

Zentralanstalt für Meteorologie und Geodynamik



Summary of ALADIN/LACE activities at ZAMG

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SRNWP meeting 2010, Zürich, Switzerland

Actual data assimilation projects at ZAMG

- SURFEX with ASCAT data
- CANARI / CANARI+3DVAR
 - 3DVAR with GPS data



Actual data assimilation projects at ZAMG

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SURFEX (SURFace EXternalisée)

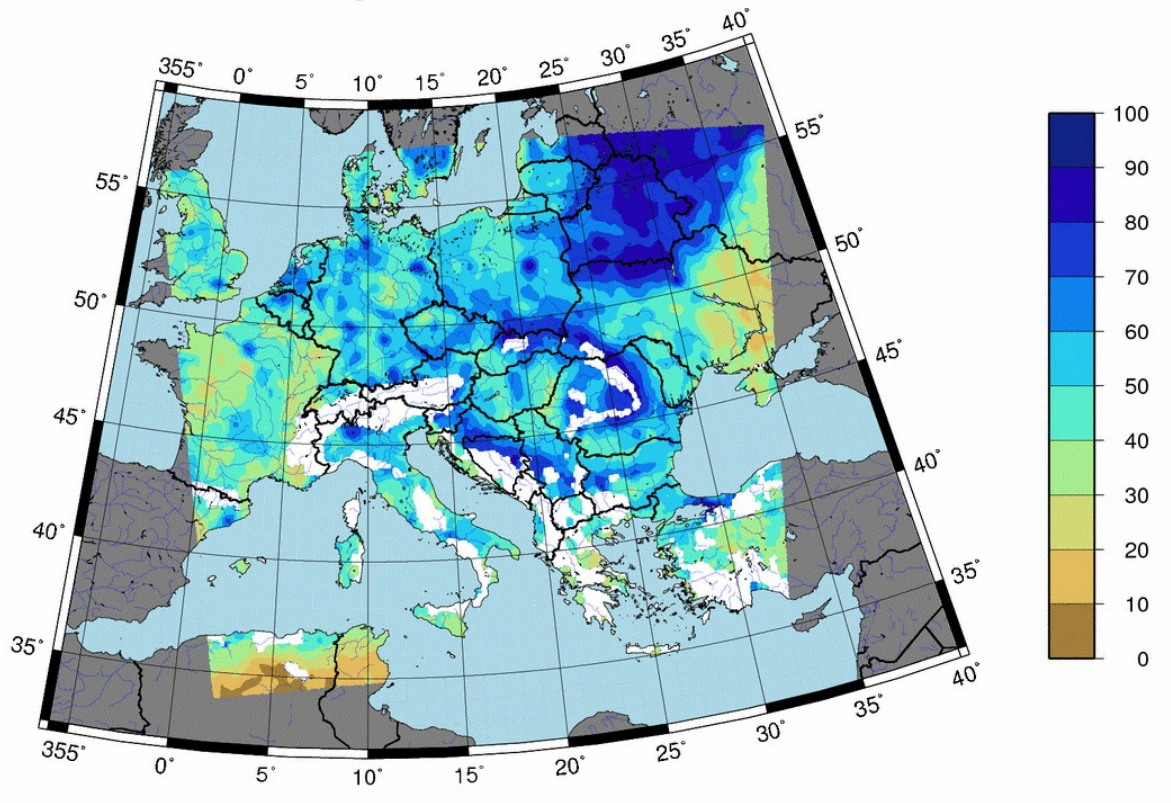
- assimilation based on the Simplified Extended Kalman Filter (EKF)
- version: 4.8
- prognostic variables: wg, w2, Ts, T2
- data to assimilate: soil moisture, T2M, RH2M
- data screening: CDF matching, quality flags

- 6hourly assimilation cycle every 6 hours
- offline mode





mean ASCAT soil moisture for January-June 2010



Advanced Scatterometer
on board METOP

polar orbiting satellite
active Scatterometer
microwave spectrum
($\lambda=5.7\text{cm}$)

spatial resolution: 25km
temporal resolution: $\sim 1.5\text{d}$
Data availability: ~ 2 hours
after the measurement

soil moisture values valid
for 0-2cm depth

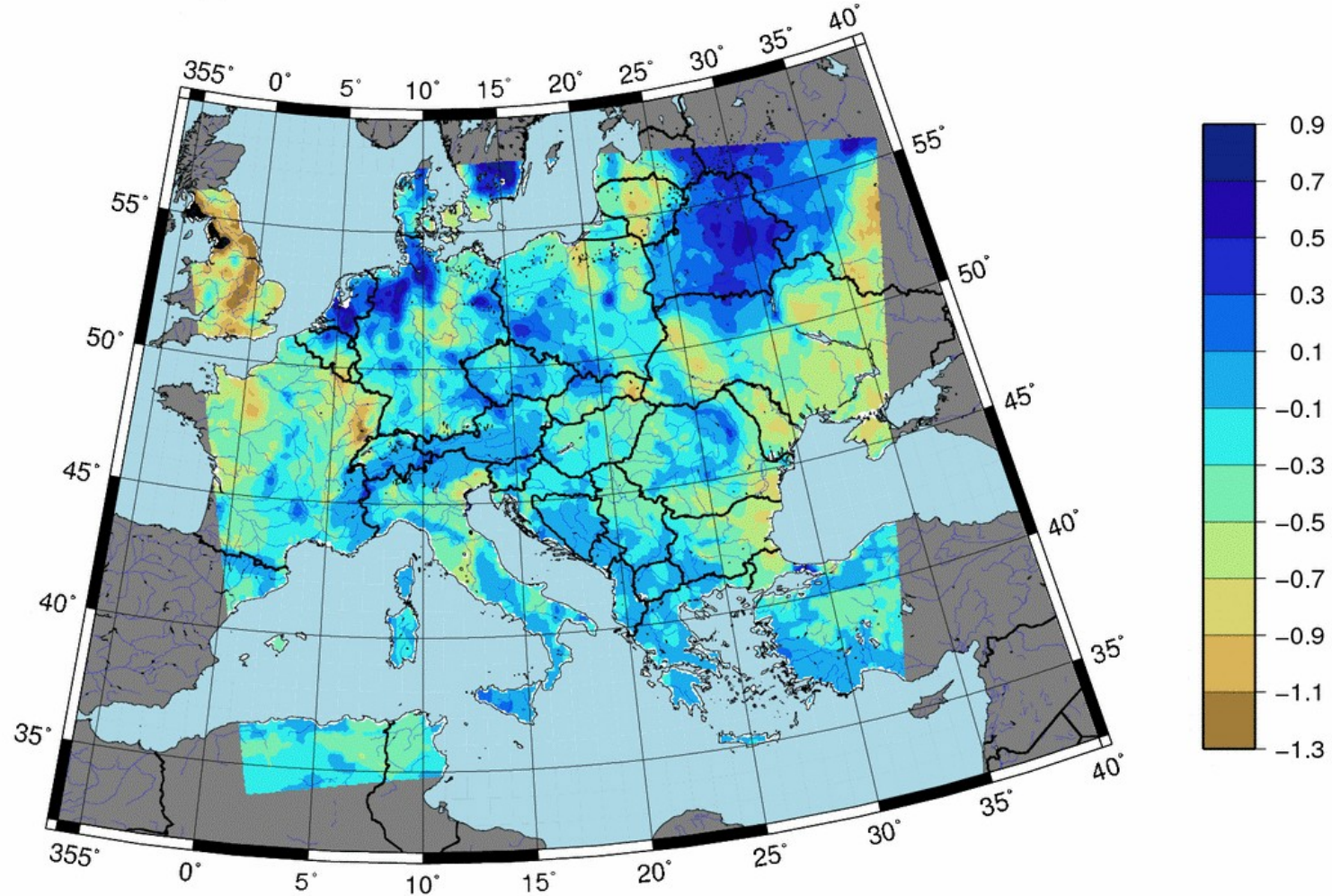
http://www.zamg.ac.at/satweb/Kunden/HSAF_products/h07/





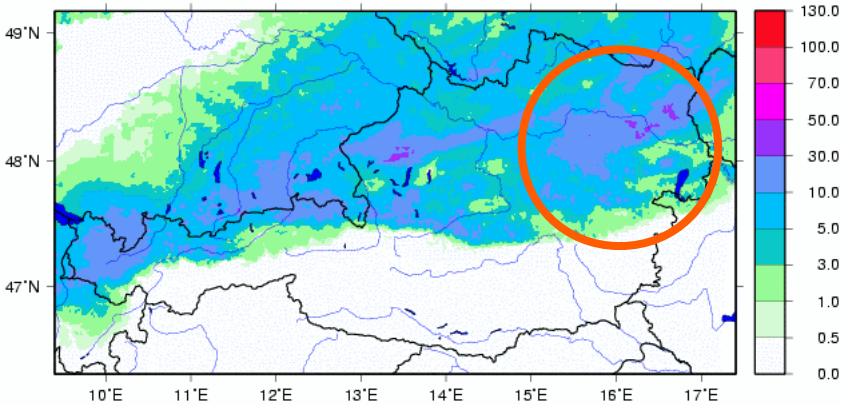
analysis increments

ANAL_INCR WG1 20100720-20100730

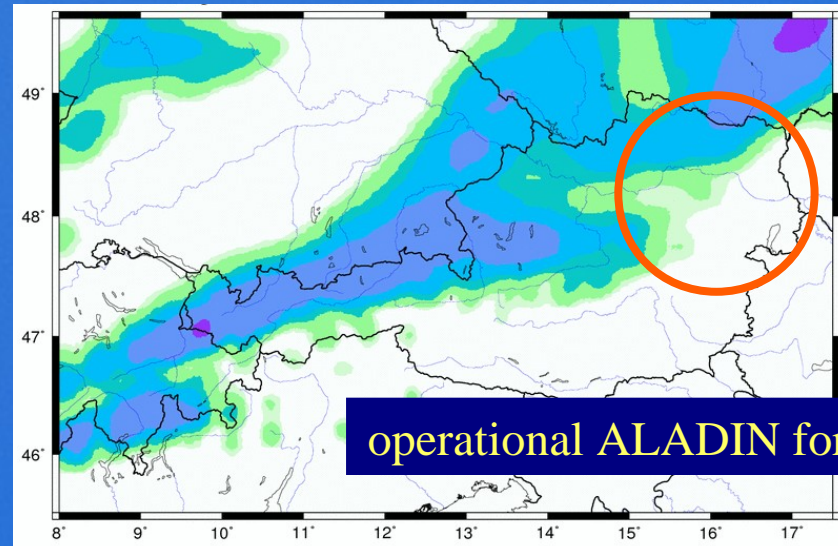


Case study of a severe thunderstorm in Vienna on July 23rd, 2009

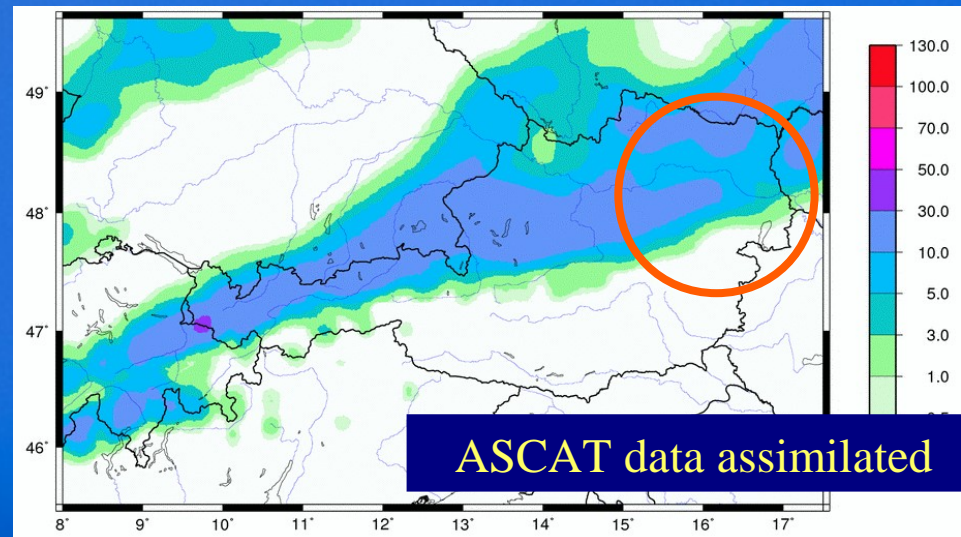
INCA Precip. Analysis [mm] 20090724 00 UTC, 06 h sum



INCA precipitation analysis
23.7.2009, 18-00UTC



operational ALADIN forecast

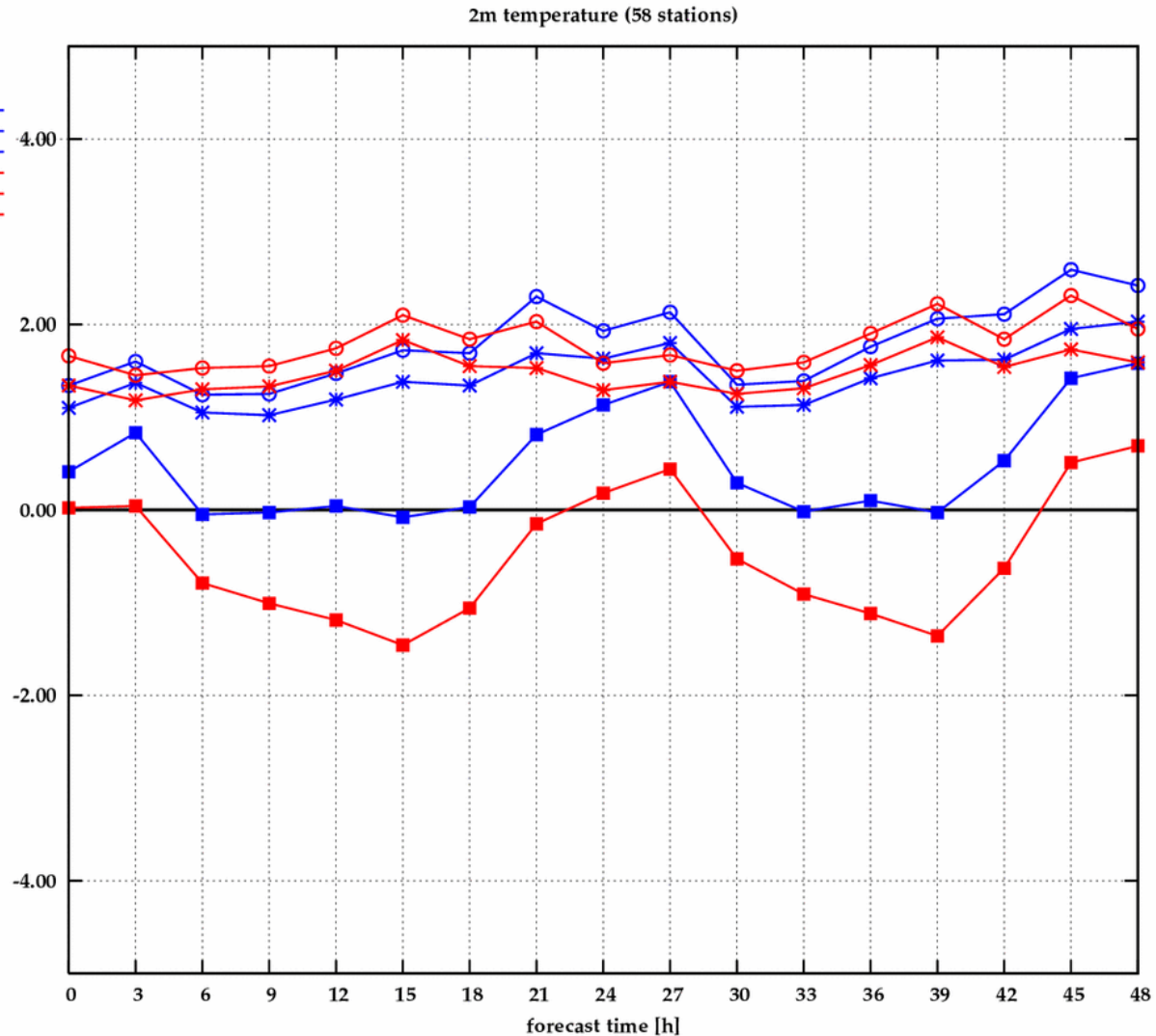


ASCAT data assimilated

verification of forecasted 2m-temperature for July 2009

Station verification:
 period: 20090720 - 20090730
 run: OPER 00 vs EX42 00
 stations: 58
 parameter: 2m temperature

mMAE OPER 00 *
 mBIAS OPER 00 ■
 mRMSE OPER 00 ○
 mMAE EX42 00 *
 mBIAS EX42 00 ■
 mRMSE EX42 00 ○

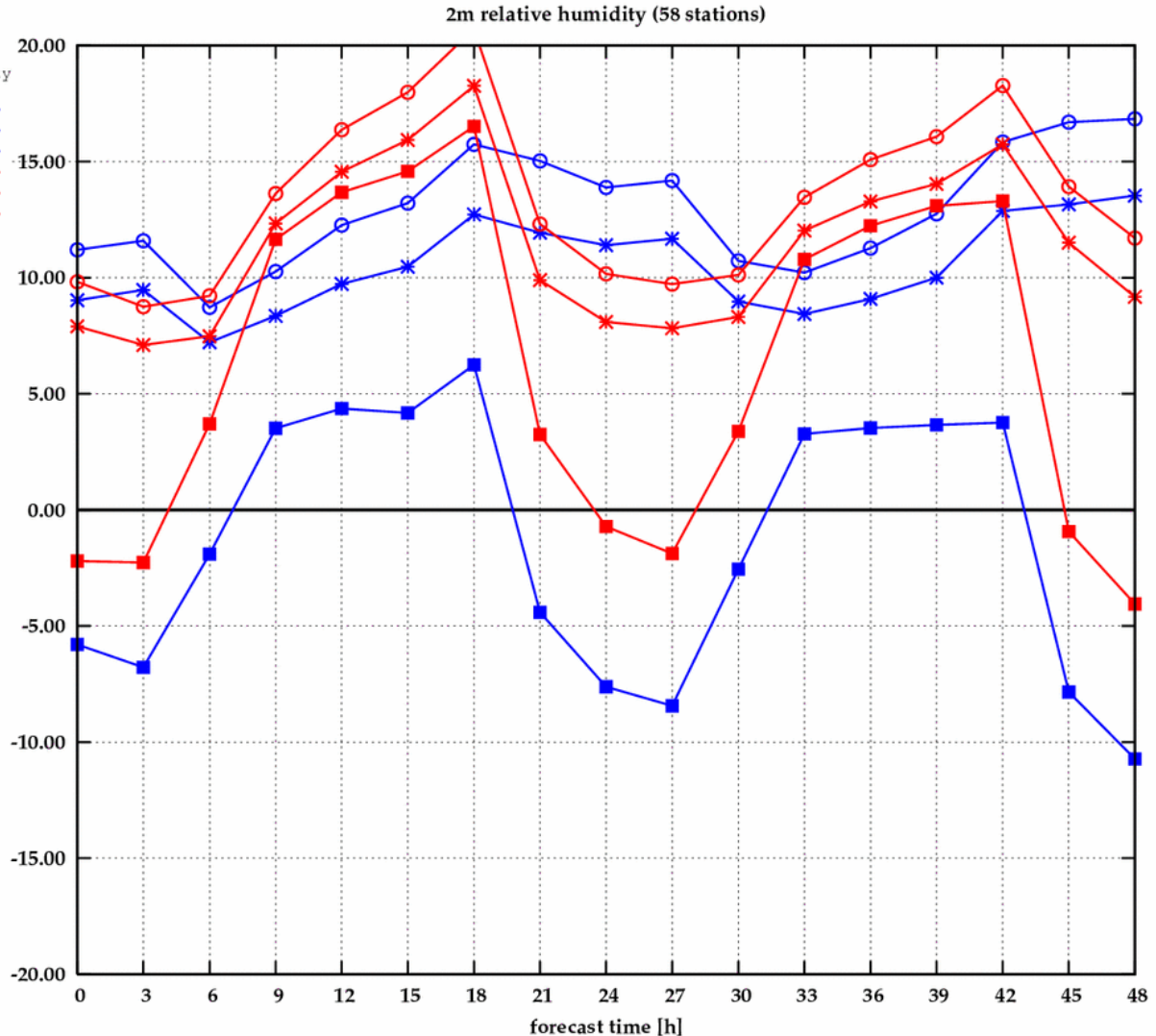




verification of forecasted 2m-relative humidity for July 2009

Station verification:
 period: 20090720 - 20090730
 run: OPER 00 vs EX42 00
 stations: 58
 parameter: 2m relative humidity

- mMAE OPER 00 * (blue asterisk)
- mBIAS OPER 00 ■ (blue square)
- mRMSE OPER 00 ○ (blue circle)
- mMAE EX42 00 * (red asterisk)
- mBIAS EX42 00 ■ (red square)
- mRMSE EX42 00 ○ (red circle)





SURFEX

- + improvement for single events
 - + Preoperational test suite is technically ready to start
 - BIAS correction needs to be improved
 - boundary layer is too moist on average – RH2M
 - too much convective initiation
- further tuning of the model is required



Actual data assimilation projects at ZAMG

- SURFEX with ASCAT data
- CANARI / CANARI+3DVAR
 - 3DVAR with GPS data





CANARI (Code d'Analyse Nécessaire à ARPEGE pour ses Rejets et son Initialisation)

- cy32t1 for assimilation
- cy35t1 for forecast (927/001/FPOS)
- assimilated parameters: T2M, RH2M (OPLACE and ZAMG database)
- prognostic variables:
 - SURFRESERV.EAU
 - SURFTEMPERATURE
 - SURFRESERV.NEIGE
 - SURFRESERV.INTER
 - SURFRESERV.GLACE
 - PROFTEMPERATURE
 - PROFRESERV.EAU
 - PROFRESERV.GLACE



results : OPER (blue) vs OPLACE+TAWES (red)

SAL verification
 period: 20100124 - 20100208
 domain 00: 10KM_OESTERREICH_GESAMT
 lon: 09.50 - 17.30
 lat: 46.10 - 49.20
 gridpoints: 1972 (58 x 34)
 dx, dy- 10km

FORECAST RANGE: 0 - 72, DT: 06 h

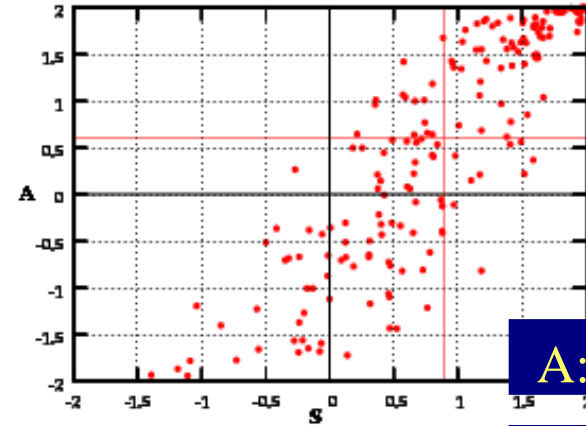
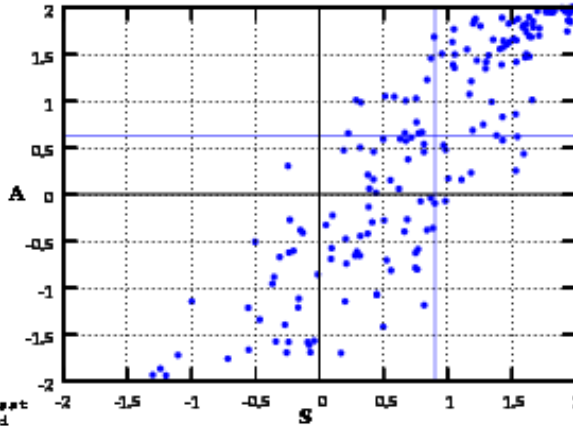
	event type:	EX01	EX19
	total:	192	192
A	(obs=yes, mod=yes):	189	189
B	(obs=no, mod=yes):	003	003
C	(obs=yes, mod=no):	000	000
D	(obs=no, mod=no):	000	000

EX01 EX19

AMPLITUDE SCORE A [-2:+2]:
 0: perfect QPF forecast
 -2: QPF underestimated
 +2: QPF overestimated

STATISTICS for A:

	EX01	EX19
mean :	0.62	0.60
stdev:	1.21	1.22
var :	1.47	1.49
max :	2.00	2.00
min :	-1.94	-1.94

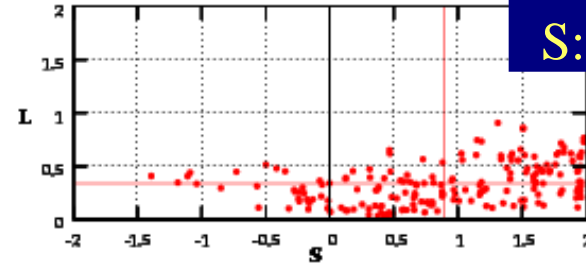
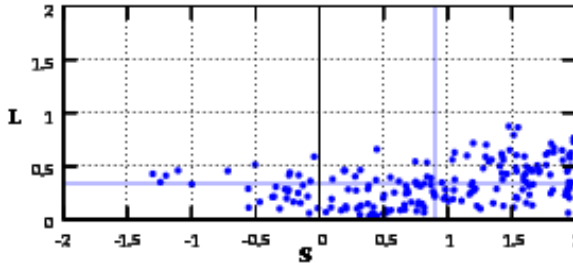


A: 0.62 vs 0.60

STRUCTURE SCORE S [-2:+2]:
 0: perfect structure forecast
 -2: objects too small/peaked
 +2: objects too large/flat

STATISTICS for S:

	EX01	EX19
mean :	0.90	0.89
stdev:	0.80	0.80
var :	0.64	0.64
max :	1.98	1.98
min :	-1.30	-1.39

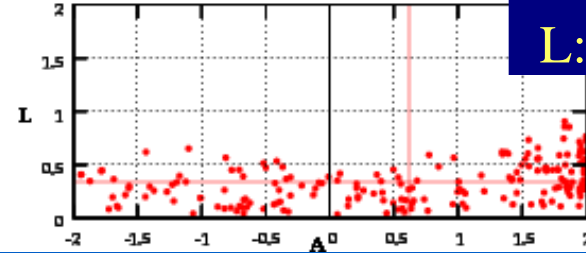
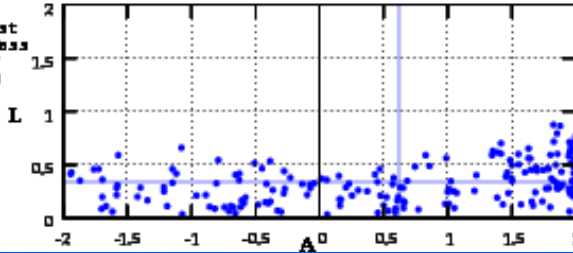


S: 0.90 vs 0.89

LOCATION SCORE L [0:+2]:
 0: perfect location forecast
 +2: wrong center of Total Mass
 and/ or Center (TCM) of
 objects relative to TCM

STATISTICS for L:

	EX01	EX19
mean :	0.34	0.34
stdev:	0.19	0.19
var :	0.04	0.04
max :	0.87	0.91
min :	0.03	0.03



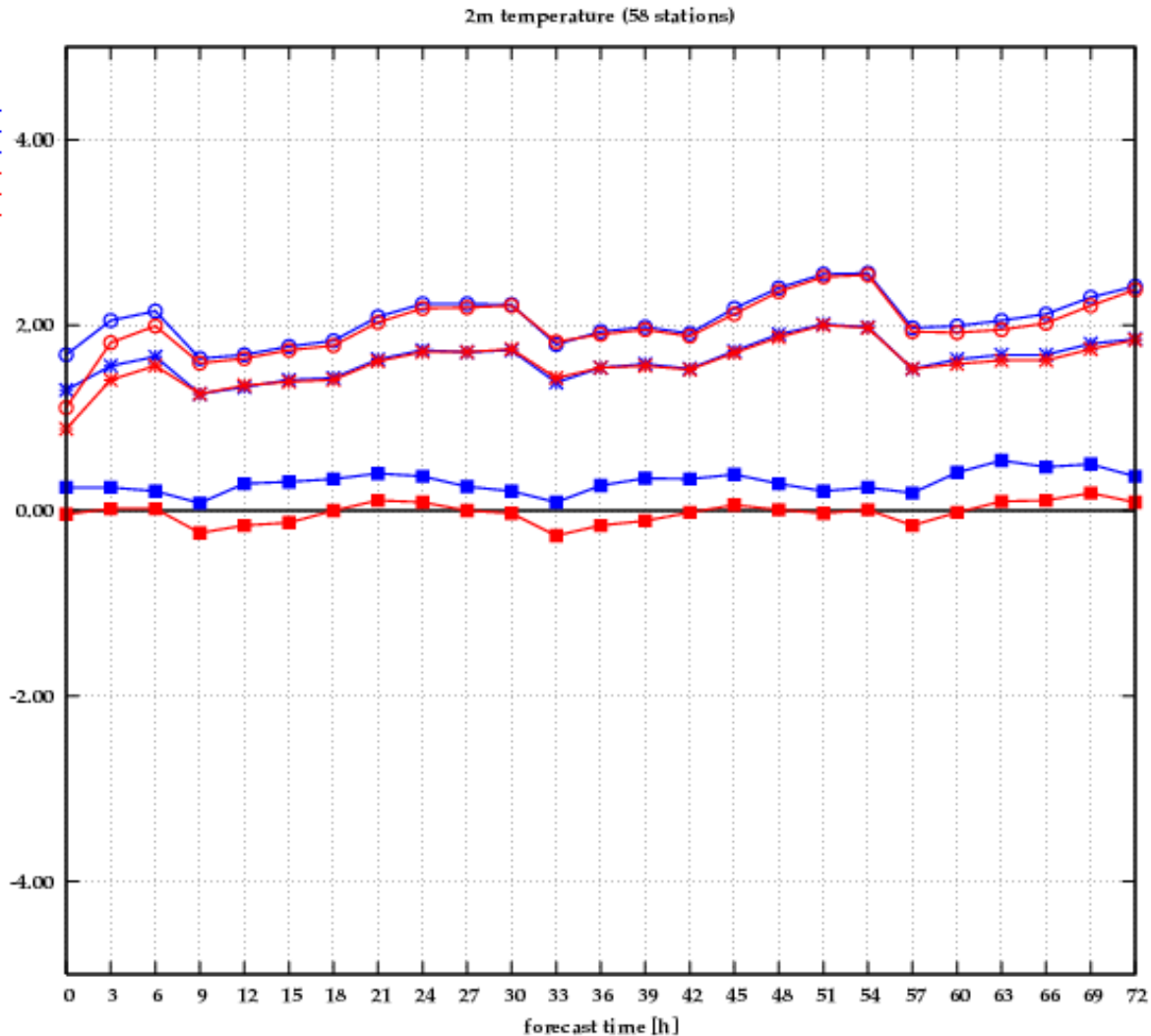
L: 0.34 vs 0.34



results : OPER (blue) vs OPLACE+TAWES (red)

Station verification:
 period: 20100124 - 20100209
 run: EX41 00 vs EX19 00
 stations: 50
 parameter: 2m temperature

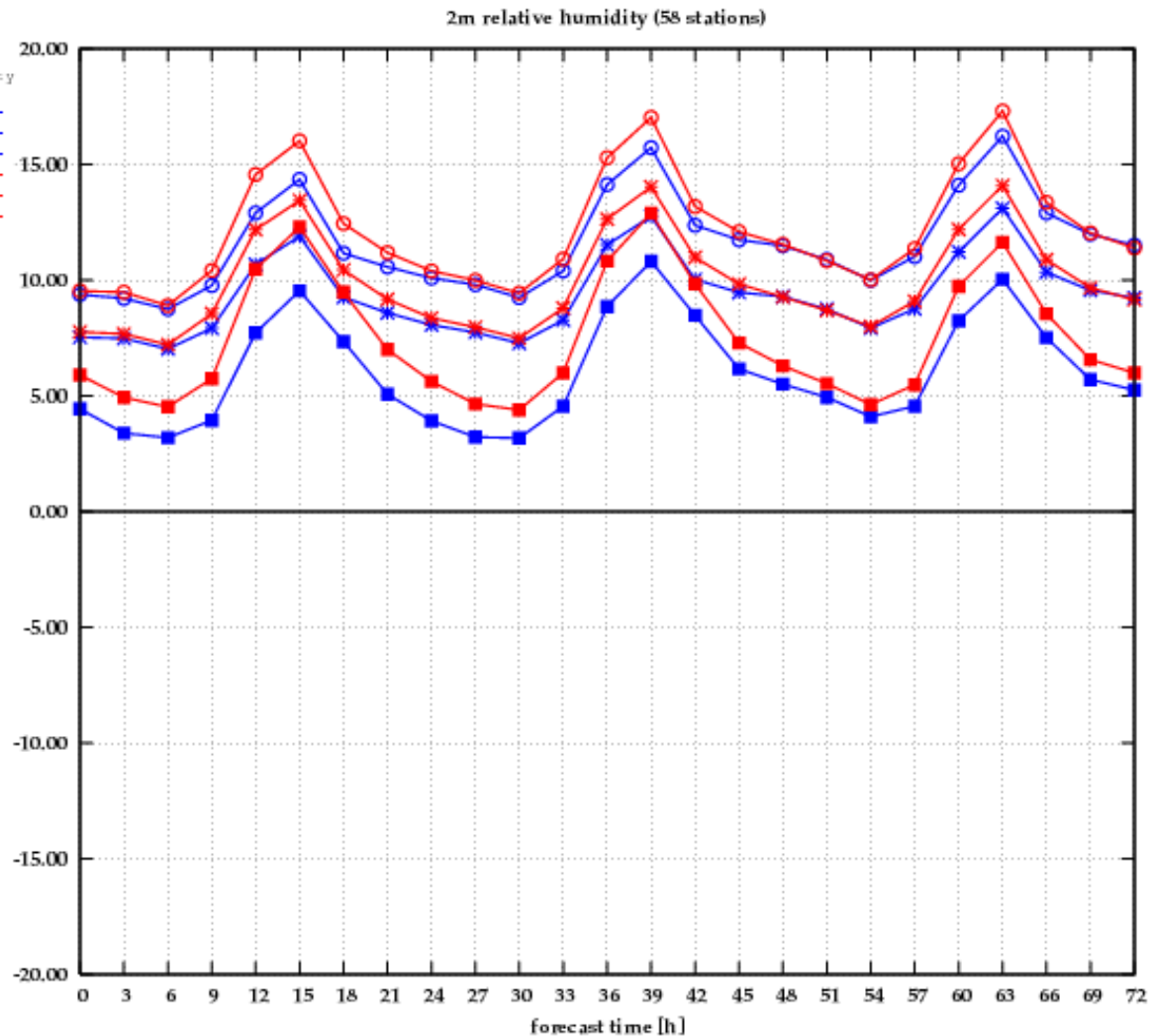
mMAE EX41 00 *
 mBIAS EX41 00 ■
 mRMSE EX41 00 ○
 mMAE EX19 00 *
 mBIAS EX19 00 ■
 mRMSE EX19 00 ○



results : OPER (blue) vs OPLACE+TAWES (red)

Station verification:
 period: 20100124 - 20100209
 run: KK41 00 vs KK19 00
 stations: 50
 parameter: 2m relative humidity

mMAE EX41 00 *
 mBIAS EX41 00 ■
 mRMSE EX41 00 ○
 mMAE EX19 00 *
 mBIAS EX19 00 ■
 mRMSE EX19 00 ○





results : OPLACE (blue) vs OPLACE+TAWES (red)

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 domain 00: 10KM_CENTRALREICH_GESAMT
 lon: 09.50 - 17.30
 lat: 46.10 - 49.20
 gridpoints: 1972 (58 x 34)
 dx, dy- 10km

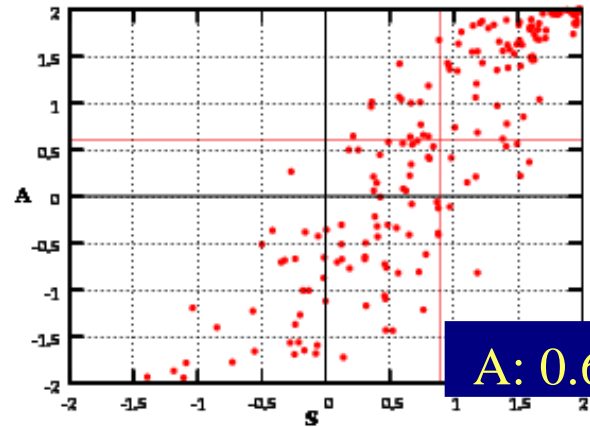
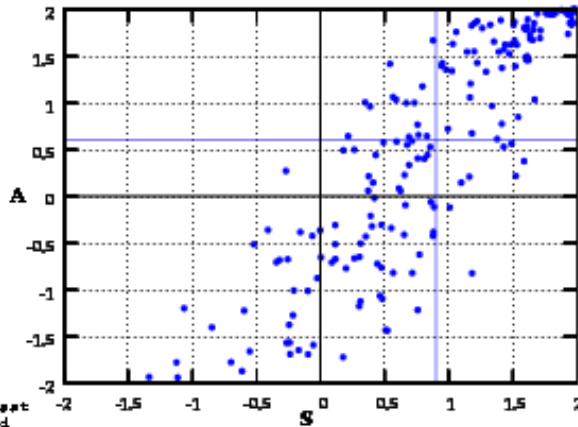
FORECAST RANGE: 0 - 72, DT: 06 h

	event type:	EX20	EX19
	total:	192	192
A	(obs=yes, mod=yes):	189	189
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C	(obs=yes, mod=no):	000	000
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STATISTICS for A:

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mean :	0.60	0.60
stdev:	1.22	1.22
var :	1.49	1.49
max :	2.00	2.00
min :	-1.94	-1.94

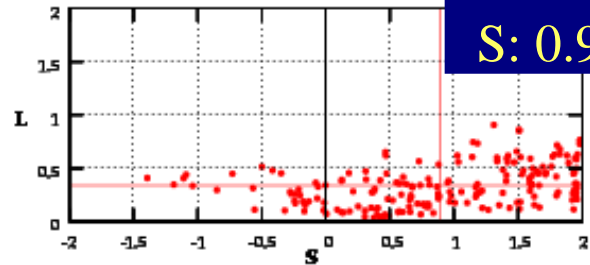
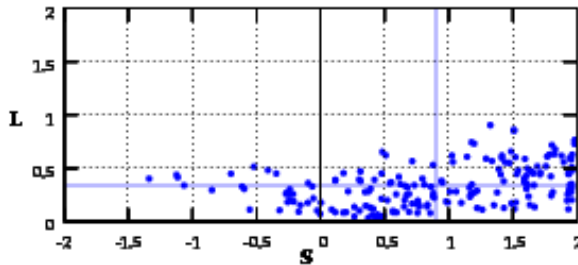


A: 0.60 vs 0.60

STRUCTURE SCORE S [-2:+2]:
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 -2: objects too small/peaked
 +2: objects too large/flatt

STATISTICS for S:

	EX20	EX19
mean :	0.90	0.89
stdev:	0.79	0.80
var :	0.63	0.64
max :	1.98	1.98
min :	-1.34	-1.39

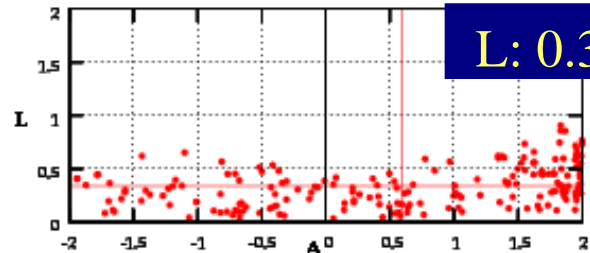
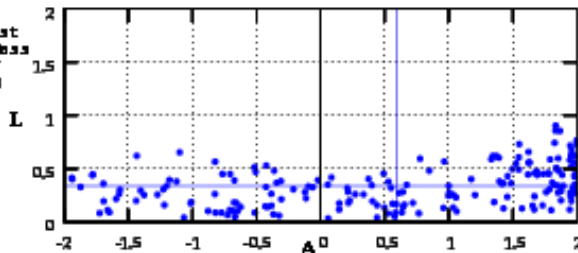


S: 0.90 vs 0.89

LOCATION SCORE L [0:+2]:
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STATISTICS for L:

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mean :	0.34	0.34
stdev:	0.19	0.19
var :	0.04	0.04
max :	0.90	0.91
min :	0.03	0.03



L: 0.34 vs 0.34

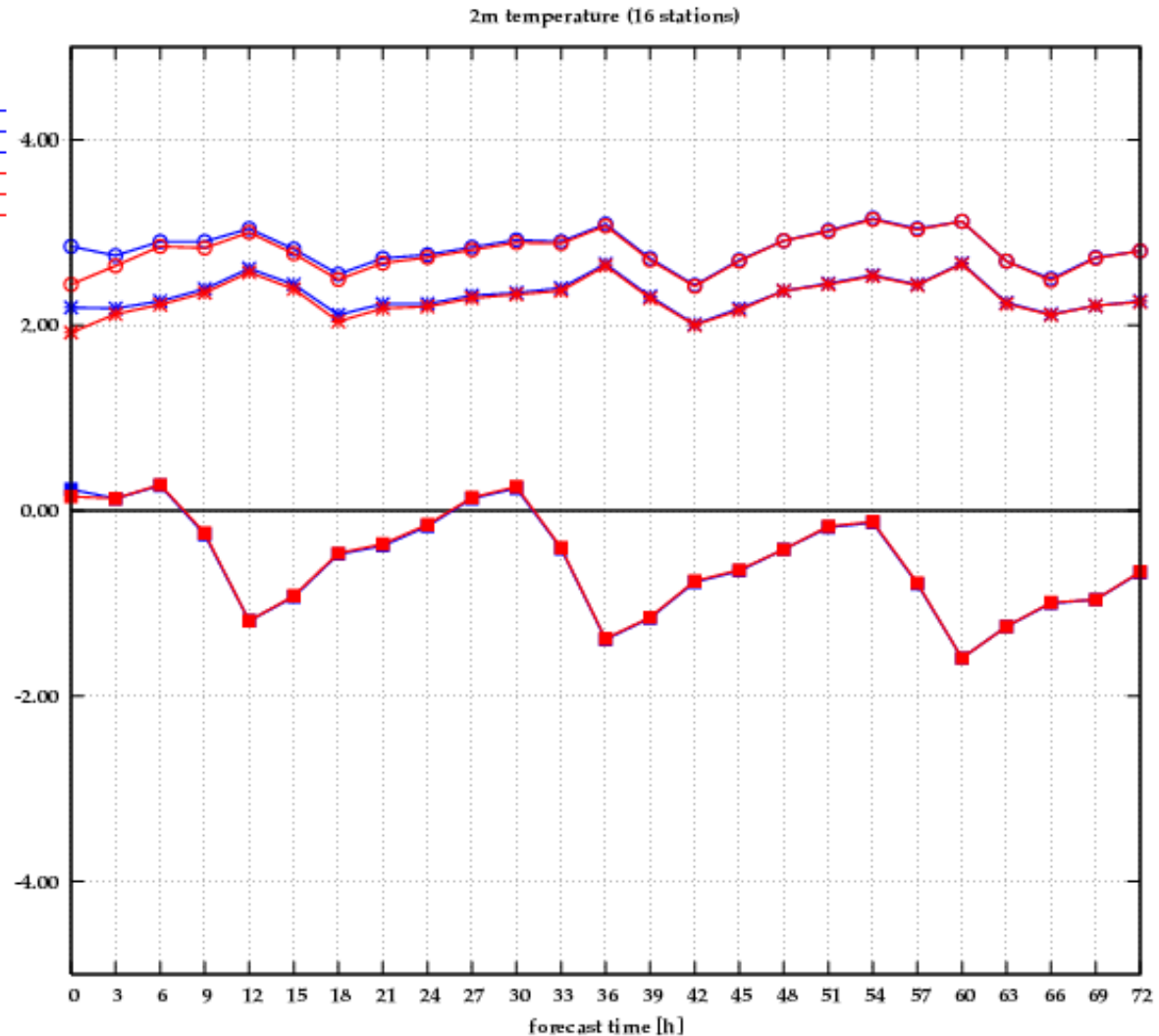




results : OPLACE (blue) vs OPLACE+TAWES (red)

Station verification:
 period: 20100124 - 20100209
 run: KK20 00 vs KK19 00
 stations: 16
 parameter: 2m temperature

mMAE EX20 00 *
 mBIAS EX20 00 ■
 mRMSE EX20 00 ○
 mMAE EX19 00 *
 mBIAS EX19 00 ■
 mRMSE EX19 00 ○

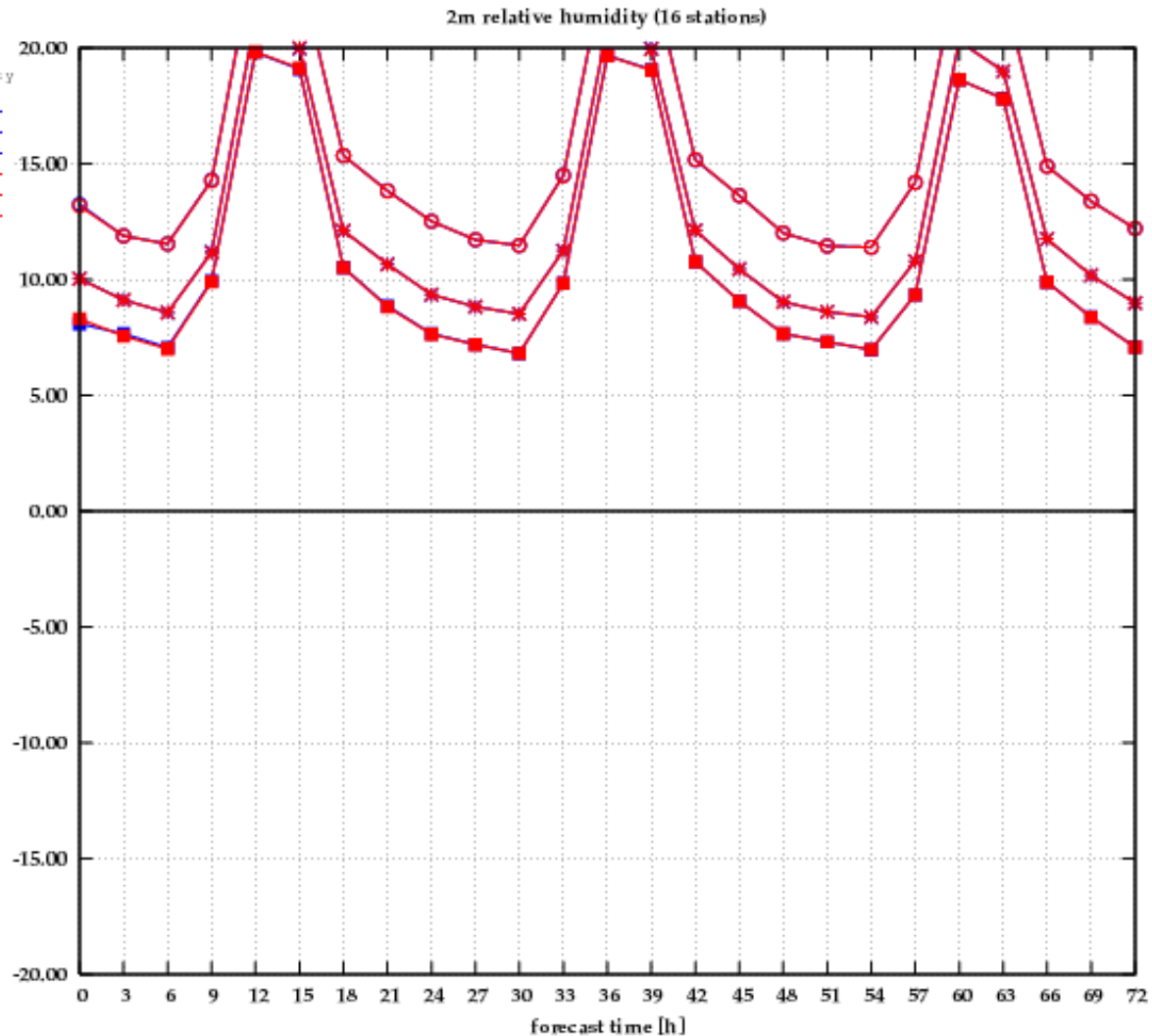




results : OPLACE (blue) vs OPLACE+TAWES (red)

Station verification:
 period: 20100124 - 20100209
 run: KK20 00 vs KK19 00
 stations: 16
 parameter: 2m relative humidity

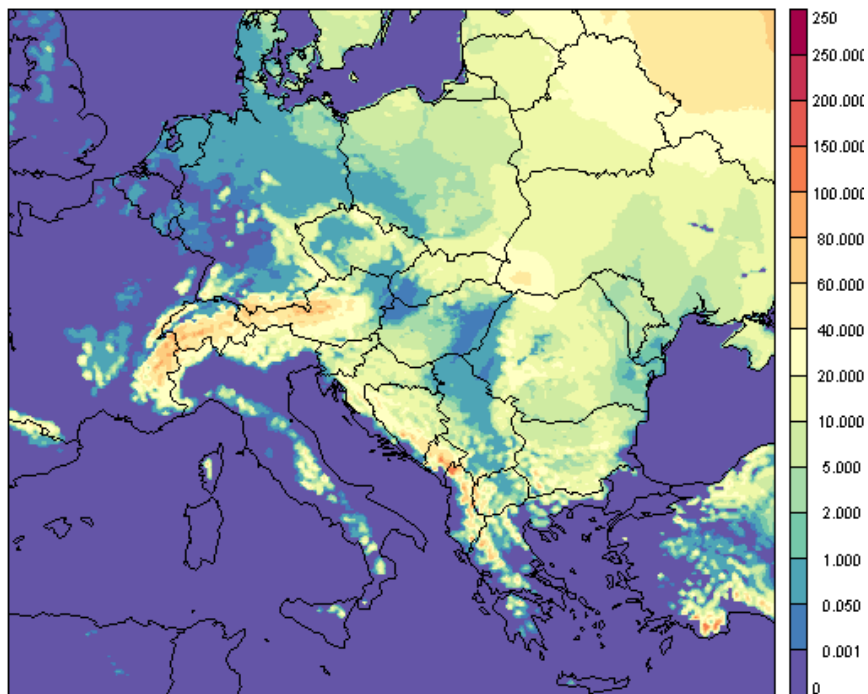
mMAE EX20 00 *
 mBIAS EX20 00 ■
 mRMSE EX20 00 ○
 mMAE EX19 00 *
 mBIAS EX19 00 ■
 mRMSE EX19 00 ○



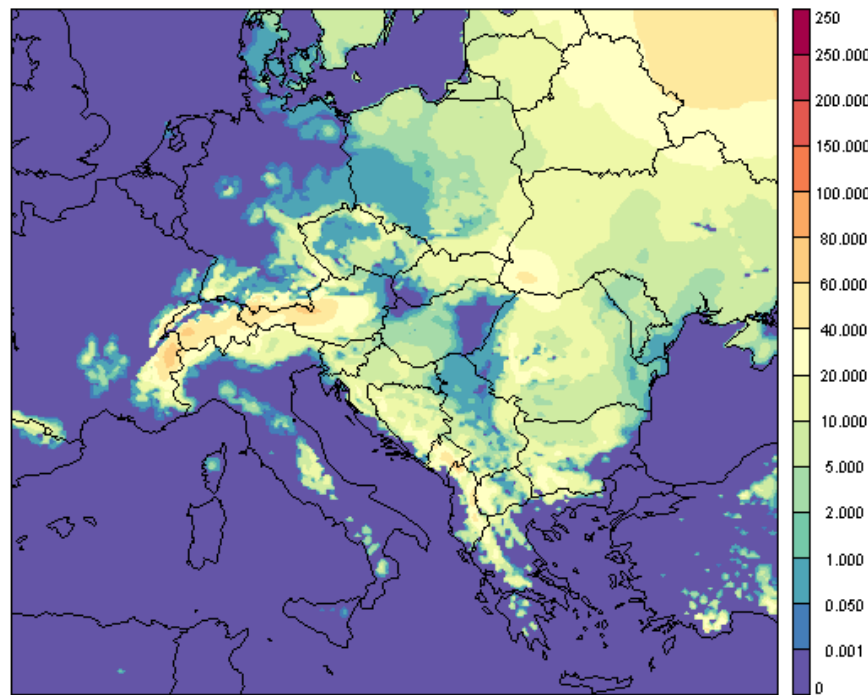


results : snow cover

SNOW CANARI 2010020800+00h



SNOW OPER 2010020800+00h



kg/m²

More snow in CANARI due to relaxation towards climate file values.





CANARI

- + preoperational cycle is working since 2010
- + combined with 3DVAR
- + improvement for 2m & precipitation forecasts
- + tests with cy36t1 started

- snow cover in winter
- no long time verification for winter



Thank you for your attention!

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Surface assimilation:

SYNOP+TAWES: T_{2m} , RH_{2m} (OPLACE/ZAMG database)

3D-Var:

SYNOP+TAWES: Φ , T_{2m} , RH_{2m} (ZAMG database)

SHIP: U , V , T , RH , Φ (ZAMG database)

TEMP: U , V , T , q , Φ (OPLACE data)

AIREP: U , V , T (OPLACE data)

Windprofiler: U , V (OPLACE data)

SAT (ATOVS, AMSU-A/B): Radiance (OPLACE data)

SAT (GEOWIND): U , V (OPLACE data)

