

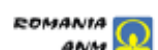
## Surface assimilation activities in LACE

**CANARI: most of the LACE colleagues**  
**Current EKF team: Helga Toth, Viktor Tarjanyi, Stefan Schneider**  
**Summarized by Mate Mile**



# *Surface assimilation activities - Outline*

- CANARI
- EKF with conventional observations
- EKF with satellite observations
- Plans, questions, discussion



# CANARI

- CANARI is the most commonly used surface assimilation in LACE community.
- The CANARI analysis increments depend on several meteorological fields (prec., 10m wind, cloudiness, surface evaporation, etc).
- However if such surface fluxes are missing from first guess, CANARI ignores these dependencies (without abort) and even produces zero surface soil moisture increments (due to missing evaporation and evapotranspiration fluxes).
  - SURFPREC.EAU.CON, SURFPREC.EAU.GEC, SURFPREC.NEI.CON, SURFPREC.NEI.GEC
  - SURFXFLU.MEVAP.E, SURFXEVAPOTRANSF
  - ATMONEBUL.BASSE
- The impact is not negligible in surface forecast scores.

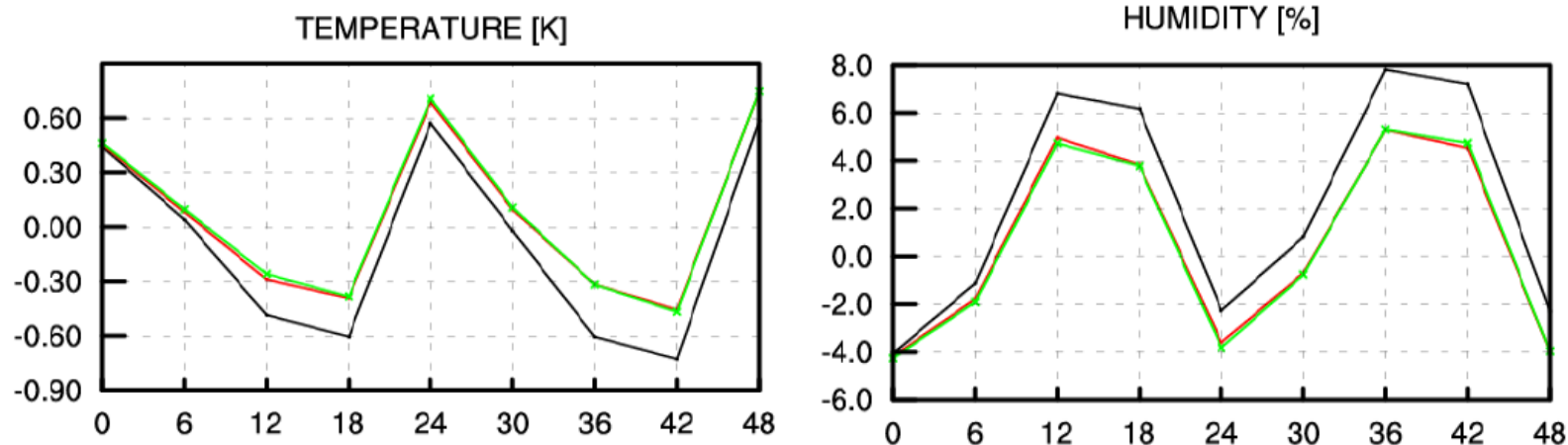


Figure 2: BIAS of T2m and RH2m for 1-10 May 2015 of 00UTC runs. Experiment without all fluxes in assimilation guesses in red, with all fluxes (and the default setting of soil moisture increments modulation) in black and with all fluxes and suppressed modulation by cloudiness, precipitation, v10m and ice (ANEUL=0, SPRECIP=10000, V10MX=10000, SICE=10000) in green.

Bucanek et. al.

# *Extended Kalman Filter with conventional obs. (Viktor Tarjanyi, Helga Toth)*

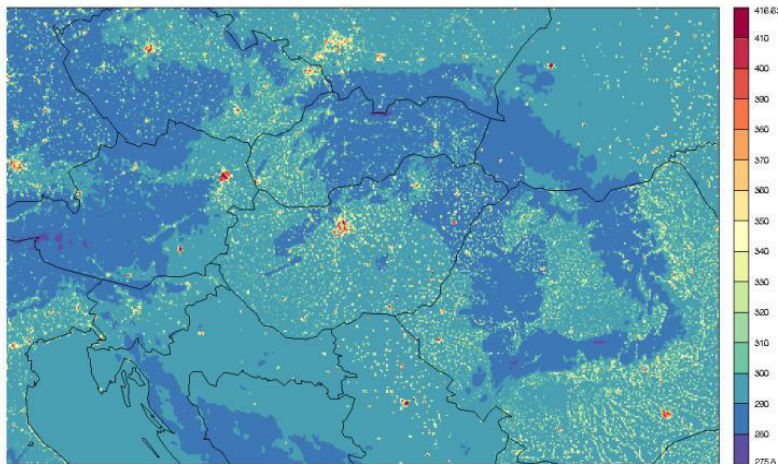
- Operational surface assimilation system
  - CANARI scheme has several limitations
  - An alternative more advanced surface assimilation scheme required for the future operational DA systems
  - Extended Kalman-Filter approach is hardly used in operational context, but has many advantages
- EKF studies by Belgian colleagues with ALARO model also showed the benefit of the system.
- In LACE the implementation of EKF kindly provided by RMI was started for AROME model.
- To keep operational context primary aims are the use of conventional observations and efficient operation
- Implementation should have to work for AROME and ALARO systems as well



# Extended Kalman Filter with conventional obs. (Viktor Tarjanyi, Helga Toth)

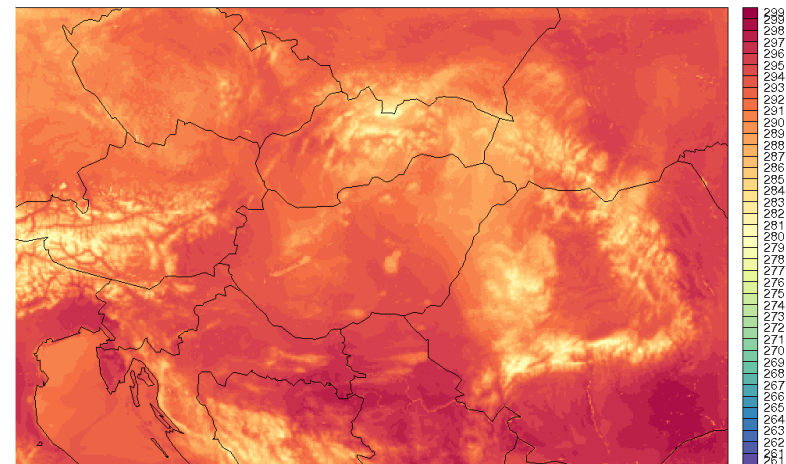
- The EKF implementation in AROME was started with SURFEX v6.0 and common cy36t1.
- Problem with offline SURFEX over town tiles (TEB scheme)
- Instead of debugging an older SURFEX and model cycle releases → try a newer ones (SURFEX v7.2 & cy38t1)
- Why SURFEX v7.2 and cy38t1? → current operational versions

T2M ANALYSIS, 05/10/2015 12:00 UTC



SURFEX v6 + cy36t1

T2M ANALYSIS, 05/10/2015 12 UTC



SURFEX v7.2 + cy38t1

# *Extended Kalman Filter with conventional obs.* *(Viktor Tarjanyi, Helga Toth)*

- The detailed validation of the implemented EKF is needed.
  - Validation of EKF analyses
  - Validation of gridded observations (data poor areas)
  - Validation of SURFEX
- It is also important to make it operationally feasible
  - Parallelized SURFEX and assimilation runs
  - Limit the number of control variables if needed

# SURFEX activities at ZAMG

*Stefan Schneider*

**Joint 26th ALADIN Workshop & HIRLAM All Staff Meeting 2016**

**4-8 April 2016**

**Lisbon**



**ZAMG**

Zentralanstalt für  
Meteorologie und  
Geodynamik



2009/10: ASCAT assimilation in ALADIN<sup>1</sup>

SURFEX: version 4.8, sEKF assimilation

MODEL: ALADIN CY35T1

9.6km grid, 60 layers

DATA: ASCAT superficial soil moisture

spatial resolution: 25km; temporal resolution: ~1.5 days

OUTCOME:

Verification for Austria<sup>2</sup> for precipitation forecasts showed only slight improvement in flatlands and no impact in mountainous terrain -> ASCAT assimilation was not implemented operational

<sup>1</sup> Funded by Austrian Research Promotion Agency (FFG) project GSM (No 819748)

<sup>2</sup> Schneider, S., Y. Wang, W. Wagner and J.-F. Mahfouf (2014): Impact of ASCAT Soil Moisture Assimilation on Regional Precipitation Forecasts: A Case Study for Austria. MWR, 142, 1525-1541. DOI: 10.1175/MWR-D-12-00311.1



# Current activities



2015/16: Sentinel-1 assimilation in AROME<sup>1</sup>

SURFEX: version 7.3, (s)EKF assimilation

MODEL: AROME CY40T1

1km to 2.5km grid, 60/90 layers

DATA: combined Sentinel-1 and ASCAT soil water index

spatial resolution: 1km; temporal resolution: 1 day

OUTCOME (so far):

Severe problems in running the code due to

- incompatibility of the proposed SURFEX v8.0 (including SODA) and the current export version of AROME (CY40T1)
- no documentation how to install/run SURFEX

<sup>1</sup> Funded by Austrian Research Promotion Agency (FFG) project CRESSIDA (No 848010)

*Thanks to Helga, Trygve, Stéphanie, David, Jostein, Patrick for helpful advice!*

# Planned activities



2016-18: Sentinel-3 LST assimilation in AROME<sup>1</sup>

SURFEX: version 8.x, (s)EKF assimilation

MODEL: AROME CY?T? (depending on availability)

1km to 2.5km grid, 60/90 layers

DATA: combined Sentinel-3<sup>2</sup> and MSG land surface temperature (LST)

spatial resolution: 1km; temporal resolution: 1 day

OUTCOME (planned):

Software included in SODA to assimilate LST – this work should be well coordinated with all partners in ALADIN/HIRLAM/LACE

Improved short-range forecasts

<sup>1</sup> One person for 2.5 years will be funded by Austrian Research Promotion Agency (FFG) project ASTRID

<sup>2</sup> Launched in February 2016, shall start to provide operational data in summer 2016

## *Plans, questions, discussion*

- LACE interest to develop further EKF based surface assimilation system (for both conv and non-conv observations)
- Cycles and SURFEX releases?
  - Developments of EKF → official export versions
  - Phasing and/or maintenance
- Cooperation among ALADIN-HIRLAM-LACE and with SURFEX community

