

Status of the implementation of TERRA_URB in ICON

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COSMO Priority Project CITTA':

City Induced Temperature change Through A'dvanced modelling

Project leader: Jan-Peter Schulz (DWD)

Project duration: Jul. 2021 – Aug. 2024

Task 1: Implementation of TERRA_URB in ICON

During the COSMO Priority Tasks AEVUS and AEVUS2 the TERRA_URB urban parameterisation in the COSMO model was demonstrated to be able to reproduce the key urban meteorological features. In the framework of the transition of the COSMO Consortium to the ICON model TERRA_URB needs to be implemented in ICON.

Deliverables: TERRA_URB in ICON.

Involved scientists: Jan-Peter Schulz (DWD) 0.4 FTE, Mikhail Varentsov (RHM) 0.1 FTE, Carmine De Lucia (CMCC) 0.1 FTE

FTEs: 0.6 FTE (Jul. 2021 – Jun. 2022)

Task 1: Implementation of TERRA_URB in ICON

Steps of implementation:

Porting of TERRA_URB from the COSMO to the ICON model par for par.

1. New namelist switches implemented:

`lterra_urb`

`lurbfab`

`itype_eisa`

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Steps of implementation:

2. New fields implemented:

<code>fr_paved</code>	impervious surface area (ISA)
<code>ahf</code>	anthropogenic heat flux
<code>urb_isa</code>	impervious surface area of the urban canopy
<code>urb_ai</code>	surface area index of the urban canopy
<code>urb_alb_red</code>	albedo reduction factor for the urban canopy

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Steps of implementation:

2. New fields implemented:

<code>urb_fr_bld</code>	building area fraction with respect to urban tile
<code>urb_h2w</code>	street canyon H/W ratio
<code>urb_h_bld</code>	building height
<code>urb_alb_th</code>	thermal albedo of urban material
<code>urb_alb_so</code>	solar albedo of urban material
<code>urb_hcap</code>	volumetric heat capacity of urban material
<code>urb_hcon</code>	thermal conductivity of urban material

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3. Modifications in ICON for TERRA_URB:

In land surface (TERRA): Heat capacity and thermal conductivity modified according to TERRA_URB.

In land surface (TERRA): Evaporation from puddles.

In turbulence: Modify thermal roughness length.

In radiation: Modify visible and thermal albedo.

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Proposal for different steps of implementation:

1. Keep land use classification GlobCover and hardcoded global constants for testing the functionality of TERRA_URB in ICON.
2. Once the functionality is confirmed and the new urban canopy parameter fields are available from EXTPAR, implement them in ICON, likely together with a new land use classification (ECOCLIMAP-SG).
3. Extended tuning of ICON for ECOCLIMAP-SG, first with TERRA_URB switched off, after successful tuning switched on.