Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Status data assimilation in Austria

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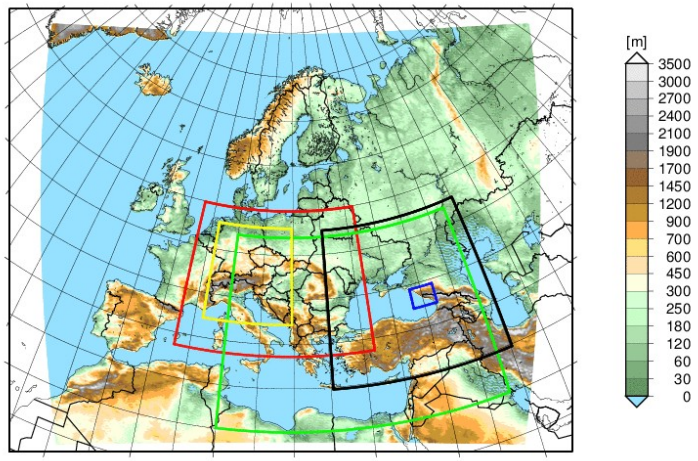
DHMZ SHMU OMSZ ZAMG ROMANIA ANM

Operational configurations

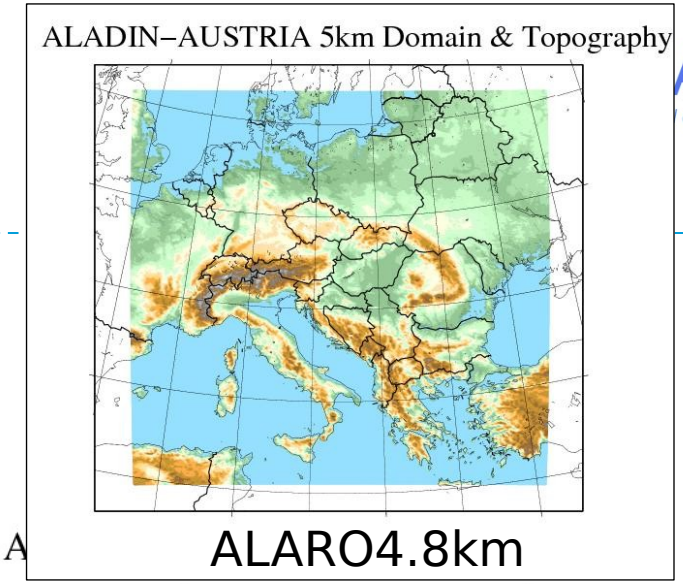
- **ALARO 4.8km L60** cy36t1 IFS-coupling+INIT+CANARI-SOIL 4x/day+72h
- **AROME 2.5km L90** cy40t1 hourly-IFS-coupling+3D-VAR+CANARI-OIMAIN-inline+SNOW exchange 8x/day
- **ALADIN-LAEF 11km** 16 memeber IFS-EPS coupling BREEDING-BLENDING+CANARI perturbed (at ECMWF with LACE partners)

Test configurations:

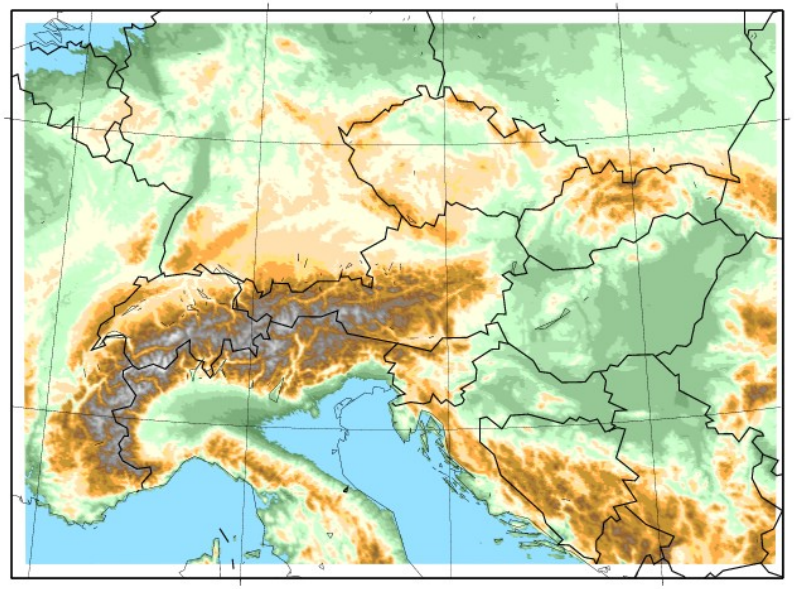
- AROME-EPS 2.5kmL60 cy40t1
  mostly downscaling PHD Endi Keresturi: tests with EDA+Jk
- AROME-RUC 2.5/1.2km L90 cy40t1
  hourly 3D-Var downscaling of AROME-soil radar assimilation, LHN, IAU, MODE-S



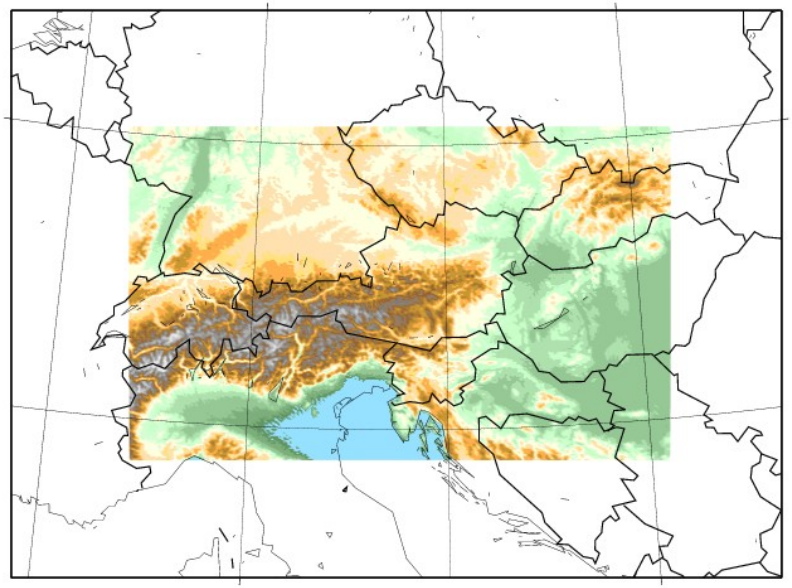
LAEF



ALARO4.8km



AROME 2.5km DET + EPS

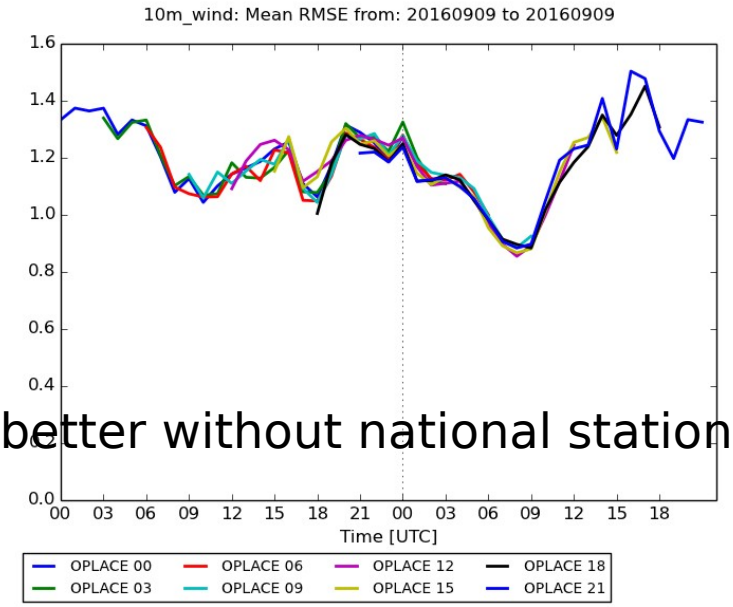


AROME-RUC 1.2km/2.5km

Operational news

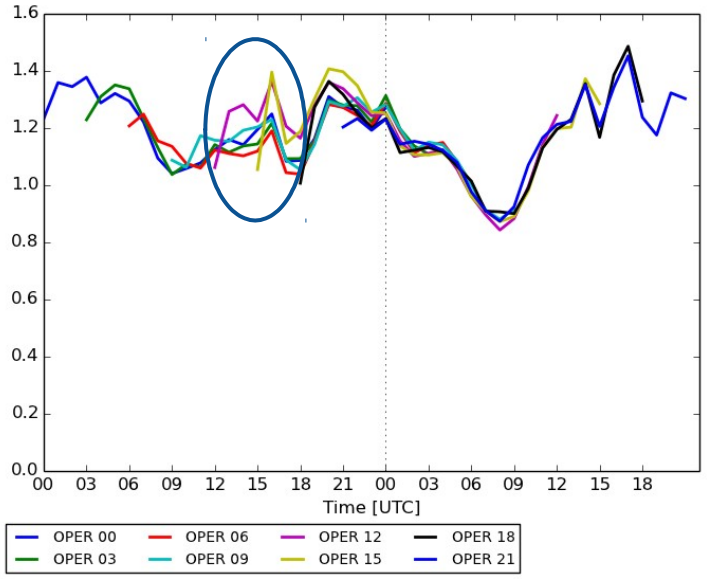
- New super computer exspected in autumn 2017
- AROME-E-SUITE with 3D-VAR cy40t1 should become operational then – right now still cy36t1
- Modification of sur

10m wind

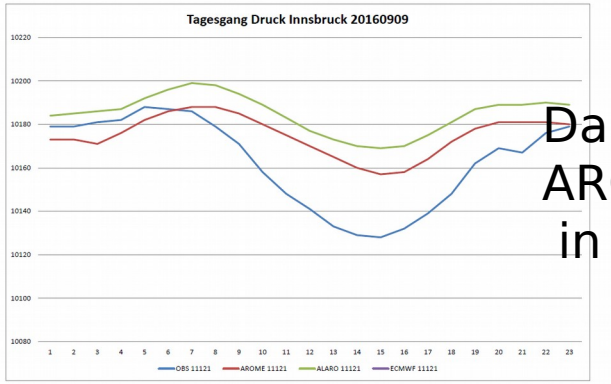


better without national stations

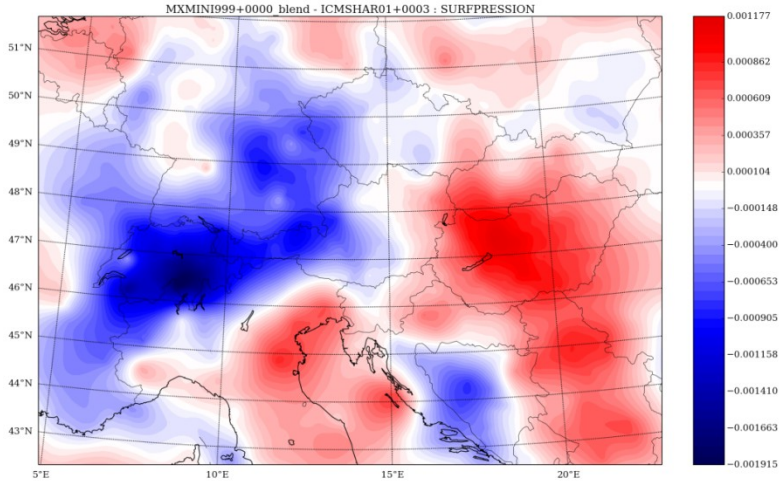
Bad performance of 12 and 15 UTC run in the first forecast hours



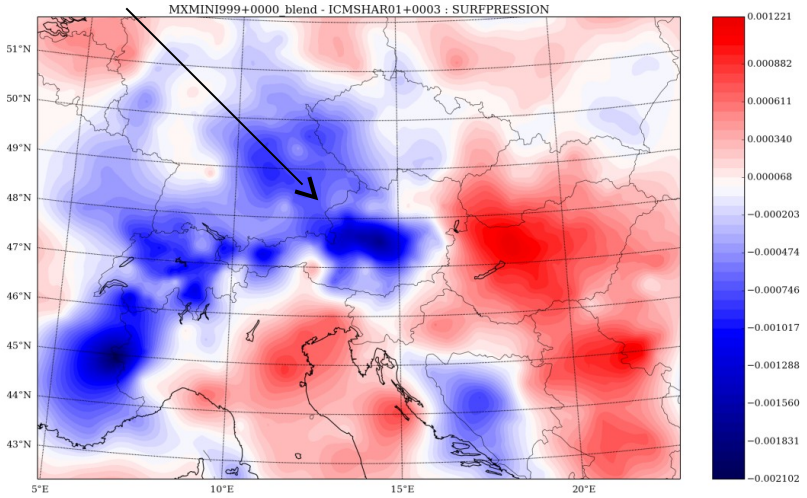
Pressure in Innsbruck for day with Alpine pumping



Daily cycle pressure at Innsbruck station
AROME is not able to simulate the Alpine heat low in full extension due to resolution



pressure increment OPLACE



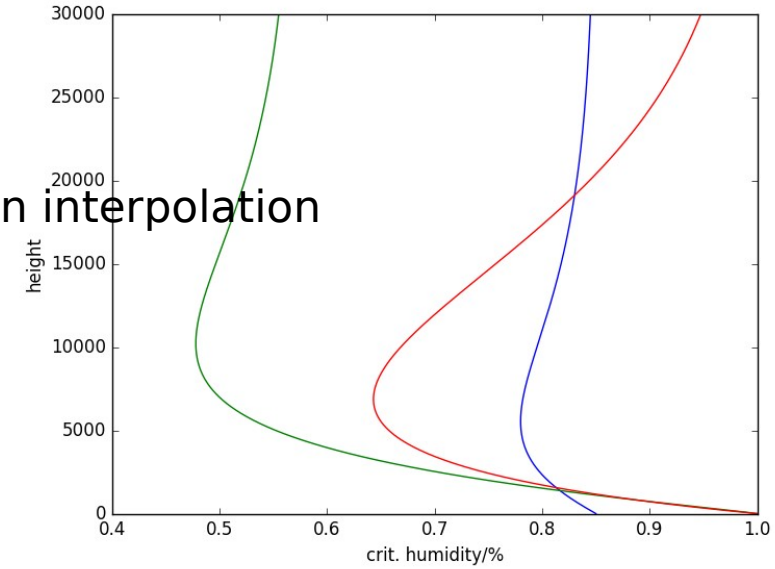
pressure increment OPLACE+national

Cloud nudging – code modifications

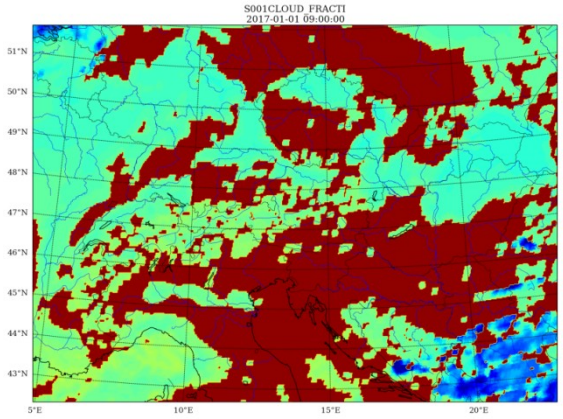
OBS-> GETCLOUDINFO PREPROC-> OBS on GRID in FA-FILE->001

- Start from: Pre-processor „getcloudinfo“ trunk r14912 40h1, main routine: branch 38h1.2, adapted to cy40t1 export
- Several timeslots: ->run pre-processor once per slot save observations to different vertical level in FA file: S001->S003, modify also: mf_phys.F90
- satellite projection adapted to Austrian data, surface data: BUFR->ASCII
- Enable reading of NETCDF NWCSAF
  - data (until now HDF5)
- add optional critical humidity profiles
  - from ALARO/Haiden 2004
- Take orography into account for surface station interpolation
- take optional saturation equation from
  - Goff-Gratch to get qsat (water and ice)
- Random perturbation generator for obs
- Use spread for cloud base estimation

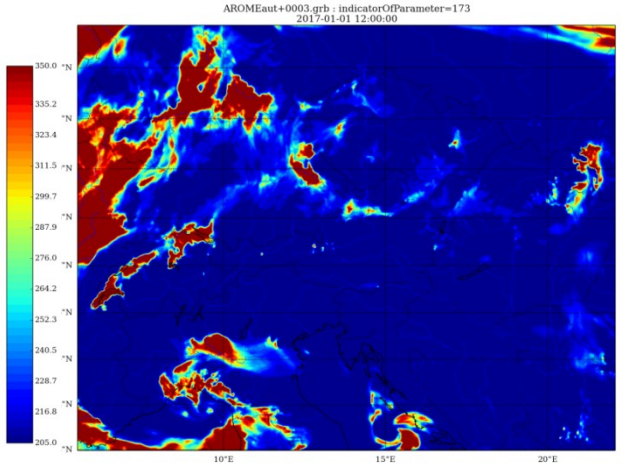
HAIDEN ALARO Van der Veen

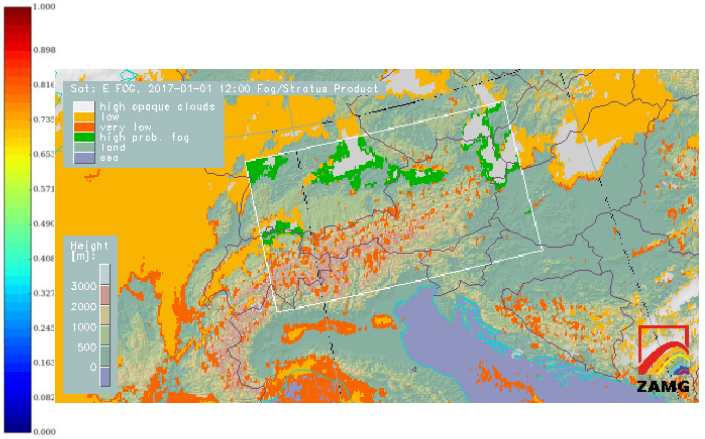


Cloud nudging 1st January 2017 09UTC+3h

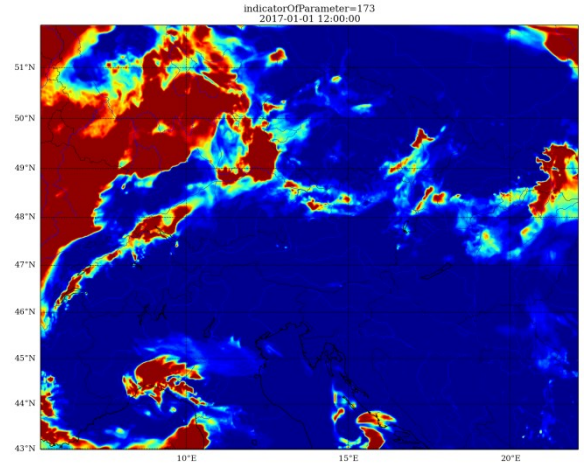


MSG-CTT/K 12UTC

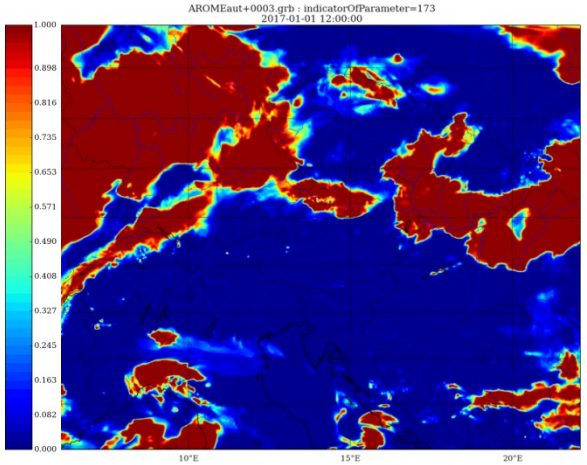




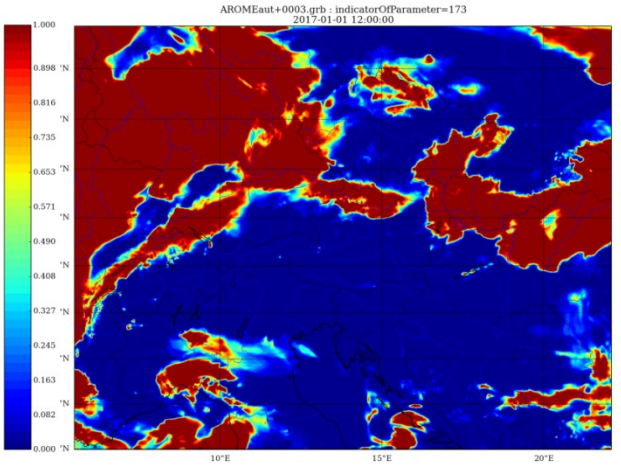
AROME low clouds reference



AROME+Van der VeenT0



AROME+Van der Veen0/0.5/1



AROME+Haiden

Tests with HARMONIE cloud masking

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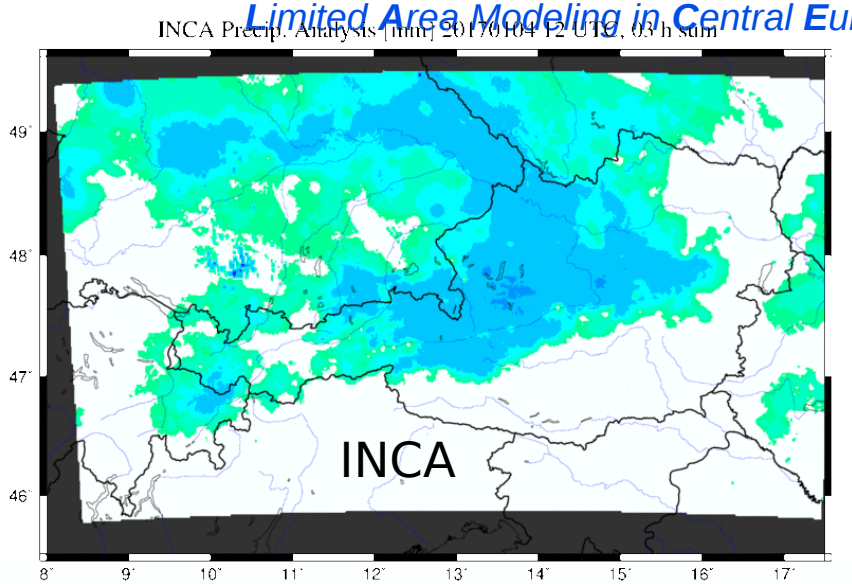
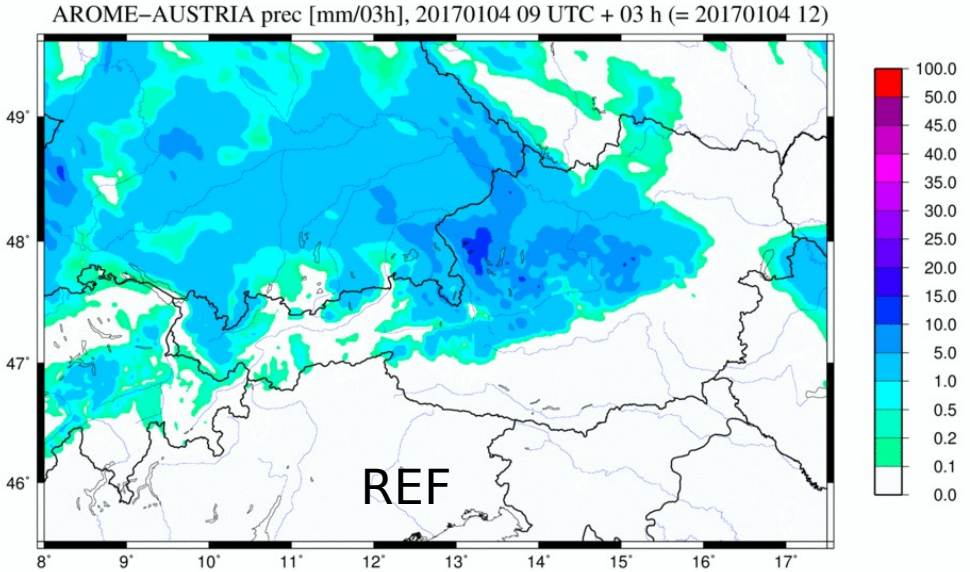
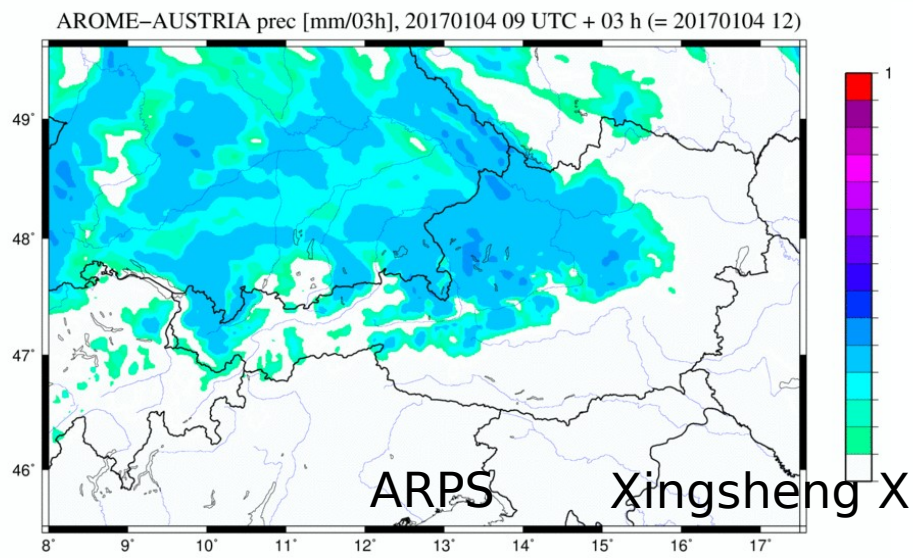
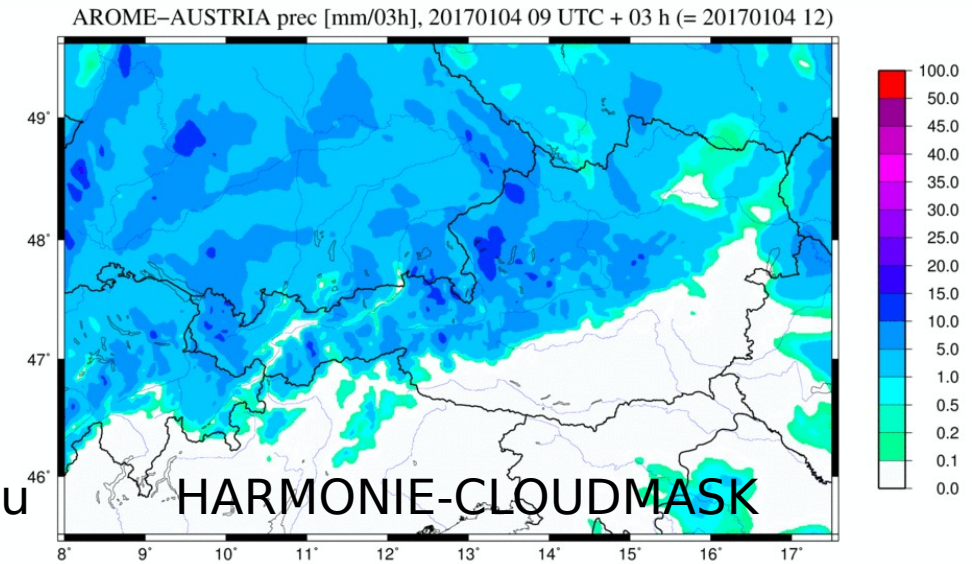




Precipitation 20170104 09UTC+3h

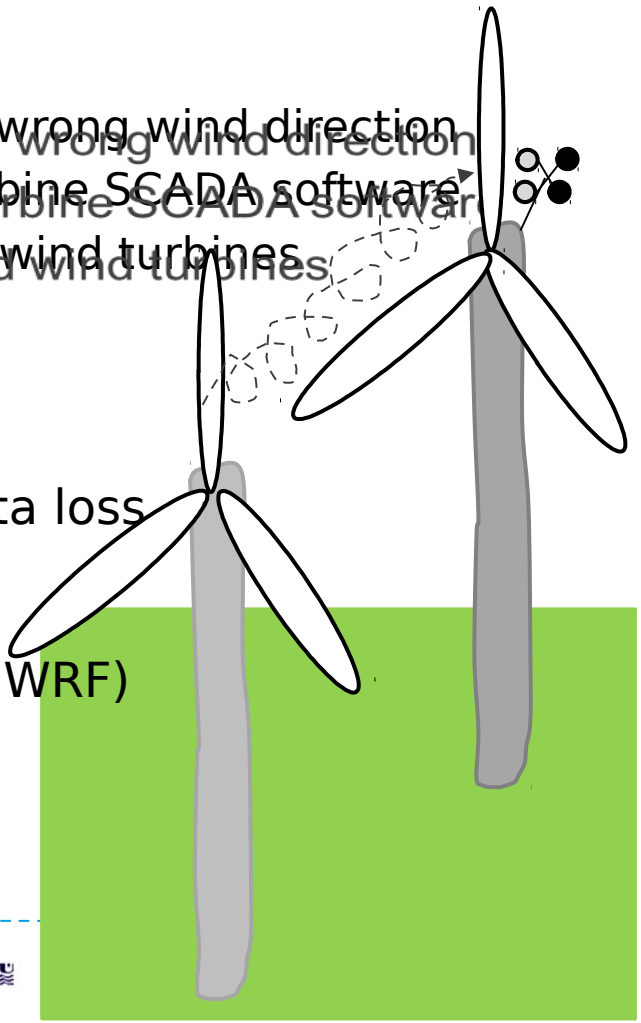


Xingsheng Xu



SCADA windturbine assimilation

- wind speed, temperature and gondola position/wind dir at hub height
- Treat in AROME like one layer wind profiler enable temperature for obstype 6 ($(\sigma_o = 1.41\ K; 1.89 \frac{m}{s})$
- put data to obsoul format
- Reject data, if turbine is not in working mode -> wrong wind direction
- speed is corrected for perturbation of flow by turbine SCADA software
- problem: airflow is also disturbed by neighboured wind turbines
  - ->the model „does not know“ it ->bias



possible solutions:

Take only highest/single standing turbine data – data loss
wind direction specific blacklisting
bias correction from longer timeseries – variability?
parameterise windfarm in model (Fitch et al. 2012, WRF)
to reduce effect in the first guess

- **S**upervisory **C**ontrol and **D**ata **A**cquisition

FFG Austrian Research Promotion Agency
DHMZ SHMU

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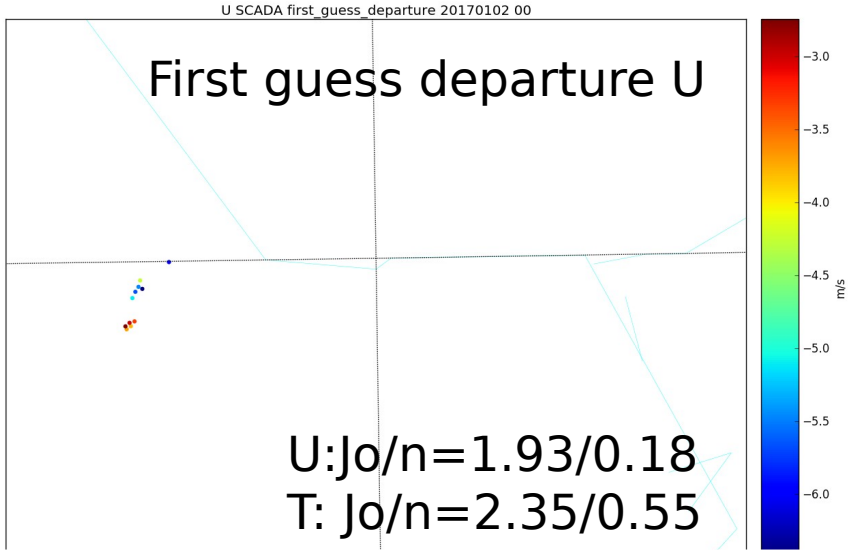
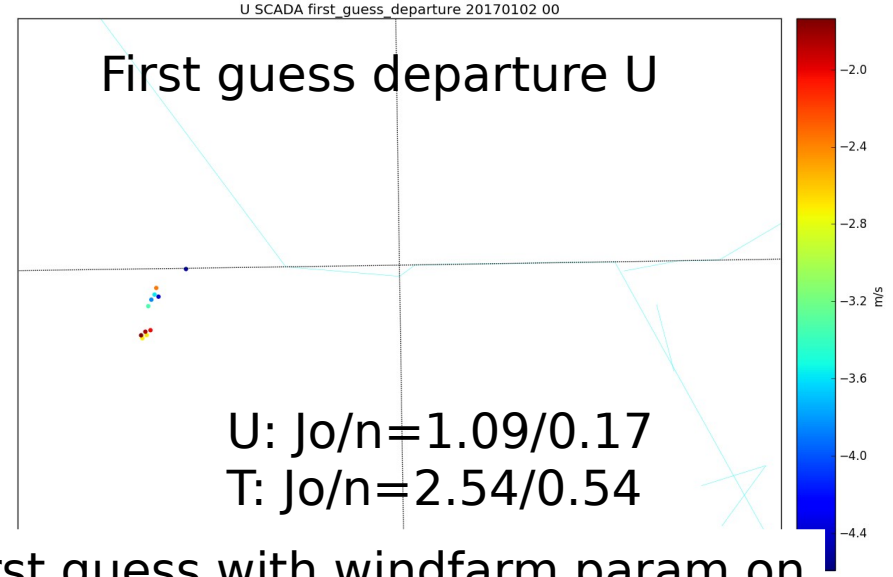


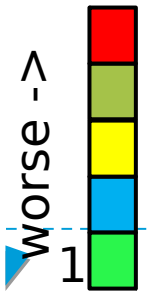
first guess with windfarm param off



first guess with windfarm param on

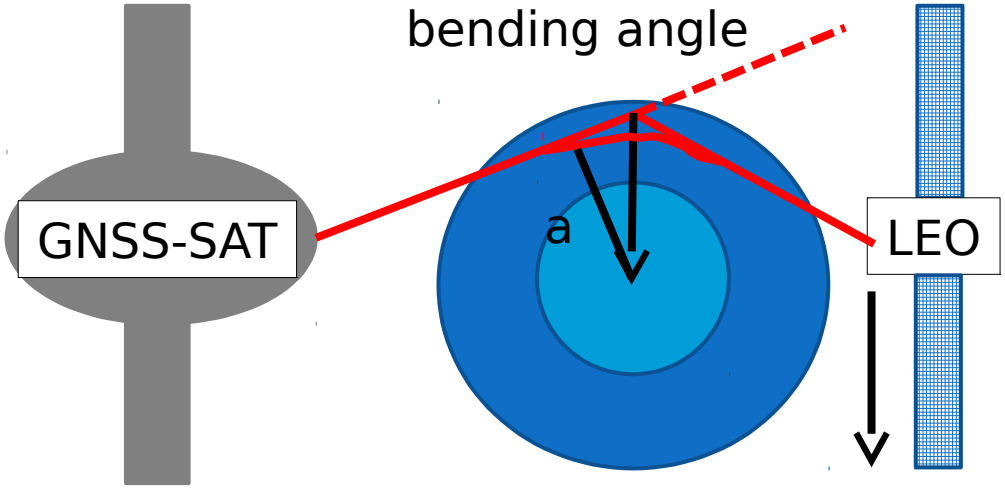
+3h forecast
Verified against
13 turbines

EXP	BIAS U	BIAS V	BIAS T	BIAS FF	RMSE U	RMSE V	RMSE T	RMSE FF
REF	2.061	-4.570	0.420	2.329	2.530	2.590	1.038	2.603
ASSIM	1.743	-4.260	0.363	1.925	2.269	2.310	1.023	2.243
PAR	1.219	-3.977	0.189	1.337	1.723	1.759	0.982	1.630
COMB	1.24	-3.951	0.200	1.347	1.742	1.774	0.989	1.641
REF2	1.628	-4.177	0.233	1.791	2.043	2.091	0.979	2.024



Experiments with GPS-RO project AROSA

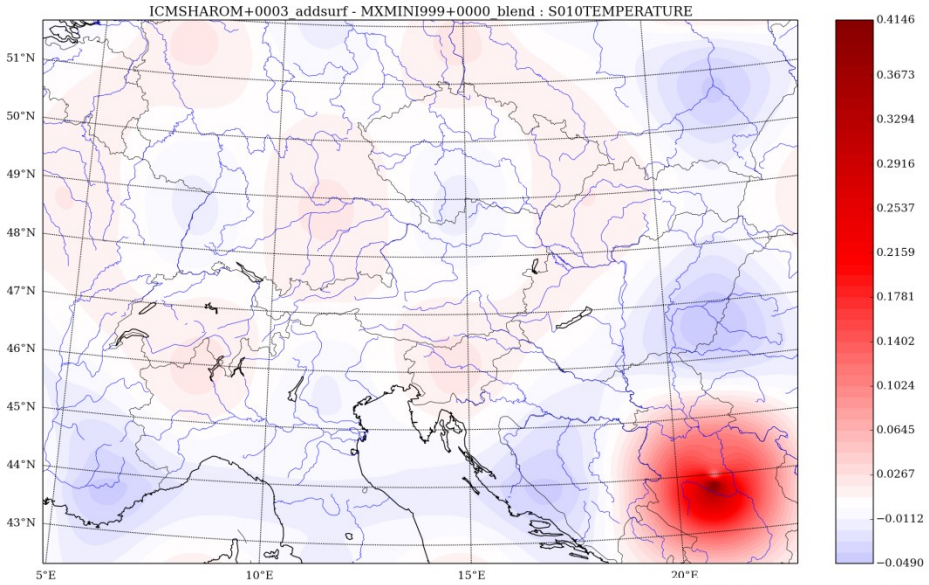
- Operator available in AROME (Healy et al.)
- working with BUFR-files from ROM-SAF and private company Spire Inc.



Questions:
low model top problematic,
blacklisting,
thinning
enough observations
Could operator be adapted?

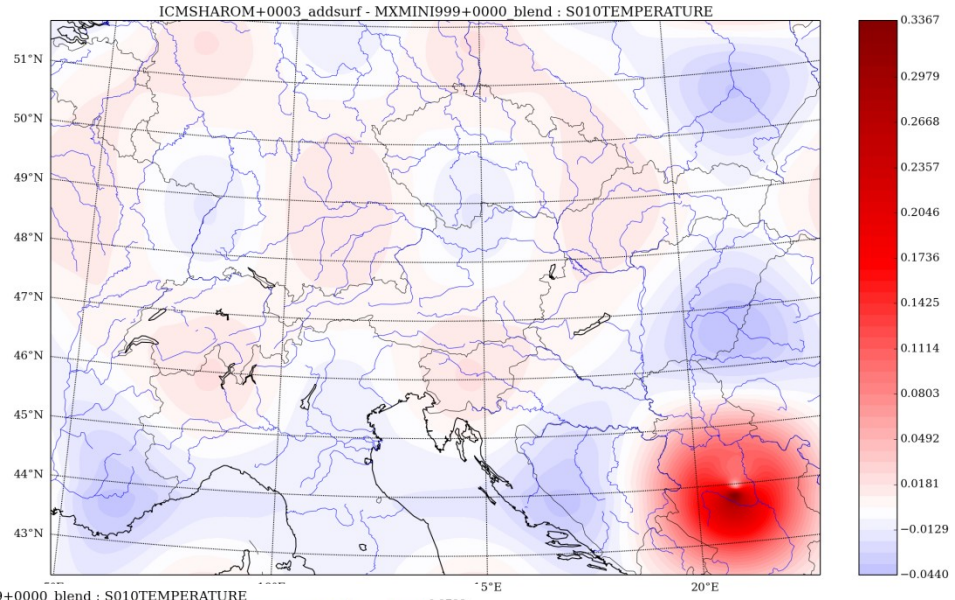
$$\alpha(a) = -2a \int_a^\infty \frac{\mathrm{d}(\ln n)/\mathrm{d}x}{(x^2 - a^2)^{1/2}}\,\mathrm{d}x,$$

GPS-RO (project AROSA): Single profile experiment 27th April 2017 09UTC L10



1D-operator

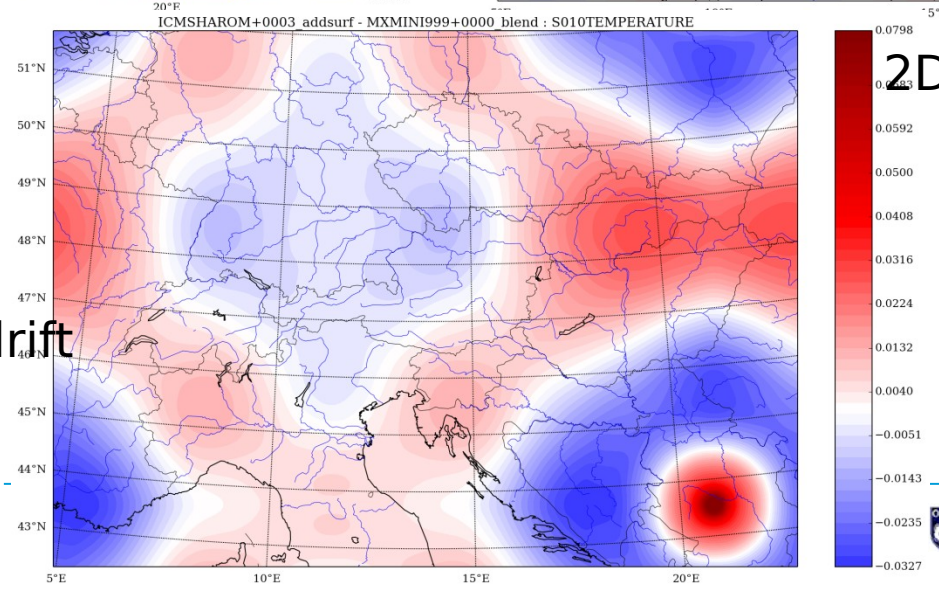
T L10



2D-operator 121point

NAMELIST

NOBSPROFS(10)>1



2D no tangent. point drift

llignore_tpd=.TRUE.

Plans for the near future

- Migration to new HPC
- Running test periods with AROME-RUC 1.2km
- Tests with Austrian MODE-S, SODAR, latent heat nudging (project VIEsion)
- Some more tests with cloudmasking + SCADA + EDA (project ICE-CONTROL)
- Tests of GPS-RO assimilation in AROME (project AROSA)
- Update of B-Matrix EDA based?
- Wind-nudging
- Further tests on RADAR assimilation
- EKF-activities Stefans‘ talk