Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

ALADIN

HIRLAM

ALARO status overview

with contributions by
Radmila Brožková, Ján Mašek, Martin Dian

Neva Pristov

DHMZ · SHMU · ARSO METEO Slovenia · OMSZ · ZAMG · ROMANIA ANM

Talk outline

ALARO status

ALARO developments

- Turbulence scheme TOUCANS (with shallow convection)
- Radiation scheme ACRANEB2 (sunshine duration)
- Screen level interpolation
- 2m temperature in special situation
- *Complementary subgrid drafts scheme*
- *Coupling with SURFEX*

Presentation
Luc Gerard

Outlook

Presentation
Rafiq Hamdi

ALARO status

ALARO-1 Working days

12-14 September 2016, Brussels, RMI

- 31 participants from 11 countries
- a status overview, spread knowledge, planning
- lectures by developers
- presentations from evaluators/users

http://www.rclace.eu/?page=163

ALARO status

ALARO is a canonical model configuration of the ALADIN system

In the operational use in ALADIN countries

ALARO-0: at, be, hr, ro, sk, si,
ALARO-1vA: *be*, tr, hr, po, hu
ALARO-1vB: cz, *sk*

model resolution between 8 km – 4 km, 2 km, 1.3 km

National posters

In EPS systems

ALADIN-LAEF, GLAMEPS, EPS at HMS,
convection-permitting: HarmonEPS, RMI-EPS

Presentations
Martin Belluš
Geert Smet

In climatological simulations

be, cz, se

ALARO-1 versions

- ALARO-1vA
  export CY38T1.bf3, CY40T1.bf5, documentation (February 2015)

+screen level interpolation (May 2016)

- ALARO-1vB
  CY43T2, back-phased cy40t1.bf7 (January 2017)
  - Shallow convection closure, exponential-random cloud overlaps in radiation and cloud diagnostics, improved sunshine duration and direct solar flux at surface

TOUCANS

- Shallow convection closure in turbulence scheme (non-precipitating)

Moist (in presence of condensation) buoyancy is parameterized from a simple mass flux-type model with simplified entrainment profiles

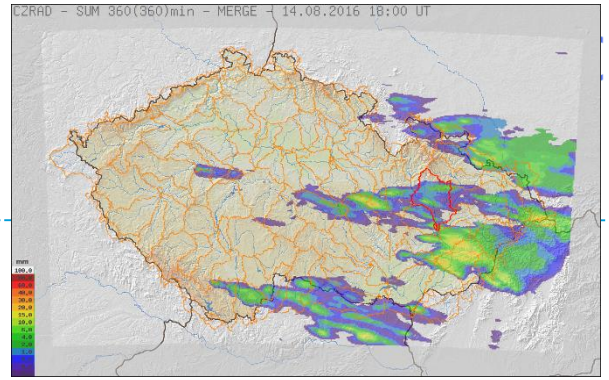
Validation:

- amount of cloudiness is increased in general – retuning is needed in radiation scheme, diagnostic cloudiness
- highest impact in summer season

Results:

- precipitation, T2m, RH2m have smaller BIAS
- precipitation structure improved
- reduction of weak precipitation
- can help precipitating convection to start at the right place

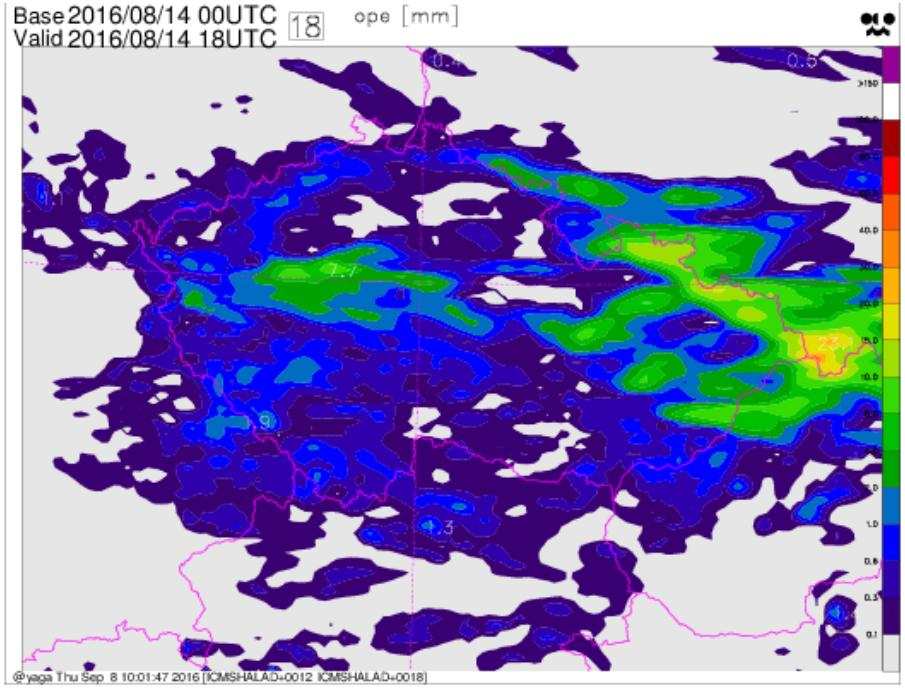
6h precipitation amounts based on radar
14.08.2016 12-18h



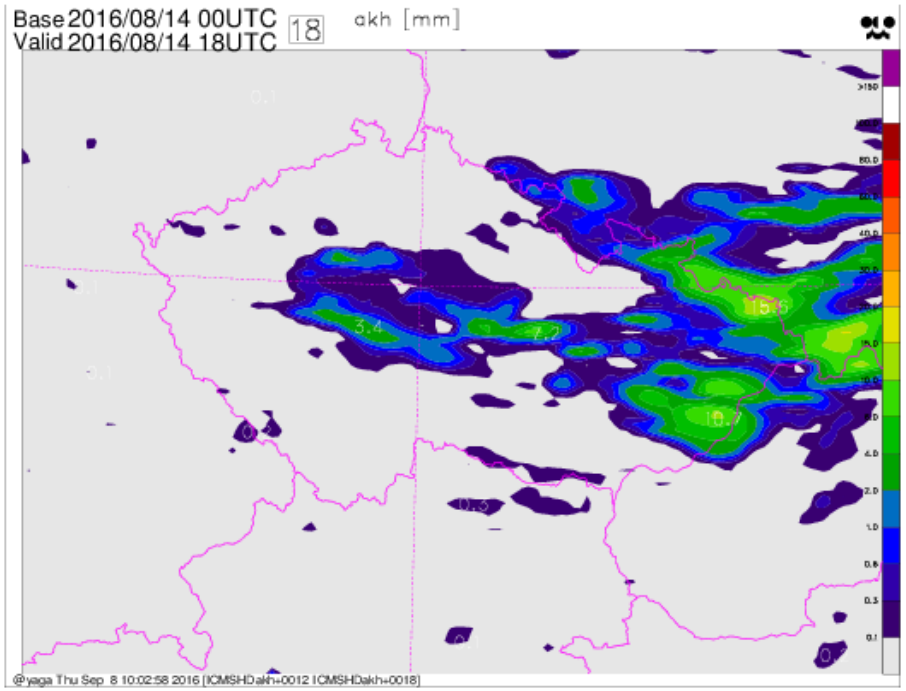
TOUCANS

- Shallow convection closure

ALARO-1vA SCC based on Ri* or Ri**



ALARO-1vB SCC based on mass-flux



6h precipitation amounts
14.08.2016 00+18h

ACRANEB2

paper describing LW part accepted into QJRMS

- NER approach presented
- writing the papers lead to significantly improved ACRANEB2 scheme
- verification against SW and LW narrowband references helped to identify the weak points, some of them are cured already

Information

DOI
10.1002/qj.3006

View/save citation

This article is protected by copyright. All rights reserved.

Keywords

longwave radiative transfer; broadband approach; idealized optical paths; net exchanged rate decomposition; bracketing; selective intermittency

PDF

Info

RTERLY JOURNAL OF THE
METEOROLOGICAL SOCIETY

Explore this journal >

Res

Single interval longwave radiation scheme based on the net rate decomposition with bracketing

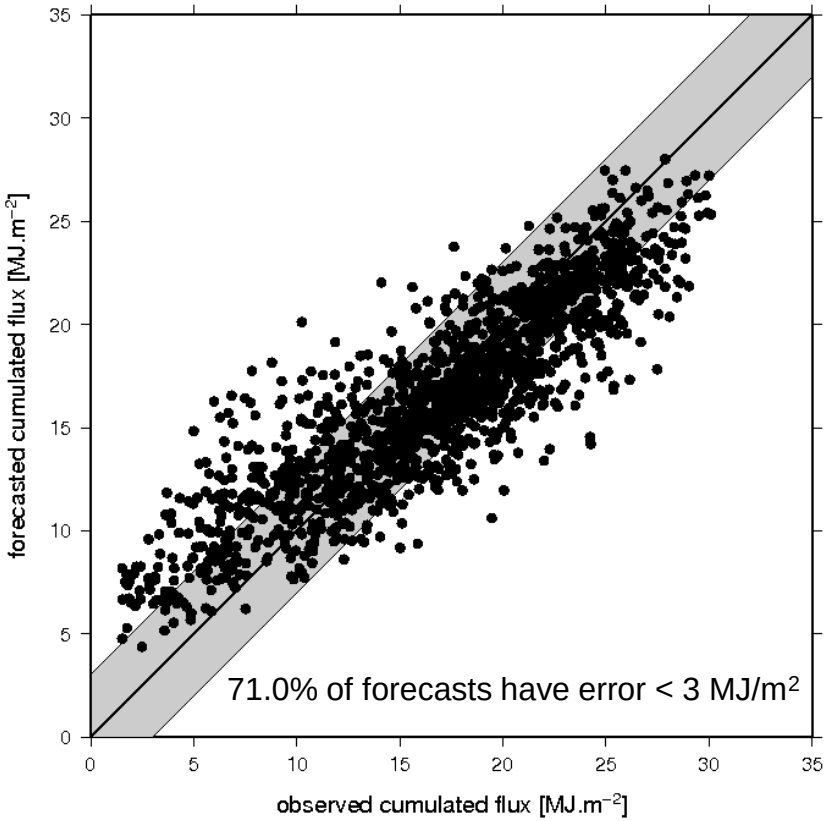
J.-F. Geleyn, J. Mašek, R. Brožková, P. Kuma, D. Degrauwe, G. Hello, N. Pristov

Accepted manuscript online: 24 January 2017 Full publication history

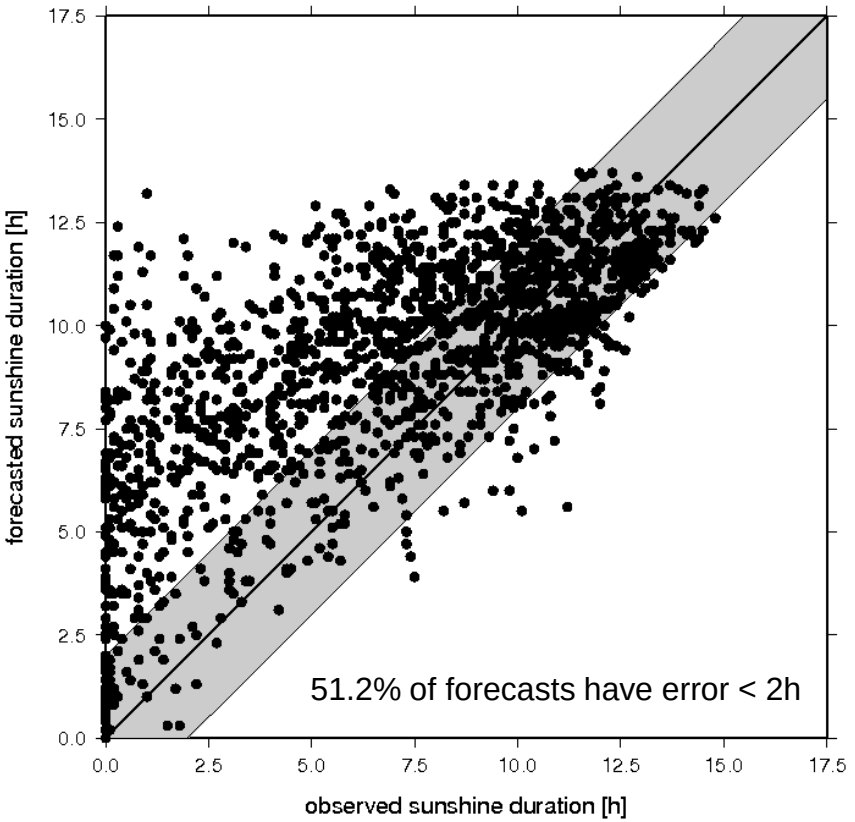
DOI: 10.1002/qj.3006 View/save citation

Sunshine duration

Daily global radiation



Daily sunshine duration



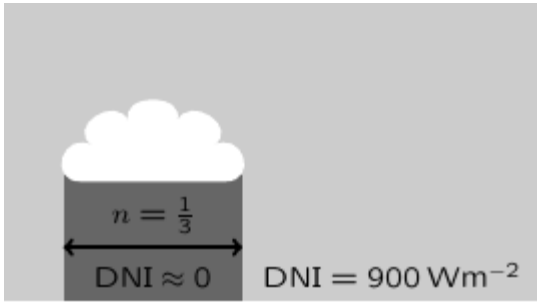
Period: 30 Jun – 26 Sep 2016
19 Czech stations

CHMI **ALARO-1vA**
00+24 hour forecasts

Sunshine duration – new treatment

- Sunshine condition is defined as direct normal irradiance (DNI) at the surface exceeding 120W/m^2

- Determining sunshine duration from grid box averaged DNI leads to severe overestimation in cases with partial cloud cover

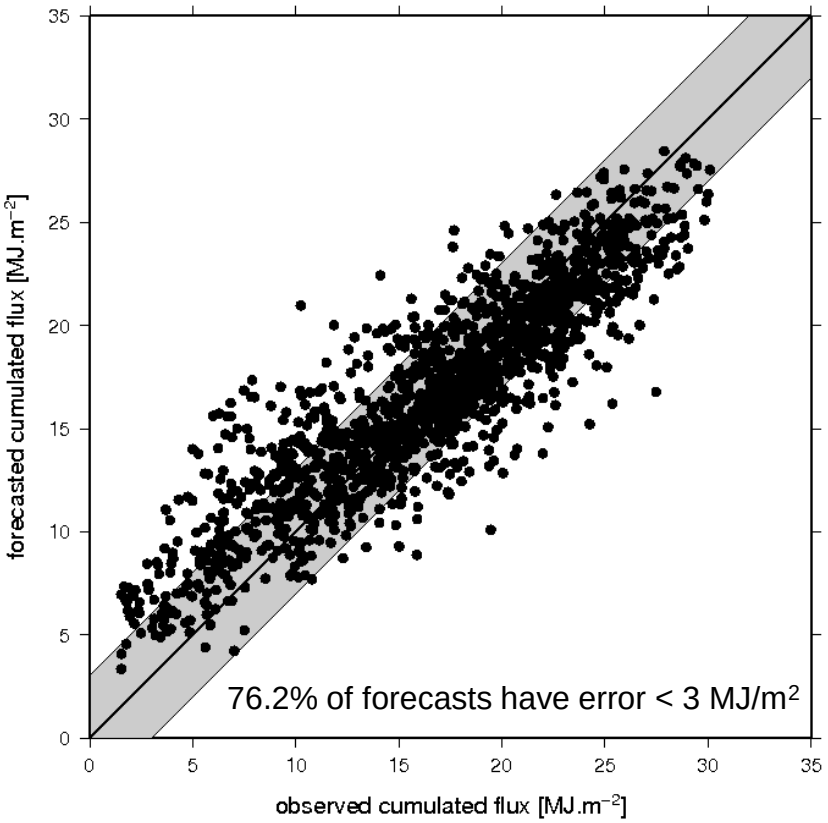


Grid box averaged DNI ~600W/m^2
sunshine duration whole time step
in reality around 2/3 of time step

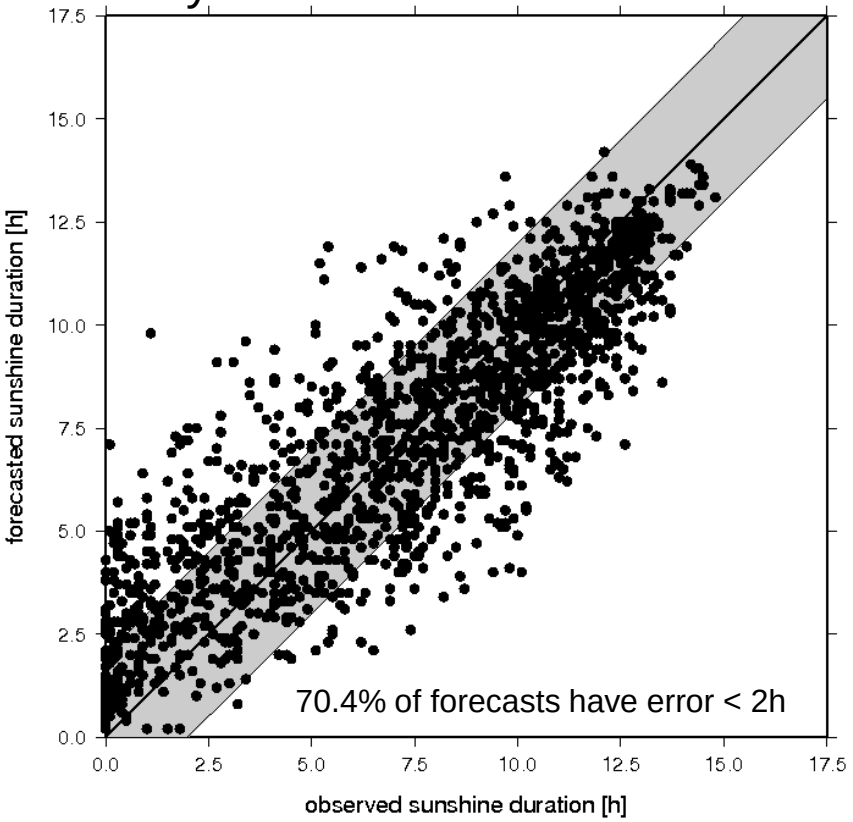
- Solution: sunshine condition is evaluated separately below clouds and in the clearsky part of grid box, then weight the result by cloud cover

Sunshine duration – new treatment

Daily global radiation



Daily sunshine duration



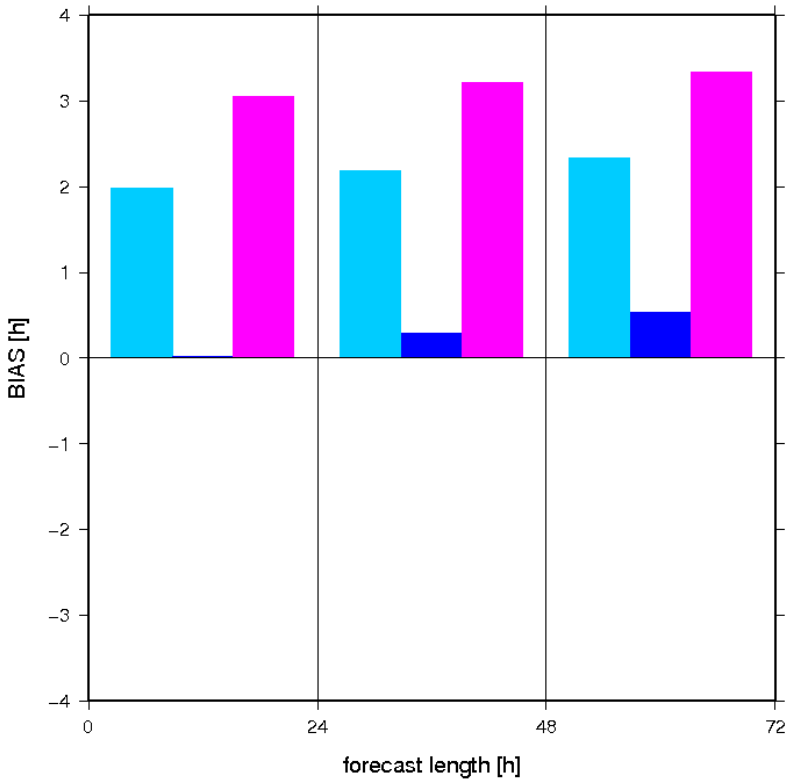
Period: 30 Jun – 26 Sep 2016
19 Czech stations

CHMI **ALARO-1vB**
00+24 hour forecasts

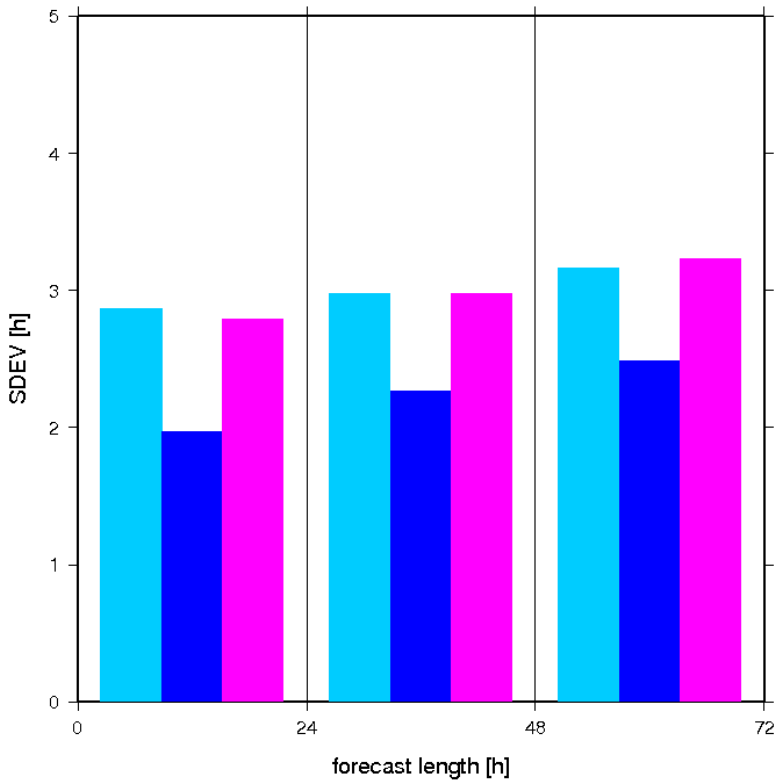
Sunshine duration

Daily sum

BIAS



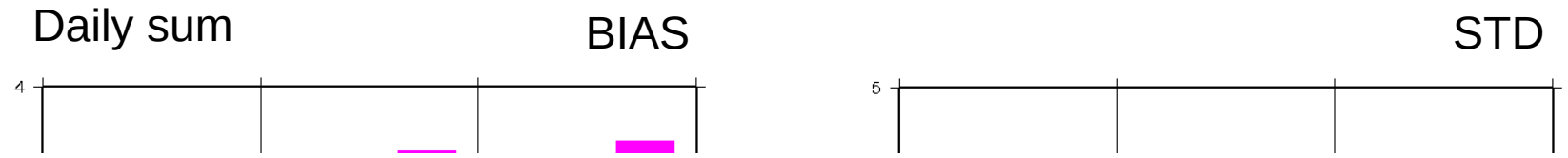
STD



Period: 30 Jun – 26 Sep 2016
19 Czech stations

CHMI **ALARO-1vA** previous oper
CHMI **ALARO-1vB** current oper
ECMWF

Sunshine duration



Part of improvement is coming from the exponential-random cloud overlap (instead of maximum-random one) and from related retunings in the cloud scheme.

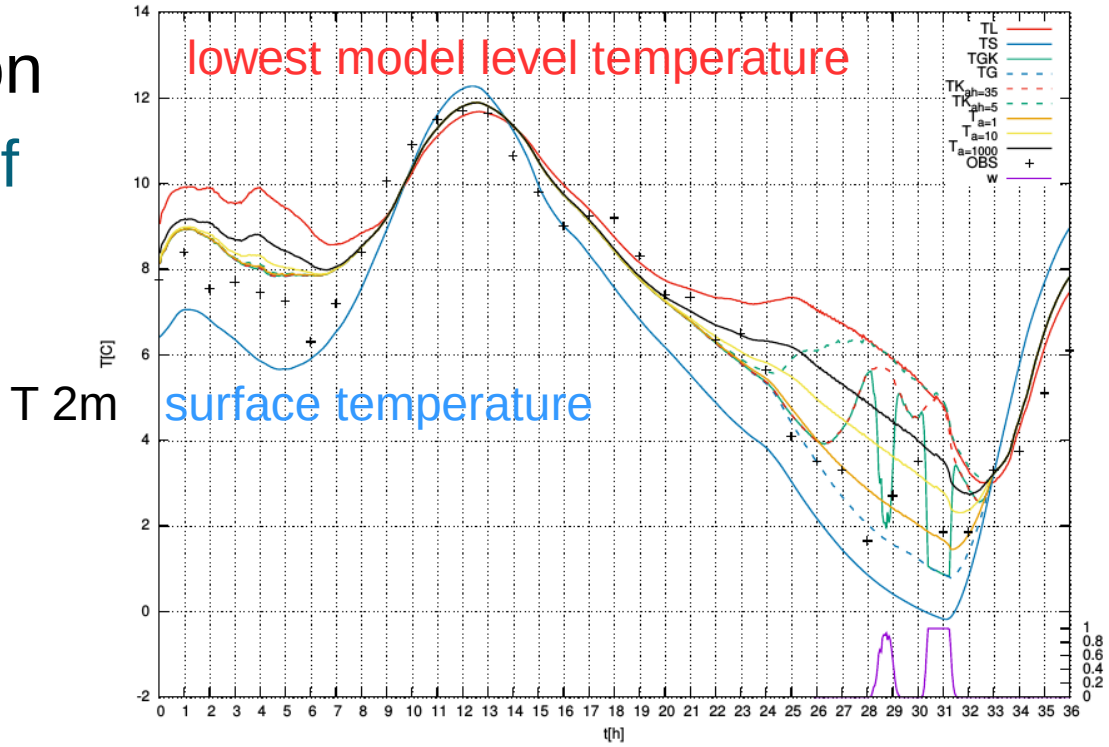
Overestimations of global radiation and sunshine duration remain during winter due to insufficient low inversion clouds.

Period: 30 Jun – 26 Sep 2016
19 Czech stations

CHMI ALARO-1vA previos oper
CHMI ALARO-1vB current oper
ECMWF

Interpolation to screen level (T2m, RH2m) in stable situations

- modified interpolation
  - Problem: mixture of Geleyn 1988 and Kullmann 2009 method has oscillations



Time (hour)

mixture of Geleyn and Kullman

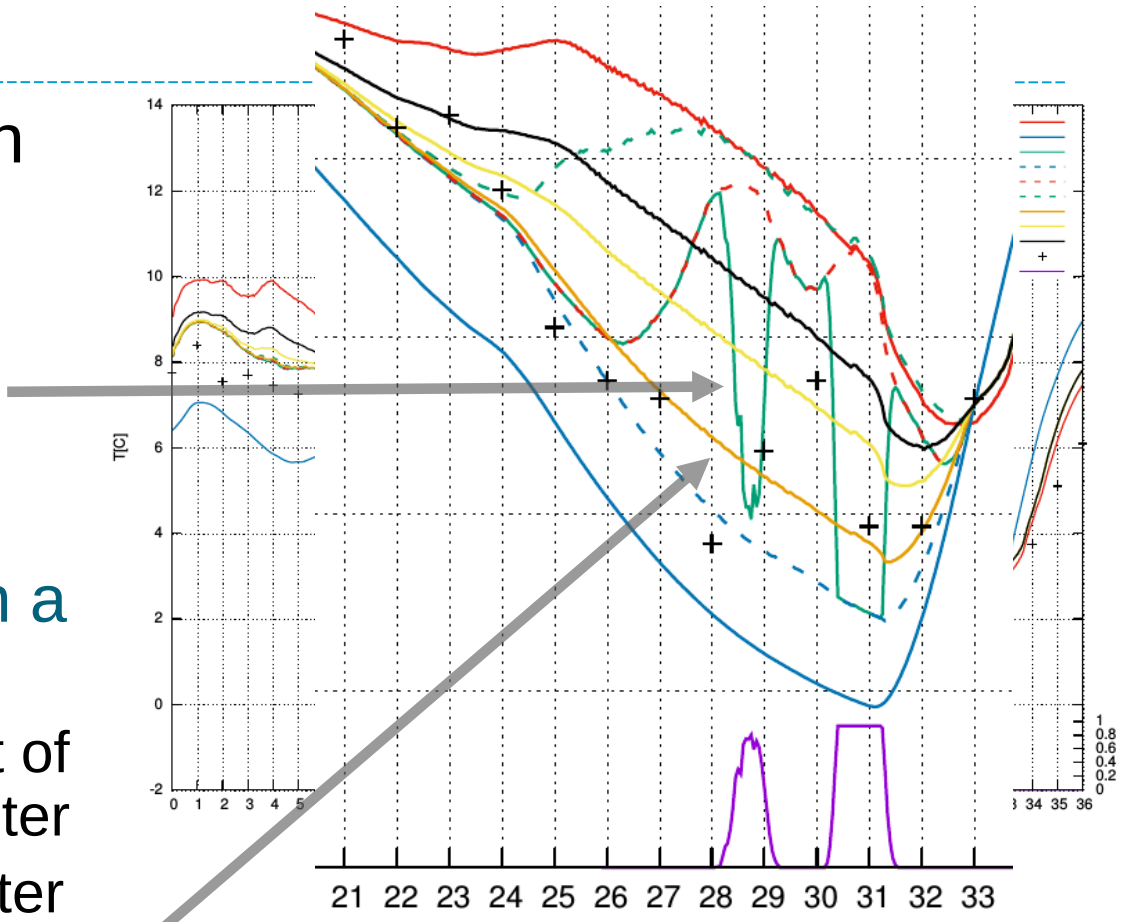
Geleyn 1988 (dashed line)

Kullman 2009 (dashed line)

new recomended

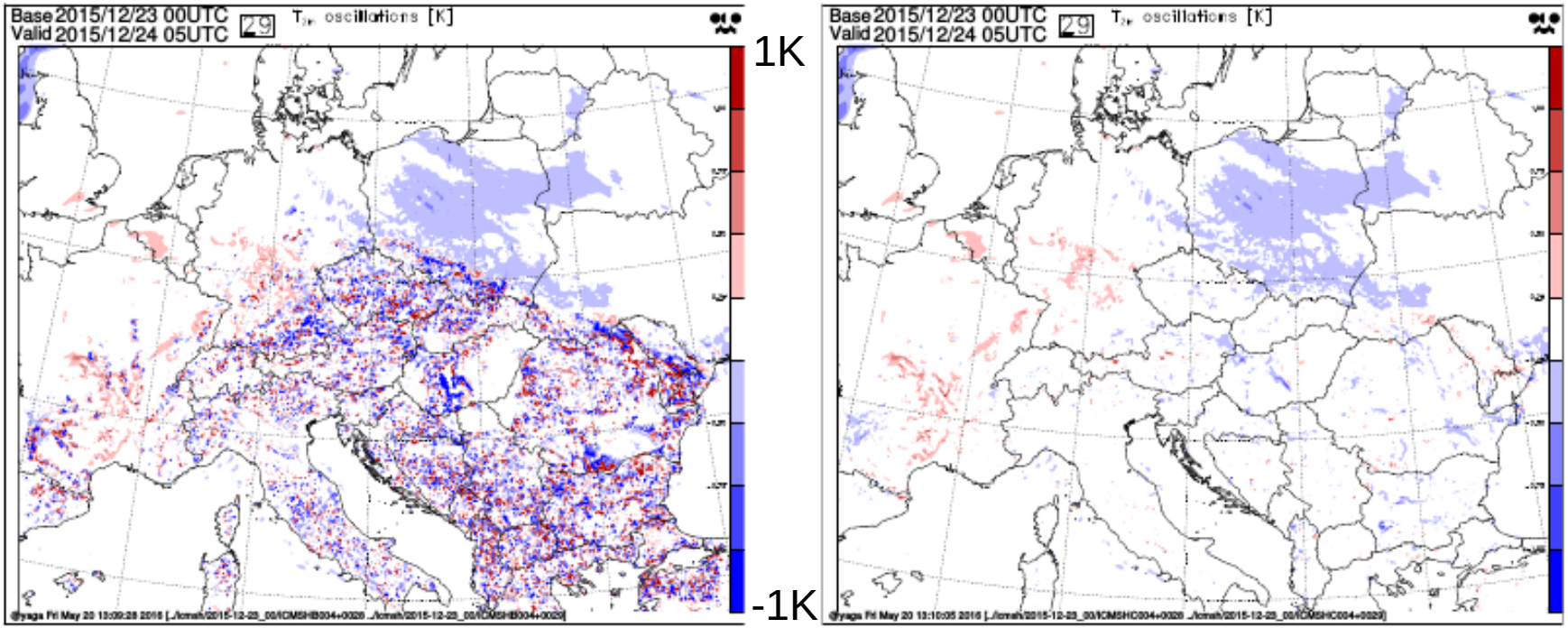
Interpolation to screen level (T2m, RH2m) in stable situations

- modified interpolation
  - Mixture of Geleyn 1988 and Kullmann 2009 method has oscillations
  - Solution: Kullmann method redefined in a non-oscillatory way
    - different placement of elimination parameter
    - one tuning parameter changing interpolated T2m monotonically



mixture of Geleyn and Kullman
Geleyn 1988 (dashed line)
Kullman 2009 (dashed line)
new recomended

Interpolation to screen level (T2m, RH2m) in stable situations



Old

1h 2 m temperature difference
23.12.2015 00+29h

New

T 2m – snow model in ISBA scheme

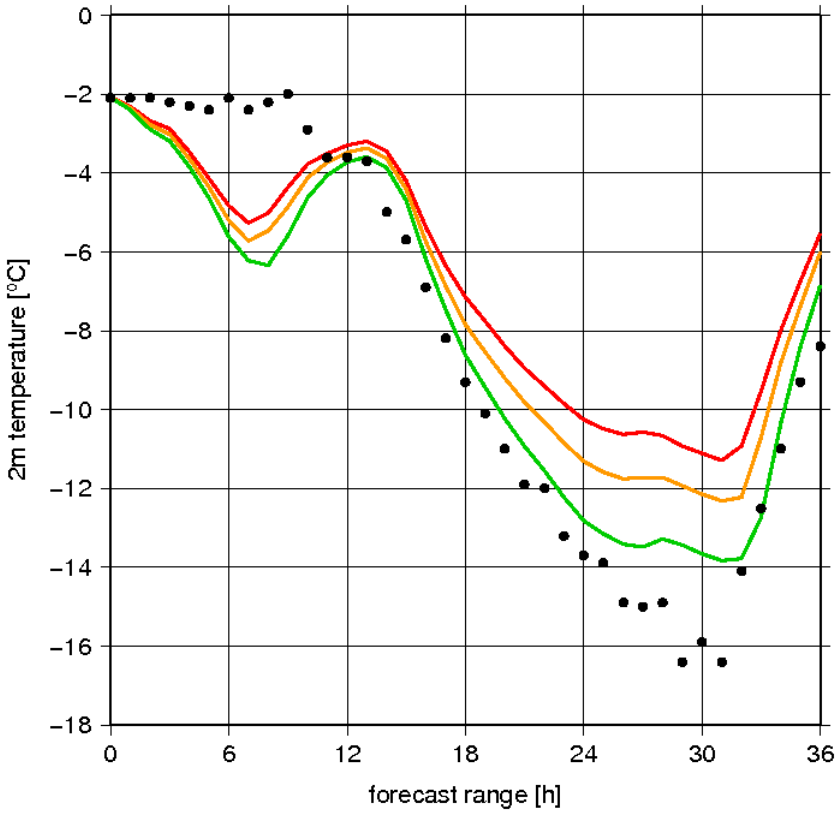
- Minimum 2m temperature in stable anticyclonic situations with snow cover
  - Cooling process not represented well:
    - snow layer being part of surface ISBA layer, implying T_snow = T_surf
  - The idea is to reduce heat exchange with the deep soil in the presence of snow (namelist parameter NCHSP)

    Tested in ARPEGE in 2003

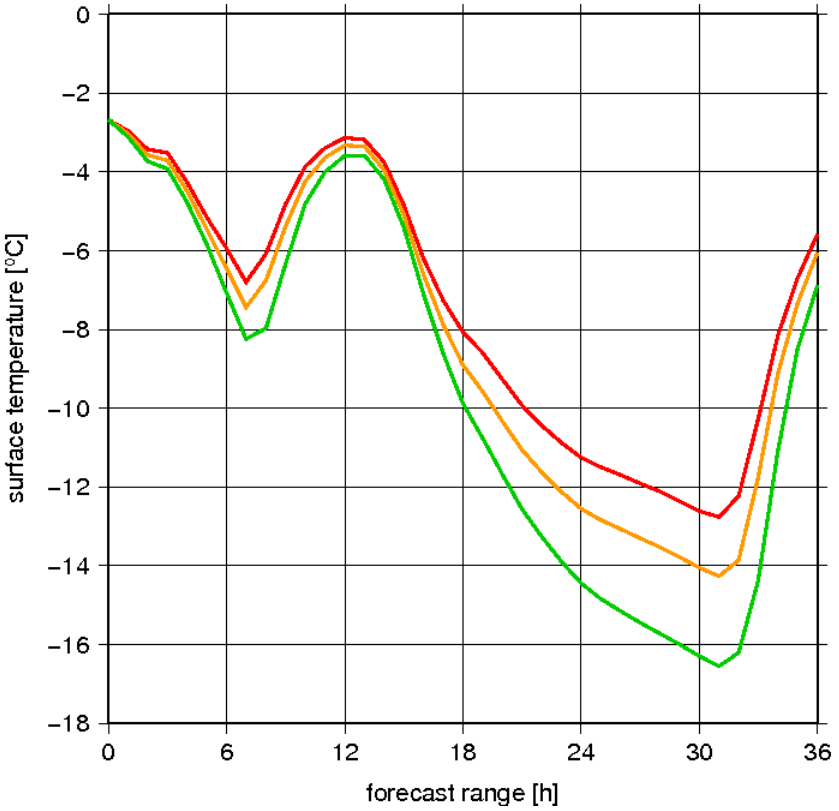
    Re-evaluated with ALARO-1 now

T 2m – snow model in ISBA scheme

2 m temperature



surface temperature



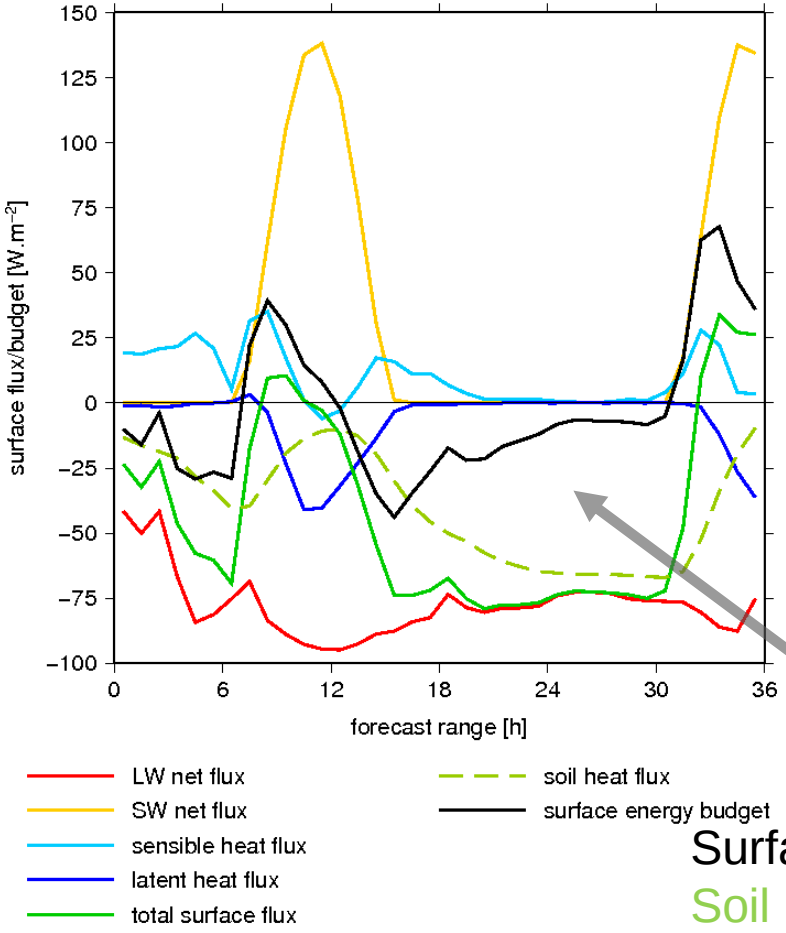
10 Jan 2017 00run +36
Prague

Operational settings
extreme (NCHSP=1) soft (NCHSP=2)

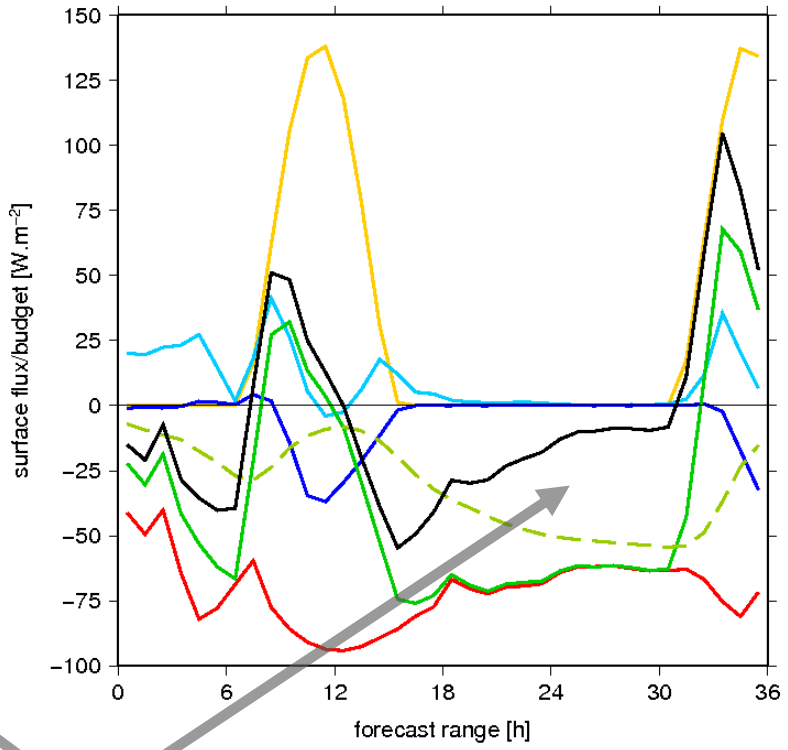
T 2m – snow model in ISBA scheme

Fluxes and surface energy budget

Operational settings



Extreme settings



Surface energy budget

Soil heat flux (dashed)

10 Jan 2017 00run +36

Prague

T 2m – snow model in ISBA scheme

- Minimum 2m temperature in stable anticyclonic situations with snow cover
  - evaluate impact of NCHSP in cycling during longer period
  - 2-layer ISBA is insufficient in such case, solution with NCHSP provides only partial cure
  - usage of SURFEX with more advanced snow scheme
  - problem is related also to the quality of snow analysis

Outlook

- Enhancement of the 3MT downdraft parameterization towards **unsaturated downdraft** option
- Adding aspects of **Complementary Sub-grid Drafts** to new radiation, turbulence and microphysics
- Further enhancements of the **Third Order Moments** and **mixing length scale** parameterization in TOUCANS
- Further steps towards **the unification of cloudiness**
- Linking with the **SURFEX** scheme

Thank you!