Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Status data assimilation in Austria

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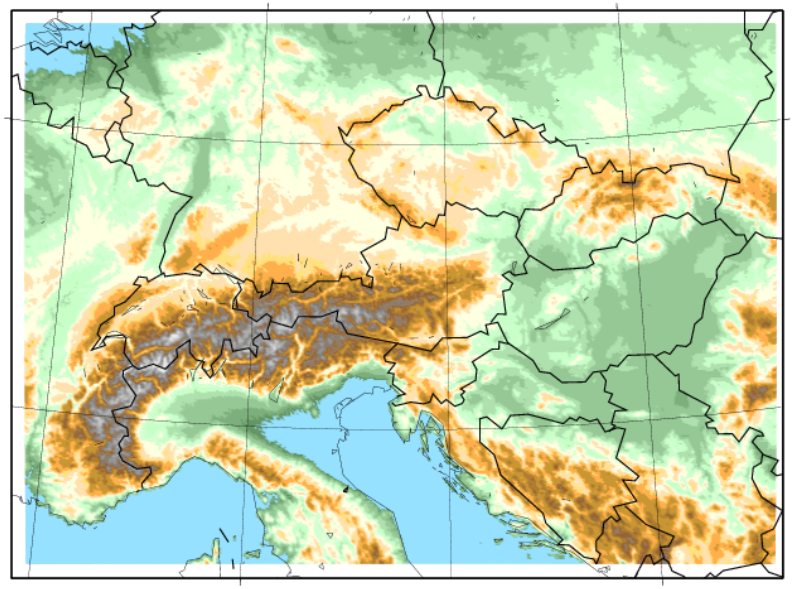
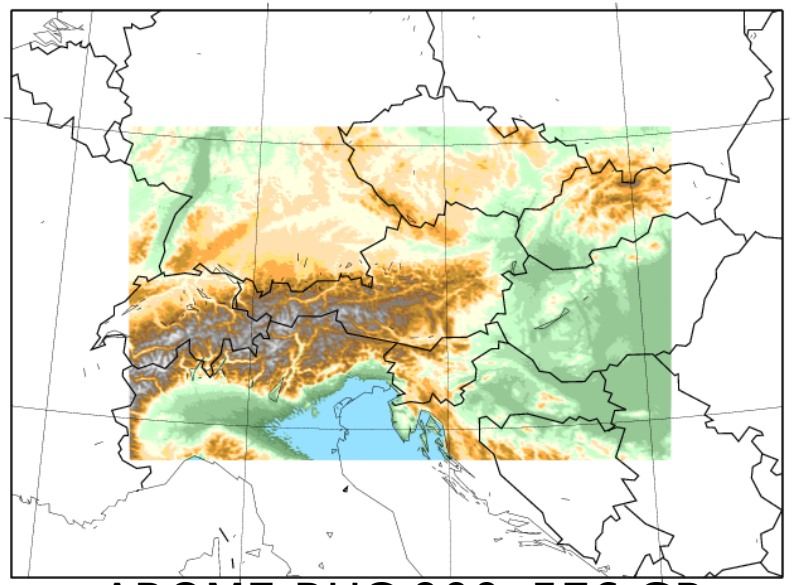
DHMZ SHMU OMSZ ZAMG ROMANIA ANM

Significant changes in operations during 2019

- C-LAEF (AROME-EPS) becomes operational end 2019
- Hourly AROME-RUC 1.2km becomes operational end 2019
- ALARO-0 4.8km wil



AROME-/C-LAEF 600x432 GP



AROME-RUC 900x576 GP

Operational configurations CMCs

ALARO-0 4.8km L60 cy40t1	**AROME-Aut L90 cy40t1**	**C-LAEF-2.5km L90/16 cy40t1**	**AROME-RUC 1.2km L90 cy40t1**
3h-IFS 4x/day +72h dt=180s	1h-IFS 8x/day +60h dt=60s	6h-IFS-EPS 2x/day +48h+2x6h dt=60s	1h-AROME-Aut 24x/day +12h dt=30s
dynamical downscaling	3D-VAR	3D-Var-EDA-Ens-Jk	3D-VAR +LHN+FDDA-nudging+VARQC
CANARI	CANARI-OIMAIN +MESCAN inline+ SNOW exchange/ SNOWGRID+SAT	CANARI-EDA (with screening) MESCAN +snow as AROME-Aut	CANARI-OIMAIN MESCAN +additional Tlakes +SNOW as AROME-Aut
DFI	-	-	IAU (45+5min)
	Static Ens-B from LAEF downscaling	Static Ensemble B from C-LAEF and V from IFS-EPS	Static-Ens-B from AROME-RUC EDA+ differences of the day

Observations used in AROME/C-LAEF(no sat):

Obstype	Parameter
Synop+Tawes+Ship	U10m,V10m, RH2m,T2m, Z
AMDAR	U, V, T
GEOWIND	U, V (WVCL1/2,WVMW1, IR3, VIS3)
TEMP	U, V, T, Z, Q
PILOT	U, V
MSG-SEVIRI	WV radiances
NOAA18/19/MetOp-A,-B	AMSU-A, AMSU-B, MHS, HIRS
MetOp-A	IASI
MetOp-A	U10m, V10m ASCAT ocean winds

T_LAKE from Lake Constance from measurement interpolated inside OIMAIN 25km

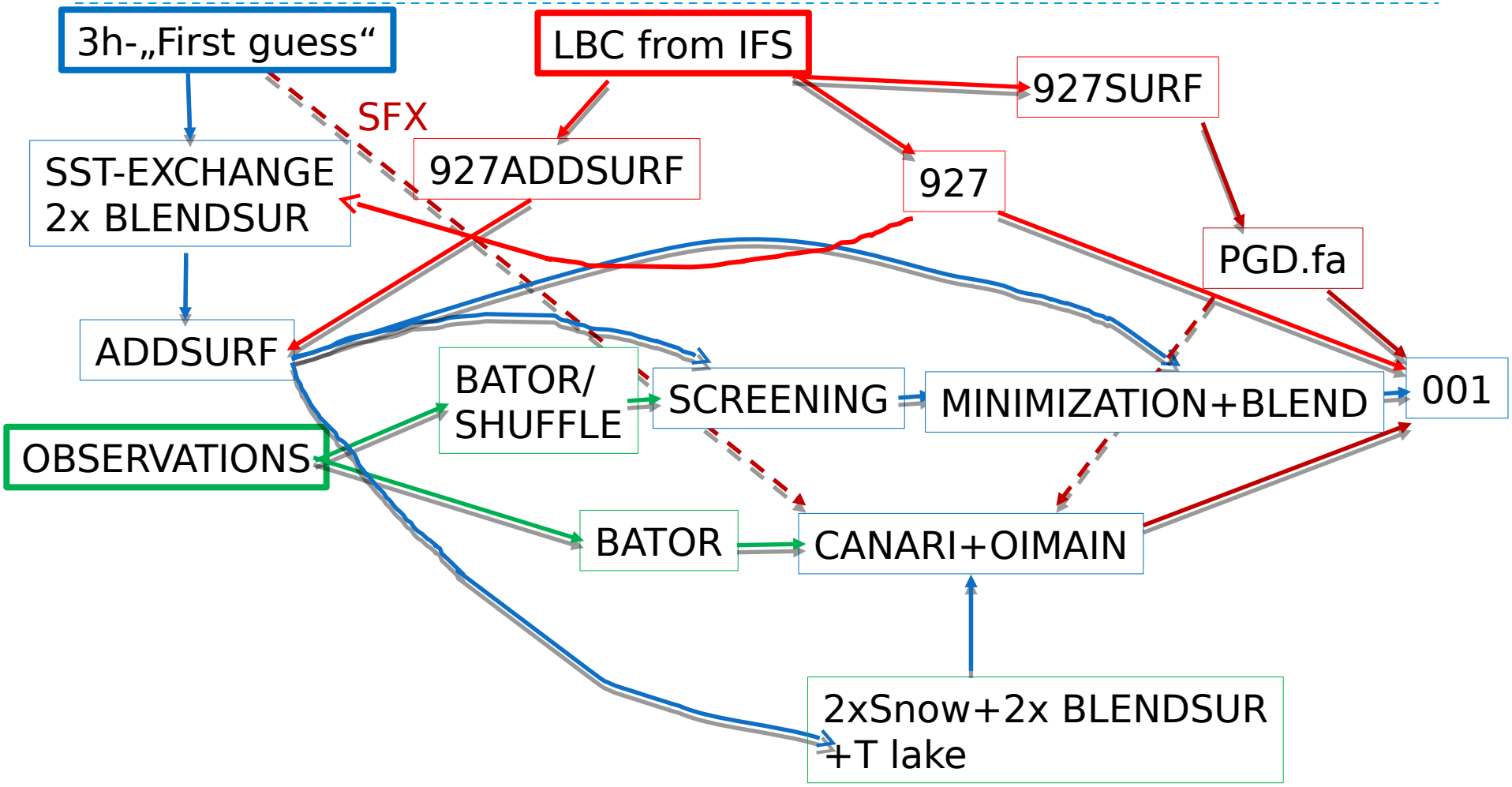
CANARI settings: REF_A=190km, LVARSIGO=F, LMESCAN=T, LCORRF=T
REF_S_T2=5.0,REF_S_H2=0.3,RCLIMCA=0.045,RCT2SY=3.9, RCH2SY=2.5
OROLIM=3800.,ORODIF=1650. -> no change since last year

Additional observations in AROME-RUC:

Obstype	Parameter
SYNOP national (OPLACE)	U10m,V10m, RH2m,T2m, Z
MODE-S ARSO/CHMI (MRAR) KNMI/AT	U, V, T +AMDAR-Q
RADAR AT/SI/D HR/CZ/SK/F (1 station)	DOW+REF +saturation of profiles
GNSS (AT national)	ZTD
(ATMS SUOMI+NOAA20)	Radiances ch1-3,5-14,16-22
INCA	RR5min via LHN
TAWES+10/20/30min	T2m/RH2m/U10m/V10m via FDDA Nudging
T-Lake (Fertoe/Balaton) pseudo obs	TS_WATER

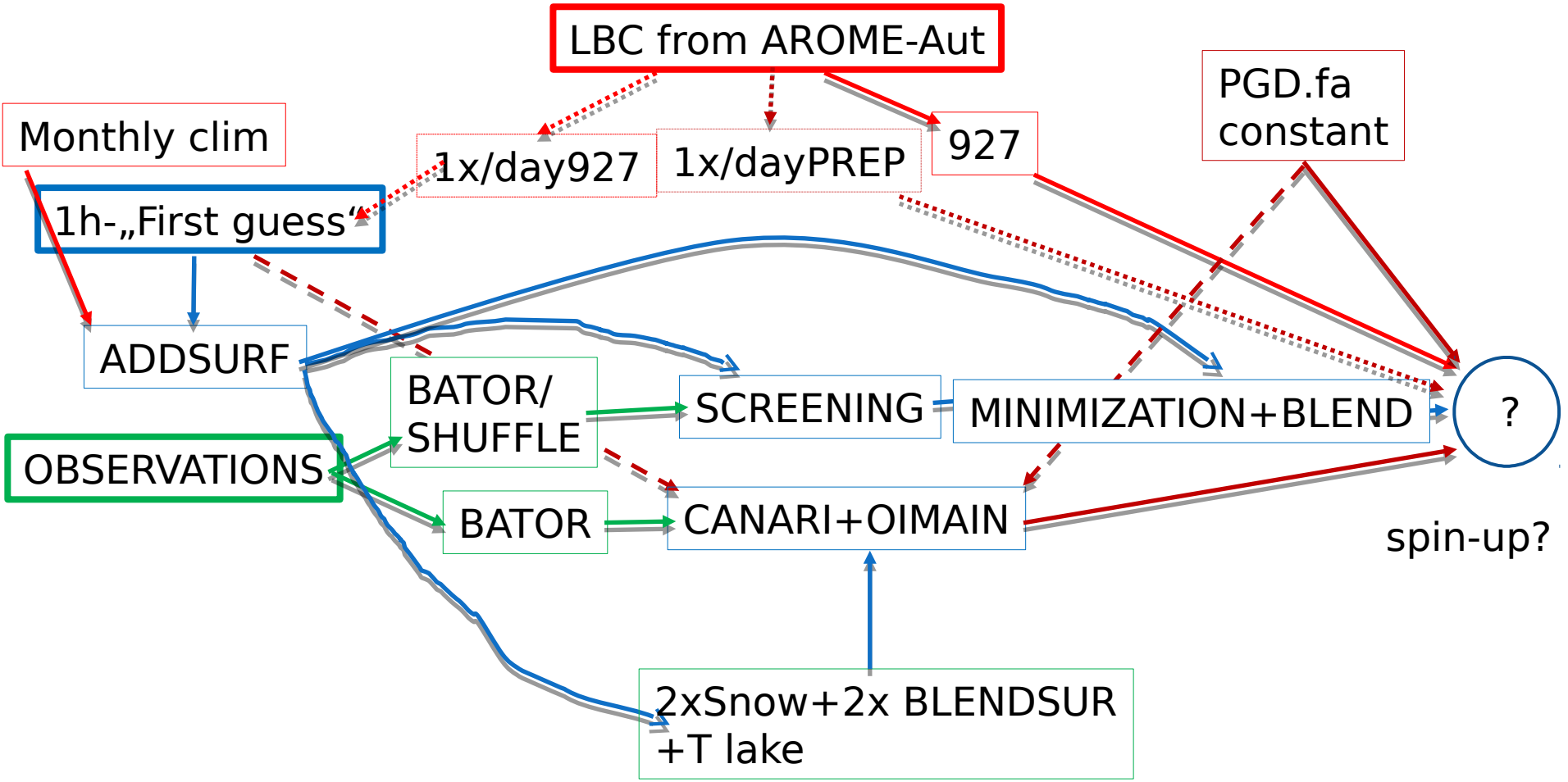
CANARI settings: REF_A=110km, LVARSIGO=F, LMESCAN=T, LCORRF=T
REF_S_T2=5.0,REF_S_H2=0.3,RCLIMCA=0.045,RCT2SY=3.9, RCH2SY=2.5
OROLIM=3800.,ORODIF=1650.

AROME-Aut structure (3 hourly cycle)



no separated assimilation(long cutoff)/production cycle; window +-90min

AROME-RUC structure part A

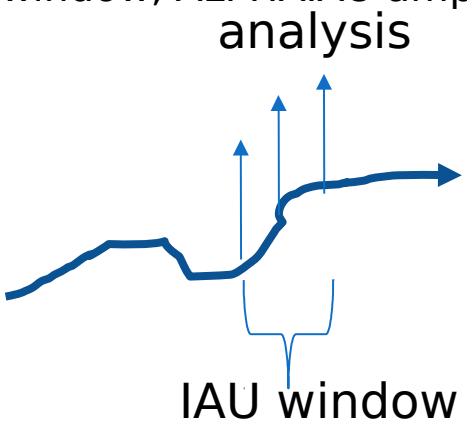


window -90/+30min additional observations

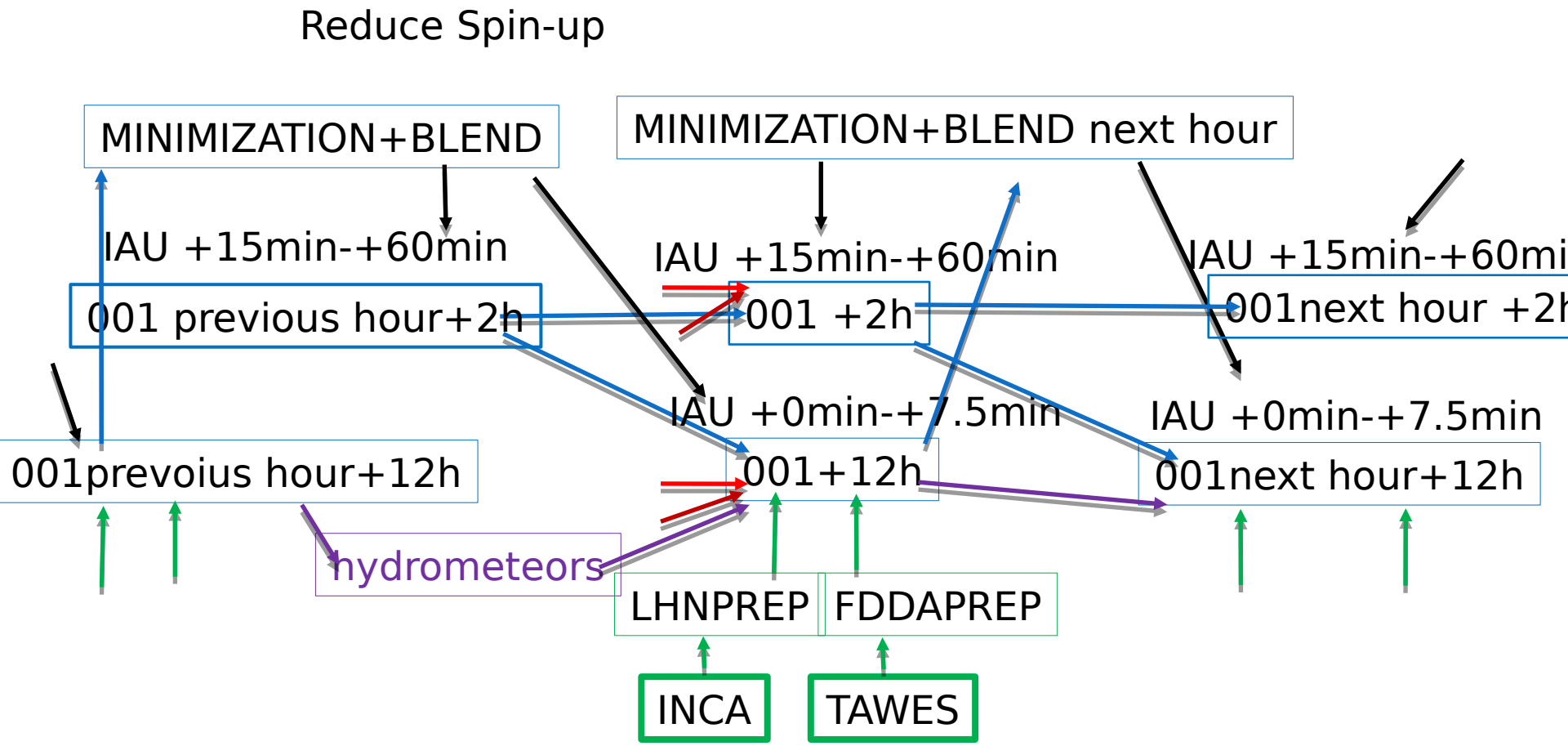
Incremental Analysis Update IAU

- Idea: Bloom et al. Mon Wea Rev.1996
- „Nudging of analysis“
- adds during integration in a defined time window each timestep a part of the analysis increment to the first guess
- Implemented by MF P. Brousseau in AROME cy43t2; (backphased to cycle 40t1)
- Can be used to 1. add increment/use observations later during the forecast (MF) ->short window
- 2. or to smooth increment in time and so filter spin-up (ZAMG)

  ->long window
- Needs guess+analysis;
- switches: LIAU to switch IAU on, TSTARTIAU starttime of window in s ->TSTOPIAU endtime of window, ALPHAIAU amplification factor multiplied with the increment per timestep

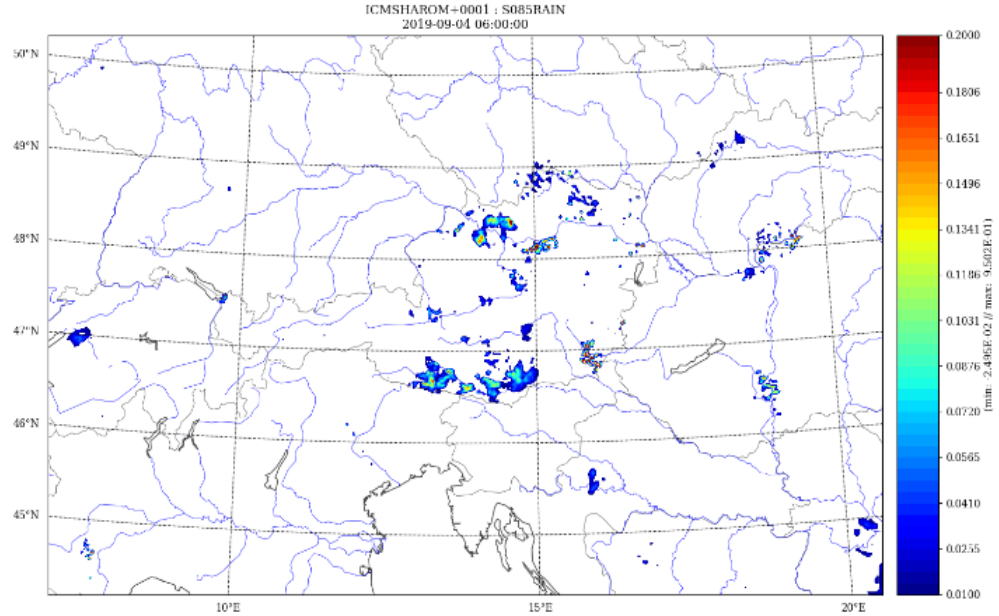


AROME-RUC structure part B

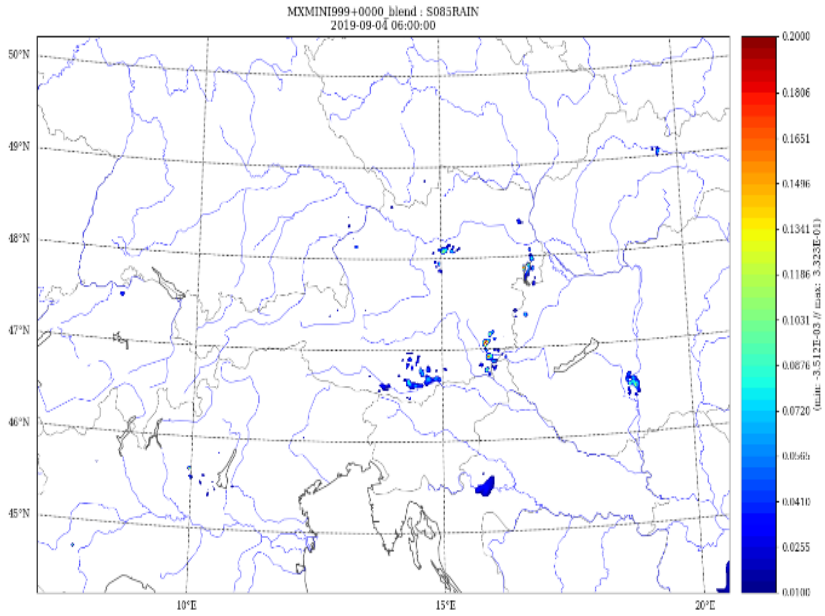


two hourly cycles one using minimization via IAU at 0-5min the other at 15-60min IAU with long window seems to affect hydrometeors

IAU detoriates hydrometeors ->additional blending



S085RAIN after +15min-60min IAU



S085RAIN after +1h run with LHN+FDDA-Nud

Observation was rain=0 on that day

STD assimilation in AROME-RUC (F. Weidle)

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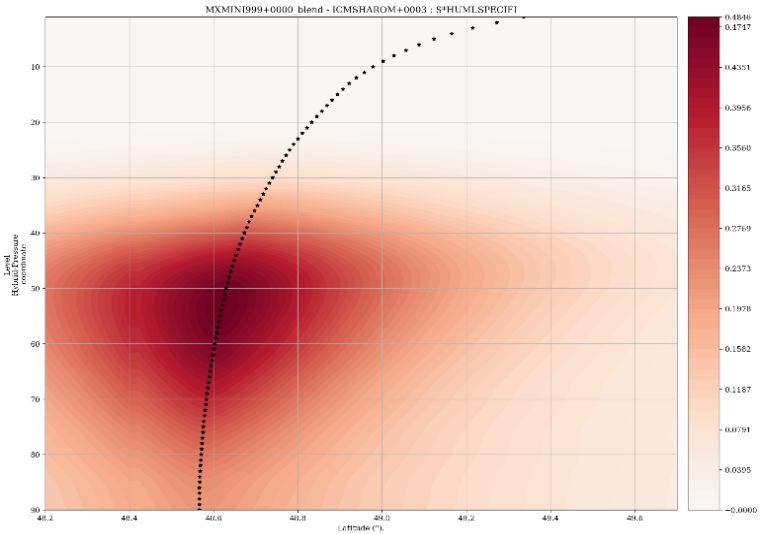
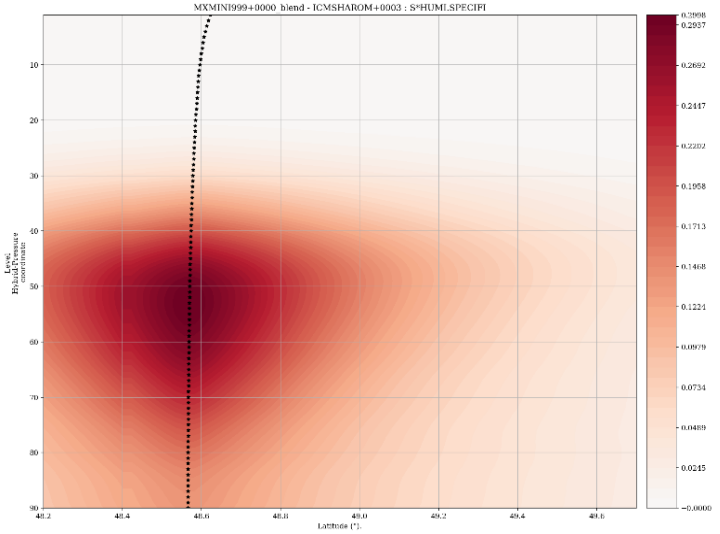
LACE nwp central europe

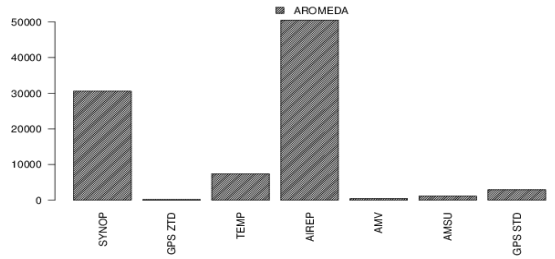
Operator from KNMI backphased to cy40t1 export

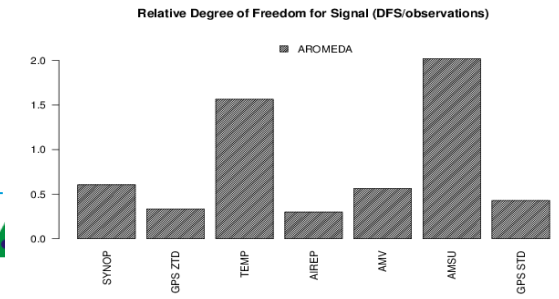




Model levels->

Single obs Q increments for two elevation latitude





EPOSA ECHTZEIT POSITIONIERUNG AUSTRIA

TU WIEN

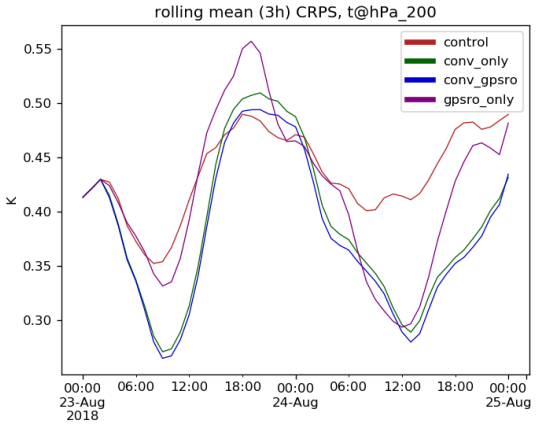
ETH zürich

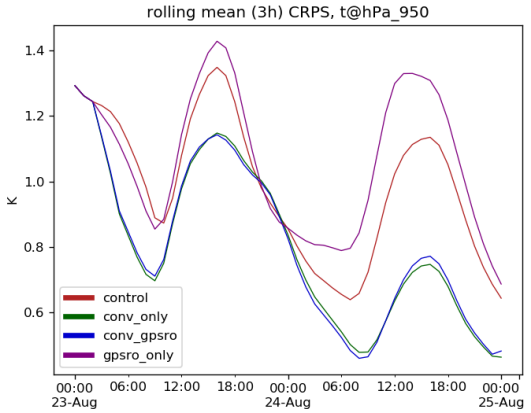
GEO

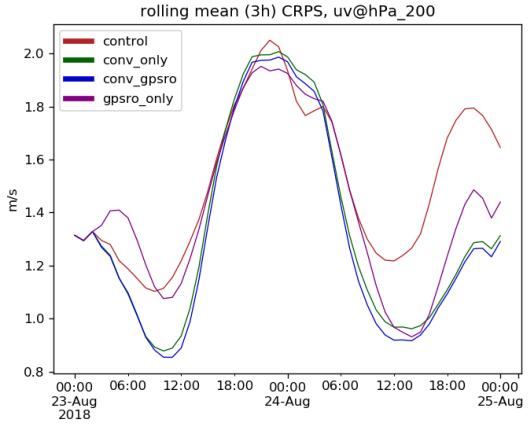
DHMZ

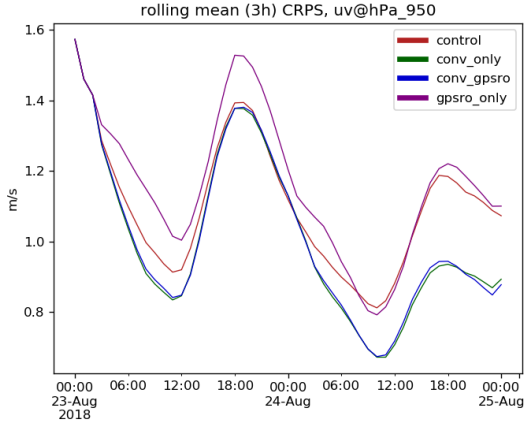
SHMU

GPS-RO OSSE (Phillip Scheffknecht)





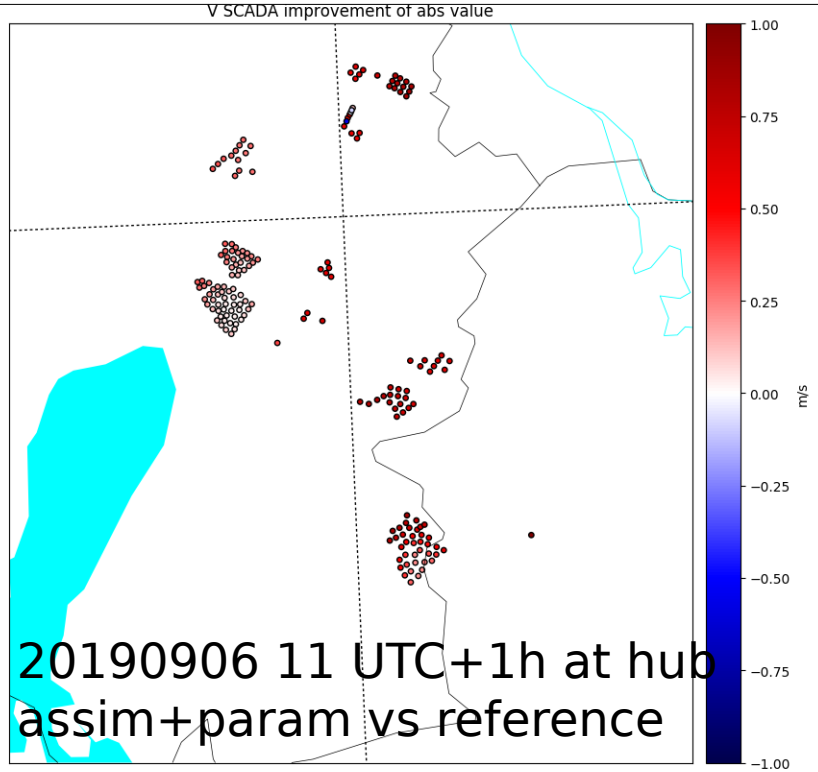




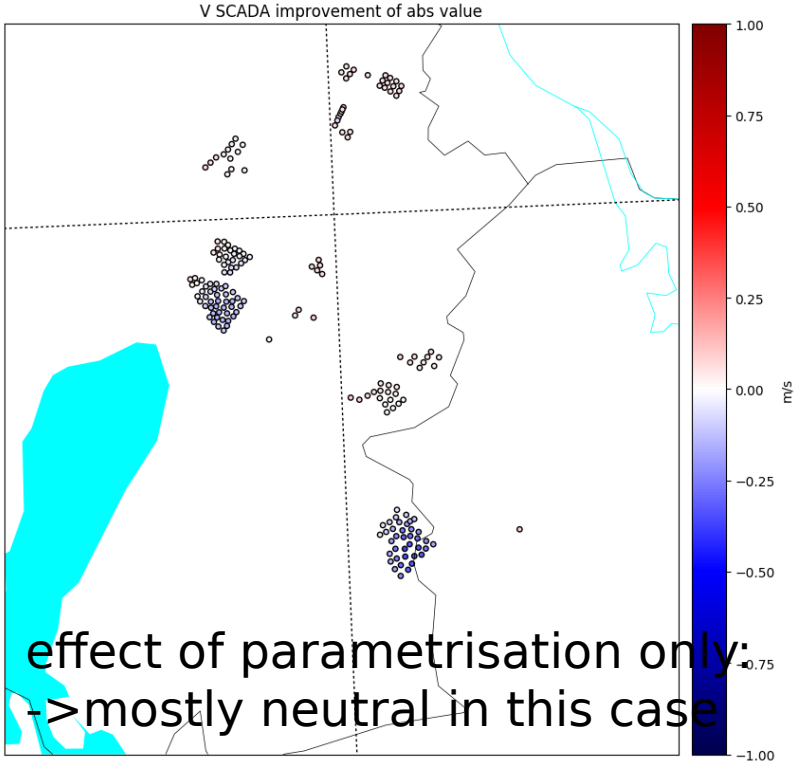
Positive impact on wind and temperature above 500hPa; below mixed

windfarms in AROME-RUC (about 200 turbines)

- QC based on deviation of measured wind and power from power curve
  -> turbine in regular mode
- Blacklisting of wind turbines with large bias or standard deviation (12 turbines)
- Parameterisation of turbine effects on the environment (approach of Fitch et al. 2012)
  ->U, V, TKE tendencies based on turbine type, height, diameter and wind
- New pre-processing (Python) to handle large number of turbines
- Assimilate SCADA wind (temperature also possible, but measurement only 0 digit prec



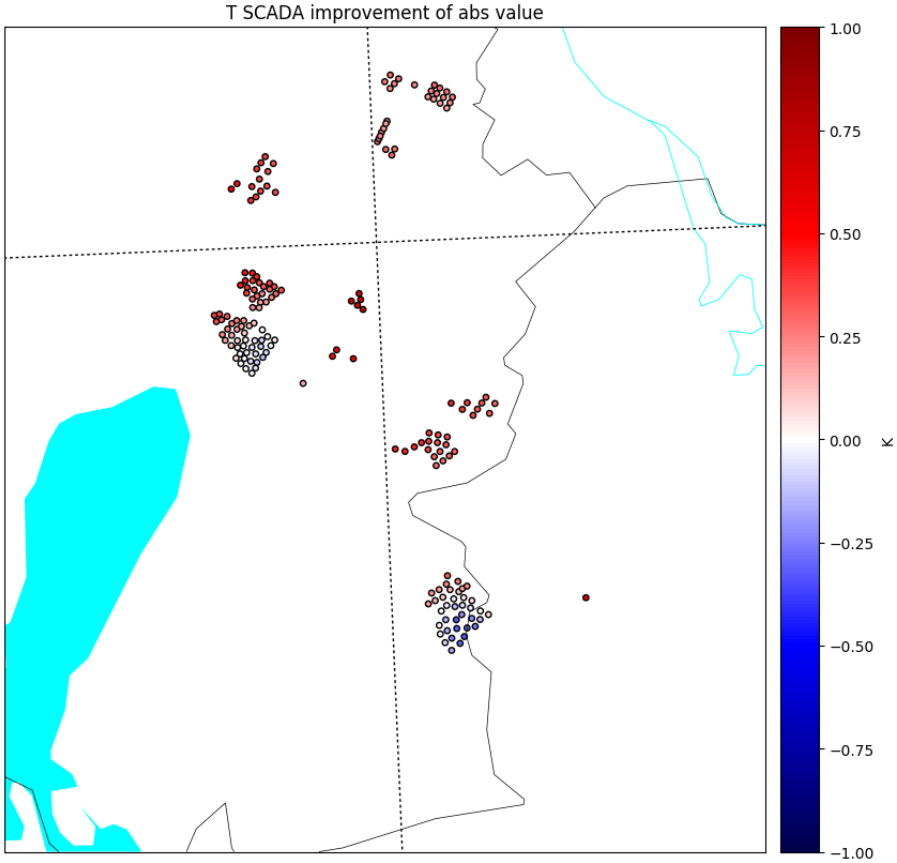
20190906 11 UTC+1h at hub
assim+param vs reference



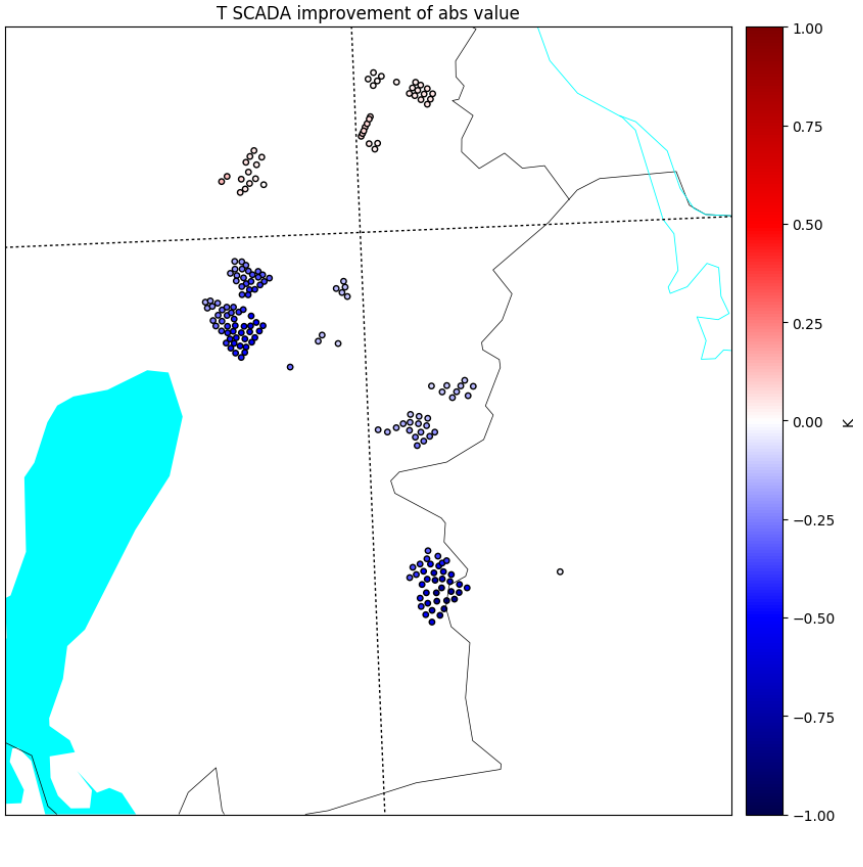
effect of parametrisation only:
->mostly neutral in this case

Observation about 3.5m/s from 335°

effect of windfarm wind assimilation on temperature



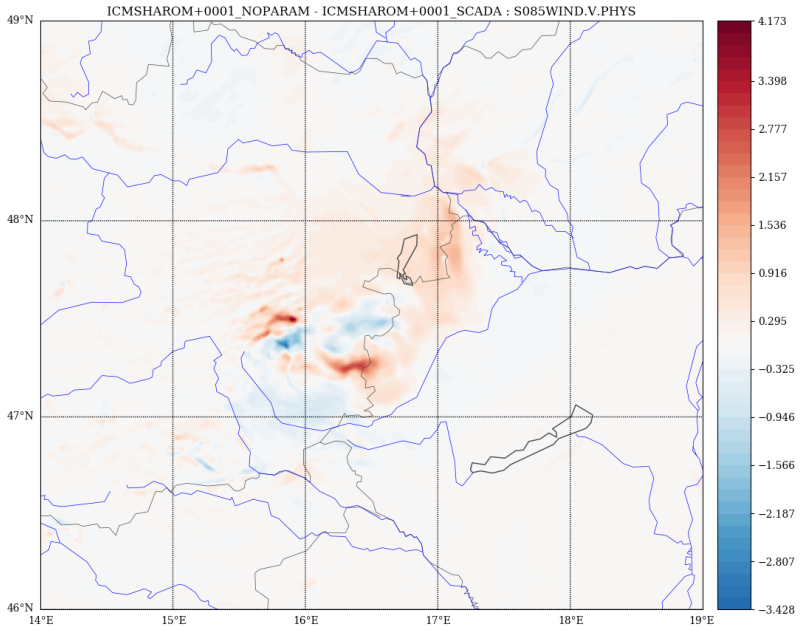
assim+ param vs reference

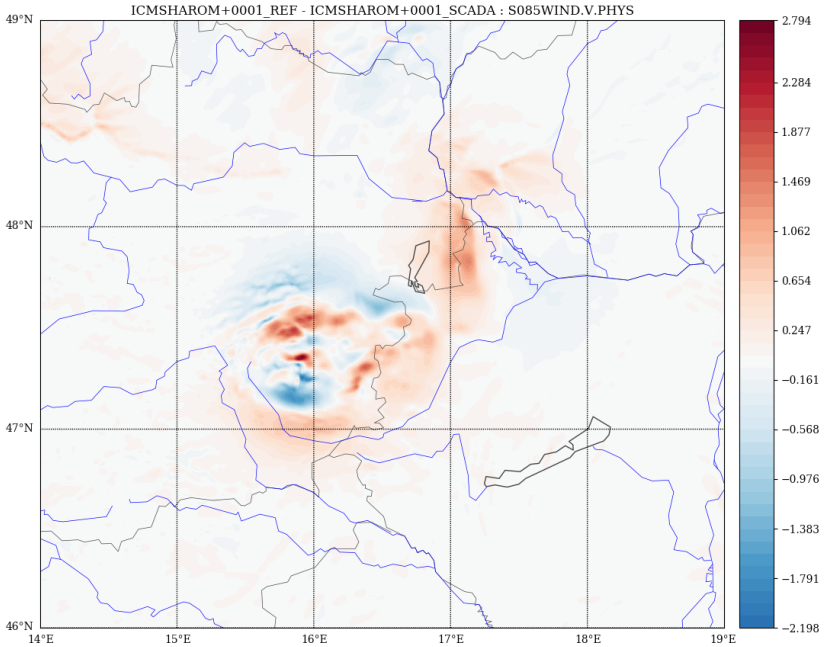


param only vs reference

In this case parametrisation has neutral to negative impact, while assimilation is benefitial for V and T

difference in V 6.9.2019 11 UTC+1h



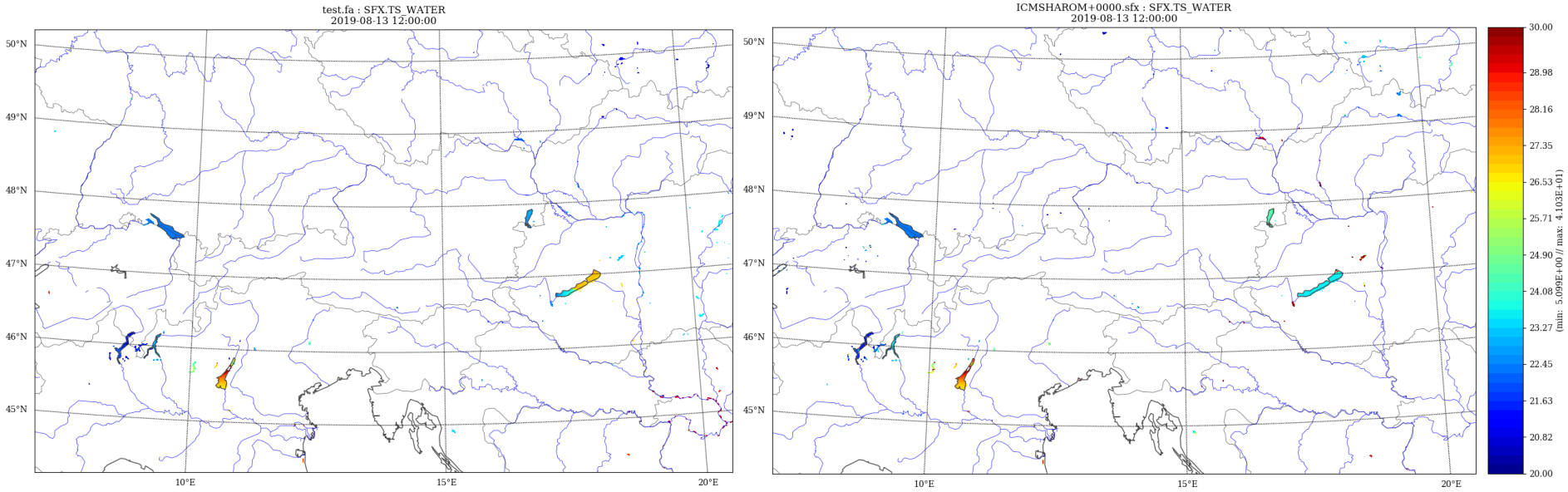


reference-(assim+parameterized farms) difference due to assimilation and Parametrisation of windfarms

param-(assim+param) difference only due to assimilation

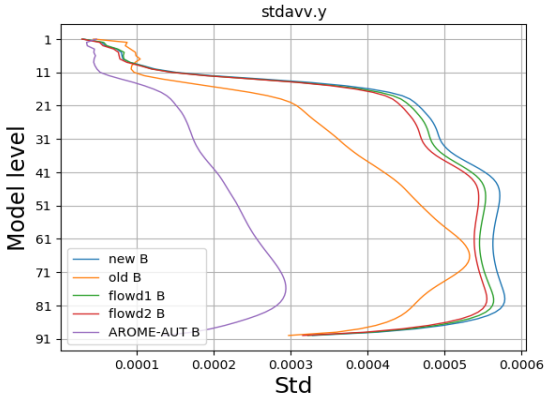
Lake temperatures from SYNOP T2m

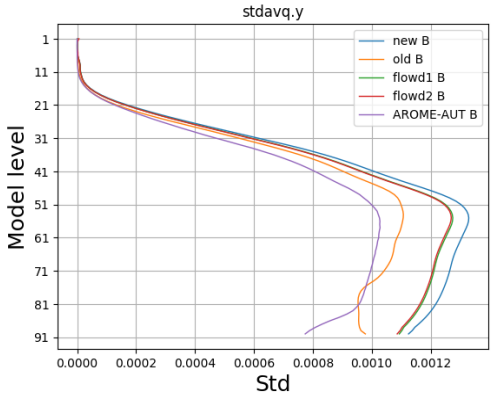
- Fertoe: Podersdorf 11084 assume 8h mean T2m=T-Lake
- Balaton: Siofok 12935 assume 12h mean T2m=T-Lake

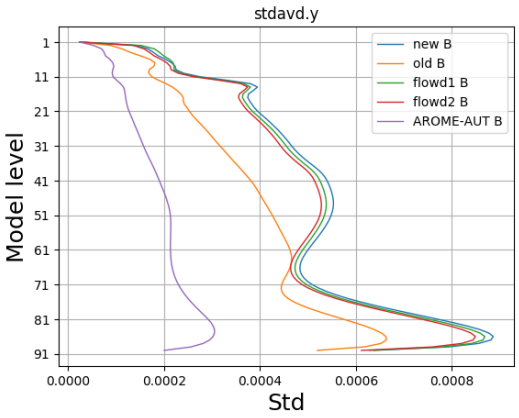


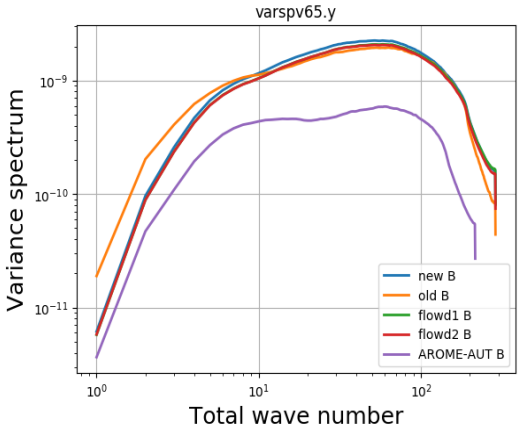
T2mfertoe=24°C Twaterobs=23°C
T2m Balaton=24°C Twaterobs=26°C

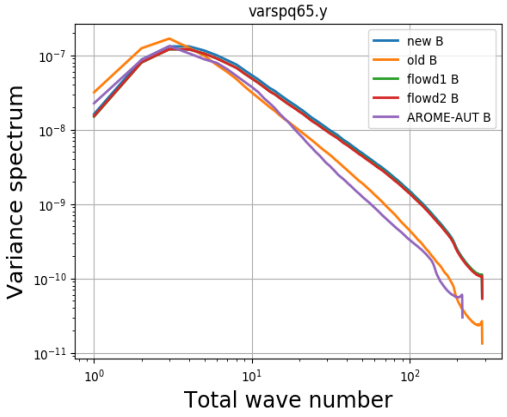
B-Matrix properties

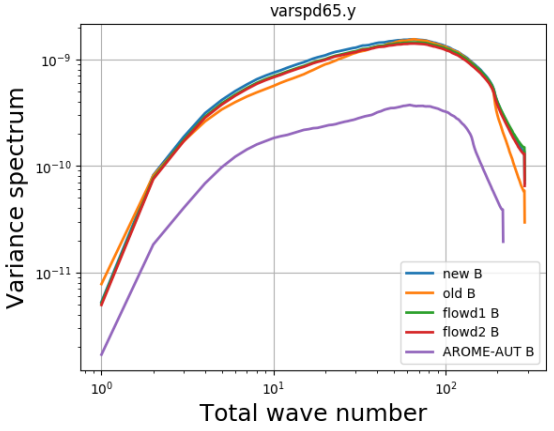




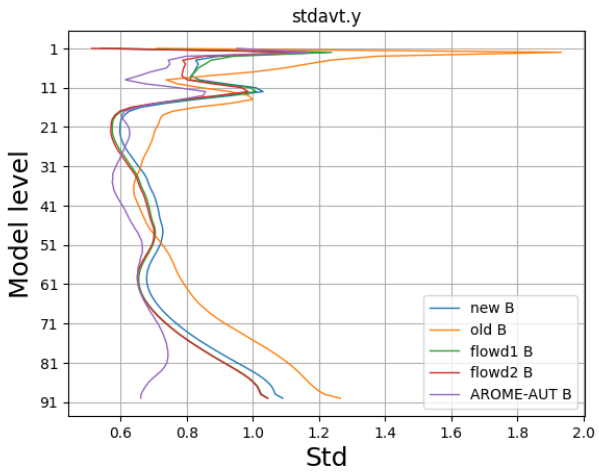


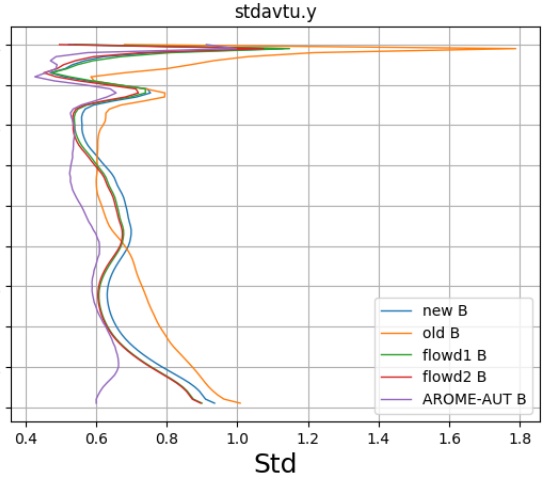


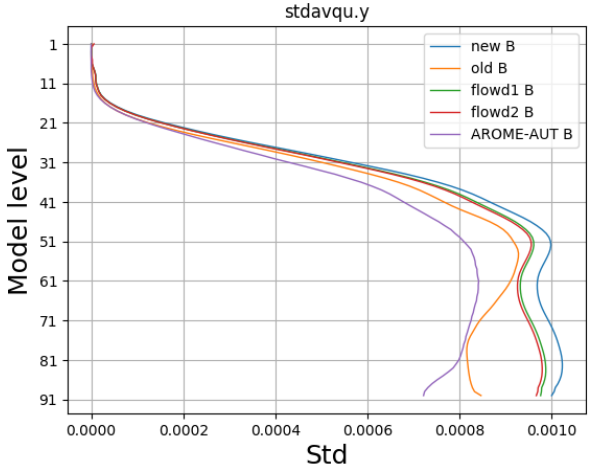


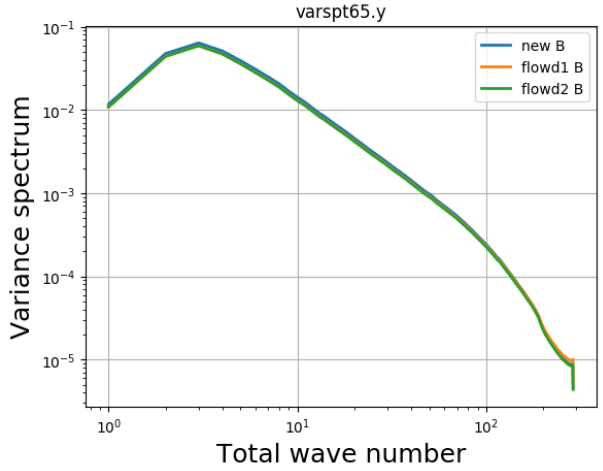


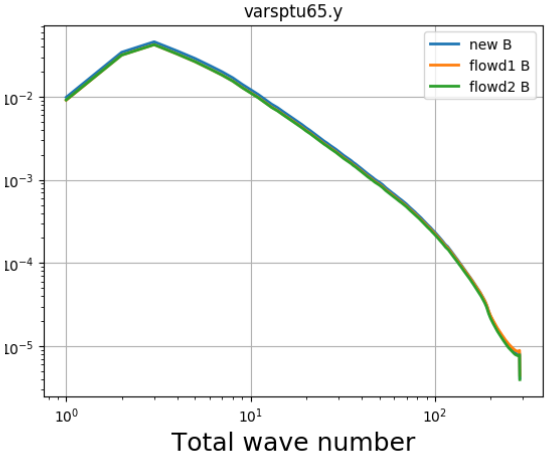
B-Matrix properties

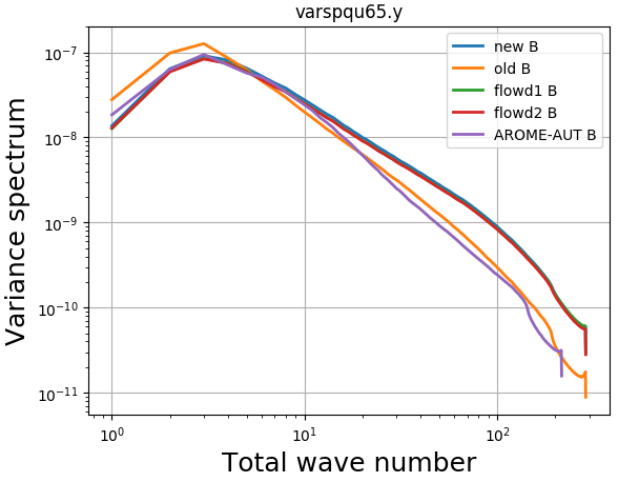
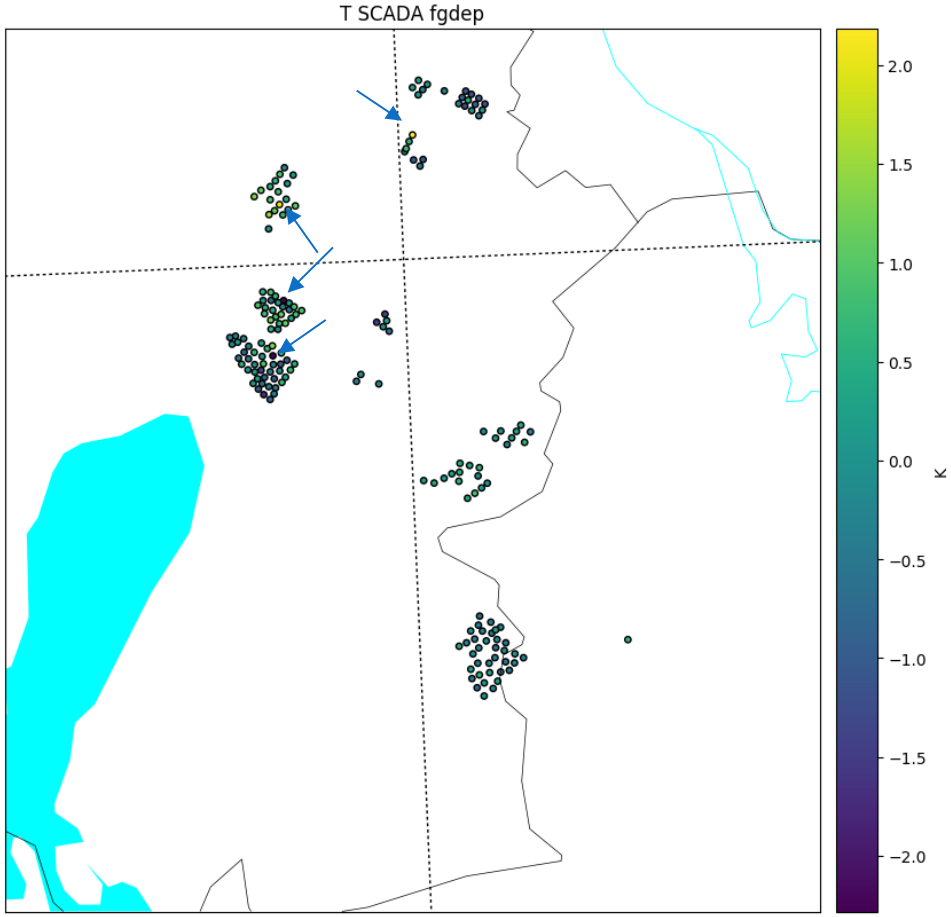
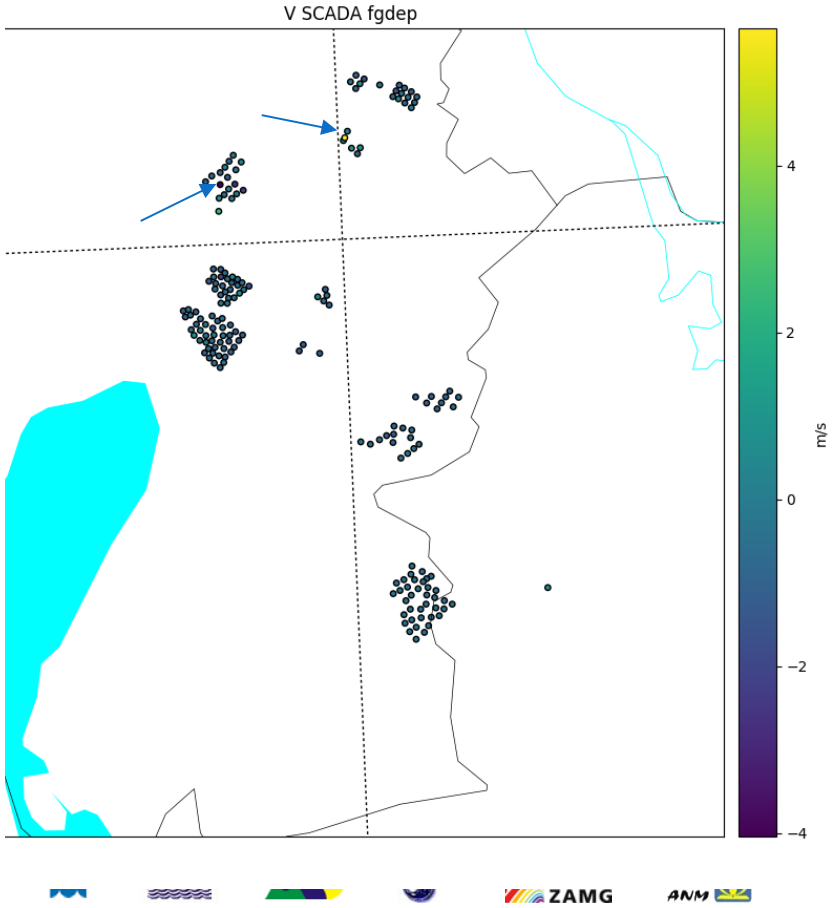








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