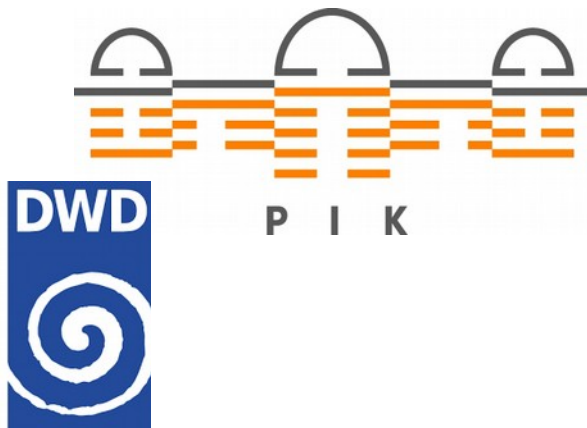


# The Urban Model Intercomparison project (status update 2016/03/10)

By the SOILVEG\_URB subgroup

“Core” members:

Sebastian Schubert,  
Matthias Demuzere,  
Gianluca Musetti;  
Hendrik Wouters (coordination),  
Kristina Trusilova



# Overview of urban parametrizations

Name	TEB alongside TERRA_ML	TERRA-URB	TERRA-ML / DCEP-BEP
Responsability	Kristina Trusilova	Hendrik Wouters	Sebastian Schubert
Features	inner building temperature snow model, water skin layer roofs/walls/roads, tiled urban fraction	Direct representation of the buildings and pavements in TERR-ML using a tile approach, Thermal and radiative bulk urban land-surface scheme, thermal-roughness length parametrization, density distribution of puddle depths, building surface area index, anthropogenic heat emission, and water-storage parameters, "SURY"	Street canyon model advanced double-canyon radiation scheme, shadows, radiation trapping, roof/wall/ground fluxes; coupled with the PBL scheme not only through surface fluxes but also by means of energy and momentum fluxes in layers above the surface
Input	Standard extpar	Additional fields in EXPAR for impervious surface area (EEA or NOAA) and anthropogenic heat emission (NCAR)	Full 3D cityGML
References	Trusilova et al., 2013 Trusilova et al., 2008, Masson 2001	Wouters et al., in submission Wouters et al. 2015, Wouters et al. 2012, Flanner 2009, Demuzere et al. 2008, De Ridder, 2012	Schubert et al. 2014, Schubert et al. 2012, Martilli et al. 2002, Gröger et al. 2008
applications	Urban climate of Europe and Germany	Long-term urban climate modelling, its impact on heat-stress, extreme precipitation, air-quality, NWP, CPS micro-ensemble model (CORDEX.BE), UPIM (urban precipitation)	Urban climate of Berlin and Basel. Mitigation: roof albedo and urban vegetation, urban climate change Germany

# Different urban parametrizations in COSMO-CLM. Why?

- There is no perfect model...
  - Large vs. Small # of parameters (cfr. Availability; uncertainty)
  - Computational cost vs. Speed
  - Built-in extension vs. external module
  - Variation in particular performance
  - Different approaches have different applications

# A great opportunity...

- Urban models of different complexity have been compared in offline mode (Grimmond et al, 2012)
- Do a similar exercise in a coupled version with exactly the same configuration
  - Address the impact of urban-parameterization complexity and approach on modelling urban climate (e.g. magnitude, vert/hor extent UHI)
  - Address to importance of several urban features on the urban climate system
  - Discover strength and weaknesses of the different parameterizations
  - Provide recommendations on which urban parametrization is suitable for which purpose (cfr. Meteorological and air-quality forecasting, mitigation studies, longterm scenarios)
- Structuring urban modelling efforts:
  - Finding common optimal COSMO model settings that fits any urban climate modelling

# Agreements on *Urban Workshop in November 2012*

- Exactly the same model setup and boundary conditions
  - CCLM4.8CLM19, 1km resolution, 2002, Cascade-nested in ERA-INTERIM, 50 vertical layers...
  - Exactly the same input parameters
- Two separate Model domain studies:
  - Berlin:
    - BEP/DCEP vs. TEB vs. TERRA\_URB:
    - *focus on urban model applicability*
    - *paper lead by Kristina (published)*
  - Basel:
    - BEP/DCEP vs. TERRA-URB: comparison fluxes and vertical profiles
    - *high-quality measurements, including fluxes allow comparison of urban model performance and relate its impact on the urban meteorological features*
- Shared data storage at DKRZ (has been gratefully used!)

# Status: Berlin

- Manuscript for results for **Berlin** are published in MetZet:

Home > Zeitschriften & Reihen > Meteorologische Zeitschrift > Vorveröffentlichungen > The urban l... Français English Deutsch

Beitrag

## The urban land use in the COSMO-CLM model: a comparison of three parameterizations for Berlin

Trusilova, Kristina; Schubert, Sebastian; Wouters, Hendrik; Früh, Barbara; Grossman-Clarke, Susanne; Demuzere, Matthias; Becker, Paul

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## Abstract

The regional non-hydrostatic climate model COSMO-CLM is increasingly being used on fine spatial scales of 1–5 km. Such applications require a detailed differentiation between the parameterization for natural and urban land uses. Since 2010, three parameterizations for urban land use have been incorporated into COSMO-CLM. These parameterizations vary in their complexity, required city parameters and their computational cost. We perform model simulations with the COSMO-CLM coupled to these three parameterizations for urban land in the same model domain of Berlin on a 1-km grid

# Status: Basel

- Evaluation and comparison was initiated with high-quality meteorological data of the BUBBLE urban boundary layer experiment:
  - tower measurements (radiative components, surface sensible heat and latent exchange...)
  - Multiple measurements of T<sub>2M</sub> and humidity at (non)urban stations.
  - Vertical temperature profiles...
- **Since autumn 2014, Basel** intercomparison has been **on hold** because of **limited resources**

# Intercomparison for Zürich



- See Gianluca Musetti's presentation:  
*Gianluca Musetti, D. Brunner, S. Henne, J. Allegrini, H. Wouters, S. Schubert, J. Carmeliet. **Impact of model resolution and urban parametrization on urban climate simulation: a case study for Zürich***
- TERRA\_URB versus DCEP intercomparison with screen-level two-metre measurements + sensitivity resolution (similar to Berlin)
- Successful
- However, more detailed (flux) measurements allowing for more in-depth comparison does not seem available for Zürich





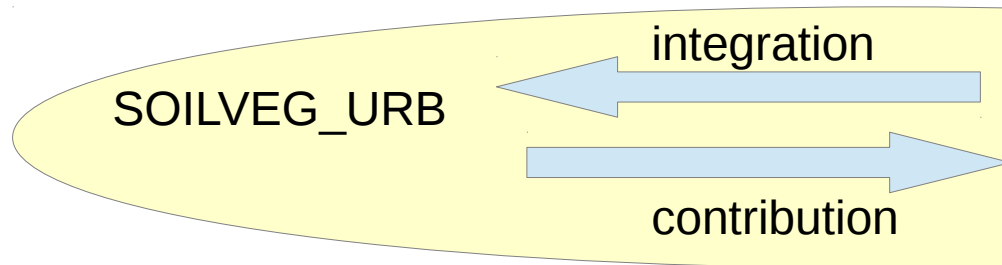
# for Basel

(preliminary plan → to be discussed)

- Operational NWP Forcing from Meteoswiss
- Start with Baseline simulations... *500m resolution / one summer during BUBBLE experiment*
  - with DCEP (by EMPA) → In the framework of Gianluca's thesis...
  - with TERRA\_URB → by KU Leuven
- To be done:
  - To be confirmed by his PhD supervisor committee
  - Generation of Basel urban canopy parameter datasets
  - besides baseline runs... make plan / put research questions that fit Gianluca's thesis and 'other resources'
  - Is shared storage data still needed?

# Possible SOILVEG\_URB activities

Continuation URBMIP



Local Climate Zones classification  
(Stewart and Oke, 2012) – WUDAPT.org



Coordinated namelist model parameter testing

Following the  
example of EVAL-working group (Anders et al.)

Influence of new model developments that might affect urban climate modelling:

- in the turbulence scheme by Matthias R. (cfr. Stable boundary layer)
- regarding Bare Soil moisture (cfr. Diurnal cycle / overall underestimation of day-time surface temperatures)
- vegetation shading

- Questions, remarks, suggestions?

