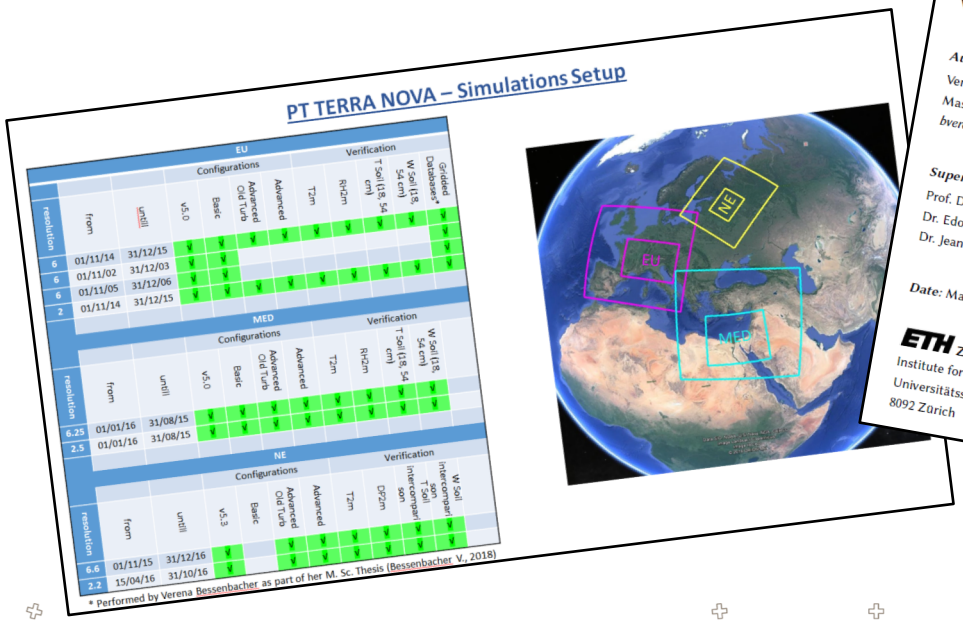
PT TERRA Nova, 09.2016 – 02.2019

Y. Ziv / IMS (PTL), V. Bessenbecher / ETHZ

- Compare different **recent** versions and configurations of **TERRA**, on different target domains
- Compare COSMO-TERRA with COSMO-CLM (Community Land Model), MSc ETHZ



PT TERRA NOVA – Simulations Setup

EU

resolution	from	until	Configurations: v5.0	Basic	Advanced Old Turb	Advanced	T2m	RH2m	T_Soil (18, 54 cm)	W_Soil (18, 54 cm)	Gridded Database*	Verification
6	01/11/14	31/12/15	✓	✓								
6	01/11/02	31/12/03	✓	✓								
6	01/11/05	31/12/06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	01/11/14	31/12/15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

MED

resolution	from	until	Configurations: v5.0	Basic	Advanced Old TurB	Advanced	T2m	RH2m	T_Soil (18, 54 cm)	W_Soil (18, 54 cm)	Verification
6.25	01/01/16	31/08/15	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.5	01/01/16	31/08/15	✓	✓	✓	✓	✓	✓	✓	✓	✓

NE

resolution	from	until	Configurations: v5.3	Basic	Advanced Old TurB	Advanced	T2m	DP2m	T_Soil intercomparison	W_Soil intercomparison	Verification
6.6	01/11/15	31/12/16	✓		✓	✓	✓	✓	✓	✓	✓
2.2	15/04/16	31/10/16			✓	✓	✓	✓	✓	✓	✓

* Performed by Verena Bessenbacher as part of her M. Sc. Thesis (Bessenbacher V., 2018)

IAC Institute for Atmospheric and Climate Science

Master Thesis

Comparison of COSMO-TERRA and COSMO-CLM² in weather mode for summer heat extremes

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Date: May 31, 2018

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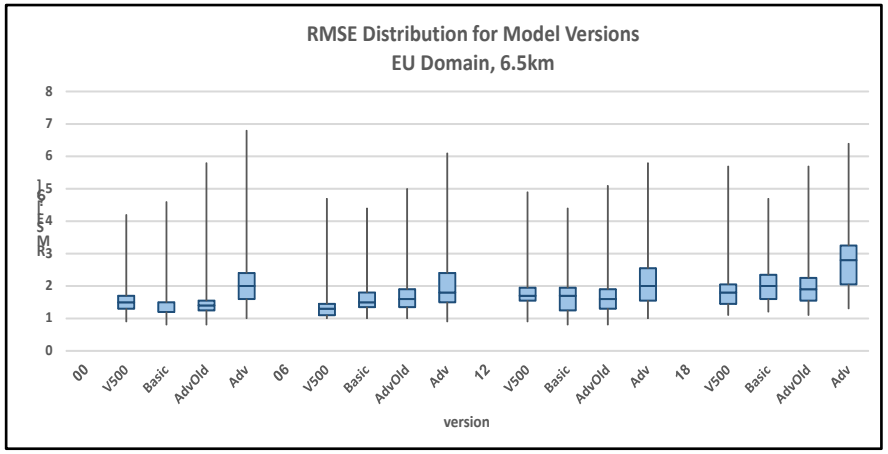
PT TERRA Nova, 09.2016 – 02.2019

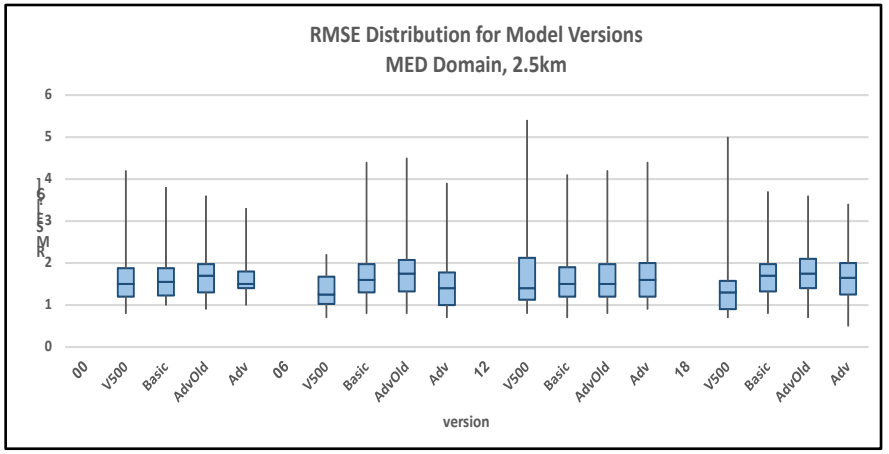
Y. Ziv / IMS (PTL), V. Bessenbecher / ETHZ

- Project is finished
- **Final report** available on COSMO web site
  (http://www.cosmo-model.org/content/tasks/workGroups/wg3b/docs/Priority_Task_TERRA_Nova_Final_Report.pdf,
  http://www.cosmo-model.org/content/tasks/workGroups/wg3b/docs/MasterThesis_TERRA_CLM_Report.pdf)
- Tested configurations
  - **2 models** (COSMO-TERRA, COSMO-CLM)
  - **3 domains** (Central Eu, Eastern Med, North-Western Ru)
  - **4 configurations** (v5.0, v5.05 conservative / advance & old turb / advanced & new turb)
- Used resources
  - 7 COSMO contributors + 3 colleagues from ETH Zurich (COSMO-CLM2 community)
  - **IMS, RHM, MCH, DWD, ETHZ**
  - 24 years of weather simulation

PT TERRA Nova, 09.2016 – 02.2019

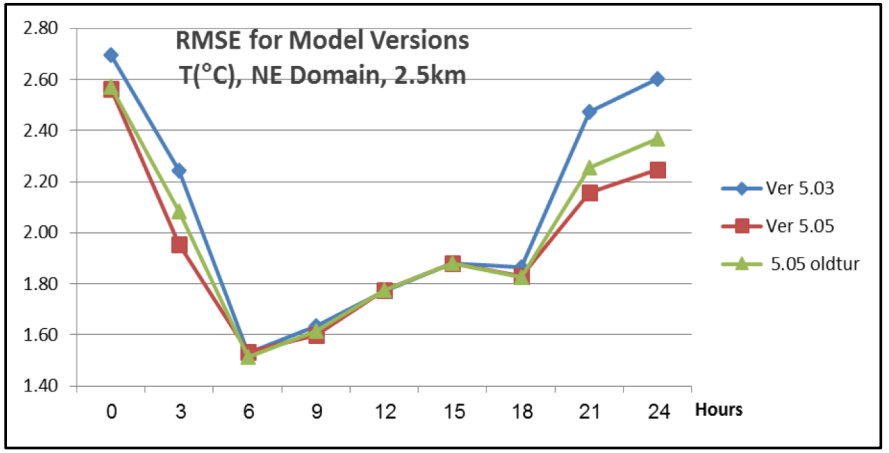
Verification – 2m temperature RMSE for 3 domains and 4 time of days





2m Temperature RMSE in 3 domains:
EU 6km (top-left), MED 2.5km (top-right), NE 2.2km (bottom-right).

In EU domain Advanced configuration performs the worst, while in MED domain Advanced configuration is somewhat better. In NE domain Advanced configuration has the lowest RMSE.



PT TERRA Nova, 09.2016 – 02.2019

Y. Ziv / IMS (PTL), V. Bessenbecher / ETHZ

Main **findings**

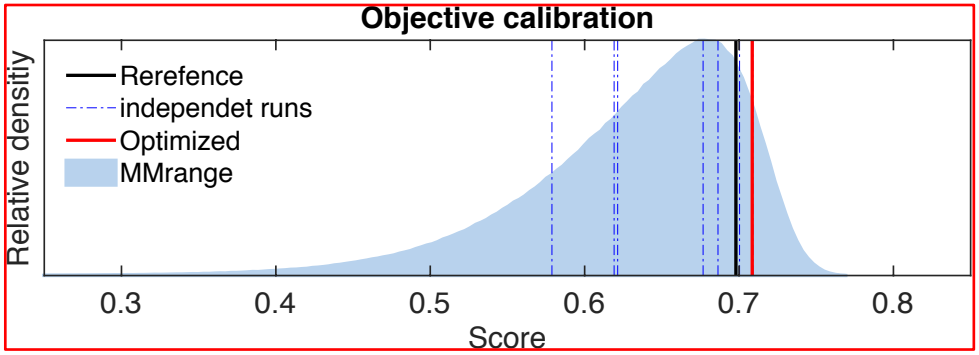
- **All** TERRA configurations exhibit similar performances, but ***detailed*** **performances depend on target areas**
- **All** v5.05 TERRA configurations perform reasonably *(in particular no significant soil drying in advanced v5.05 …)*
- Decreased performance of TERRA fluxes with increased **vegetation** density
- Superior **CLM fluxes** do **not** translate into improved near surface temperature *(model tuning targets TERRA, compensation of old aerosol climatology errors only in TERRA)*

PP CALMO-MAX, 06.2017 – 09.2020

A. Voudouri / HNMS (PPL)

CALMO methodology is recognized as a relevant approach

- *Two published papers in refereed papers and two more submitted (Atm. Research)*
- ***Call for contribution** to a special 'Atmosphere' issue "Evaluation and Optimization of Atmospheric Numerical Models"*
- *Similar research by Duan, Q. et al. 2017., BAMS*
- *Used at ETHZ for climate run calibration (**new proposal in preparation**)*
- *Is being applied at B-TU (**calibration of COSMO with new dycore**, A.Will)*



PP CALMO-MAX, 06.2017 – 09.2020

A. Voudouri / HNMS (PPL)

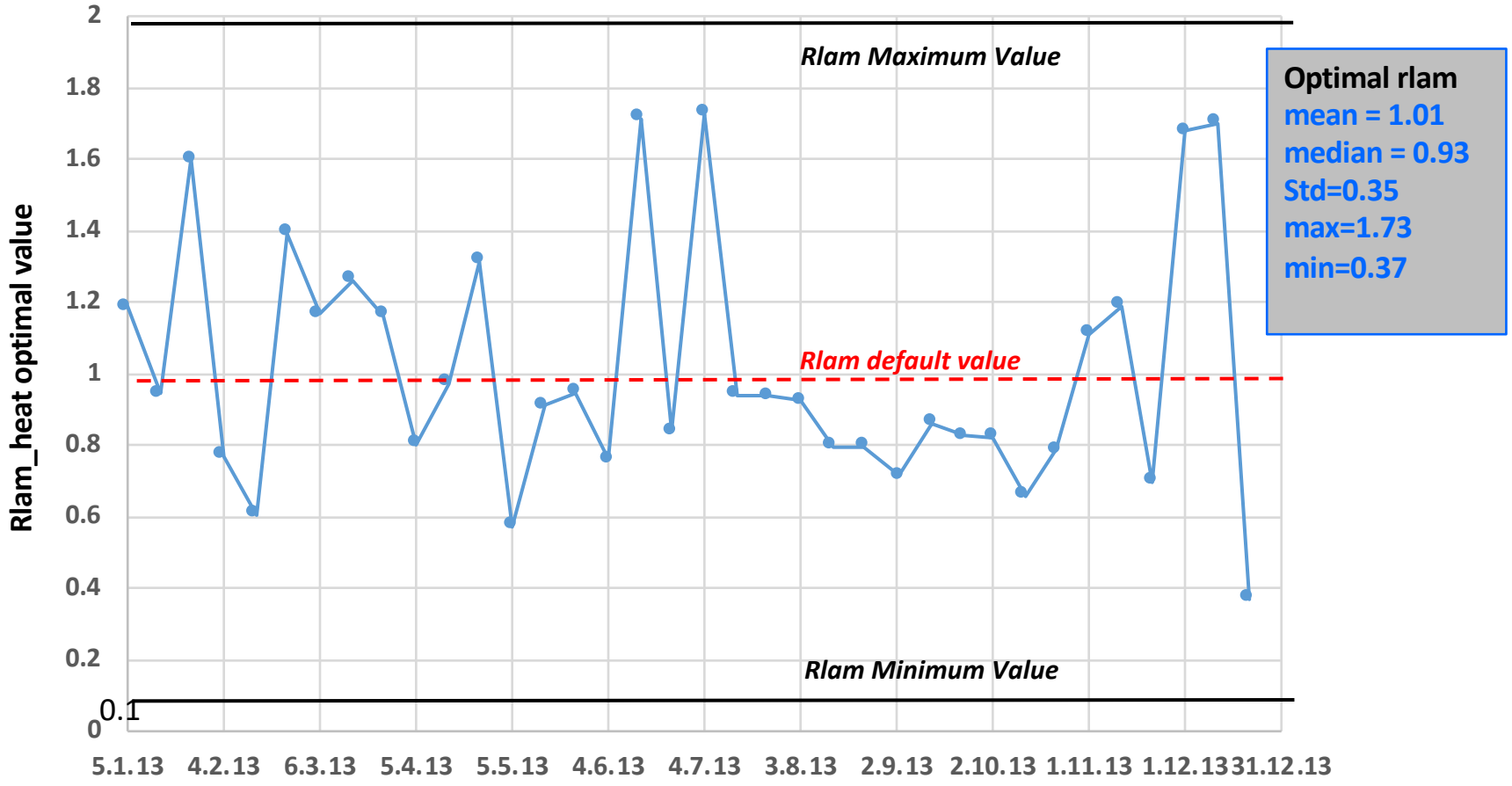
A **one year extension** has been granted, **09.2019-09.2020**.

PP team is working hard to provide the following **deliverables** :

- Clear demonstration of benefit measured by standard verification scores
  (COSMO-1 or another COSMO configuration)
- Optimization of the method
  (MM fitting strategy, parameter space partition, coarser resolution, smaller domain…)
- Standard procedure on model parameter documentation put in place
  (in particular for ICON-LAM)
- Comprehensive and clear user manual
  (in particular about the Meta-Model)
- Draft future activities after PP ends
  (support users in calibration activities)

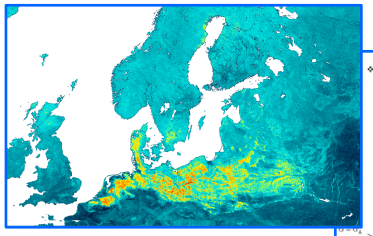
PP CALMO-MAX

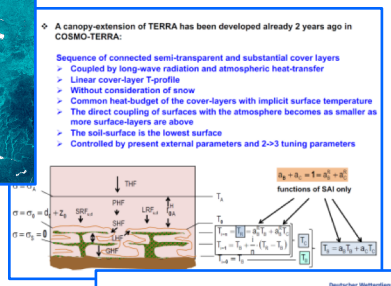
Optimal rlam_heat *for COSMO-1, one year hindcast, 10 days optimal*

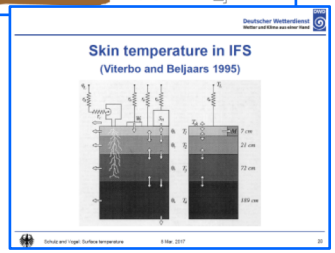


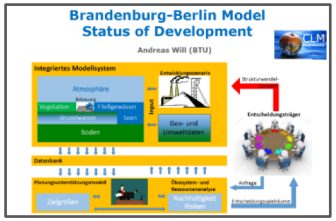
rlam_heat : scaling factor for the thickness of the laminar boundary layer for heat

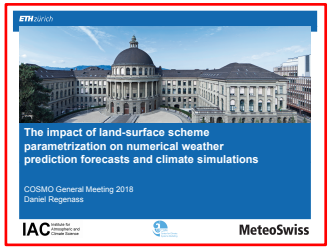
More TERRA activities

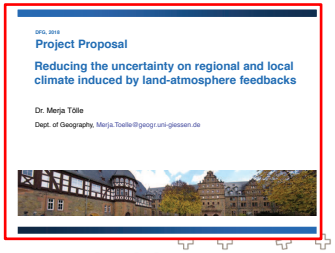












- Juergen Helmert / DWD (**TERRA SCA**), implementation of global high-resolution **soil information** in TERRA
- Matthias Raschendorfer / DWD, **re-formulation** of surface processes in the frame of **PT ConSAT**
- Jan-Peter Schulz / DWD, **bare soil** evaporation and **skin temperature** (effects of **vegetation**)
- Andreas Will / **BTU**, support for vertically **inhomogeneous** soil types (e.g. from HWSD or BUEK 200 data set) by re-writing the Richards equation.
- PhD thesis at **ETHZ**, Daniel Regenass
  - **Catchment** water balance as a **validation** tool
  - Comparing Schlemmer et al. 2018 **hydrology** with standard hydrology
- DFG project at **Uni Giessen** with **2 PhD's**, lead by Merja Tölle
  - Eva Nowatzki, working on **dynamic vegetation** (phenology model) that accounts for seasonal influences and inter-annual variability
  - Mingyue Zhang, working on land surface **data set** (including winter and summer crop)

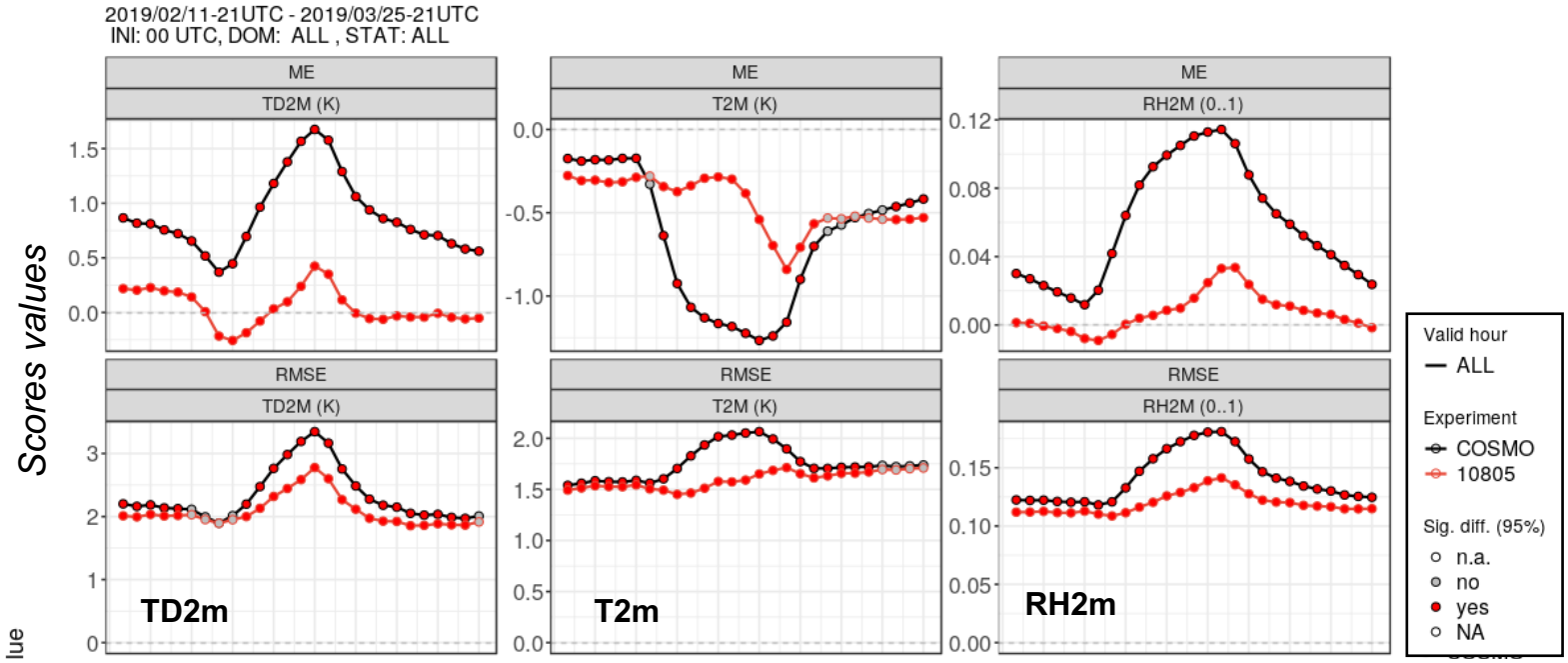
Improved processes in the land surface model TERRA:

Bare soil evaporation und skin temperature

Jan-Peter Schulz[1] and Gerd Vogel[2]

[1]Deutscher Wetterdienst, Offenbach, Germany
[2]Deutscher Wetterdienst, Lindenberg, Germany

COSMO General Meeting, 9 - 12 Sep. 2019, Rome, Italy



Validation COSMO-D2 experiment 10805

Simulation period: 11 Feb. – 25 Mar. 2019 (six weeks)

itype_evsl = 4 : New bare soil evaporation
itype_root = 2 : Exponential root profile
cwimax_ml = 0.0005 : Interception reservoir activated
itype_heatcond = 3 : Soil thermal conductivity dependent on moisture
itype_canopy = 2 : Skin temperature

Significant improvement of scores ! Recommended new configuration !