Implementation and validation of OI analysis in a coupled ALARO/SURFEX system

Anamarija Zajec
Host: Matjaž Ličar (ARSO)

Introduction

- the aim - conduct a short cycled experiment in ALARO coupled with SURFEX

  - compare evolution of surface fields (SURFEX and ISBA)

- A one week run with ALARO/SURFEX was performed, and the results were compared to the operational ALARO (cy43t2)

About model

- Domain 589x589
- 1 km resolution
- 1 h RUC
- first guess for start of experiment was from operational
- For .sfx file is made dynamic adaptation (preplbc) from ELSCF file and after that is cycled upper air and surfex fields
- In canari - change of namelist
- ICMSHANALINIT.sfx – guess, ICMSHANAL+0000.sfx with this file integration doesn’t work good

- After canari the SFX.SST field in ICMSHANAL+0000.sfx appears to be erroneous
- This leads to a segmentation fault after one time step

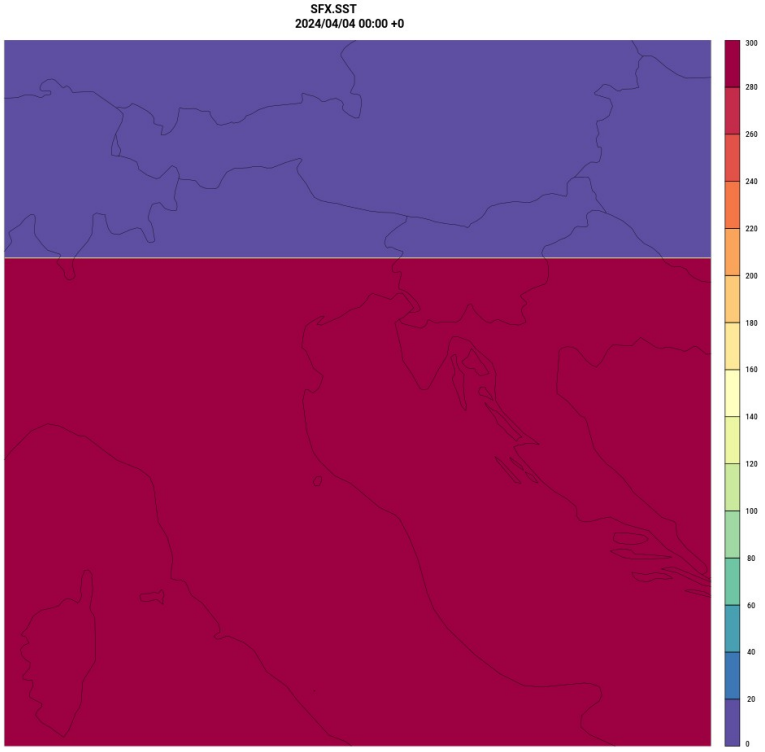


Image	PC	Routine Line	Source
libifcoremt.so.5	000014814E64362C	for__signal_handl	Unknown Unknown
libpthread-2.26.s	000014813B166300	Unknown	Unknown Unknown
libpthread-2.26.s	000014813B1627E3	pthread_spin_lock	Unknown Unknown
libmlx4.so.1.0.28	000014812936C12E	Unknown	Unknown Unknown
libuct_ib.so.0.0.	000014812A6E89E8	Unknown	Unknown Unknown
libucp.so.0.0.0	000014812AF9FBFA	ucp_worker_progre	Unknown Unknown
libopen-pal.so.40	00001481394BB02C	opal_progress	Unknown Unknown
libopenpal.so.40	00001481394C1815	ompi_sync_wait_mt	Unknown Unknown
libmpi.so.40.20.5	000014813E13EAFF	ompi_request_defa	Unknown Unknown
libmpi.so.40.20.5	000014813E16C82D	MPI_Waitany	Unknown Unknown
libmpi_mpifh.so.4	000014813E45AB40	pmpi_waitany	Unknown Unknown
MASTERODB	000000000594BA76	mpl_waitany_mod_m 82	
mpl_waitany_mod.F90			
MASTERODB	0000000002EF88D3	slcomm_IP_slcomm_ 385	slcomm.F90
MASTERODB	0000000002EF6CFC	slcomm_ 187	slcomm.F90
MASTERODB	0000000001BAAC05	call_sl_ 259	call_sl.F90
MASTERODB	0000000001983205	call_sl_stack_ 91	call_sl_stack.F90
MASTERODB	00000000016B3D65	gp_model_ 583	gp_model.F90
MASTERODB	0000000000BEB477	gp_model_stack_ 71	gp_model_stack.F90
MASTERODB	0000000000BF545C	scan2m_ 503	scan2m.F90
MASTERODB	0000000000443F92	stepo_ 313	stepo.F90
MASTERODB	000000000041BBA5	cnt4_ 1207	cnt4.F90
MASTERODB	0000000000412AE1	cnt3_ 152	cnt3.F90
MASTERODB	0000000000412858	cnt2_ 109	cnt2.F90
MASTERODB	00000000004125B2	cnt1_ 125	cnt1.F90
MASTERODB	0000000000411A44	cnt0_ 165	cnt0.F90
MASTERODB	000000000040CEC7	MAIN__ 148	master.F90
MASTERODB	000000000040CBC2	Unknown	Unknown Unknown
libc2.26.so	000014813ADBAF8A	__libc_start_main	Unknown Unknown
MASTERODB	000000000040CADA	Unknown	Unknown Unknown

ifs.stat

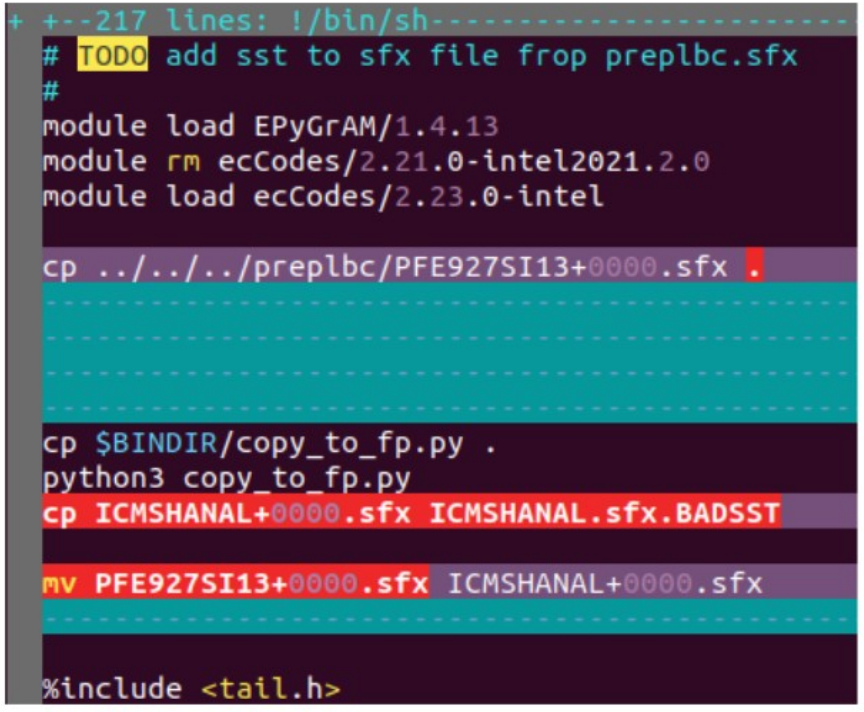
10:59:14	000000000	CNT3	-999	4.153	4.153	4.443	0:00	
0:00	0.00000000000000E+00			0GB			0MB	
10:59:22	0AAX00000	STEPO	0	9.568	9.568	11.664	0:09	
0:11	0.00000000000000E+00			0GB			0MB	
10:59:30	QAAA00AAI	STEPO	0	7.908	7.908	7.946	0:17	
0:19	0.19039319700779E-03			0GB			0MB	
10:59:42	0AAA00AAA	STEPO	0	11.574	11.574	12.807	0:29	
0:32	NaN			0GB			0MB	
10:59:43	0AAA00AAI	STEPO	1	0.398	0.398	0.398	0:29	
0:32	NaN			0GB			0MB	

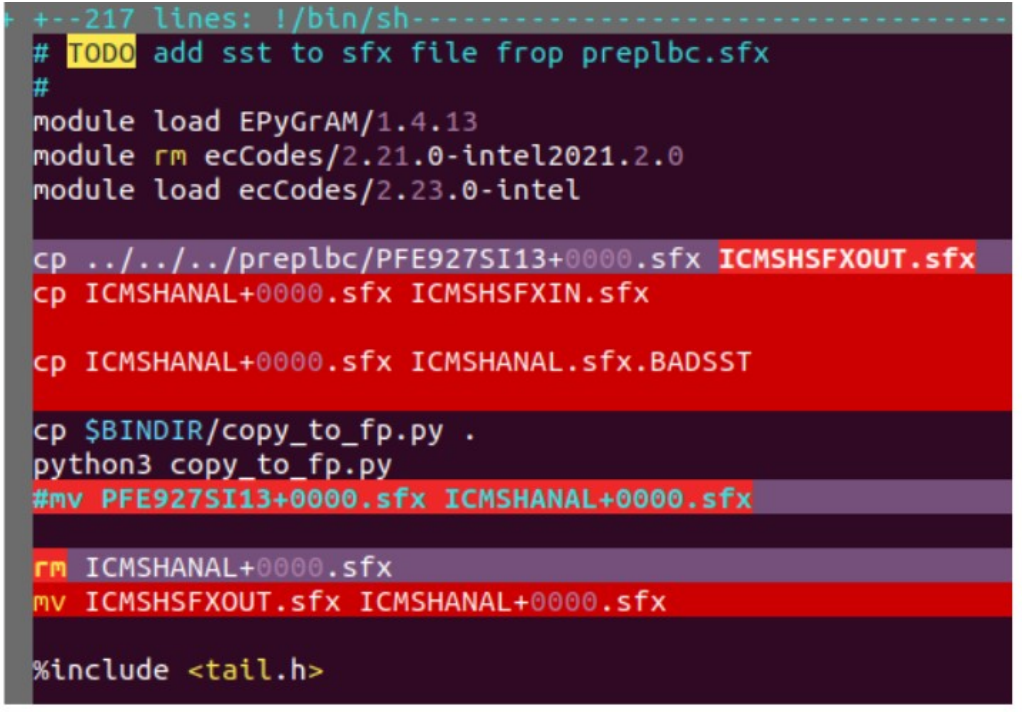
- With copy_to_fp.py we rewrite fields from ICMSHANAL+0000.sfx in PFE927SI13.sfx
- There are NaNs appearing in surfex/SURFEX/drag.F90 when PPS and PQA variables are read
- Replacing SFX.SST with the SST field from PFE927SI13+0000.sfx using epygram produces the same problem
- Replacing the following ISBA fields: "SFX.TS_WATER", "X001TG1", "X001TG2", "X001WG1", "X001WG2", "X001WG3", "X001WGI1", "X001WGI2", "X001WSN_VEG1", "X001RSN_VEG1","X001ASN_VEG" in PFE927SI13+0000.sfx with the fields from ICMSHANAL+0000.sfx once canari concludes resolves the issue

Modifications in scripts

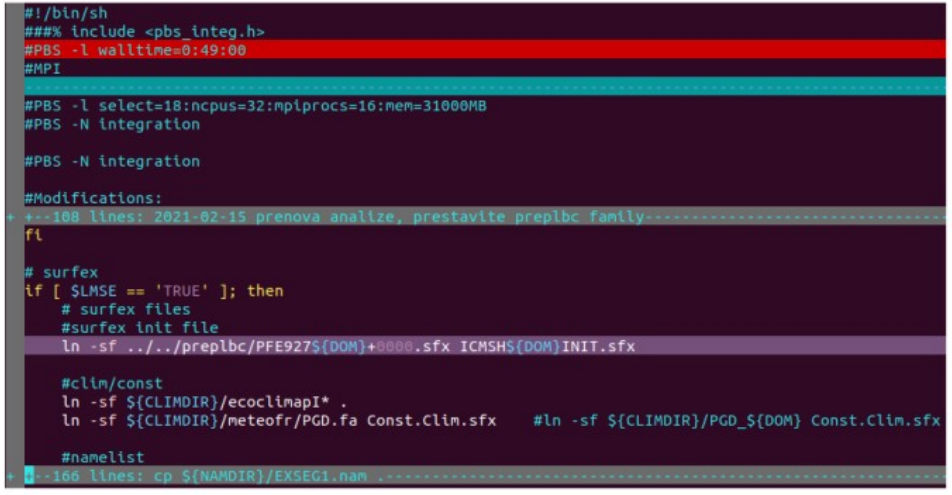
- There where made some changes in scripts for canari, integration and copy to fp

- canari

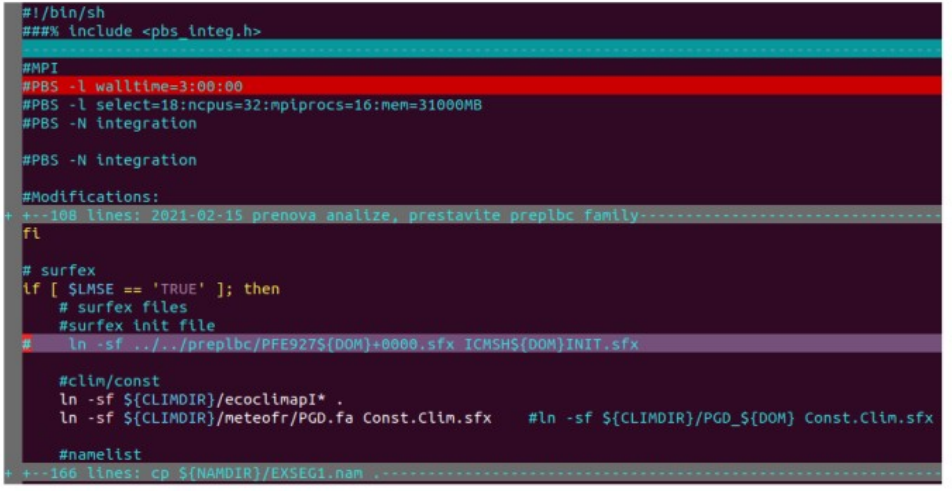




integration

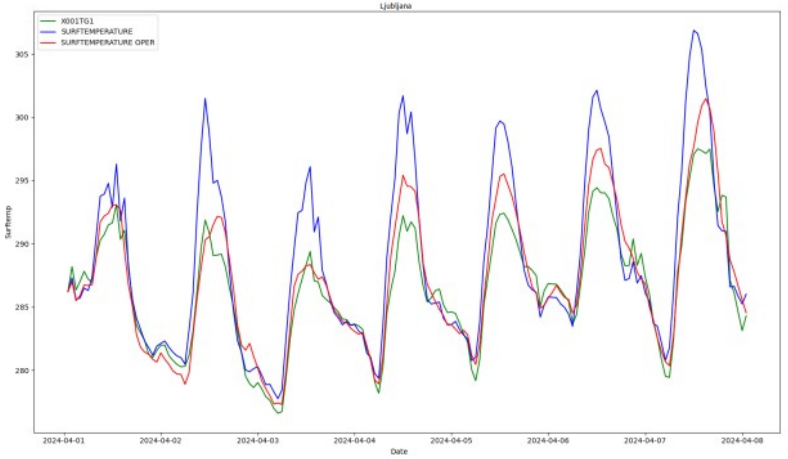


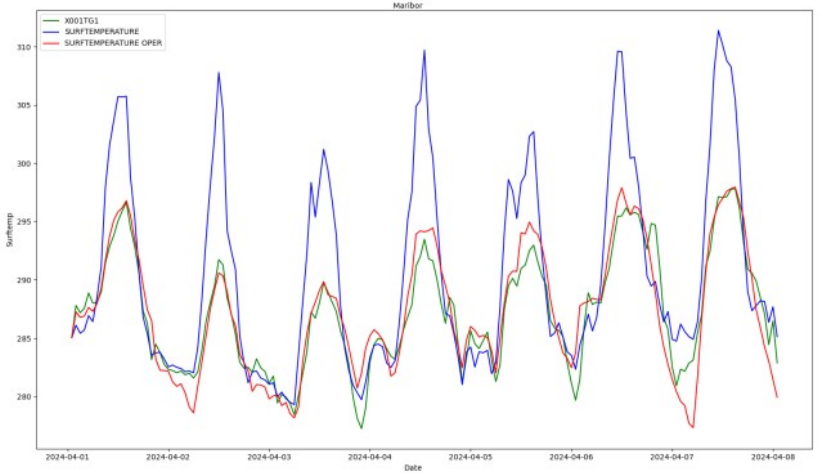
```
#!/bin/sh
###% include <pbs_integ.h>
#PBS -l walltime=0:49:00
#MPI
#PBS -l select=18:ncpus=32:mpiprocs=16:mem=31000MB
#PBS -N integration

#PBS -N integration

#Modifications:
+--108 lines: 2021-02-15 prenova analize, prestavite preplbc family-----------
fi

# surfex
if [ $LMSE == 'TRUE' ]; then
    # surfex files
    #surfex init file
    ln -sf ../../preplbc/PFE927${DOM}+0000.sfx ICMSH${DOM}INIT.sfx

    #clim/const
    ln -sf ${CLIMDIR}/ecoclimapI* .
    ln -sf ${CLIMDIR}/meteofr/PGD.fa Const.Clim.sfx    #ln -sf ${CLIMDIR}/PGD_${DOM} Const.Clim.sfx

    #namelist
+   +--166 lines: cp ${NAMDIR}/EXSEG1.nam .-------------------------------------
```

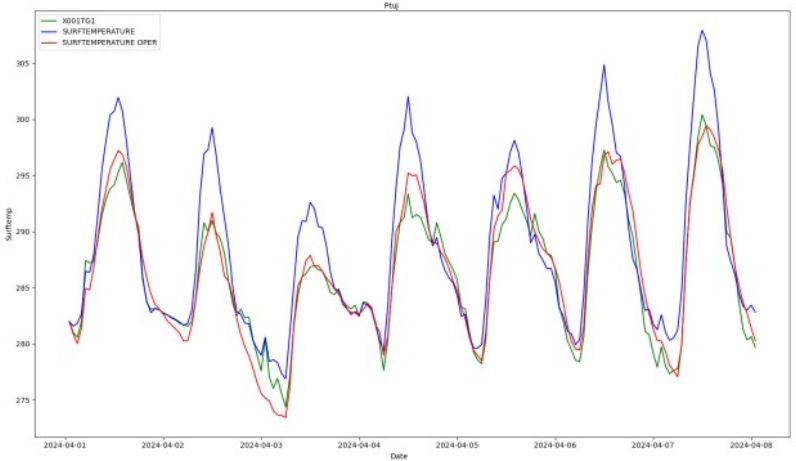


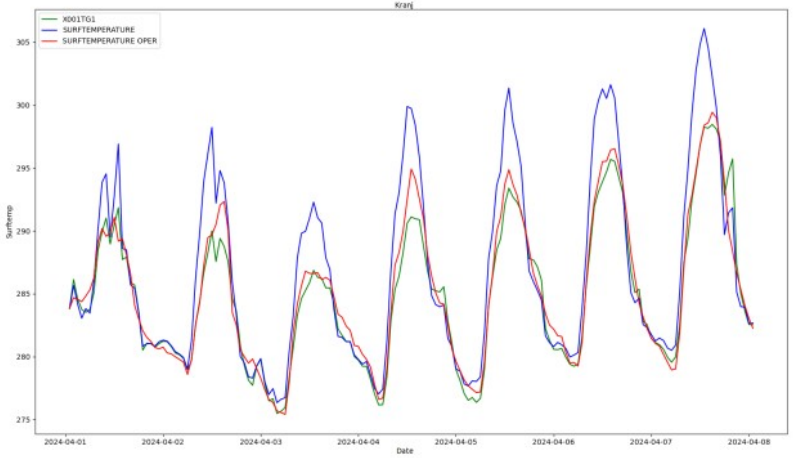
```
#!/bin/sh
###% include <pbs_integ.h>

#MPI
#PBS -l walltime=3:00:00
#PBS -l select=18:ncpus=32:mpiprocs=16:mem=31000MB
#PBS -N integration

#PBS -N integration

#Modifications:
+--108 lines: 2021-02-15 prenova analize, prestavite preplbc family-----------
fi

# surfex
if [ $LMSE == 'TRUE' ]; then
    # surfex files
    #surfex init file
#    ln -sf ../../preplbc/PFE927${DOM}+0000.sfx ICMSH${DOM}INIT.sfx

    #clim/const
    ln -sf ${CLIMDIR}/ecoclimapI* .
    ln -sf ${CLIMDIR}/meteofr/PGD.fa Const.Clim.sfx    #ln -sf ${CLIMDIR}/PGD_${DOM} Const.Clim.sfx

    #namelist
+   +--166 lines: cp ${NAMDIR}/EXSEG1.nam .-------------------------------------
```

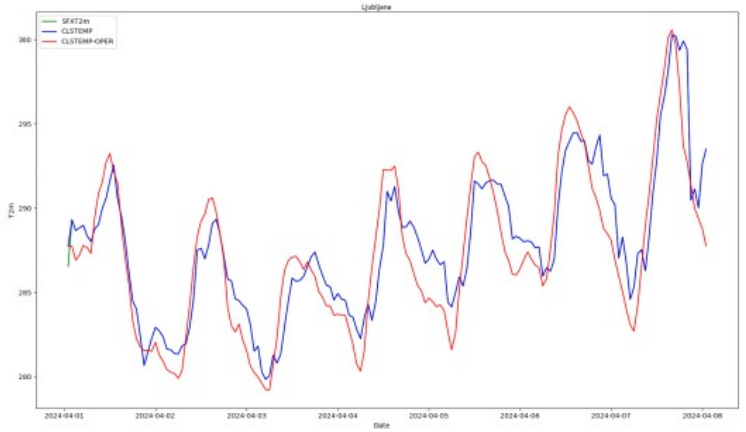
Results

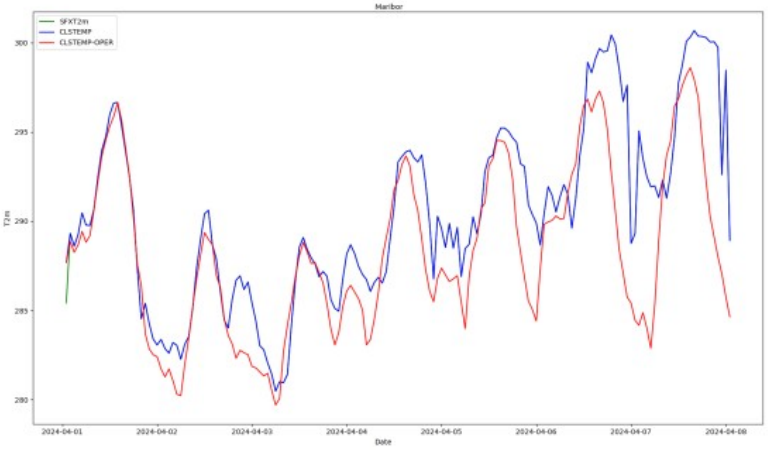

Ljubljana
X001TG1
SURFTEMPERATURE
SURFTEMPERATURE OPER
Surftemp
Date

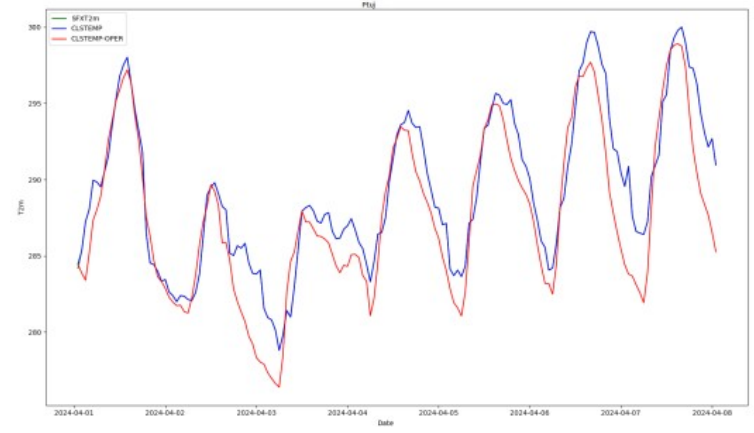

Maribor
X001TG1
SURFTEMPERATURE
SURFTEMPERATURE OPER
Surftemp
Date

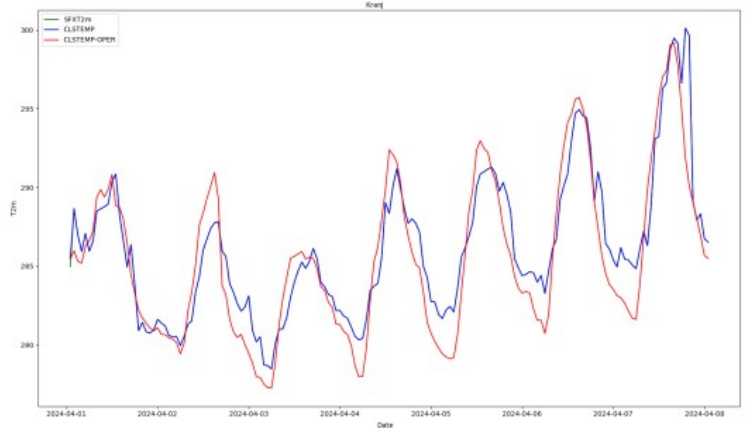

Ptuj
X001TG1
SURFTEMPERATURE
SURFTEMPERATURE OPER
Surftemp
Date

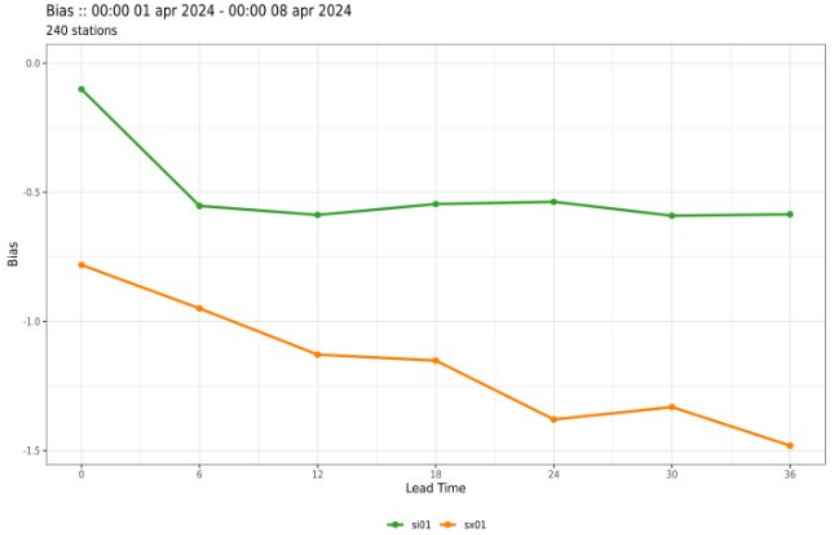

Kranj
X001TG1
SURFTEMPERATURE
SURFTEMPERATURE OPER
Surftemp
Date

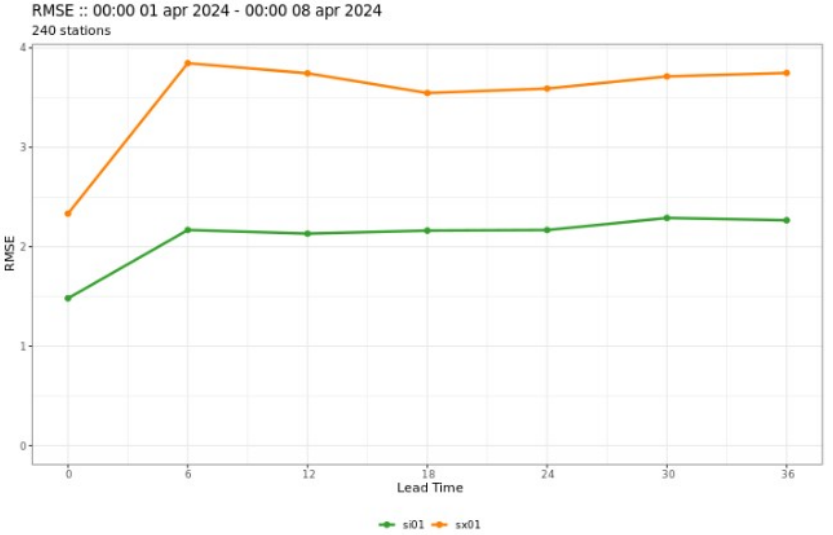

Ljubljana
SFXT2m
CLSTEMP
CLSTEMP-OPER
T2m
Date

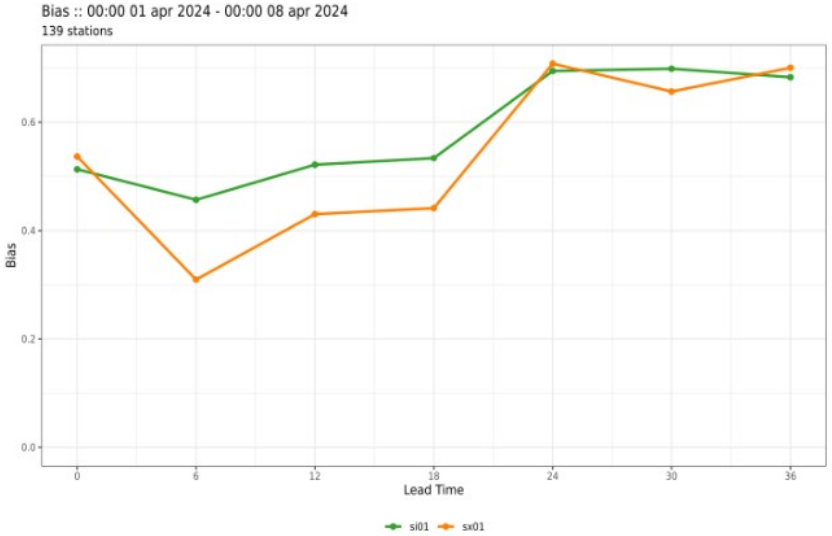

Maribor
SFXT2m
CLSTEMP
CLSTEMP-OPER
T2m
Date

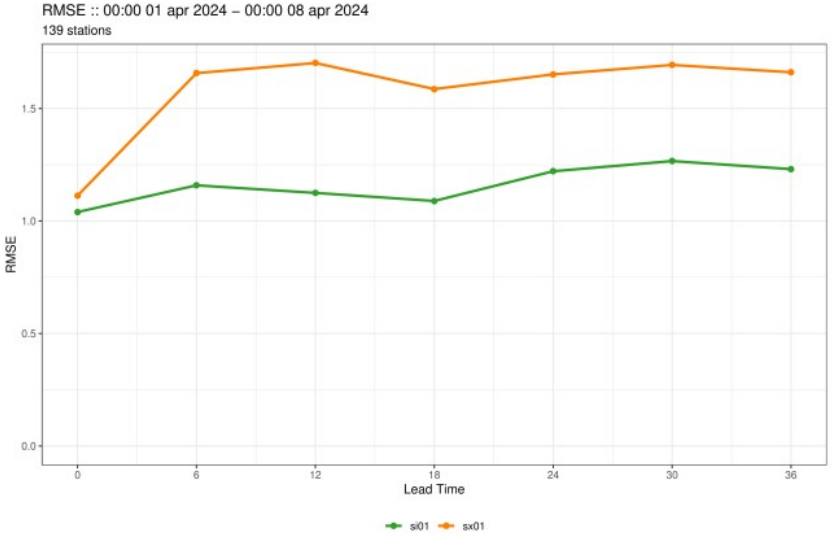

Ptuj
SFXT2m
CLSTEMP
CLSTEMP-OPER
T2m
Date

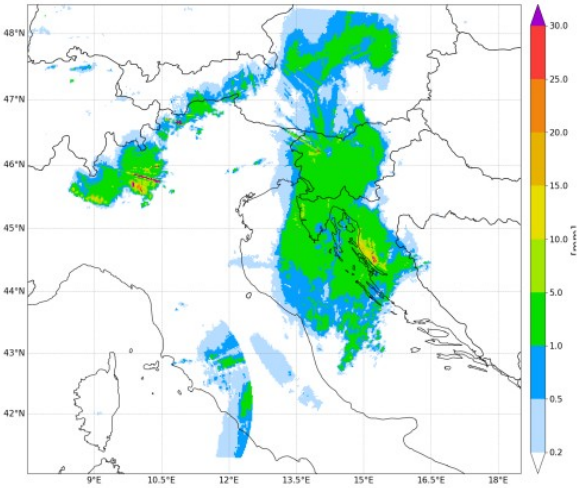

Kranj
SFXT2m
CLSTEMP
CLSTEMP-OPER
T2m
Date

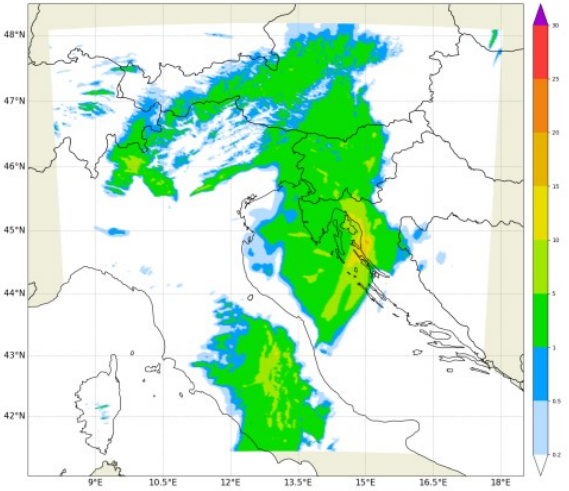

Bias :: 00:00 01 apr 2024 - 00:00 08 apr 2024
240 stations
Bias
Lead Time
si01
sx01

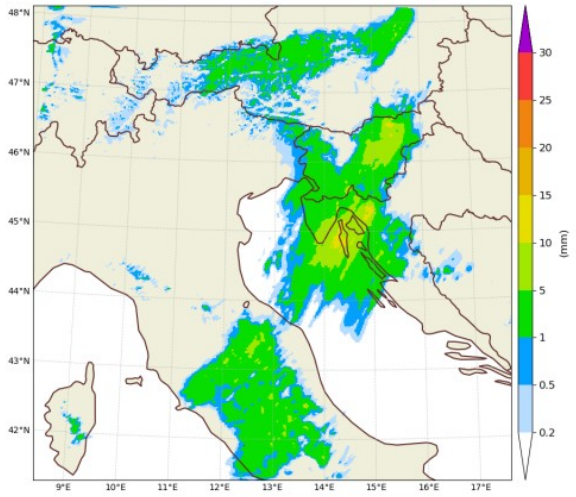

RMSE :: 00:00 01 apr 2024 - 00:00 08 apr 2024
240 stations
RMSE
Lead Time
si01
sx01


Bias :: 00:00 01 apr 2024 - 00:00 08 apr 2024
139 stations
Bias
Lead Time
si01
sx01


RMSE :: 00:00 01 apr 2024 – 00:00 08 apr 2024
139 stations
RMSE
Lead Time
si01
sx01







-1.4.2024. 17 UTC
-radar plot
-the operational forecast of rain
-forecast of rain with SURFEX

Conclusion

- An assimilation cycle using ALARO coupled with SURFEX was conducted, and the evolution of surface fields was compared between SURFEX and ISBA
- The fields SURFTEMPERATURE and X001TG1 were found to be close to each other, and CLSTEMPERATURE was the same as SFX.T2M
- A one-week run with ALARO/SURFEX was performed, and the results showed that the operational model performed better
- With further tuning, we could achieve better results, potentially leading to improved forecast