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COSMO WG3b: Activity Review

Jean-Marie Bettems / MeteoSwiss

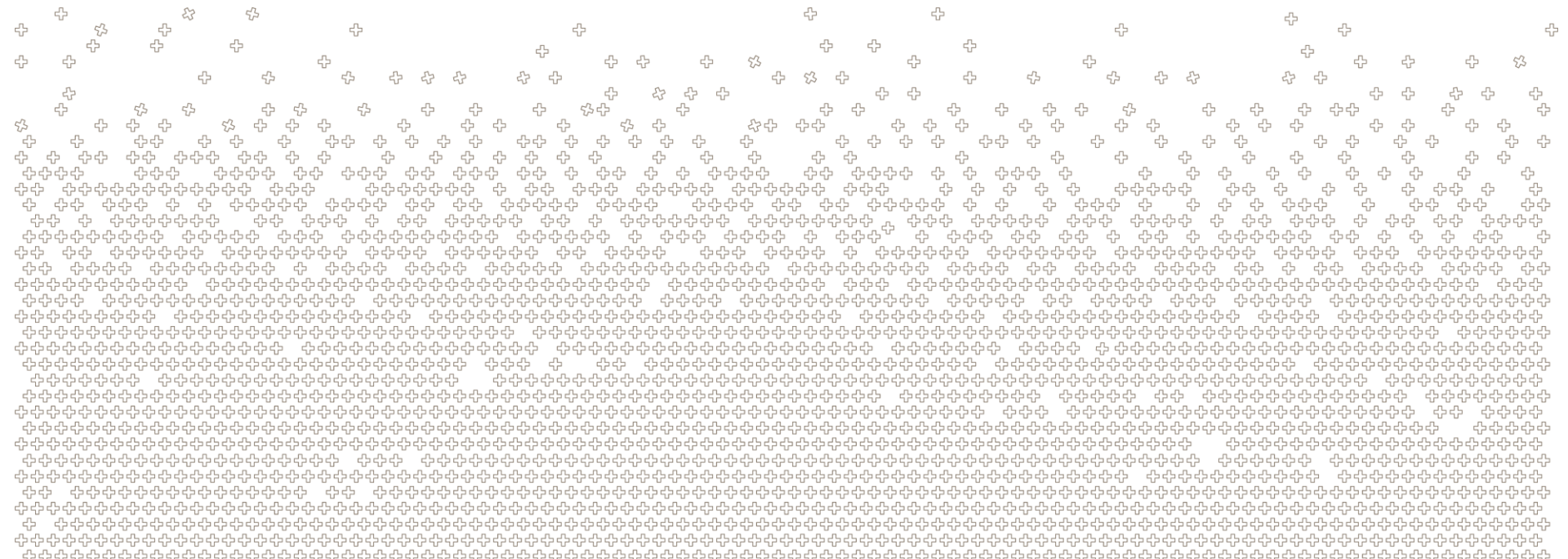
Offenbach, COSMO GM, September 2016



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Priority projects & tasks



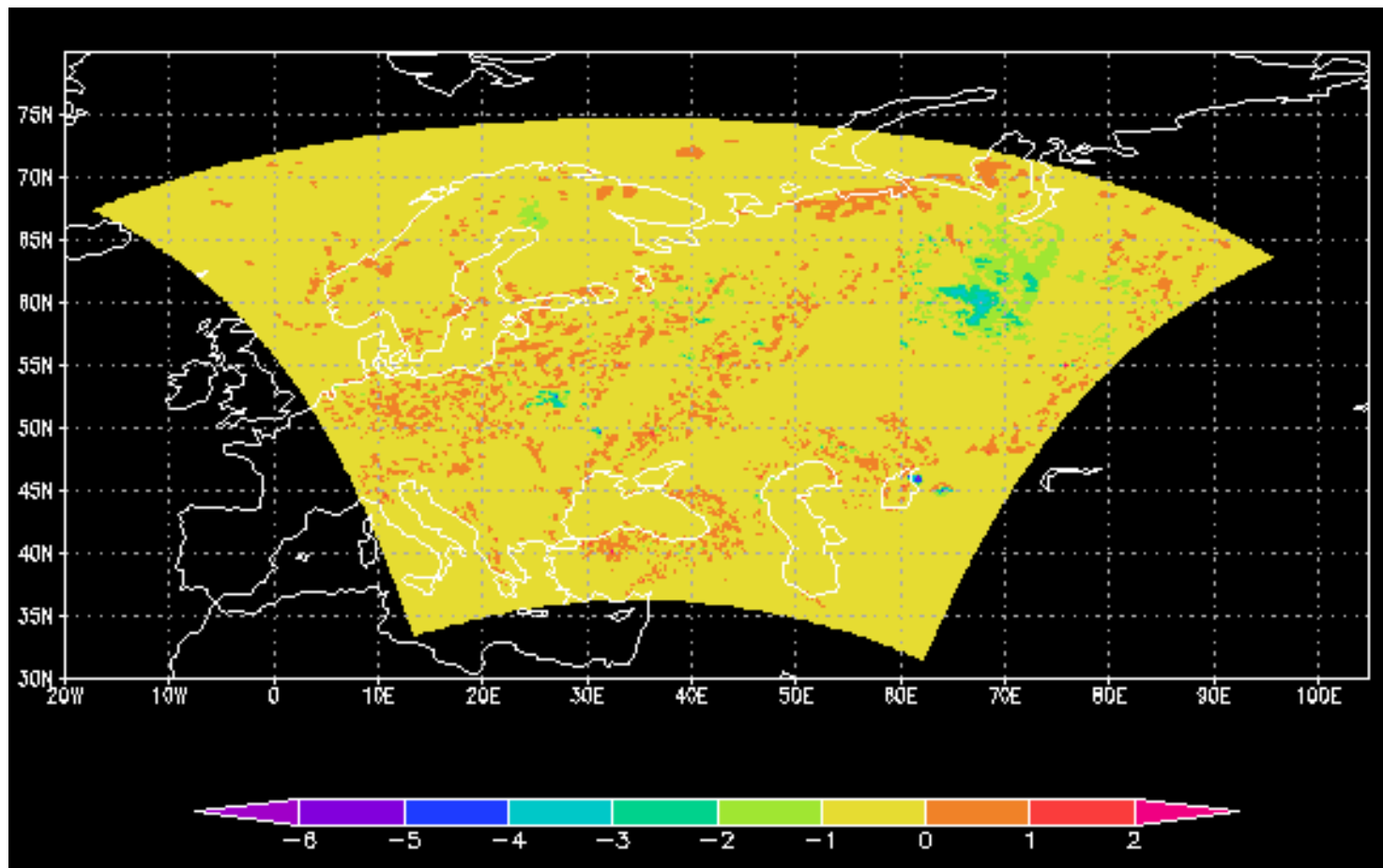
PP and PT (*finish, actions pending*)

- **PT Mire, 09.2011 – 03.2013, RHM**
 - Goal: *add parameterization of mire in TERRA*
 - Key feature: *mire defined by soil type peat
modified heat diffusion and Richard's equation*
 - Status: *peer reviewed paper in 'Water resources research'
code available
available verification results not fully convincing*

- **Follow-up action?**
 - Additional verification required? *Collect more results for SMC*
 - Is this development compatible with latest TERRA?
Organize meeting with DWD to discuss scientific issues (lead Inna)
 - Incorporate in official TERRA? *Uli S. got the code, gives feedback to RHM*

Tests with mire parameterization in COSMO-RU.

Impact of new parameterization



ΔT_{2m} 08.08.2012 12:00 (12h)

PP and PT (*finish, actions pending*)

- **PT SNOWE, 09.2014 – 09.2015, RHM**
 - Goal: *improve analysis of snow water equivalent*
 - Key feature: *off line 1D model to compute snow pack density*
 - Benefit: *positive impact on T2m at boundary of snow pack*
 - Deliverable: *full snow analysis package (incl. NOAA snow mask)*
 - Status
 - *Scientific documentation in COSMO Newsletter 16*
 - *Technical documentation and code will be available on COSMO web*
- **Follow-up action?**
 - Unified package (currently MCH, DWD, RHM... ICON ...)
 - Link with multi-layers snow model
 - *Start a discussion (scientific techniques, ensemble, kalman...) Organize meeting at CUS*
But currently not a priority at DWD

PP and PT (*finish, actions pending*)

- **PT Terra SAnta, 09.2015 – 09.2016, IMS**
 - Goal: *bring TERRA standalone code up to speed with latest COSMO release in both aspects of physical schemes and coding standards.*
 - Status: *see associated talk by Yiftach Ziv*
- **Follow-up action?**
 - Will ICON framework soon provide a similar tool? *No plan*
 - Shall we keep the new package up-to-date (e.g. new block structure)?
If yes, who can take over this responsibility? IMS colleagues?
 - *Next big step is introducing new block structure. IMS could do it after TERRA Nova, and keep the software up to date.*

PP and PT (*active*)

- **PP CALMO, 01.2013 – 12.2016, HNMS**
 - Goal: *Objective calibration of COSMO model*
 - Status: *attend CALMO session (Monday & Tuesday afternoon)*
- **Follow-up project will be proposed**

PP and PT (*new*)

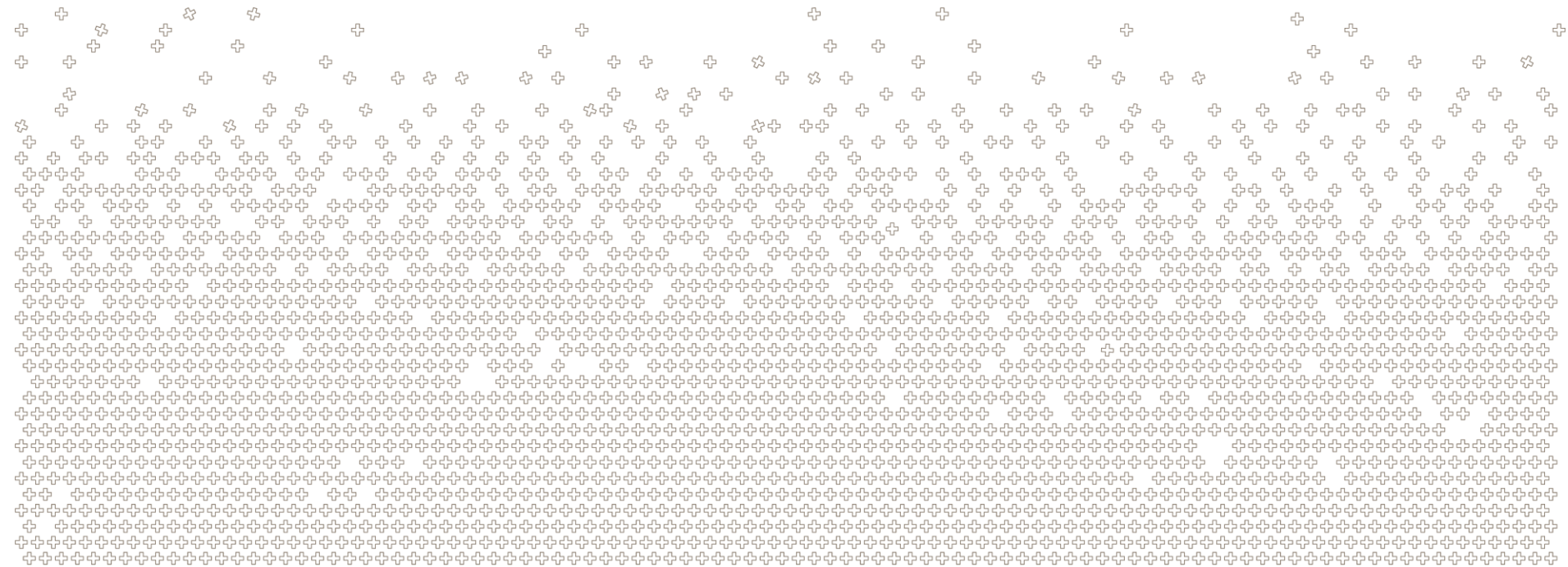
- **PT Terra Nova, 09.2016 – 09.2017, IMS**
 - Goal: *testing the new common ICON / COSMO soil module.*
 - Description: *see associated talk by Yiftach Ziv*
 - **Computing resources: *ECMWF with MCH billing accounts!***



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TERRA

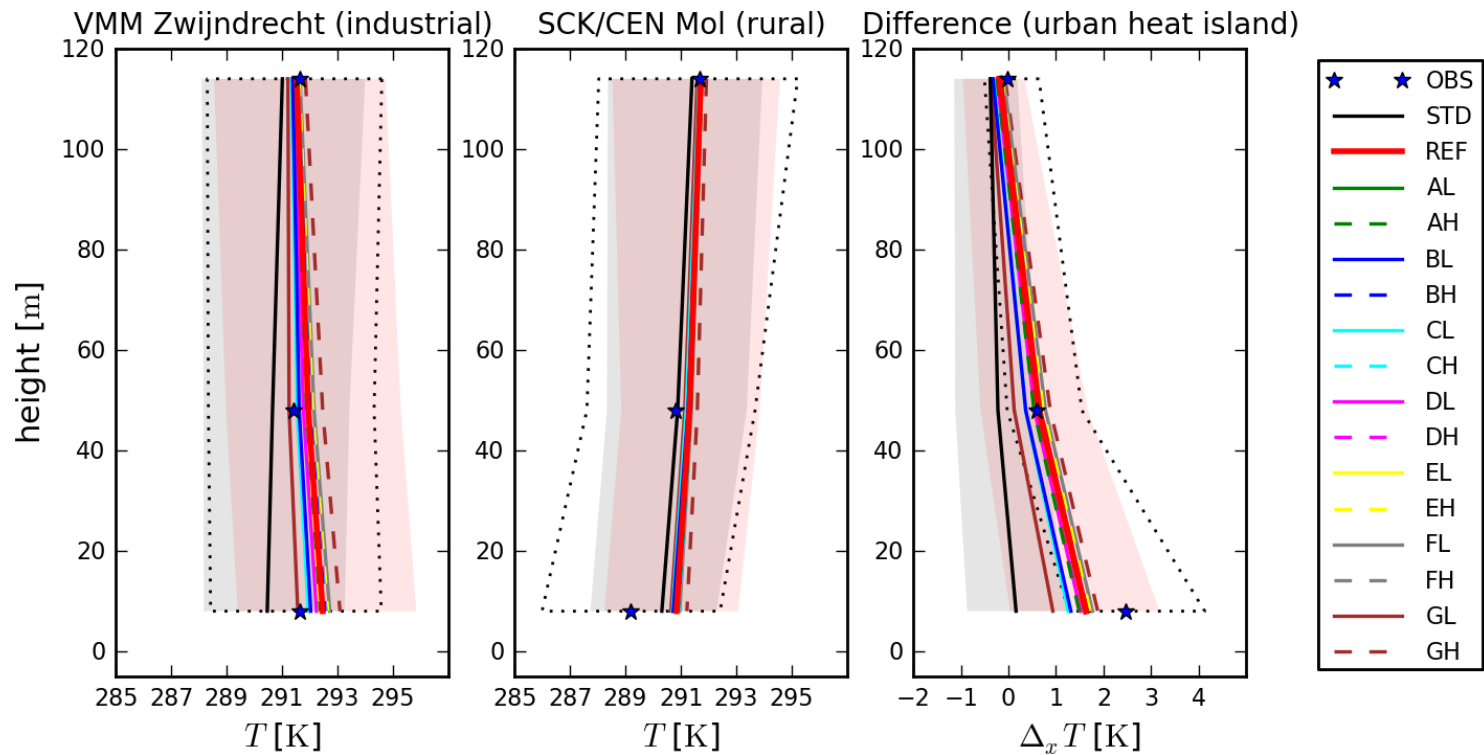


TERRA-URB (*Wouters, H.*)

- Goal: *add cheap but realistic bulk parameterization of urban effects*
- Benefit: *variability of urban heat island well reproduced*
- Status: *peer reviewed paper in 'Geoscientific Model Development'*
two new external parameters in EXTPAR
code will be available in COSMO 5.05
code responsibility by Uli Blahak / DWD

- *See also associated talk by Massimo Milelli*

TERRA-URB (*Wouters, H.*)



Observed (stars) and modelled (lines) nocturnal (0H) vertical profiles for industrial site in Zwijndrecht and the rural site in Mol, averaged for the summer period 2012/07/21 - 2012/08/20.

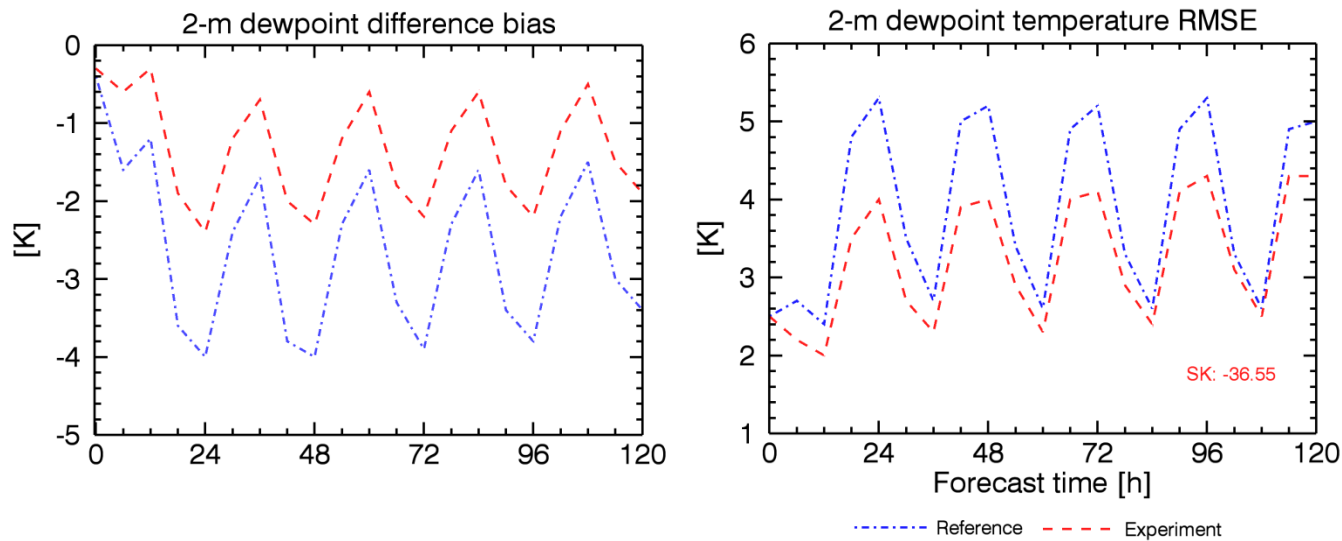
TERRA

- **Work at IMGW**
 - Revisiting bare soil parameterization in TERRA
 - Peer reviewed paper in preparation (Tellus A)
- **Work at DWD**
 - **Unified COSMO/ICON TERRA in COSMO v5.05 (Q42016)**
 - ... with many improvements
 - ... with new multi layers now model
 - ... *without* tiles
 - *See associated talk by Juergen Helmert*

TERRA – ICON

New formulation of bare soil evaporation, based on the resistance method instead of the BATS scheme (Schulz & Vogel, 2016)

ICON: NE America, January 2012, 00 UTC

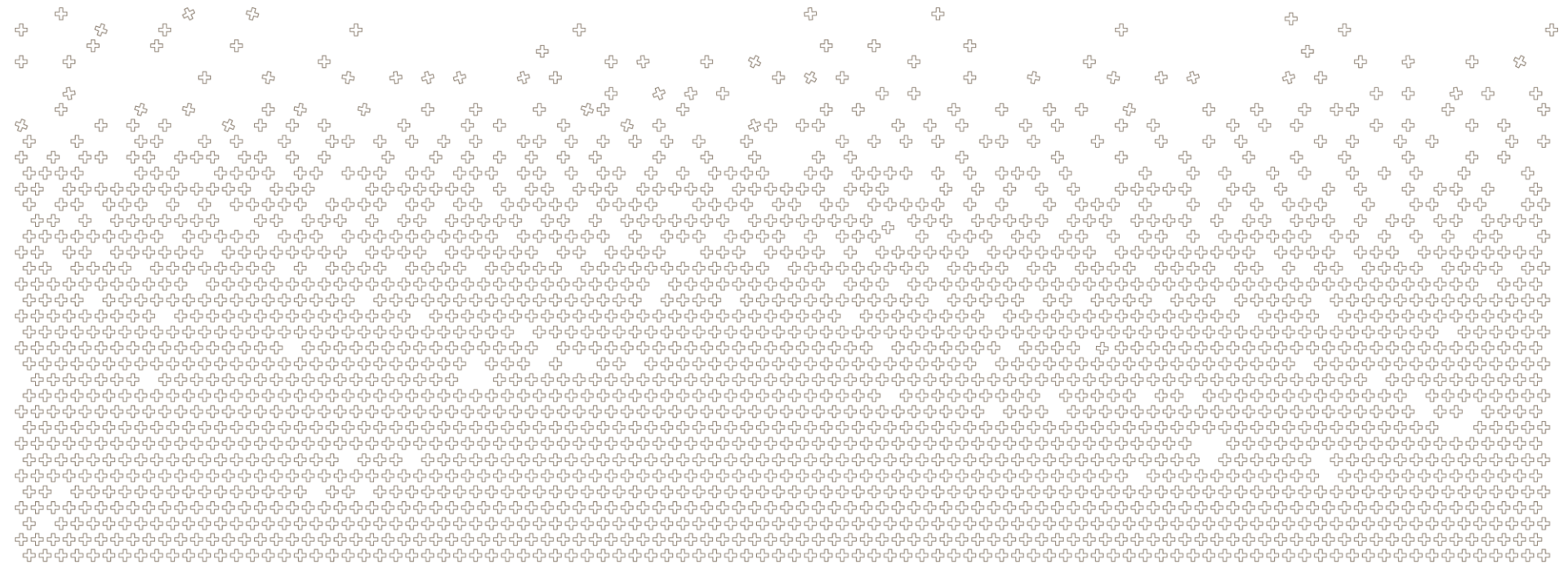




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Support



EXTPAR

- MACv2 aerosol being implemented by D. Luethi & RHM (in particular for project T2(RC)2)
- D. Luethi will resign from the function of SCA for EXTPAR after completion of this task. Successor to be defined by StC.

SRNWP data pool

- **Status**

- **NetCDF** format available (work in progress)
- Data set now open to **universities** and **R&D institutions**
- Still problems with **data quality** and **availability** for some sites: Fauga-Mauzac (FR), Cardington (UK) and Debrecen (HU)
- **Very limited usage!**

SRNWP data pool

- Questionnaire sent to the community by C-SRNWP PM, but only 3 answers (39 data pool registered users)
- **Status summary** by C-SRNWP PM (Szintai Balázs)
 - some developments needed (new format, more quality control)
 - more advertisement of the Data Pool (eg. on conferences) desirable
 - estimate maintenance costs (DWD and others)
→ D. Majewski (?)
 - if the costs of further development are high but significant usage increase can be foreseen, one could look for support (e.g. from EUMETNET)

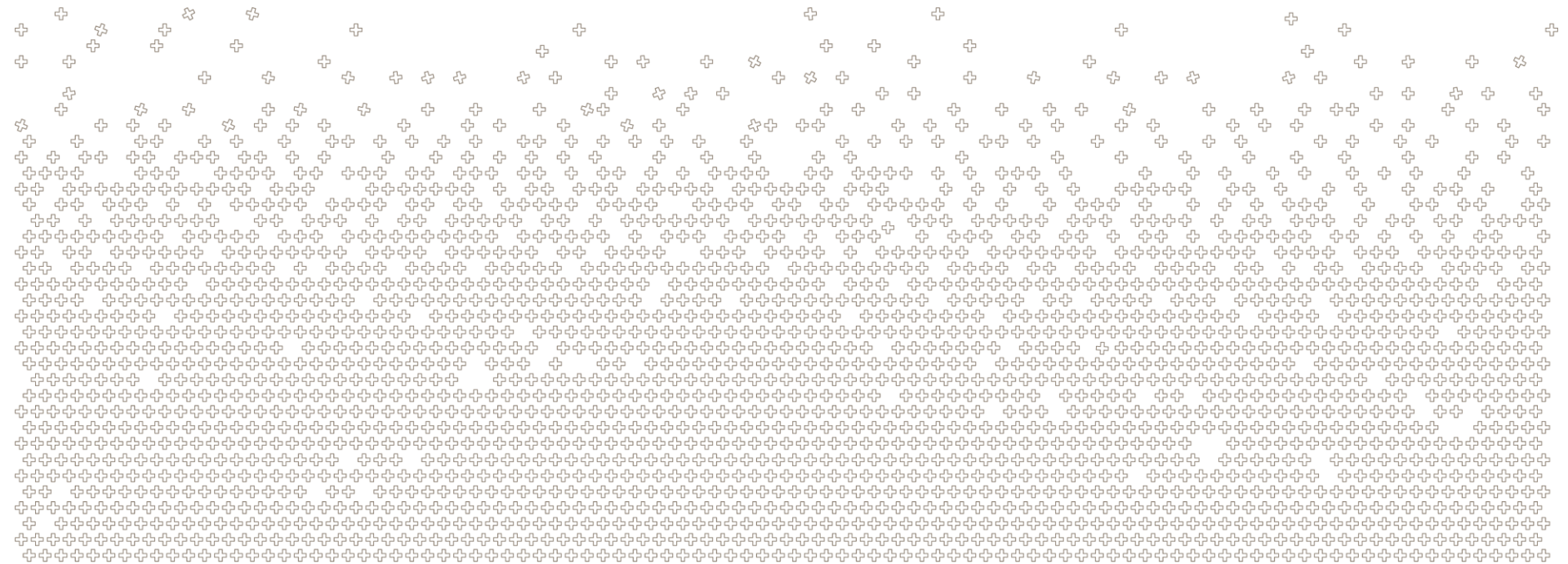
- **Any feedback from the floor?**
DWD (Claudia) estimates an usefull task



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Outlook



Mid term strategy review

- **Comparison of actual progress with the science plan 2015-2020 (SP)**
- **SMC members should consider the following items**
 - involve **COSMO community** in the process
 - stronger **cross-cutting** cooperation
 - close cooperation with **academia**
 - overall basic framework of the process is **COSMO-ICON** harmonization

- **Review of 'Short terms actions' in SP, p. 64**
- **Do some COSMO experiences or general scientific progress call for a change of strategy or priorities?**

Some input from ETHZ...



PRUDENCE → ENSEMBLES → EURO-CORDEX

Persistent systematic biases

(e.g., predominance of cold biases, southern Europe warm summer bias, overestimation of summer variability, see e.g. Kotlarski et al., 2014)



**Is land surface processes
representation the weak link
in current RCMs?**

TERRA – EURO-CORDEX

- **EURO-CORDEX: Historical ERAint-driven RCM runs over Europe (0.44 degree)**
Edouard Davin, Eric Maisonnave, Sonia Seneviratne / ETHZ

Model	Institution	LSM
ALADIN 5.2	HMS	ISBA (Noilhan and Planton, 1989; Douville et al., 2000)
HIRHAM 5	DMI	(Hagemann, 2002)
WRF 3.3.1	IPSL-INERIS	NOAH (Ek et al., 2003)
RACMO 2	KNMI	(Balsamo et al., 2009)
HadRM 3P	MOHC	MOSES (Cox et al., 1999)
RCA 4	SMHI	(Samuelsson et al., 2006)
REMO 2009	MPI-CSC	(Hagemann, 2002; Rechid et al., 2009)
RegCM 4.3	ICTP	BATS (Dickinson, 1984)
COSMO-CLM 4.8.17	CLM-Community	TERRA_ML (Doms et al., 2011)
COSMO-CLM ²	ETH Zurich	CLM4.0 (Oleson et al., 2010; Lawrence et al., 2011)

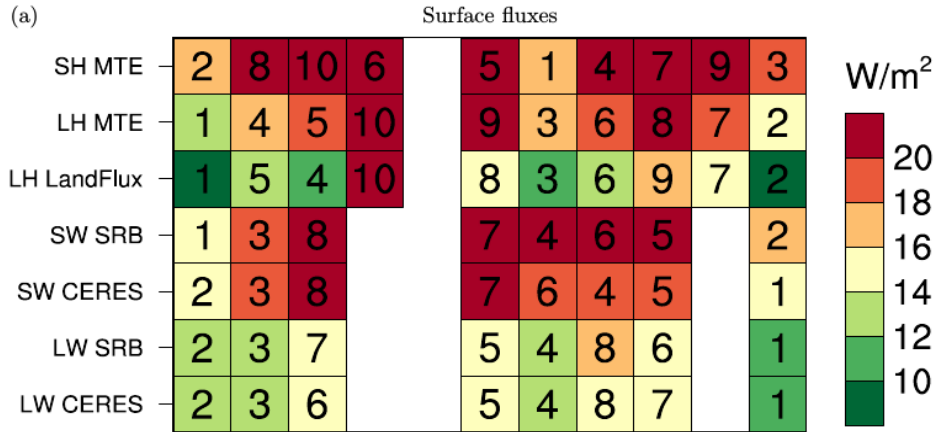


TERRA – EURO-CORDEX

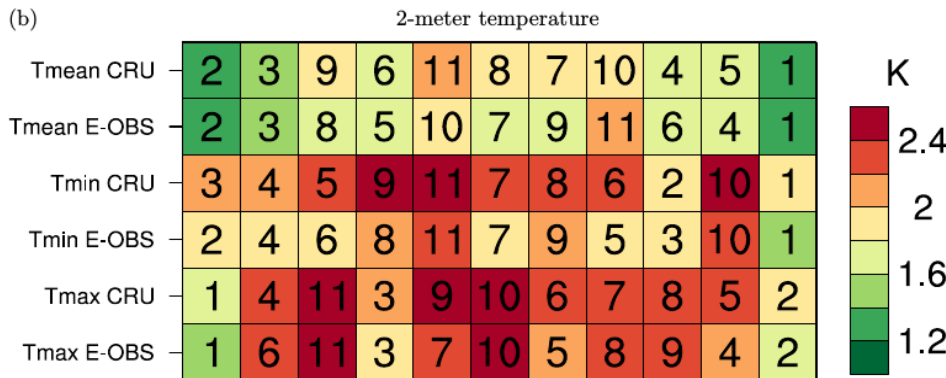
- RMSE score integrating spatial and temporal performance (based on monthly means)
- Surface fluxes, temperature, precipitation
- Whenever possible several reference datasets are used

Dataset	Variables	Resolution	Time period	Reference
CRU TS3.22	2-m temperature precipitation cloud cover	0.5x0.5	1990-2008	(Harris et al., 2014)
E-OBS v11	2-m temperature precipitation	0.5x0.5	1990-2008	(Haylock et al., 2008)
GPCP2.2	precipitation	2.5x2.5	1990-2008	(Huffman et al., 2009)
FLUXNET MTE	latent heat sensible heat	0.5x0.5	1990-2008	(Jung et al., 2011)
LandFlux-EVAL	latent heat	1x1	1990-2005	(Mueller et al., 2013)
SRB3.0	shortwave radiation longwave radiation	1x1	1990-2007	(Zhang et al., 2015)
CERES	shortwave radiation longwave radiation	1x1	2001-2008	(Rutan et al., 2015)

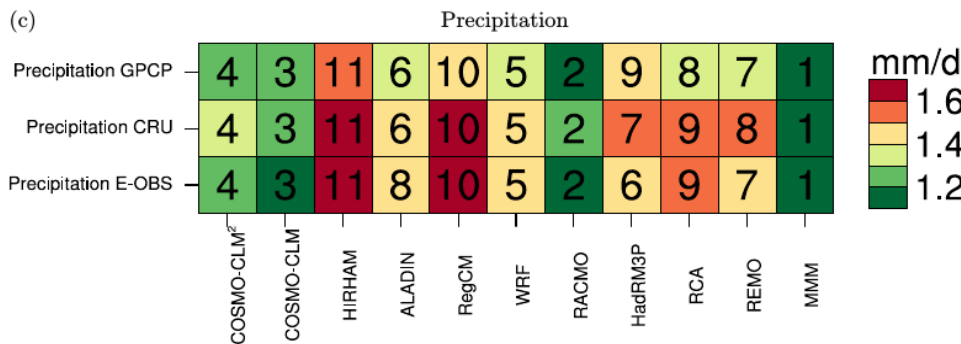
TERRA – EURO-CORDEX



Multi-scores ranking



- COSMO-CLM² outperforms COSMO-CLM and most other RCMs for surface fluxes and temperature



- No improvement for precipitation

Some input from ETHZ...

- Paper in *Environmental Research Letters* by E. Davin et al. clearly makes the point that COSMO-CLM² outperforms COSMO-CLM and most other RCMs for surface fluxes and temperature (without any expert tuning!)
- How to transfer this knowledge into an improvement of the 'standard' COSMO configuration? A common project with ETHZ / MeteoSwiss / COSMO would be most welcome by Prof. S. Seniviratne...

A new PP ?

- Some ideas
 - High resolution tests of CLM², in NWP mode, focus on extreme events, (*summer and winter & verif*) validation with SwissSMEX and more (*latest TERRA release*)
 - Calibration of CLM² using CALMO methodology
 - Calibration of TERRA using CLM² as reference
 - ...

- **Feedback ?** *Find main physical processes responsible for differences*
Link with TERRA Nova
- **Who has resources / interest to participate ?**

Thank you for your attention!

