Zentralanstalt für Meteorologie und Geodynamik

ASCAT soil moisture data assimilation with SURFEX

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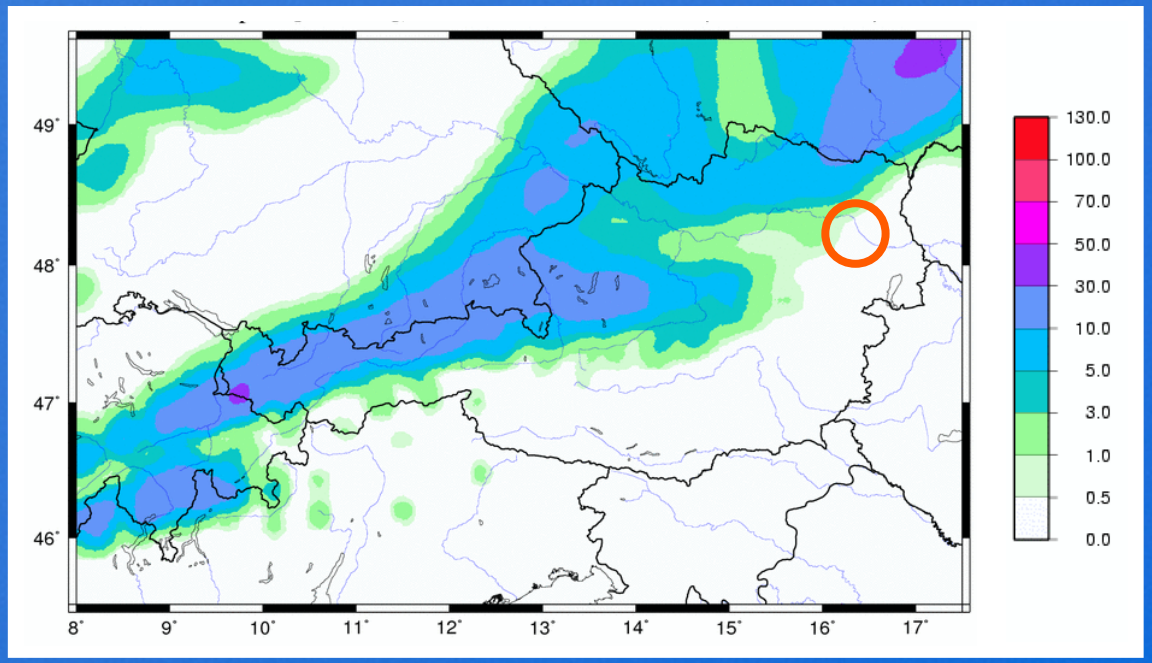
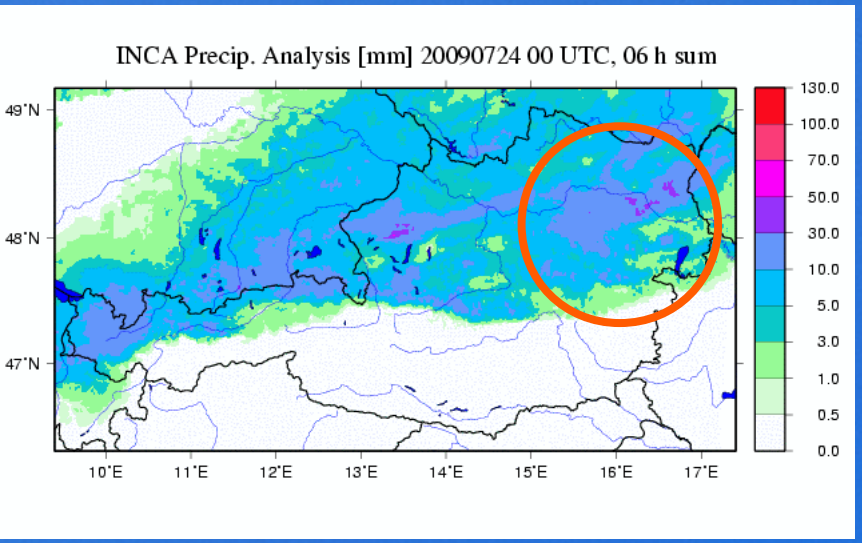
20th ALADIN Workshop & HIRLAM ASM 2010, 13-16 April, 2010, Cracow, Poland

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

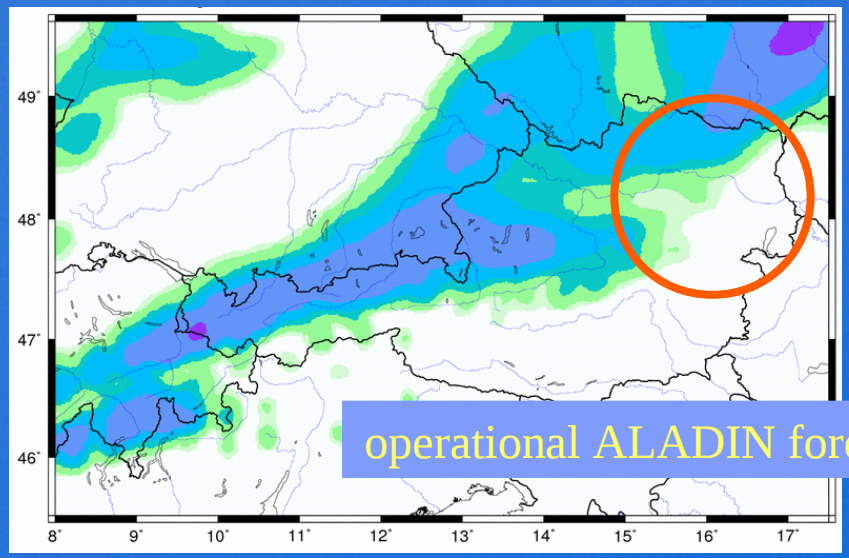
operational ALADIN precipitation forecast:
23.7.2009, 00UTC-run for 23.7.2009 18-24UTC



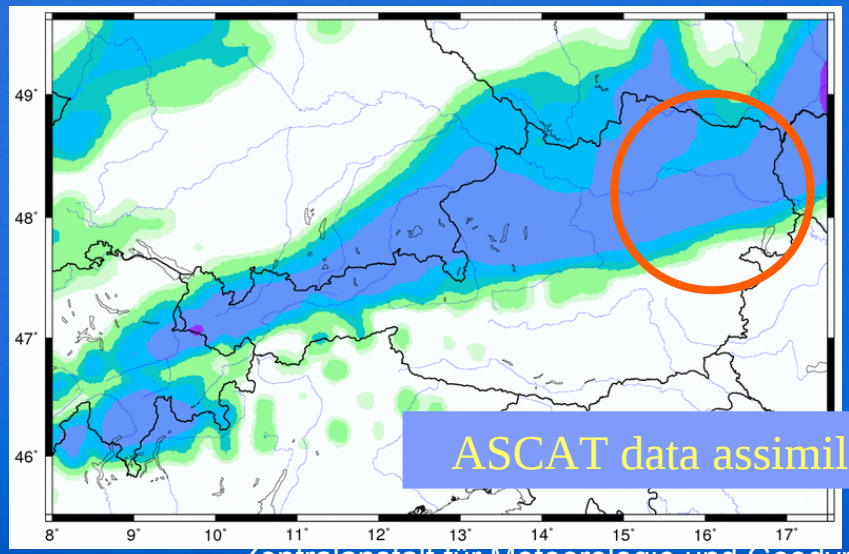
Case study of a severe thunderstorm over Vienna on July 23rd, 2009



INCA precipitation analysis
23.7.2009, 18-00UTC



operational ALADIN forecast

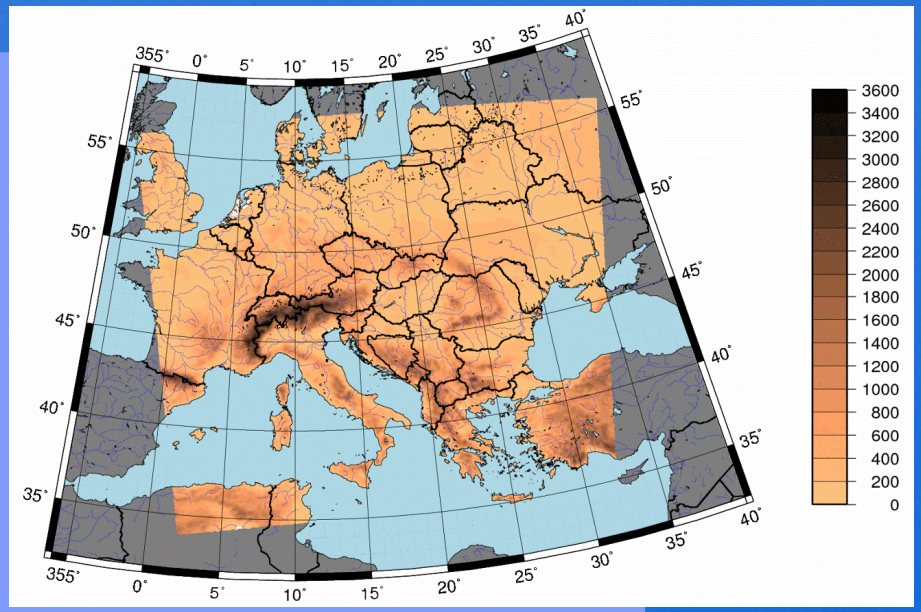


ASCAT data assimilated

motivation

downloaded from:
http://www.focus.de/fotos/persil-werbung-im-jahr-1952-undnbspim-zweiten-weltkrieg-war-das_mid_218305.html

A more detailed look …



ALADIN

Model version: CY35T1
Horizontal resolution: 9.6km
Vertical resolution: 60 layers
Time step: 415.385 seconds
Forecast range: 72h
Coupling frequency: 3h
Calculated 4 times/day at ZAMG on NEC SX-8R

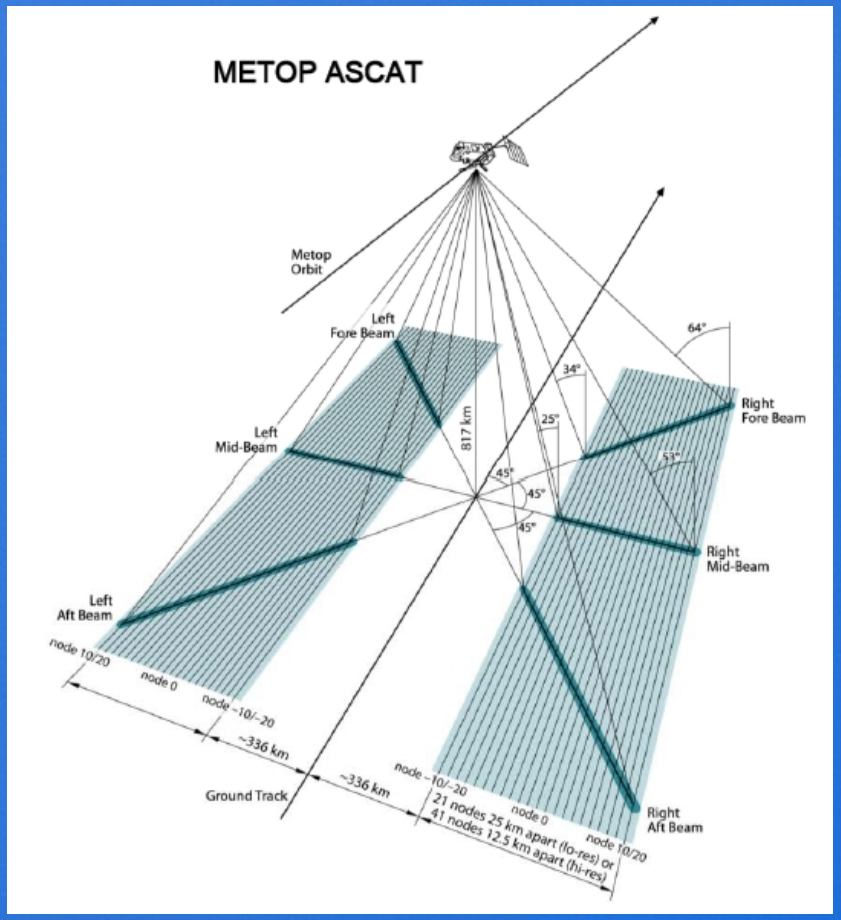
SURFEX (SURFace EXternalisée)

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

- observation error: 0.4 (fraction of SWI)
- initial background error: 0.1 (fraction of SWI)
- size of perturbation of wg for finite Jacobians: 0.0001

- 6hourly assimilation cycle every 6 hours

ASCAT



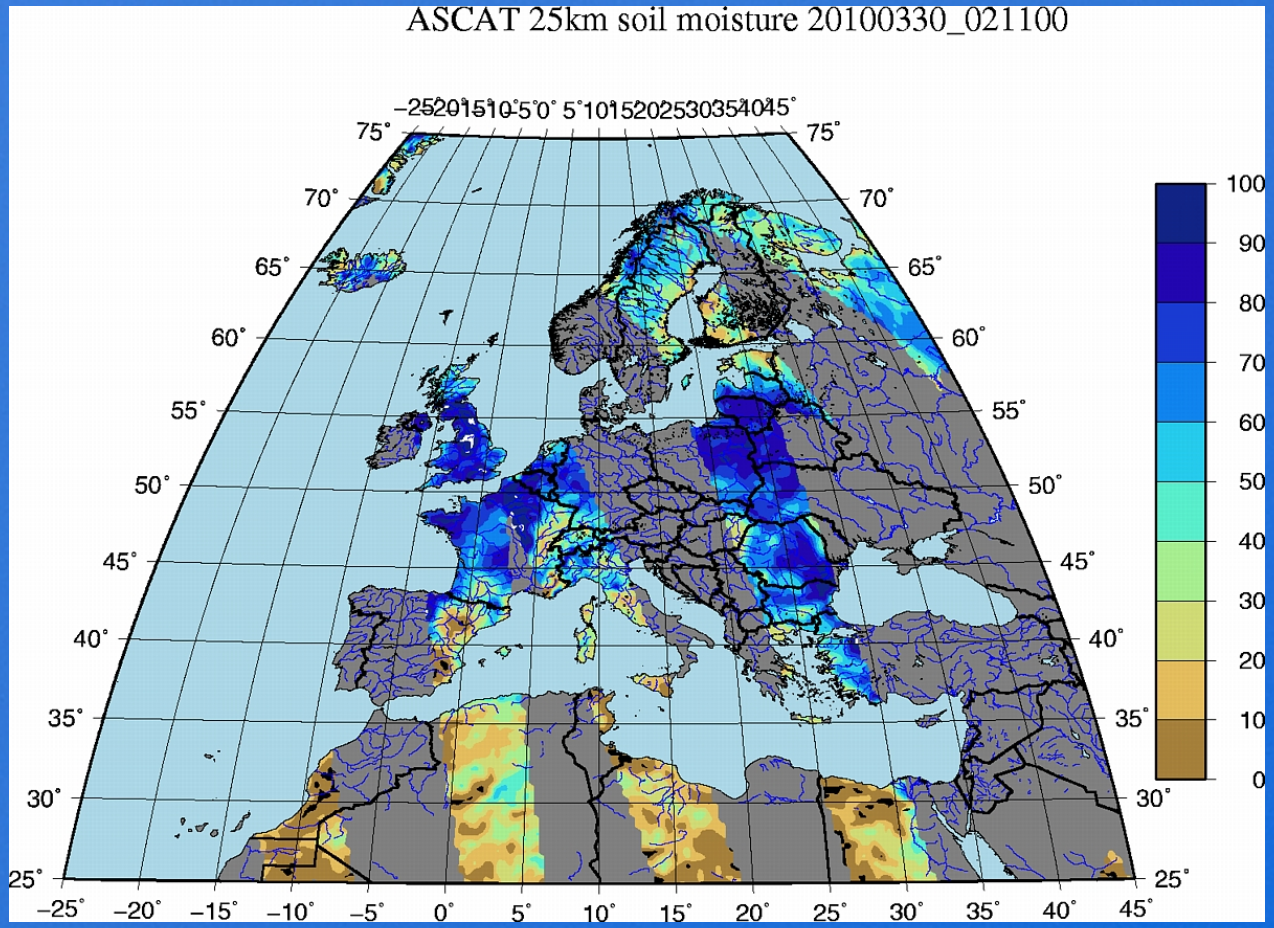
Advanced Scatterometer
on board METOP

polar orbiting satellite
active Scatterometer
microwave spectrum (λ=5.7cm)

spatial resolution: 25km
temporal resolution: ~1.5 days
Data availability: ~2 hours after the measurement

soil moisture value valid for 0-2cm depth

ASCAT

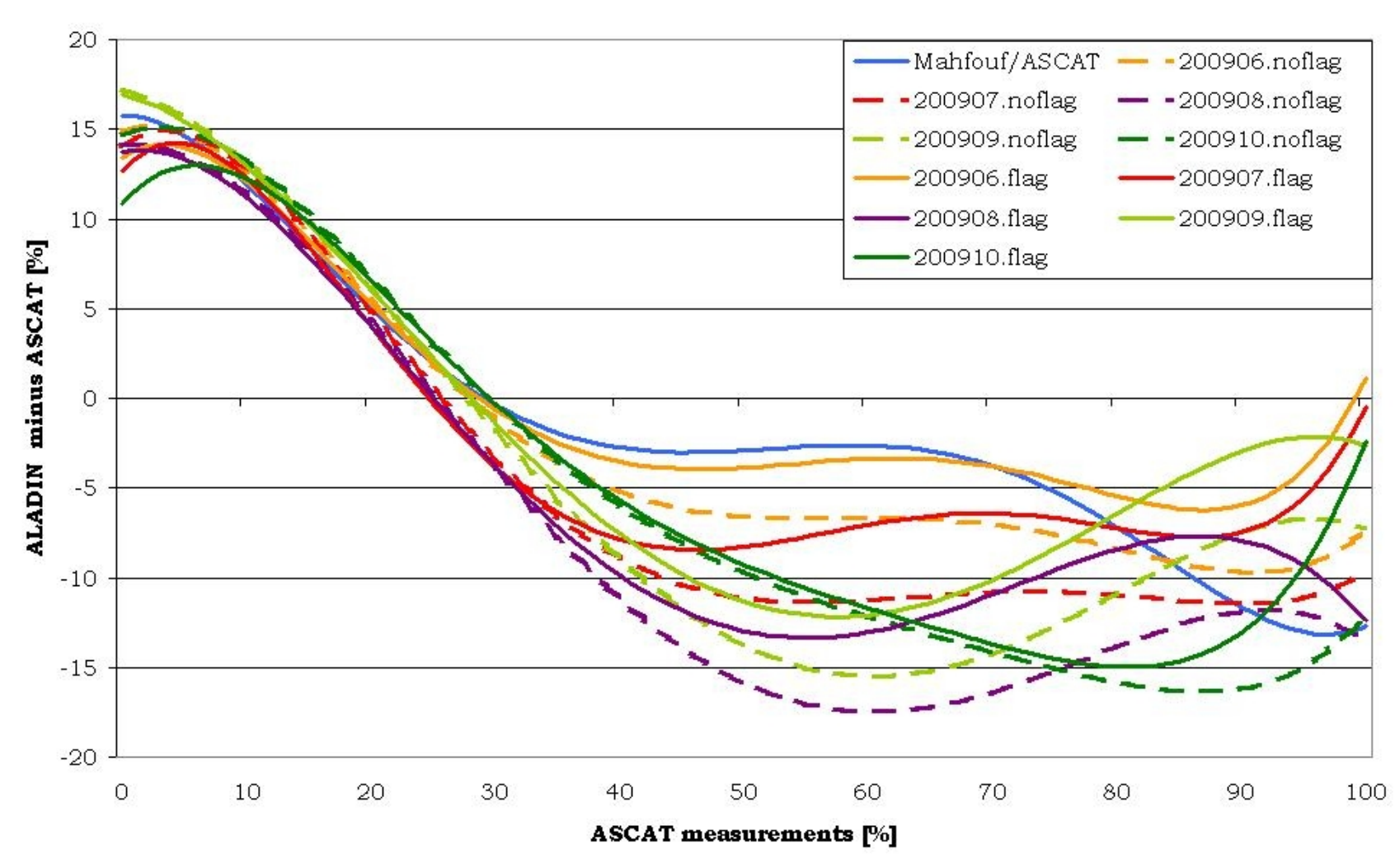


„VUT is cautious to promote the ASCAT SM product“
(EUMETSAT ASCAT Soil Moisture Product Evaluation report - 13.7.2009)

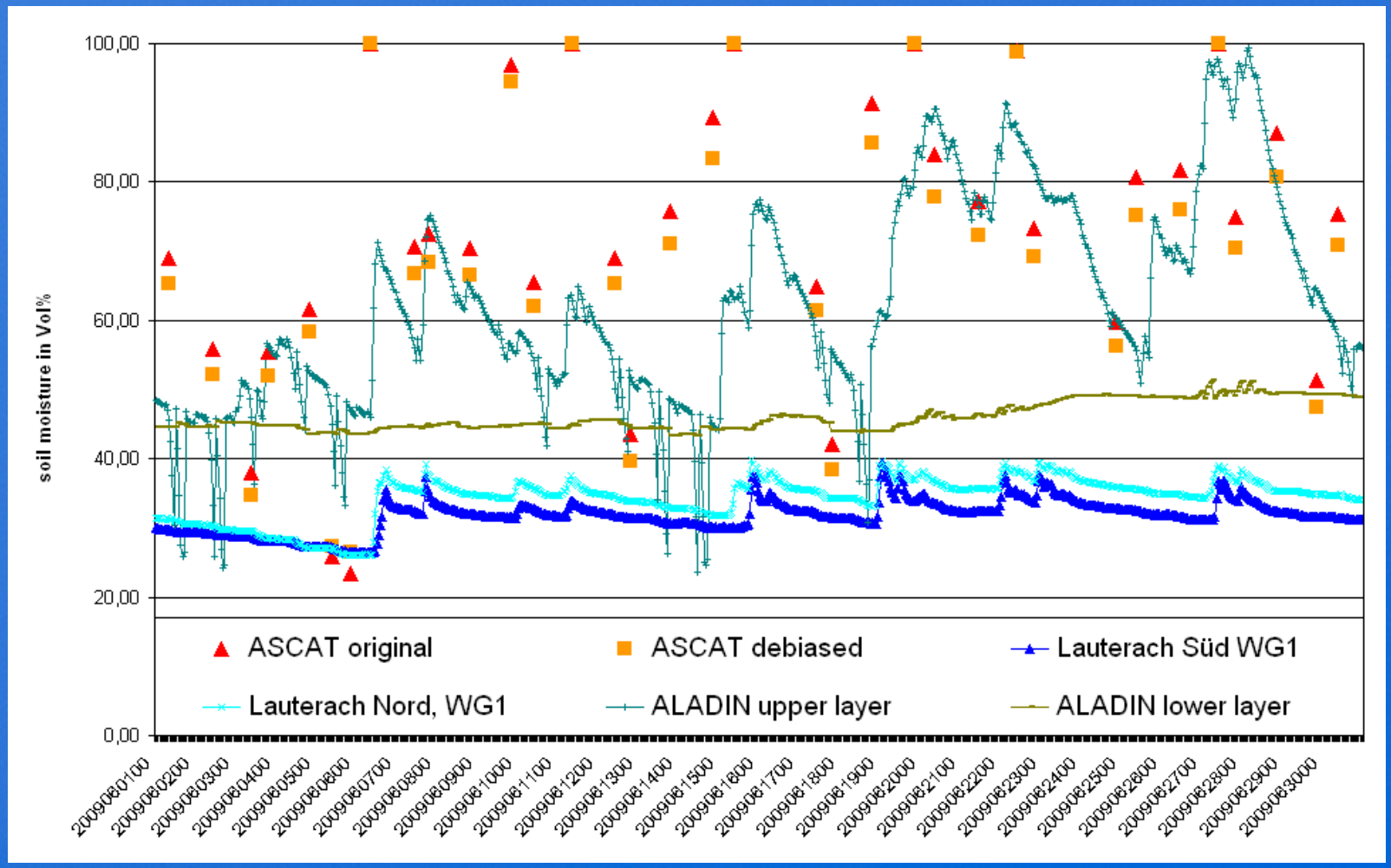
therefore:
QC & Bias correction

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

CDF matching method for ASCAT bias correction

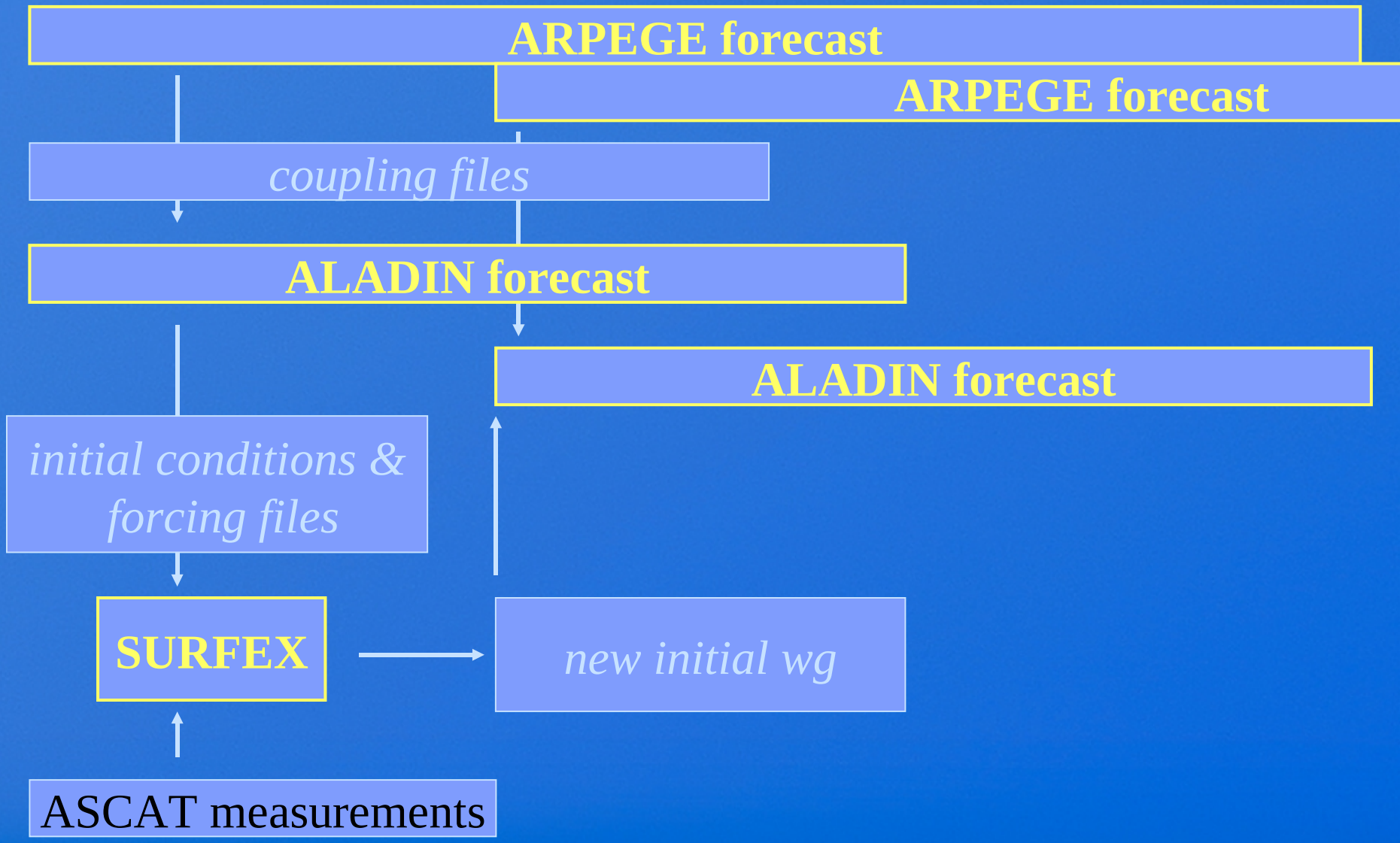


Comparison of soil moisture values at Lauterach (Vbg) for June 2009

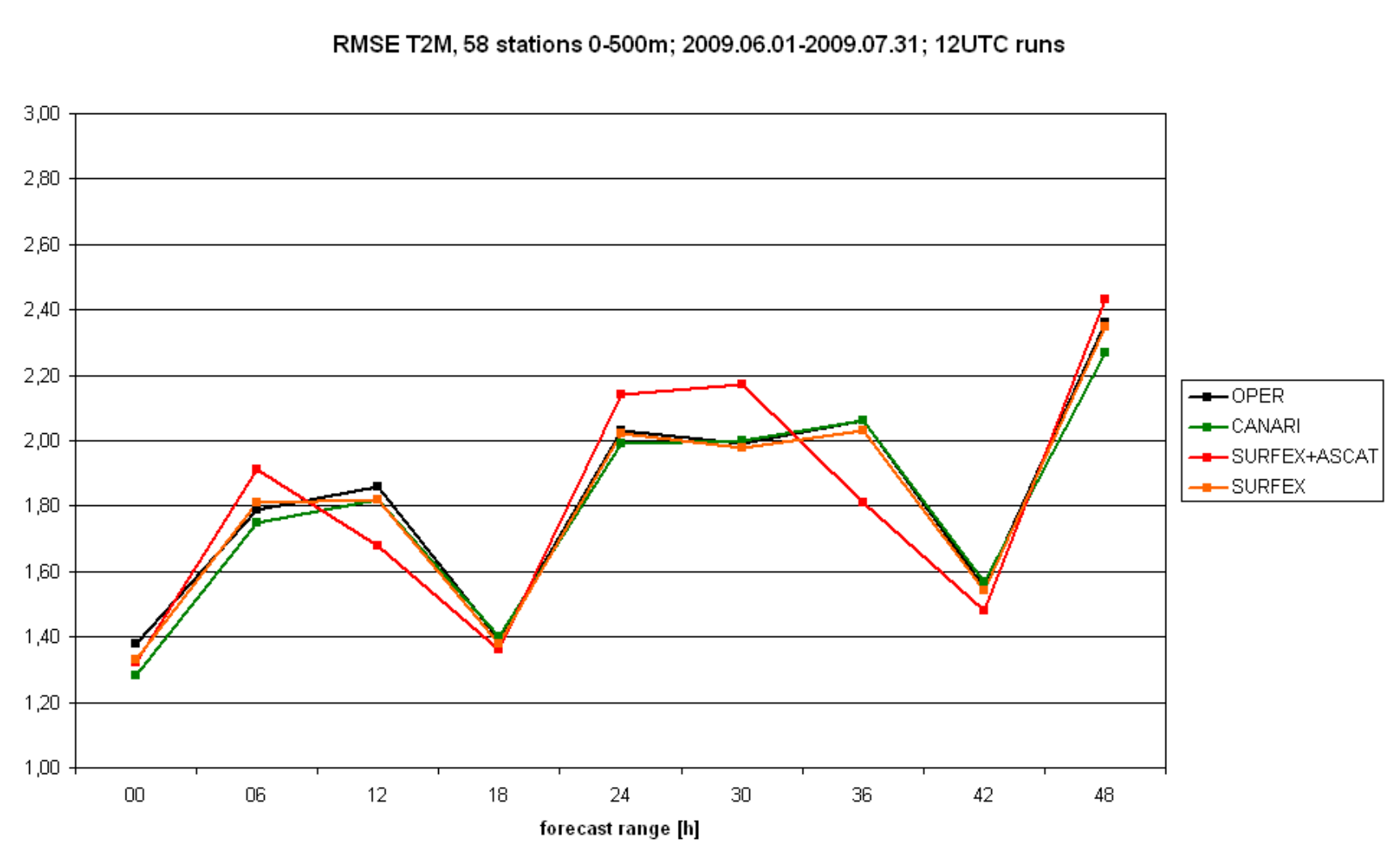


Correlation: Station-ALADIN: 0.67, Station-ASCAT 0.49

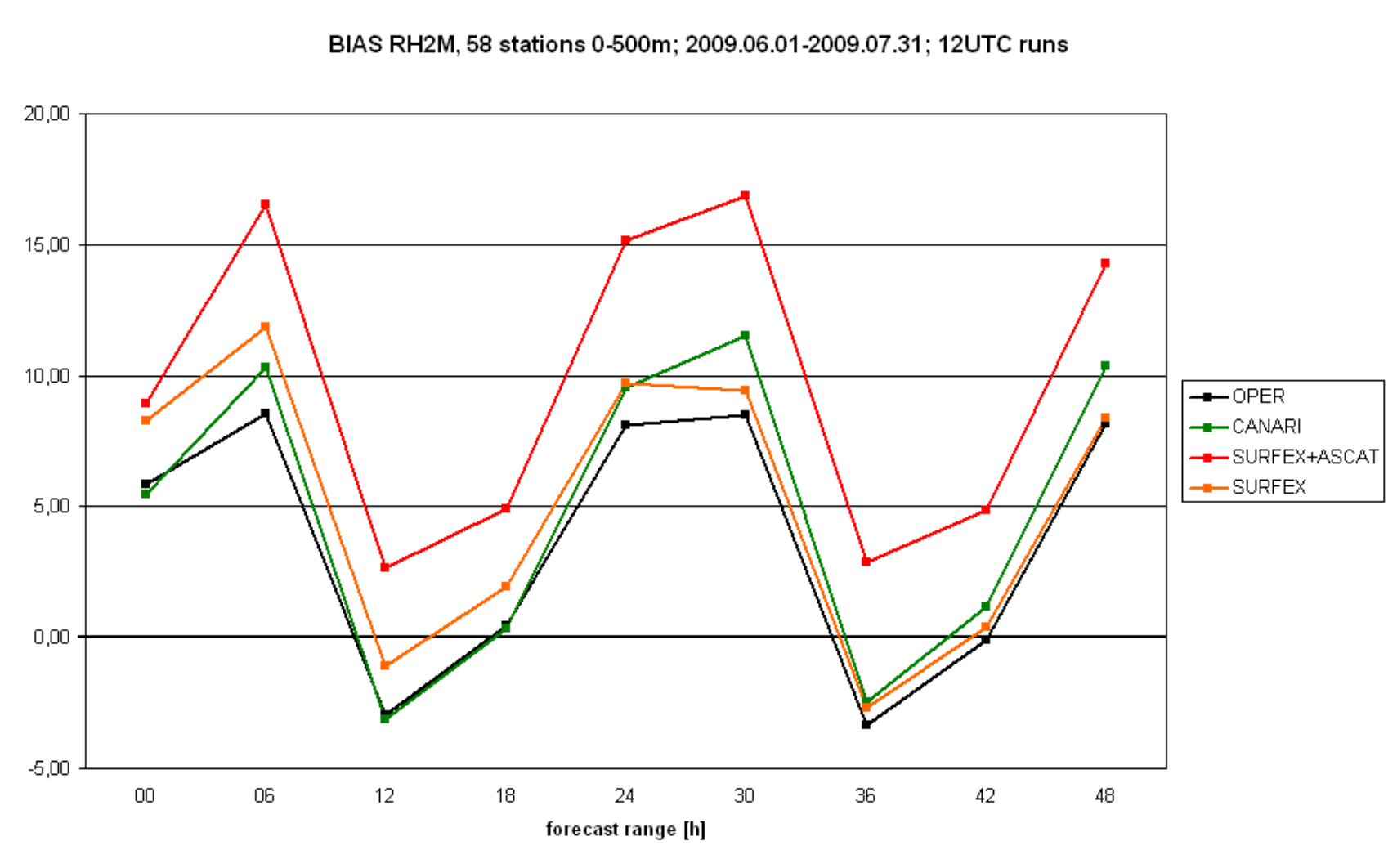
assimilation cycle



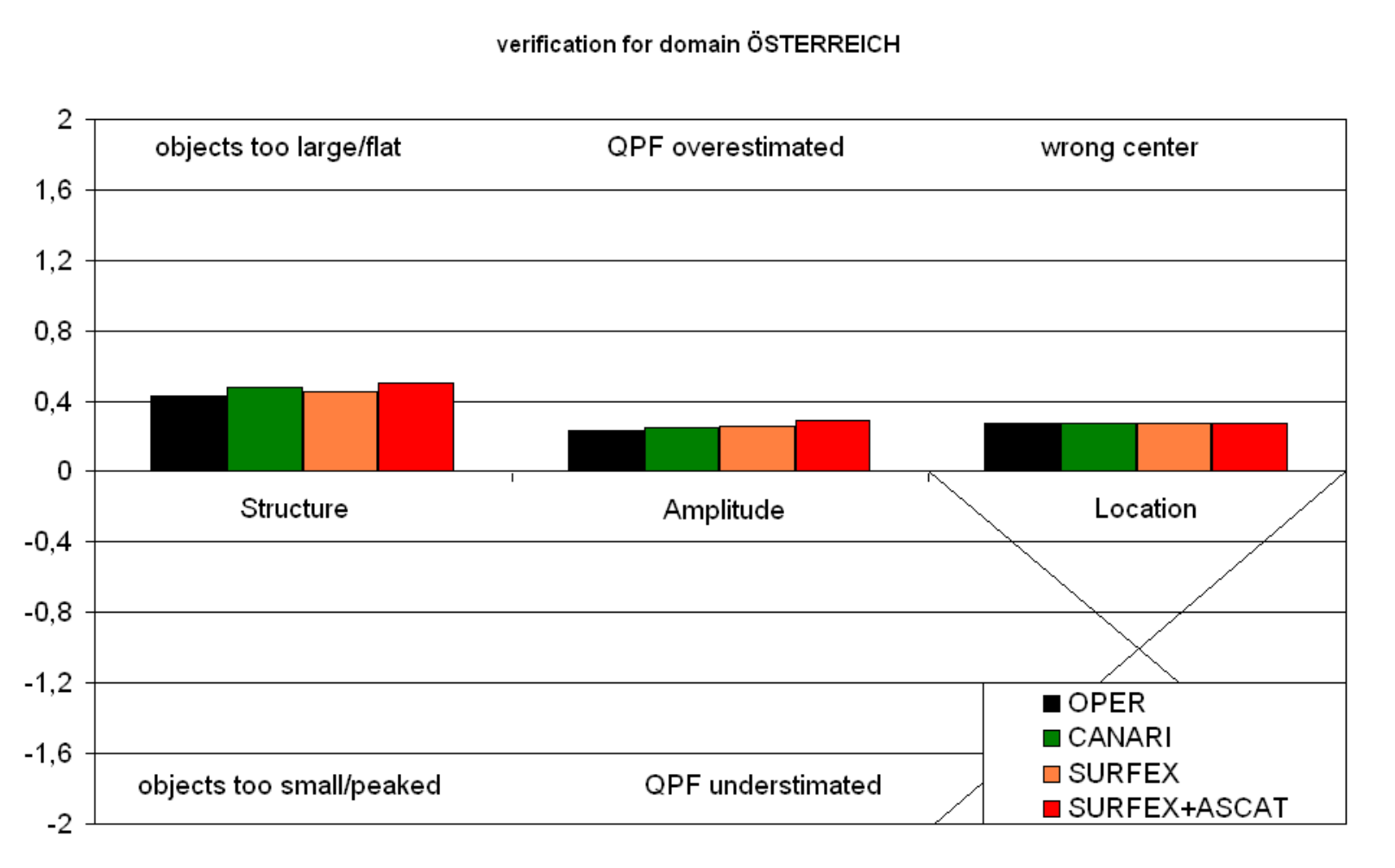
verification of forecasted 2m-temperature for June+July 2009



verification of forecasted 2m-relative humidity for June+July 2009



SAL verification of forecasted precipitation for June+July 2009



ASCAT data validation

- significant distinctions between different data sources

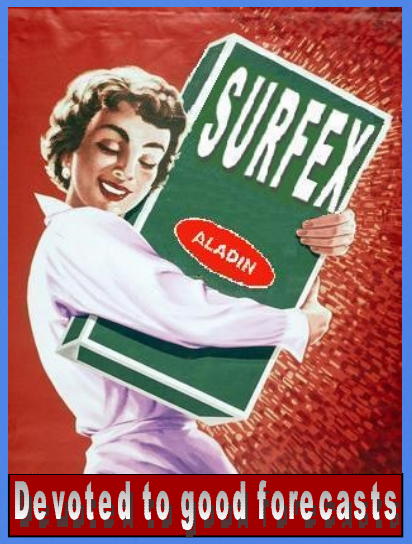
⇒Investigation of longer time series & more stations

ALADIN forecasts

Due to ASCAT assimilation,
- improvement for single events
- boundary layer is too moist on average – RH2M
- too much convective initiation

⇒further tuning of the model is required

Additional information on data assimilation activities at ZAMG can be found on the poster:
"Implementation of ALADIN 3D-Var and CANARI data assimilation at ZAMG"



Thank you for your attention!

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Investigations were partly funded by Austrian FFG-project GMSM