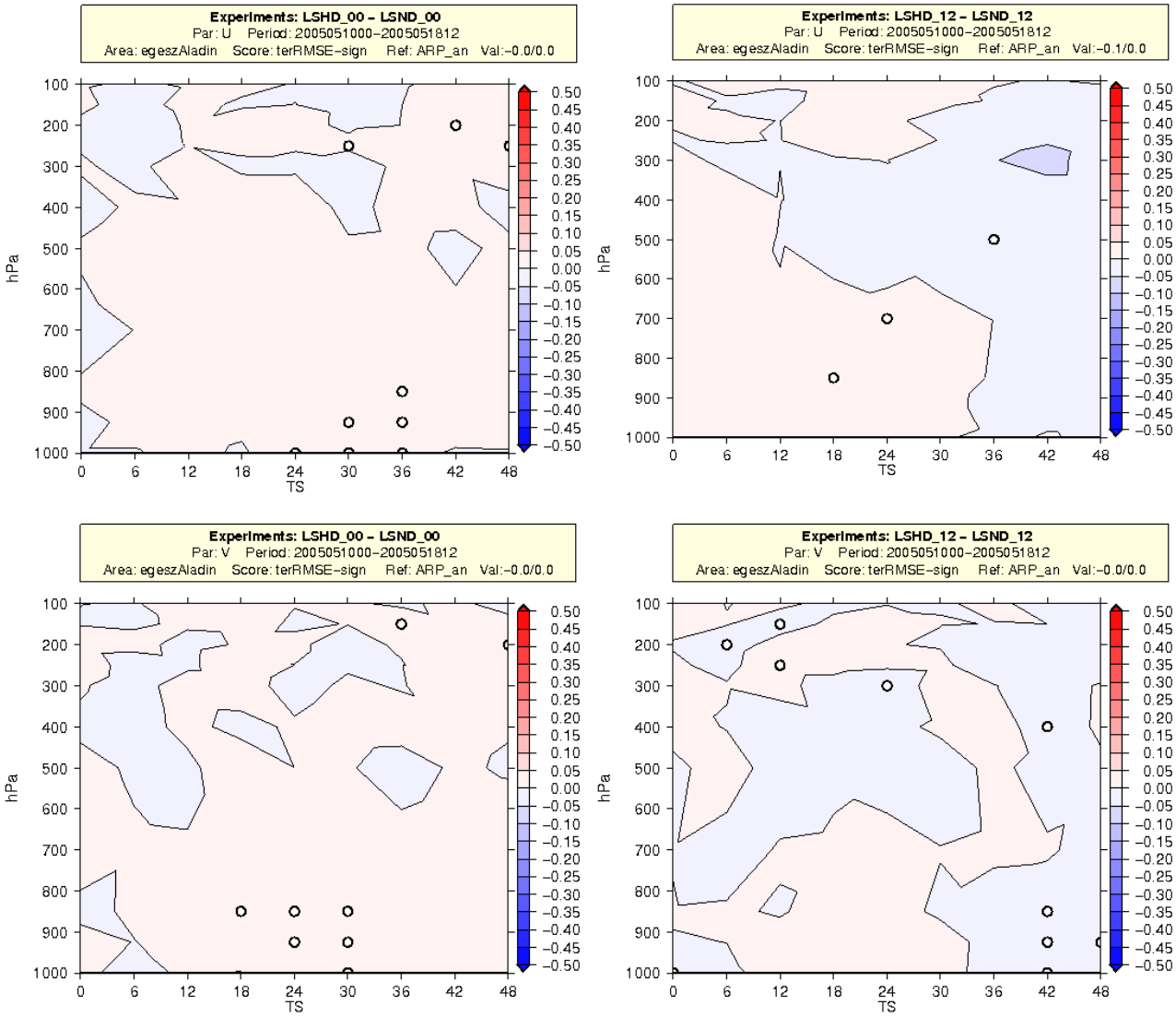
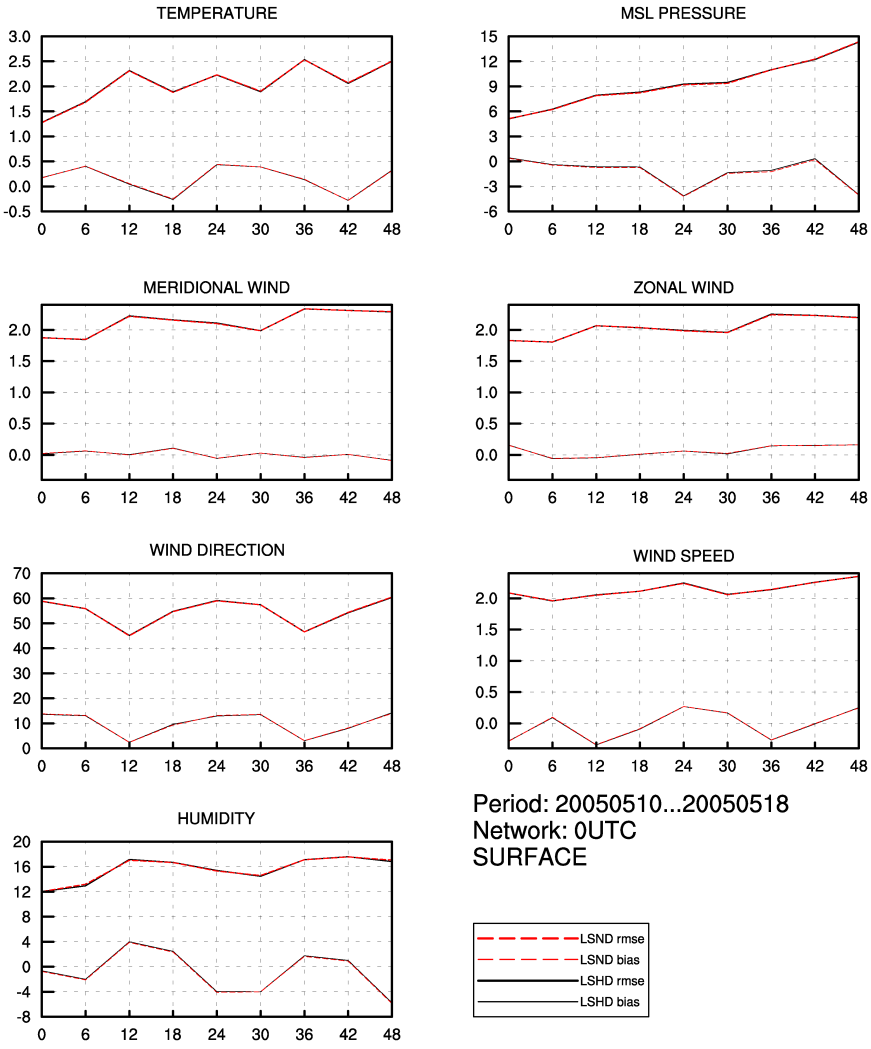
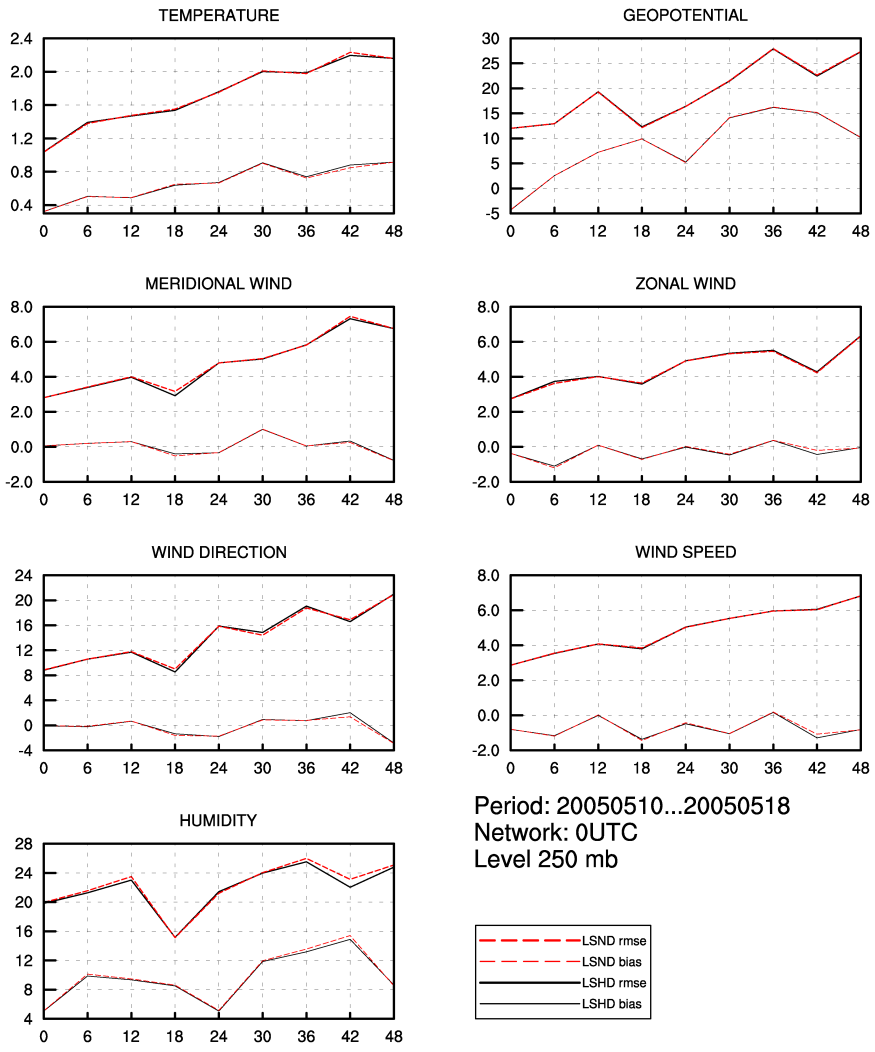


Fig.2: Verification against ARPEGE analysis: RMSE difference in wind between forecast with only GTS data and also with local LACE Non-GTS data. Red is improvement and blue is degradation of forecast for the pressure level and time. White circles show that the difference is significant on a 90% confidence level.

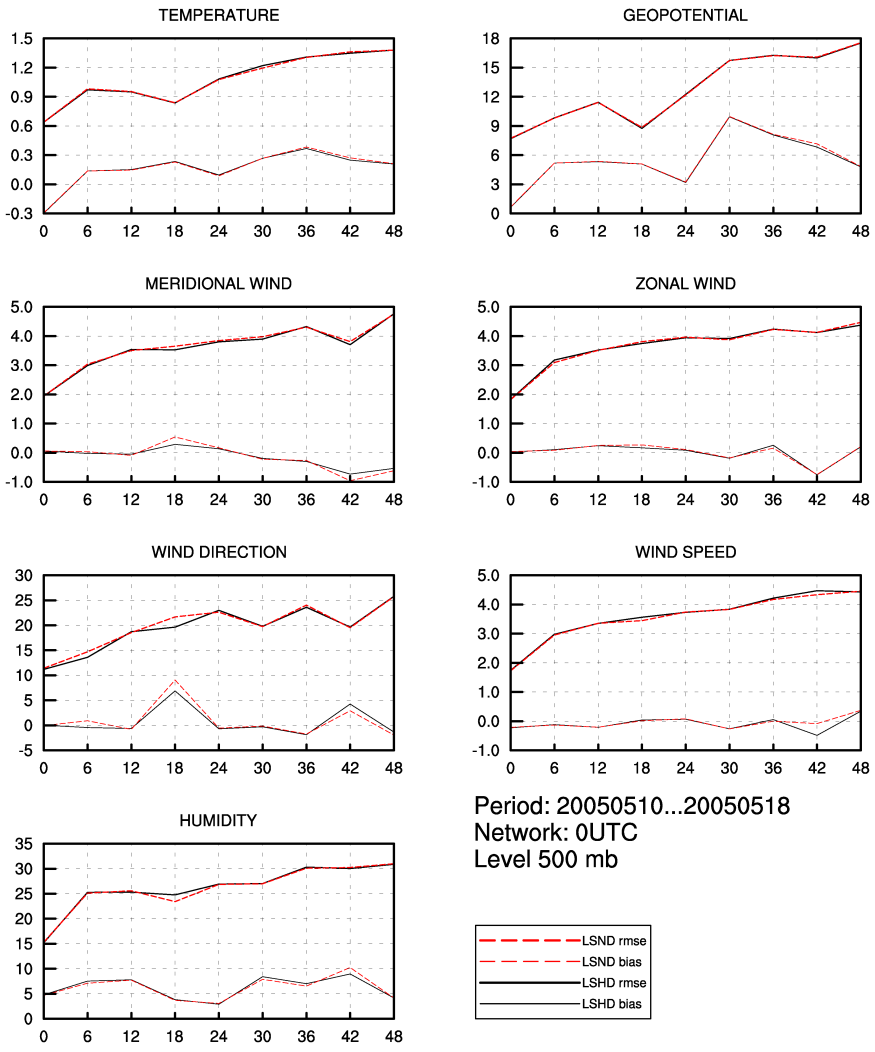
Evolution of scores with forecast range



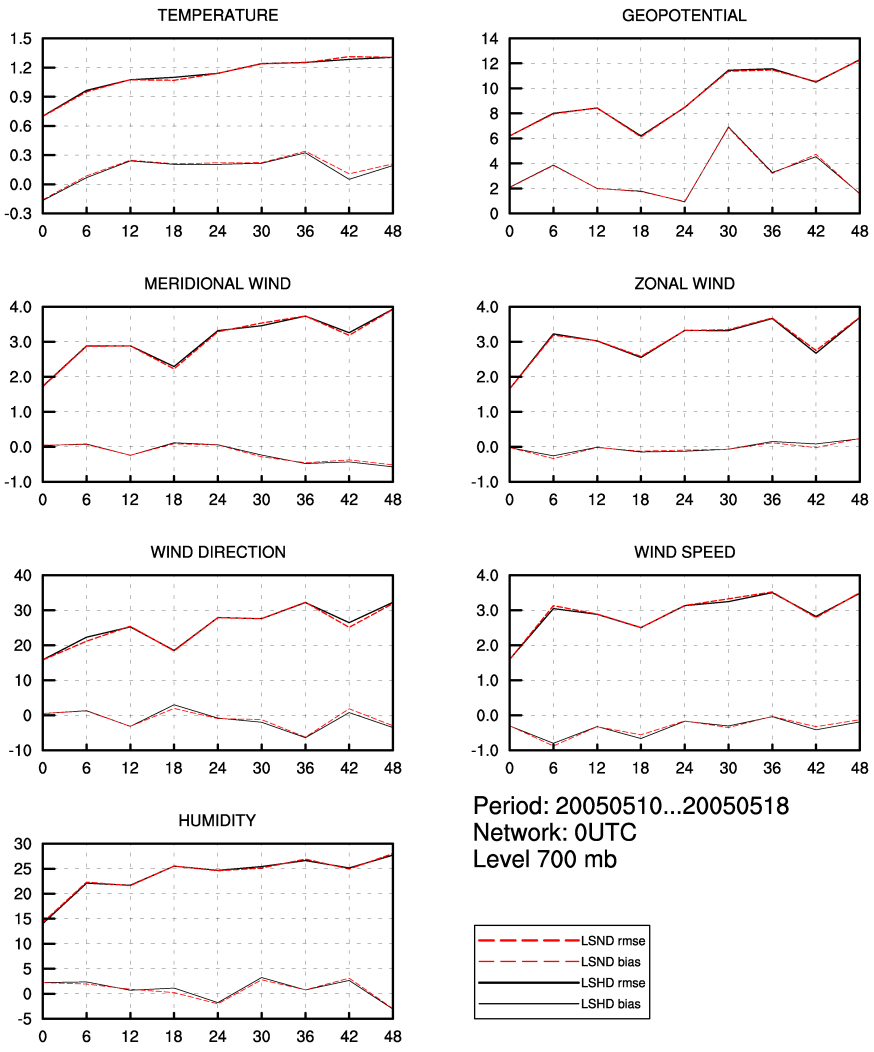
Evolution of scores with forecast range



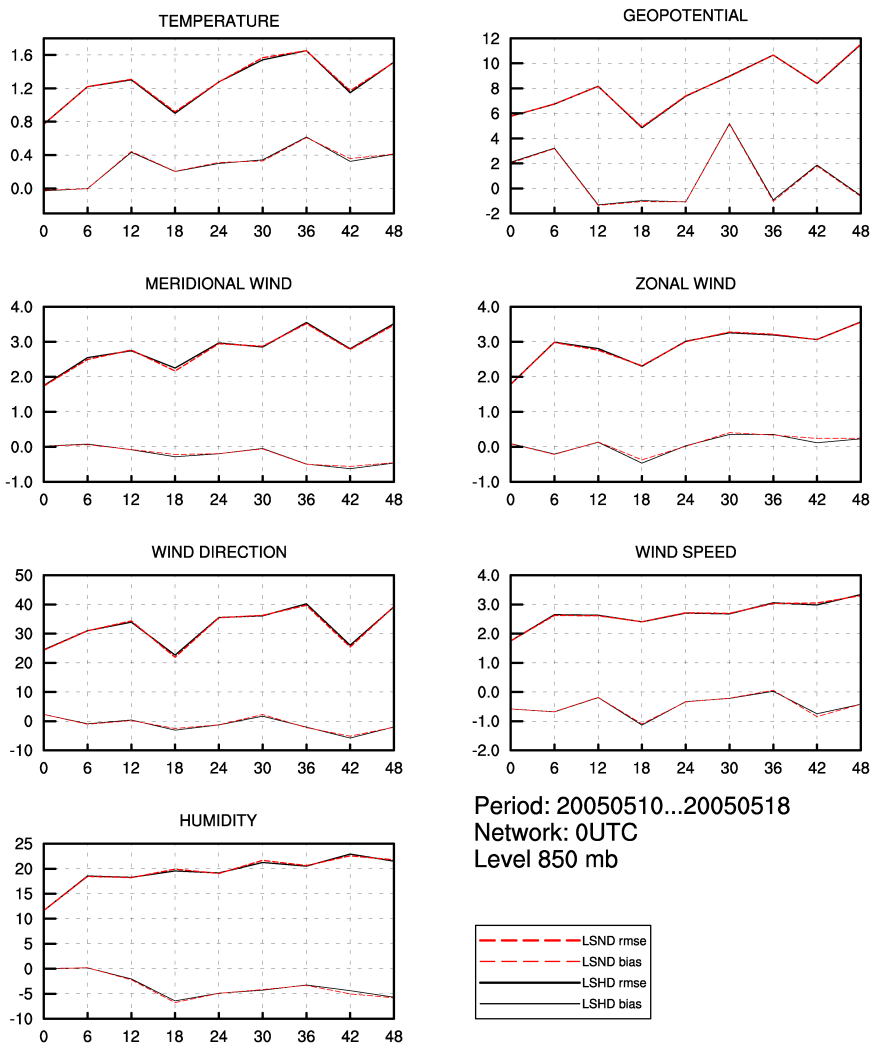
Evolution of scores with forecast range



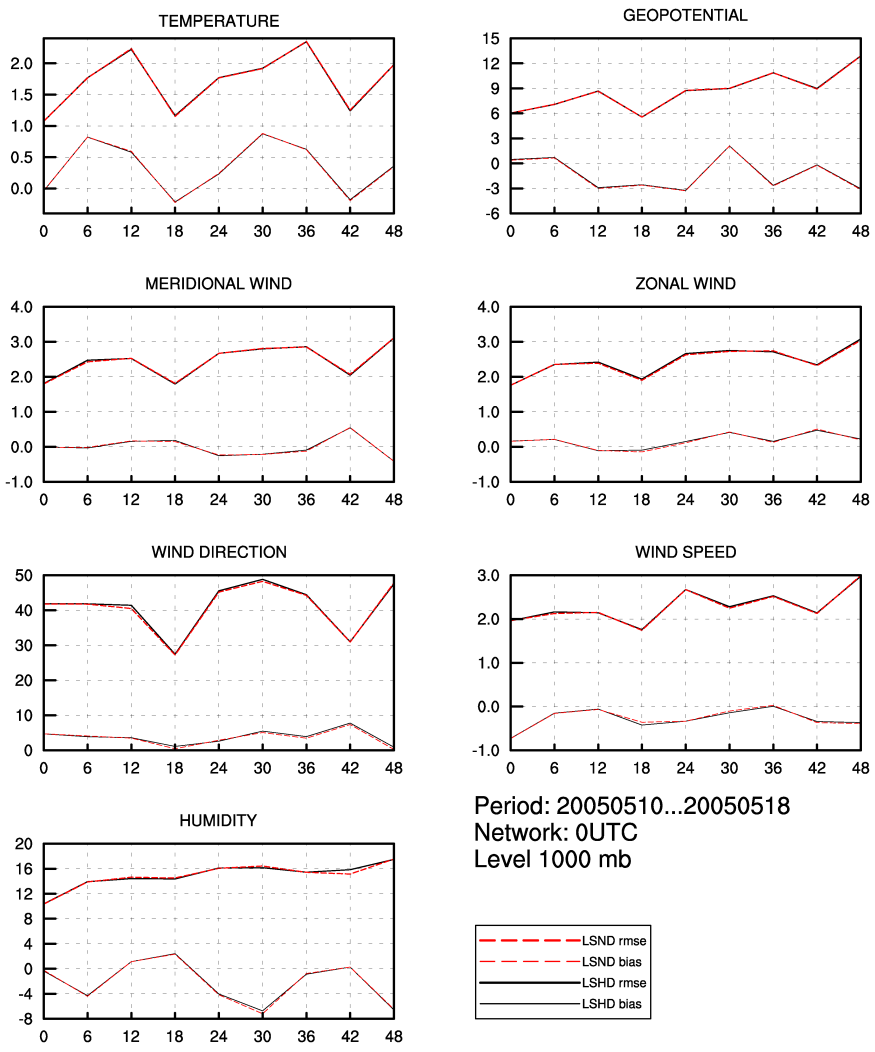
Evolution of scores with forecast range



Evolution of scores with forecast range



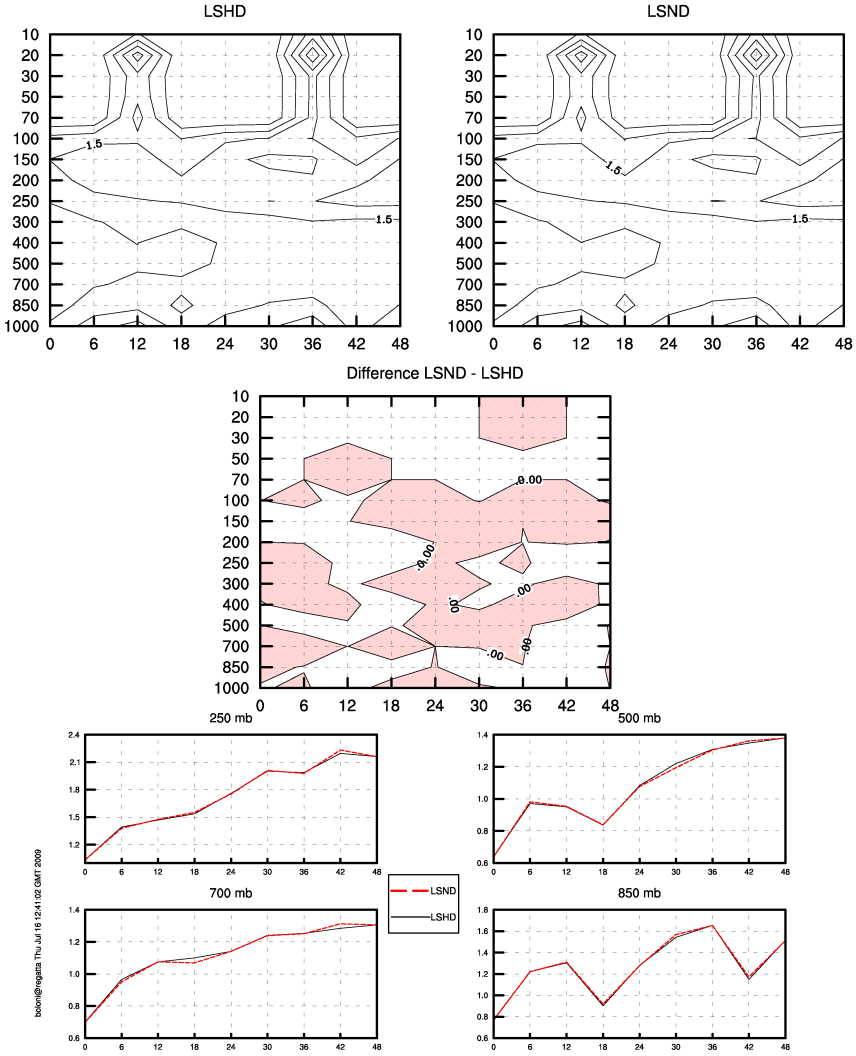
Evolution of scores with forecast range



Evolution of scores with forecast range

Period: 20050510...20050518 Network: 0UTC

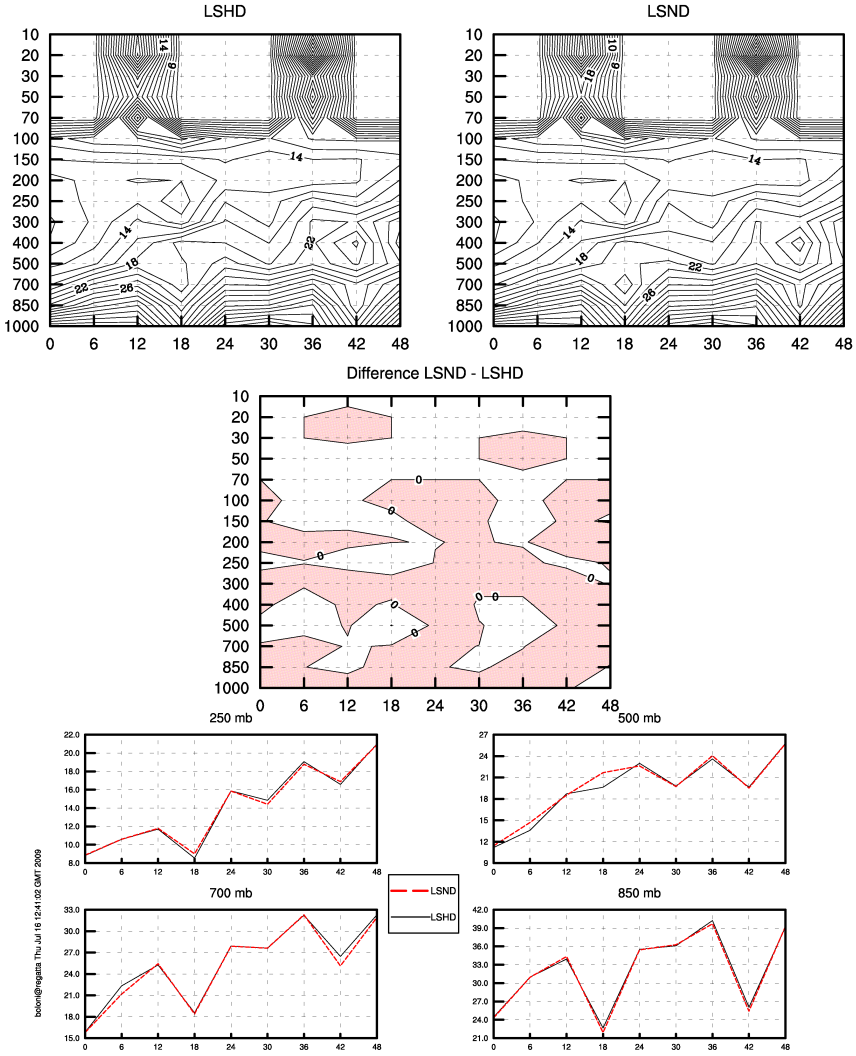
TEMPERATURE (RMSE)



Evolution of scores with forecast range

Period: 20050510...20050518 Network: 0UTC

WIND_DIRECTION (RMSE)



4. Conclusions

Veral scores are generally very neutral near the surface. There are some differences on higher levels. Most diferrences is possible to find for temperature and humidity but the impact is not relevant. For some levels and variables LSND is slightly better, for some others it is worse. Scores against the ARPEGE analysis are showing some improvement for LSND for almost all the variables for the 00 UTC runs. But practically no differences. For the 12 UTC run the impact is not clear and it looks like quality of 42-48 hour forecast is worse. Because it is only 10 days comparasion it is not possible to make definitive conclusions. Bigger impact of surface assimilation we expect in winter and spring, where the wrong analysis of snow coverage has a big impact on assignation of the right ground temperature.

Data exchange becomes very important, when the model resolution is getting higher

5. References

[1] Investigation of the use of non-GTS SYNOP reports in the ALADIN/HU 3D-VAR system - Sándor Kertész ,25th May, 2007

[2] Overview of the operational ALADIN variational data assimilation system - Sándor Kertész,17th January, 2007

6. Acknowledgements

I would like to thank Gergely Bölöni (HMS) for the good support on my first ALADIN stay. My gratitude also belongs to HMS for a very good and friendly enviroment for work.

TECHNICAL NOTES

Size of files and directories which were needed to experiment. (Maybe important for planing future experiments)

4744956 /wrkarch/oper/assim/ExpMichal/lbc/assim/
1 run 98852 /wrkarch/oper/assim/ExpMichal/lbc/assim/2005/05/10/00/
49424 /wrkarch/oper/assim/ExpMichal/lbc/assim/2005/05/10/00/PFE927HUN8_20050510_0000+000
49424 /wrkarch/oper/assim/ExpMichal/lbc/assim/2005/05/10/00/PFE927HUN8_20050510_0000+003

20165148 /wrkarch/oper/assim/ExpMichal/lbc/production/
840212 /wrkarch/oper/assim/ExpMichal/lbc/production/2005/05/10/00/
49424 /wrkarch/oper/assim/ExpMichal/lbc/production/2005/05/10/00/PFE927HUN8_20050510_0000+000
49424 /wrkarch/oper/assim/ExpMichal/lbc/production/2005/05/10/00/PFE927HUN8_20050510_0000+003
...
49424 /wrkarch/oper/assim/ExpMichal/lbc/production/2005/05/10/00/PFE927HUN8_20050510_0000+048

6097584 /wrkarch/oper/assim/ExpMichal/LSHD/
148124 /wrkarch/oper/assim/ExpMichal/LSHD/assim.2005051000.tar.gz
139784 /wrkarch/oper/assim/ExpMichal/LSHD/assim.2005051006.tar.gz
159024 /wrkarch/oper/assim/ExpMichal/LSHD/assim.2005051012.tar.gz
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...
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119584 /wrkarch/oper/assim/ExpMichal/LSHD/assim.2005052006.tar.gz
159916 /wrkarch/oper/assim/ExpMichal/LSHD/assim.2005052012.tar.gz

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159952 /wrkarch/oper/assim/ExpMichal/LSND/assim.2005052012.tar.gz

3322756 /rtovol4/nestiak/archive/mn01/assim/monitor/LSHD/
96776 /rtovol4/nestiak/archive/mn01/assim/monitor/LSHD/2005/05/10/00/
268 /rtovol4/nestiak/archive/mn01/assim/monitor/LSHD/2005/05/10/00/canNODE.001_01.00
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2096 /rtovol4/nestiak/archive/mn01/assim/monitor/LSHD/2005/05/10/00/scrNODE.001_01.00
804 /rtovol4/nestiak/archive/mn01/assim/monitor/LSHD/2005/05/10/00/varNODE.001_01.00

/rtovol4/nestiak/archive/mn01/assim/monitor/LSND/

rundir & temp=>
/vol1/nestiak/mn01/assim/
3375156 /vol1/nestiak/mn01/assim/guessdir/
/vol1/nestiak/mn01/assim/monitor
/vol1/nestiak/mn01/assim/rundir
/vol1/nestiak/mn01/prod/
/vol1/nestiak/mn01/prod/rundir

Script (backbone info)

```
Run->Assim LSHD
        Init
        prepare OBSOUL.hms  from /wrcharch/oper/assim/ExpMichal/LSHD/assim.${yy}${mm}$
{dd}${n_time}.tar.gz for CANARI and 3dVar
        RunBatodb (OBSOUL.hms only with SYNOP and TEMP)
        RunCanari {
                f_ansee=/wrkarch/oper/assim/ExpMichal/lbc/assim/${yy}/${mm}/${dd}/$
{n_time}/PFE927HUN8_${yy}${mm}${dd}_${n_time}00+000
                ln -sf ${f_ansea}  arpeg
                f_guess=/vol1/nestiak/mn01/assim/guessdir/guess.${n_date}${n_time}
                ln -sf ${f_guess}   guess
                cp     ${f_guess}   mixed
                cp ${d_NAM}/bleandsea.nml fort.4
                RunCommand -f blendsea
-c/home/aladin/pack/cy30t1_canari.01.ifort9_2B2.x.pack/bin/BLENDSUR
                mv mixed guess_mixed
                ln -sf ${d_CLIM}/HUNG8kmlin_${mm} ICMSHANALCLIM  #IMP
                ln -sf ${d_CLIM}/HUNG8kmlin_${i}  ICMSHANALCLI2  #IMP
                #backround errors of surface variables
                ln -sf  /vol1/nestiak/assim/guessdir/lisseff_${n_date}${n_time} ICMSHANALLISSE
                #-- fetching consts
                cp ${d_NAM}/POLYNOMES_ISBA        fort.61
                #-- get the guess
                cp guess_mixed ICMSHANALINIT && ln -sf ICMSHANALINIT
ELSCFANALALBC000
                #-- ODB settings for CANARI
                ODB_CMA=ECMA
                ODB_SRCPATH_ECMA=${d_DB}/ECMA.hms
                ODB_DATAPATH_ECMA=${d_DB}/ECMA.hms
                IOASSIGN=${d_DB}/ECMA.hms/IOASSIGN
                RunPoe -f 701 -n ${NBPROC} -c
/home/aladin/pack/cy30t1_canari.01.ifort9_2B2.x.pack/bin/ALDODB -c701 -vmeteo -eANAL -t1.
-maladin -ft0 -aeul
                cp NODE.001_01 canNODE.001_01.${n_time}
                cp ICMSHANAL+0000 POS1
        }
        RunBatodb (OBSOUL.hms full)
        RunLamflagReduc
        RunScreening
        Run3DVAR
        RunCreateGuess
        Archive results
    ->Assim LSND
    ->Prod   LSND
```