Schweizerische Eidgenossenschaft
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CONSORTIUM FOR SMALL SCALE MODELING
COSMO

COSMO WG3b

Status

Jean-Marie Bettems / MeteoSwiss

Offenbach, WG3b / SOILVEG meeting, March 2018

Summary of WG3b activities and links to related documents:

http://www.cosmo-model.org/content/tasks/workGroups/wg3b/default.htm

Please check and send corrections, extensions, comments to WGC!

TERRA & TURBTRAN

General and common WG3-Task

"**Con**solidation of the **S**urface-to-**A**tmosphere **(ConSAT):**

according to a dynamically adapted list of actions being the base of past and (maybe) future PTs

Current topic:

Reformulation of surface-processes with respect to roughness-effects and numerical stability in TERRA and TURBTRAN

Current contributors:

Matthias Raschendorfer (DWD)
Günther Zängel (DWD), (Jan-Peter S., Jürgen H.)

- **Main lessons from previous ConSAT tasks:**

  - …
  - **Modifications in the description of the turbulent Prandtl-layer can hardly correct the main sources of current model-errors of the diurnal cycle of near surface variables!**
  - **The process description of surface processes provides by far the largest potential for improvement!!**
  - …

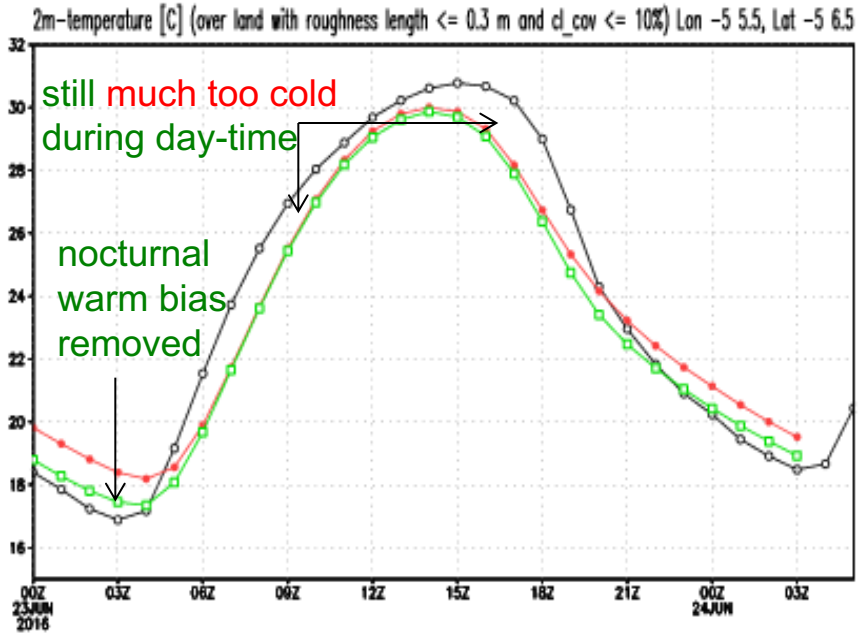
Case study: 23.06.2016

COSMO-DE with lateral boundaries from ICON-EU

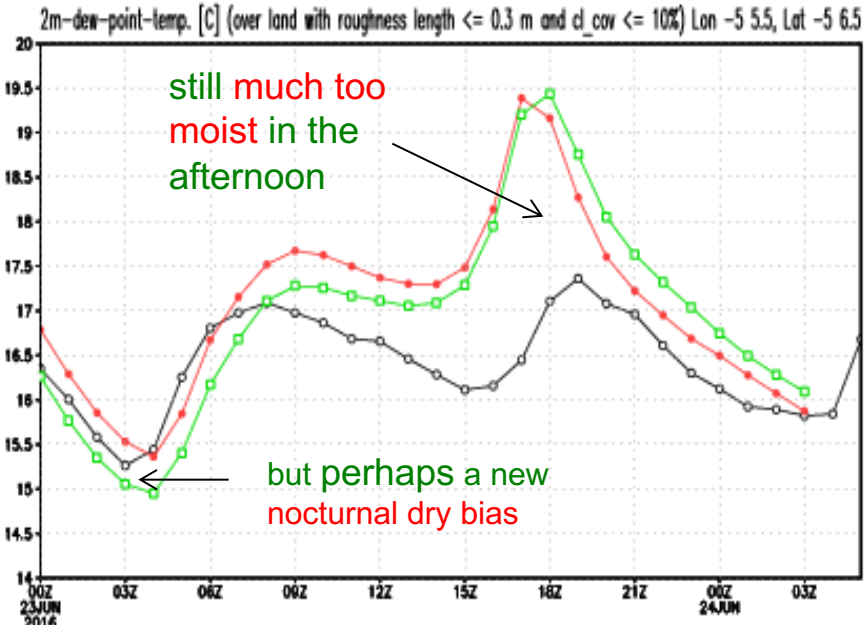
- ✓ **only for rather smooth surfaces; applied filter**
- ✓ **almost saturated soil due to long standing rain period before**
- ✓ **almost no clouds due to high pressure situation; + applied filter**

domain averaged daily cycles of near–surface variables

T_2m



TD_2m



ana_lm3_exp_10279 — out_lm3_rout — out_lm3_exp_10279

direct analysis of T_2m and TD_2m

operational configuration

revised TURBDIFF imported from ICON

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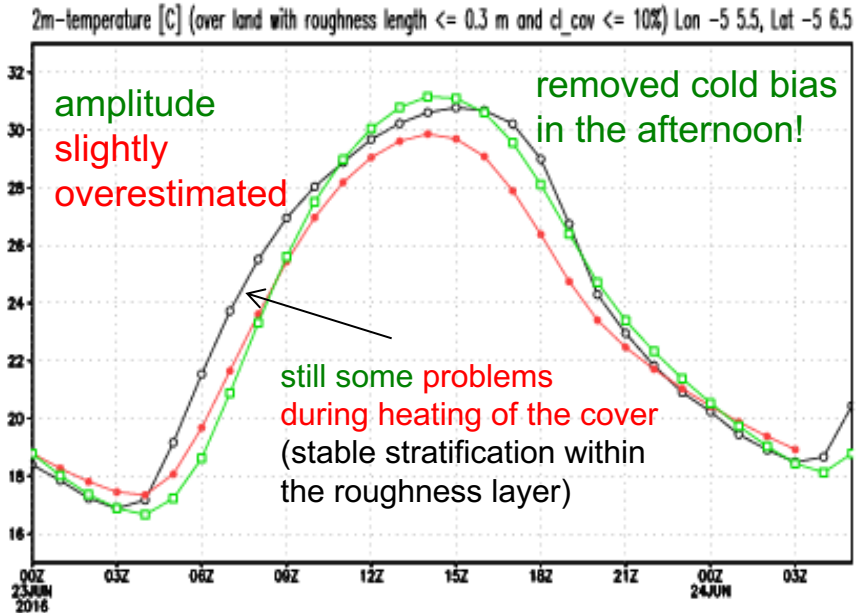
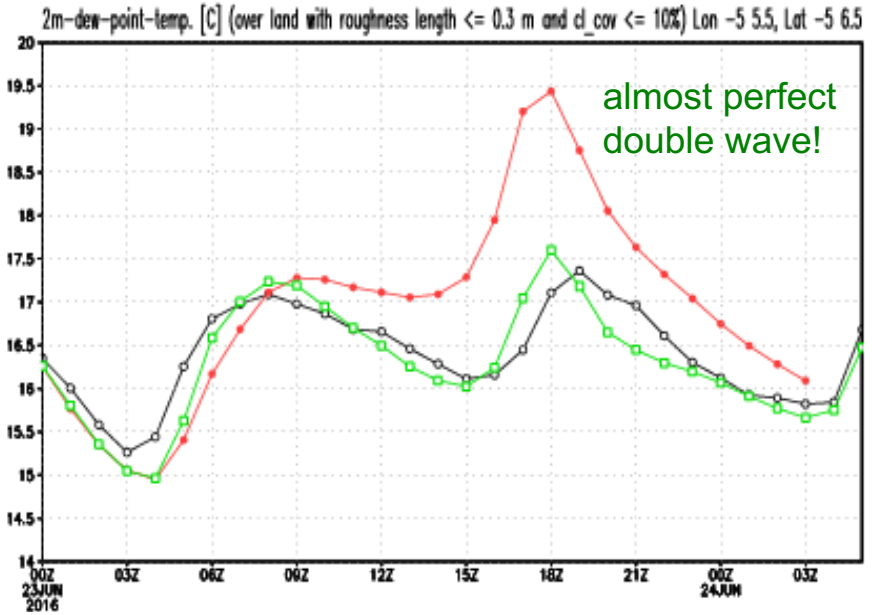
T_2m



TD_2m



ana_lm3_exp_10279 — out_lm3_exp_10279 — out_lm3_rlmk_new_surf-icon-icon-itype_surf=1-lsfluse=T-e_surf=10-c_soil=2-itype_vdif=1

direct analysis of T_2m and TD_2m

revised TURBDIFF imported from ICON

revised TURBDIFF imported from ICON
+ new decoupled surface cover: $SAI_{\infty} = 10$

PT TERRA Nova / MSc Verena / PhD Daniel

- **PT TERRA Nova**, 09.2016 – 06.2018, Y. Ziv / IMS
  MsC Verena, 12.2017 – 05.2018, Prof. Seneviratne / ETHZ
  - *document TERRA performance, compare with CLM performance*
  - *compare v5.0 / v5.05 conservative / v5.05 aggresive / CLM*
- Simulations with TERRA v5.0 (EU, RU @ 7km) and CLM (EU @ 7km) performed and being analyzed (MCH tool for standard verification, additional verification).
- Additional simulations with latest TERRA and on Eastern Mediteranean domain are planned, but only @ 7km.

- **PhD Daniel Regenass**, 01.2018 – 12.2020, Prof. Schär / ETHZ
  - *first step is to test Linda Schlemmer developments in NWP mode (topo dependent water table → strong positive effect on climate simulations)*
  - *next tasks still open, but goal is to address MCH specific shortcomings*
  - *common meeting with all stake holders took place at ETHZ on Jan. 16*
  - *use TERRA Nova test bed*

PT AEVUS

- **Urban parameterization** for operational NWP
  - *Paola Mercogliano / CIRA, 09.2017 – 12.2018*
  - *based on Hendrik Wouters bulk model*
- **Code base** is COSMO 5.04g, plus the latest URB development by Hendrik (TERRA-URB v2.3), including all known bug fixes developed for the climate version

- Code base is ready (thanks to Uli S)
- **Sanity check** of this new release is beeing perfomed by the PT team
- **AEVUS meeting**
  ICCARUS / Wednesday February 28th (chair Paola Mercogliano)

PT SAINT

- Validate and update the **multi-layer snow model** to make it production ready
  - *Sascha Bellaire / SLF, 07.2017 – 06.2019*
  - *full support of SLF (Prof. Michael Lehning)*
- **Code base** is COSMO 5.04g, plus the latest SAT development by Matthias (in particular the implicit formulation of the near surface heat budget)

- Code base is ready (thanks to Uli S.), **code has been analysed** by Sascha who is now evaluating different options (→ discussion with DWD colleagues)
- Martin Koehler will prepare an environment at ECMWF for **tests with global ICON** (but not before autumn 2018)
- **SAINT meeting**
  ICCARUS / Thursday March 1st (chair Sasha Bellaire)
  With participation of Matthias, Ekaterina …

PP CALMO-MAX

- **Calibration of unconfined model parameters**
  - *Antigoni Voudouri / HNMS, 06.2017 – 09.2019*
  - *Consolidate results of PP CALMO, provide community tool*

- Strong interest of **Prof C. Schaer / ETHZ group**
  - *This method is used at ETHZ to periodically calibrate COSMO-CLM*
- Similar method used by **Chineese group** with WRF
  - *Up to 30% improvements of precipitation scores for moonsoon case over Beijing*
  - *Paper available in BAMS / May 2017*

PP CALMO-MAX

- Two and a half days **workshop at Athens** beginning of January
  - *Omar / ETHZ (original development), Yoav / IMS, Edoardo / CIRA, Euripides, Antigoni, Flora, DImitra / HNMS, Jean-Marie / MCH*
  - *Very useful discussions, minutes have been distributed*
  - *Good example of COSMO collaboration and knowledge transfer*

- **Task 2.1 on track** (COSMO-1 calibration on Daint / CSCS)
  - *Calibrating 6 parameters of production configuration of COSMO-1*
  - *With improvement of meta-model and performance function*
  - *In depth verification should definitely show the usefulness of the method for improving the forecast quality*

PP CALMO-MAX

- **Meta-model**
  - *On COSMO web and on GitHub in public repository*
  - *Common development between IMS and ETHZ*
  - *Octave version coming (→ ECMWF)*

- **Extension of meta-model and performance function (TBE)**
  - *Consider model internal variability to filter noise*
  - *Use 6h instead of 24h accumulated precipitation (daily cycle)*
  - *Add precipitation FSS to constraint precipitation spatial structures*
  - *Add 2m humidity constraint (to avoid over fitting 2m temperature)*
  - *Add sunshine duration constraint*

PP CALMO-MAX

- **Computing cost of the method**
  - *Running calibration in hindcast mode significantly reduces the cost of the method (and simplify the experimental setting).*
  - *It is possible to fit the MM with the minimum number of simulations, namely 2*N + N*(N-1)/2 + 1 for N parameters.*
  - *If the soil memory is not an issue, sampling a full year with representative days will considerably reduce the cost of the method; otherwise a full year is most probably required.*
  - *Impact of calibrating with a reduced domain size will be evaluated.*

  - ***Case study: C1 calibration for 6 parameters:***
    Use one year hindcast with 0.5 time domain extension:
    calibration requires about 8 years operational configuration equivalent
    Is it much? … similar to MOS or EPS calibration requirements…
    Less than 2 weeks time on a machine with 1000 GPU's

PP CALMO-MAX

- **Suggestion for documentation of model tuning parameters**
  - *Table on COSMO web, ideally filled up during development phase*
  - *Including parameters implemented as hard coded values!*
  - *With short description, default, minimum and maximum values*
  - *Including information about model sensitivity (summer/winter, different target areas)*

  - *Preliminary steps done in CALMO / CALMO-MAX and in WG7*
  - ***Coordination workshop planned in Athens in Spring 2018***
  - *Should become a permanent task of COSMO*

- *All unconfined model parameters should be documented in namelist*
- *But these namelists should be only visible to experts*

SNOWE and snow analysis

- **SNOWE** defined as COSMO software by StC
  - *full featured snow analysis package, incl. snow density*
  - *developed and maintained at RHM*
  - *code and documentation available on COSMO site*
    http://www.cosmo-model.org/content/support/software/default.htm
  - *used for production at RHM*

- **Snow analysis for COSMO – Status & plan**
  ICCARUS / Thursday March 1st (chair Juergen Helmert)

EXTPAR

- In its March 2017 meeting the COSMO StC has nominated **Katie Osterried**, working at ETHZ for C2SM, as **Source Code Administrator**
- The **official source code** is available in a private repository in the C2SM organization on GitHub : https://github.com/C2SM-RCM/extpar (latest release is v4.0)
- **Automatic testing** using DWD and MCH configurations is implemented at CSCS (using Jenkins tool, all raw data available at CSCS)

- Currently **different versions of the code** exist at DWD and at MPI
- Currently **GRIB output is not working correctly** (but NetCDF is ok)

EXTPAR

Next milestone → Spring 2018

- **Code synchronization** with DWD and CLM community, unified version on GitHub.
- Improve **documentation** on the web, incl. documenting differences between COSMO and ICON.
- Review **support of GRIB output** (remove GRIB 1 support? correct or remove GRIB 2 support?).
- Once unified version is available, start integrating **ICON developments**.

TERRA Standalone

- Standalone TERRA module, based on **COSMO v5.03**
- **Maintained** by IMS (best effort)
- **Code and documentation** available on COSMO site
  http://www.cosmo-model.org/content/support/software/default.htm
- Used to provide **balanced initial conditions of the soil**
  (cheap multi-years simulations are feasible)

- **Update** to latest COSMO release required for NWP test suite (asap) and for CALMO-MAX (early 2019)
  - *New block structure*
  - *IMS could provide resources in 2018Q3, but not before*
  - *Possible resources from MCH (to be discussed internally)*

And other topics …

- **Mire parameterization**
  - *experiments in ICON showed neutral impact*
  - *the SMC has approved the implementation of MIRE in COSMO v5.06*
- **Phenology**
  - *phenology model by Stöckli et al. (2011) provides daily LAI maps (using history of relevant NWP model parameters)*
  - *using the phenology model instead of the current LAI climatology has a significant impact on surface fluxes (15 Wm-2 / LAI) and T2m (0.5 K / LAI)*
  - *… but currently no resources to follow-up on this work*
- **SRNWP data pool**
  - *Data base beeing updated for a couple of stations (LIN, PAY, CAB)*
  - *… very low usage … action dying (?)*