

SURFEX for ALADIN/ALARO

Rafiq Hamdi
with input from ALADIN colleagues

1. Experiences with SURFEX within ALADIN consortium

2. SURFEX related meeting and stays

3. Other applications & Future work

Austria

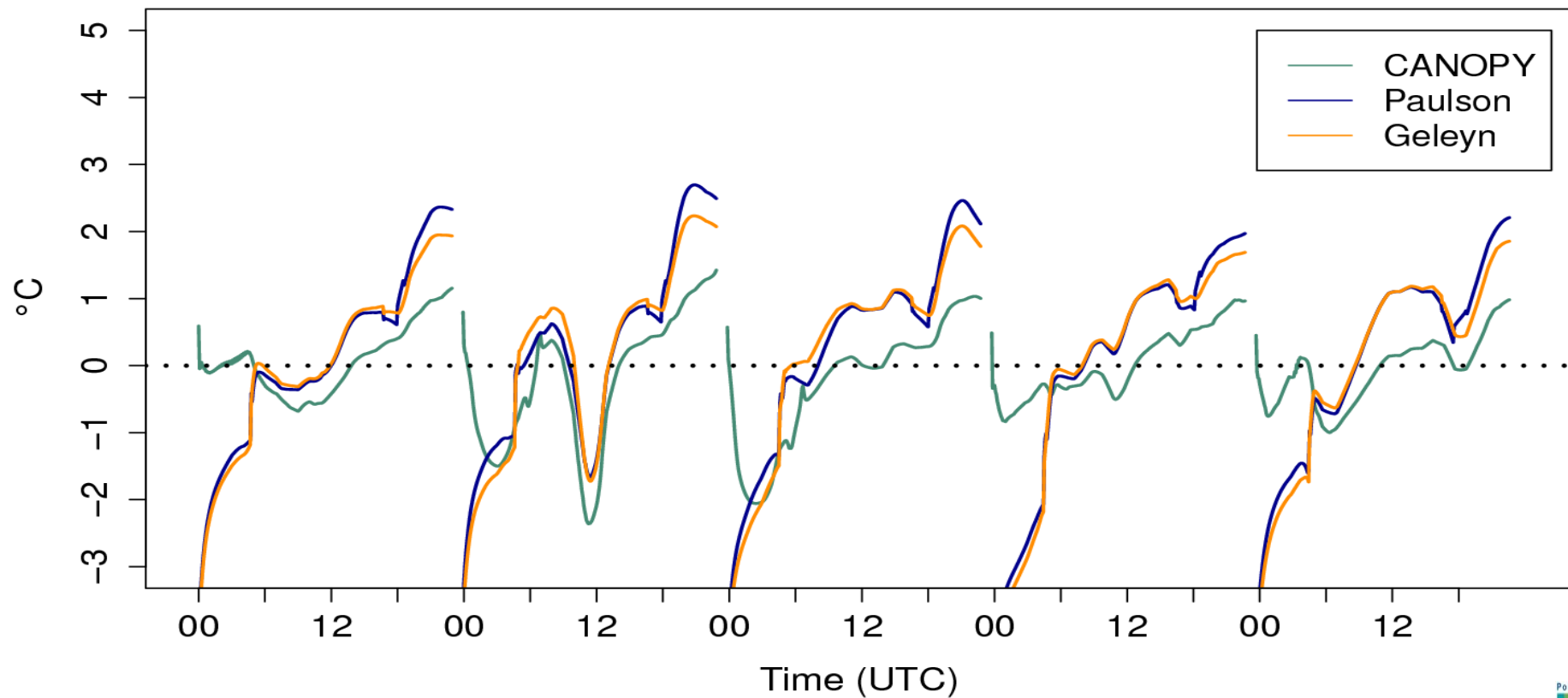
- **Soil moisture initialization studies using SURFEX_V8.0, waiting for V8 documentation...**
- **No clear contact point for SODA is available**
- **How to organize/support an information network for scientists working with SODA.**
- **SURFEX is (or seems to be?) not downward compatible**
- **CY40T1 is not able to produce soil input data which are usable in SURFEX v8.0**

Portugal

- **OI_MAIN offline data assimilation 6h cycle for an H2020 project in order to have better screen level fields as input for a Fire index (FWI).**
- **Collaboration with Evora University (Rui Salgado), a working plan to validate the physiography of the biggest European Lake in Europe - Alqueva - under a recent version of ECOCLIMAP.**
- **During a stay in Toulouse (September 2015), Maria Monterio have tested the procedures to implement the new physiography in the local climatologies and have run AROME model without problems.**
- **The second part of 2016, IPMA will have a student working on the impact of the new ECOCLIMAP + Alqueva physiography in the operational model.**

Hungary

- **SENSITIVITY STUDY FOR SZEGED, HUNGARY USING THE SURFEX/TEB SCHEME COUPLED OFFLINE TO ALARO**



Belgium

- **SURFEX EKF and 3dVar atmospheric assimilation for ALARO**



Universiteit Gent
Faculteit Wetenschappen
Vakgroep Fysica en Sterrenkunde

Een Extended Kalman Filter voor Bodem Data
Assimilatie in SURFEX

An Extended Kalman Filter for Surface Data Assimilation in
SURFEX

Annelies Duerinckx

Successfully defended in December 2015



Proefschrift tot het bekomen van de graad van
Doctor in de Wetenschappen:
Fysica
Academiejaar 2015-2016

Belgium

Initial Conditions

	Atmosphere	Soil
Open Loop (OL)	ARPEGE analysis	ARPEGE analysis
Optimum Interpolation (OI)	ARPEGE analysis	OI
Extended Kalman Filter (EKF)	ARPEGE analysis	EKF
3dVar+OL	3dVar	ARPEGE analysis
3dVar+Free run	3dVar	6h fc. from prev. run
3dVar+OI	3dVar	OI
3dVar+EKF	3dVar	EKF
3dVar+OI/EKF	3dVar	OI(soil temp.) + EKF(soil moisture)

Belgium

- **The surface assimilation using EKF has a positive effect on the humidity scores that is able to produce similar or improved scores compared to the current operational Open Loop set-up.**
- **For temperature the benefits of the surface assimilation are less pronounced, but still manage to get similar scores as the Open Loop in most cases.**
- **The potential benefits of the combination of upper-air and surface assimilation is shown in the soil moisture and screen-level relative humidity verification.**
- **It seems beneficial to include surface data assimilation in the operational set-up of the RMI. Before adding a 3D-var upper-air assimilation in the operational set-up, it should be investigated whether the use of satellite, GNSS and radar data can be used.**

Belgium

- **Testing SODA within Cy38 technically work but with problem for the offline runs to be fixed.**
- **STAEKF scheme is introduced in Cy36t1 but still to solve some final technical difficulties due to the new derivative computation of the B matrix.**

Looking for funding...

Belgium

- **To run ALARO-1 with TOUCANS and SURFEX the issue of the exchange coefficient should be solved.**
- **A solution was introduced in CY38T1OP3 interfacing the average drag coefficient PCD & PCDN calculated from SURFEX and to initialize its value for the first time step.**
- **The TOUCANS stability function were introduced in SURFEXv7.2 under the LDRAG_COEF_ARP key.**
- **This solution could be available for the next version of SURFEX V8+.**
- **A Flat-Rate stay is planned for 2016 to work further on this issue!**

SURFEX@HARMONIE system working week Bratislava, Nov. 2015

- **Intital non-surfex surface conditions from an ARPEGE-SURFEX run**
- **This was already solved for climate simulations (CMIP5), but with different SURFEX version.**
- **The set of e-suite ARPEGE files with SURFEX were made available by MF, however the procedure was not repeated successfully with those files yet.**
- **A report has been written by Olivier Giot on the implementation of this method.**



SURFEX@HARMONIE system working week Bratislava, Nov. 2015

- **ALARO-SURFEX coupling**
- **Solution made for Cy38T1OP3 has been ported to harmonie-40h1 but this was not working.**
- **The drag coefficients (PCD,PCDN) has been stored in an available RK gfl array which is not suitable as a final clean code.**
- **This will be implemented properly by Patrick as a surface field to propagate the value between time steps.**
- **Some bugs were found but still not working...**

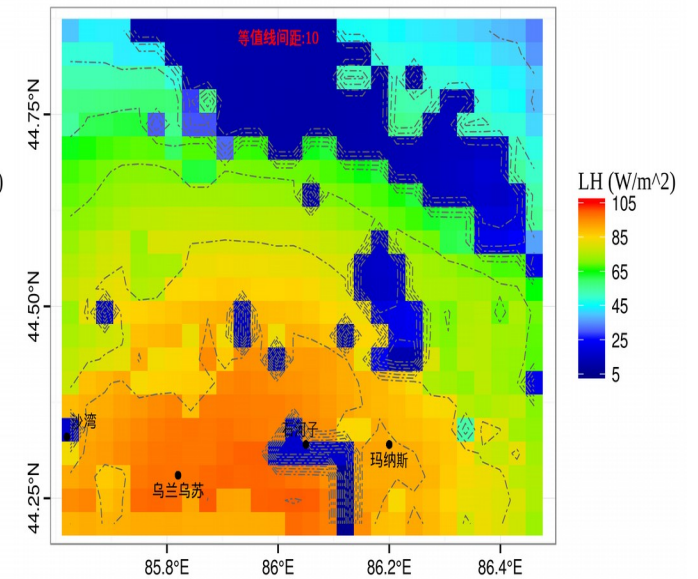
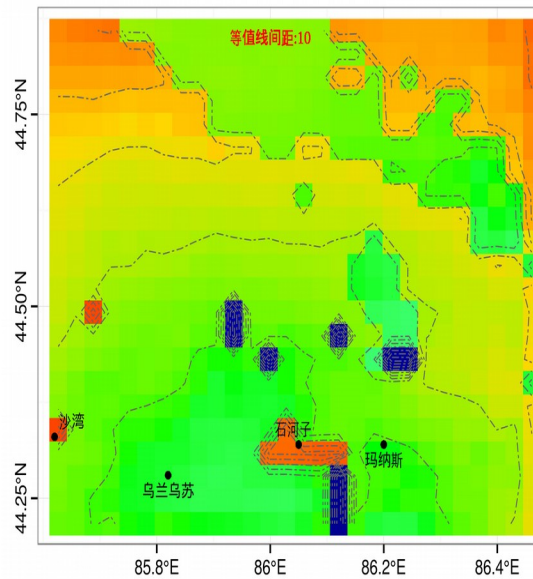
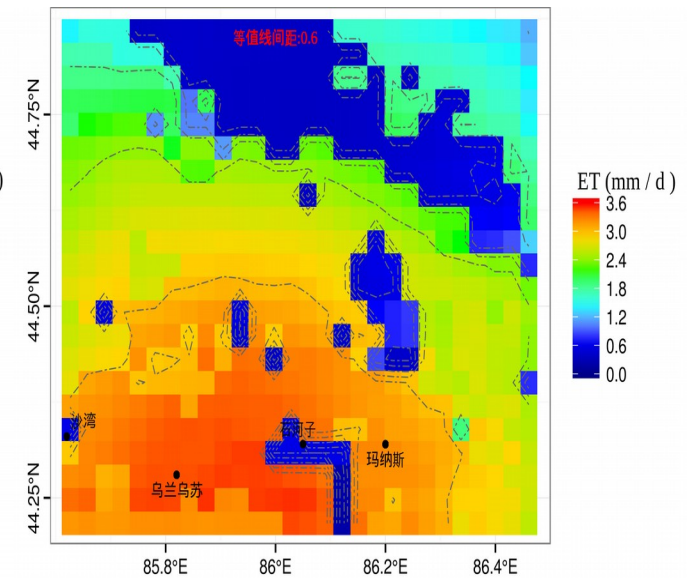
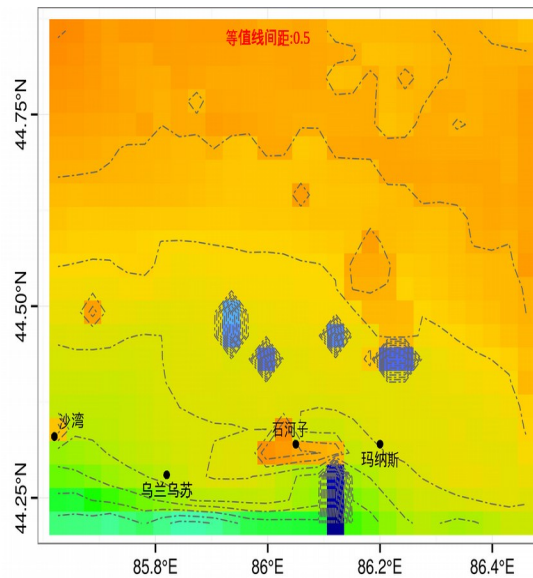
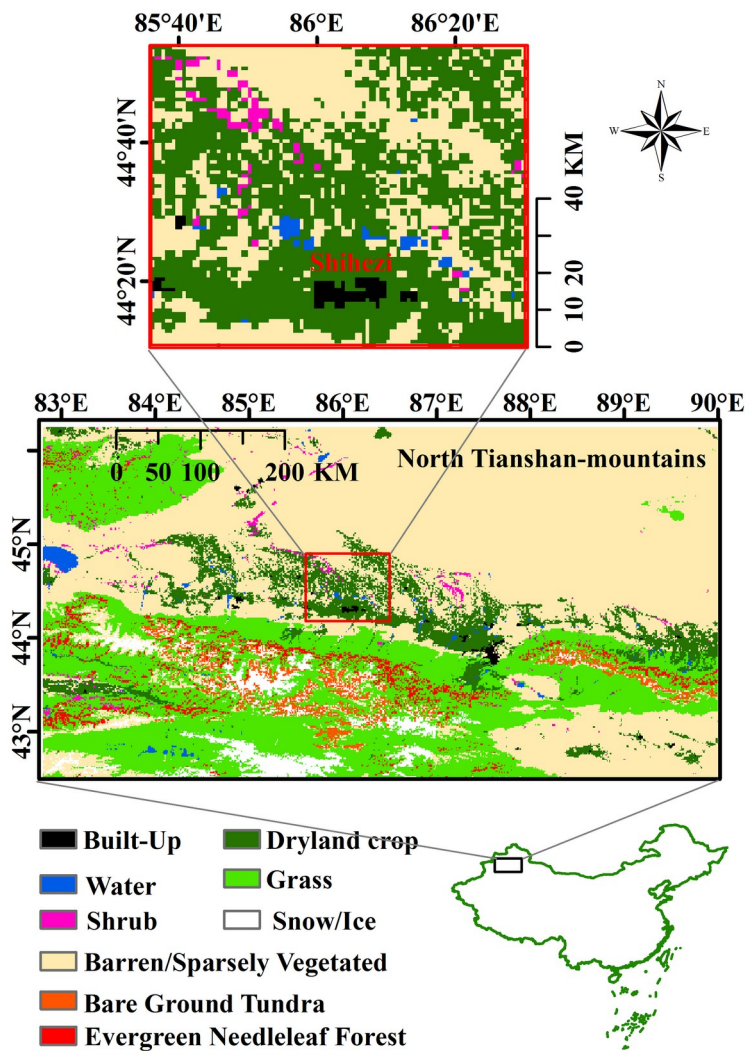


- **Stay of Gabriella (Hungary) in September 2016, for 3 weeks in Brussels: SURFEX offline urban application.**
- **Stay of Rafiq for 2 weeks in Prague: ALARO-SURFEX coupling**
- **SURFEX@ALL-STAFF Meeting in Lisbon, April 2016: Surface data assimilation and SODA related issue**
- **Stay of Mustapha (Morocco) for 2 weeks in Brussels: ALARO+SURFEX experiments over Morocco**

Urban climate modelling & collaboration opportunity with Chinese Academy of Science

1. Royal Meteorological Institute of Belgium
2. Ghent University
3. The Xinjiang Institute of Ecology and Geography

A proposal has been submitted for the Belgian call, STEREOIII



Collaboration with XIEG

Urban climate Services (ERA4CS)

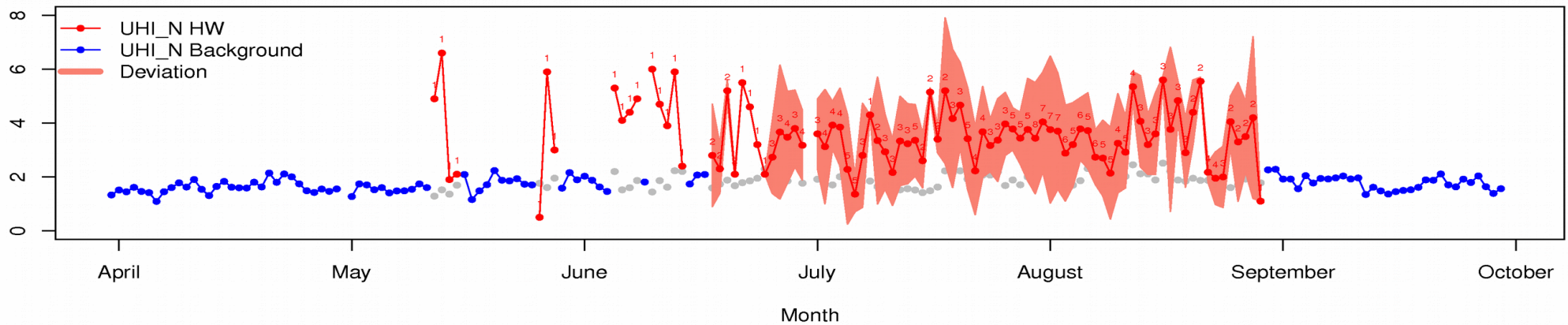
1. Royal Meteorological Institute of Belgium
2. Météo-France: teams of Valéry Masson & J.-C. Calvet
3. ...

A proposal has will be submitted for the H2020 ERA4CS call

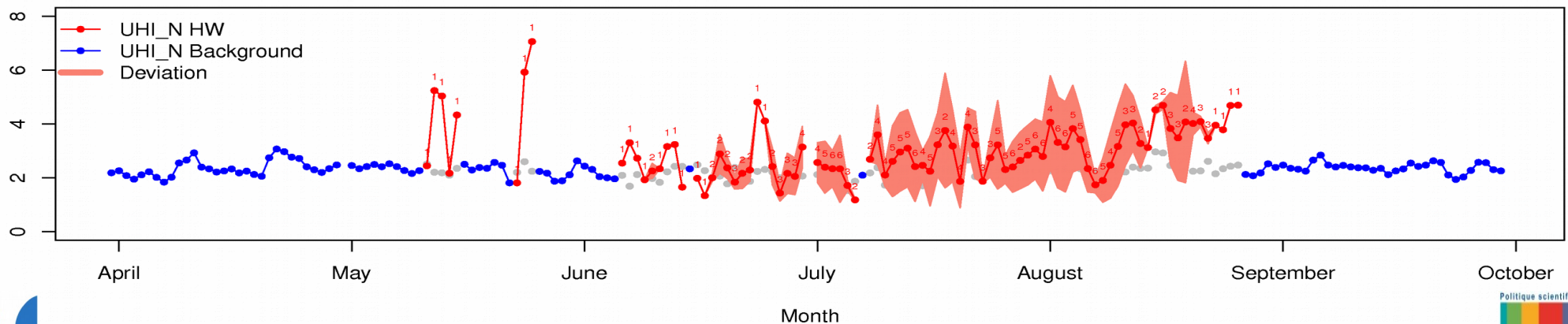
*Focus on interaction between urban effect and extreme event: for example during heat waves

Hamdi et al., 2016, UC submitted

(a) UHI_N Observed



(b) UHI_N Simulated



Publications

- Rafiq Hamdi, O. Giot, R. De Troch, A. Deckmyn, P. Termonia: Future climate of Brussels and Paris for the 2050s under the A1B scenario. *Urban Climate* 04/2015; 12:160-182.
DOI:10.1016/j.uclim.2015.03.003
- Annelies Duerinckx, Rafiq hamdi, J.-F. Mahfouf, Piet Termonia: *Study of the Jacobian of an extended Kalman filter for soil analysis in SURFEXv5*. *Geoscientific Model Development* 03/2015; 8:845-863. DOI:10.5194/gmd-8-845-2015.
- Annelies Duerinckx. *An Extended Kalman Filter for Surface Data Assimilation in SURFEX*. Universiteit Gent Faculteit Wetenschappen Vakgroep Fysica en Sterrenkunde. Promoters, Piet Termonia, Rafiq Hamdi. December 2015.