Updating urbanized COSMO through LCZs

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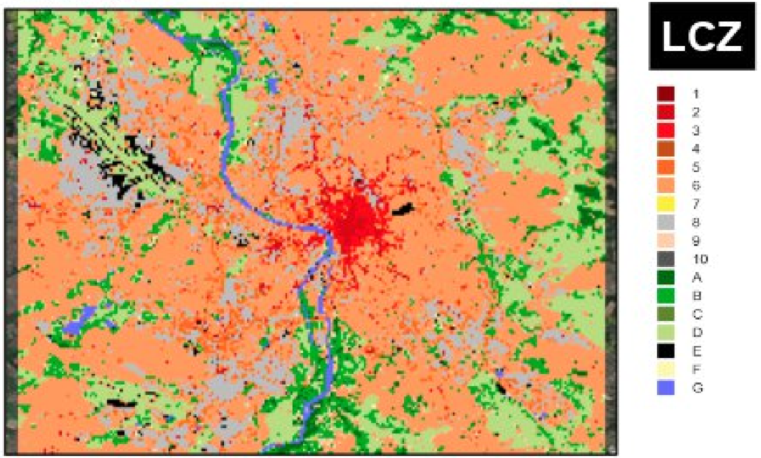
Reminder

Toulouse



Demuzere et al. (2019)

Table 3. Values of geometric and surface cover properties for local climate zones. All properties are unitless except height of roughness elements (m).

Local climate zone (LCZ)	Sky view factor[a]	Aspect ratio[b]	Building surface fraction[c]	Impervious surface fraction[d]	Pervious surface fraction[e]	Height of roughness elements[f]	Terrain roughness class[g]
LCZ 1 *Compact high-rise*	0.2–0.4	> 2	40–60	40–60	< 10	> 25	8
LCZ 2 *Compact midrise*	0.3–0.6	0.75–2	40–70	30–50	< 20	10–25	6–7
LCZ 3 *Compact low-rise*	0.2–0.6	0.75–1.5	40–70	20–50	< 30	3–10	6
LCZ 4 *Open high-rise*	0.5–0.7	0.75–1.25	20–40	30–40	30–40	>25	7–8
LCZ 5 *Open midrise*	0.5–0.8	0.3–0.75	20–40	30–50	20–40	10–25	5–6
LCZ 6 *Open low-rise*	0.6–0.9	0.3–0.75	20–40	20–50	30–60	3–10	5–6
LCZ 7 *Lightweight low-rise*	0.2–0.5	1–2	60–90	< 20	<30	2–4	4–5
LCZ 8 *Large low-rise*	>0.7	0.1–0.3	30–50	40–50	<20	3–10	5
LCZ 9 *Sparsely built*	> 0.8	0.1–0.25	10–20	< 20	60–80	3–10	5–6
LCZ 10 *Heavy industry*	0.6–0.9	0.2–0.5	20–30	20–40	40–50	5–15	5–6

Stewart & Oke (2012)

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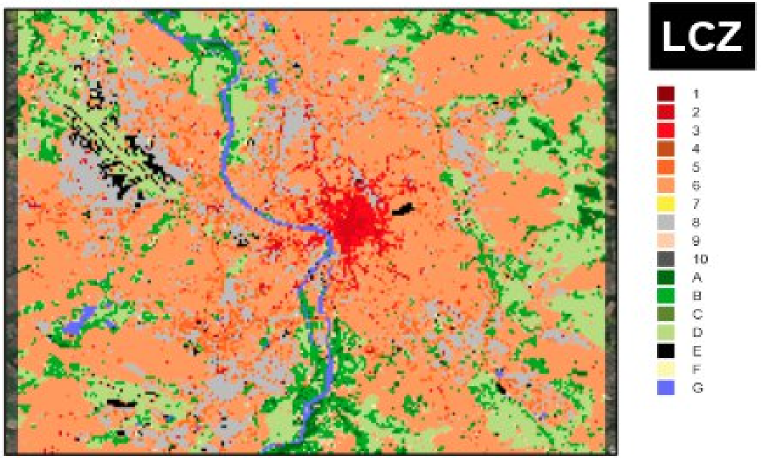

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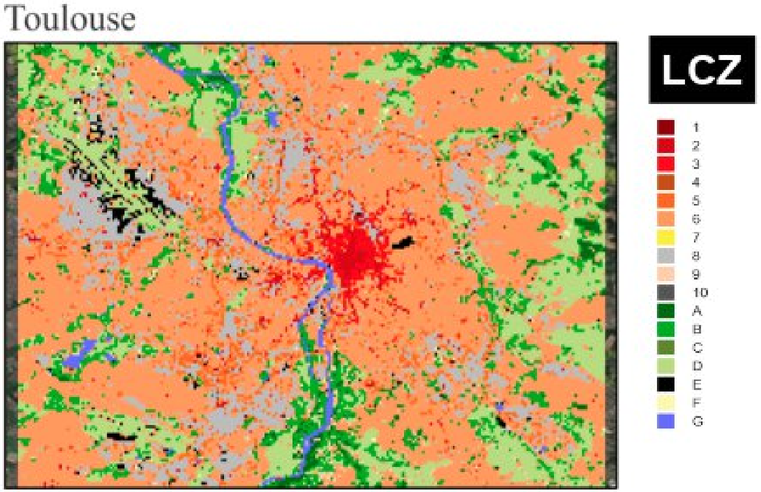


Demuzere et al. (2019)

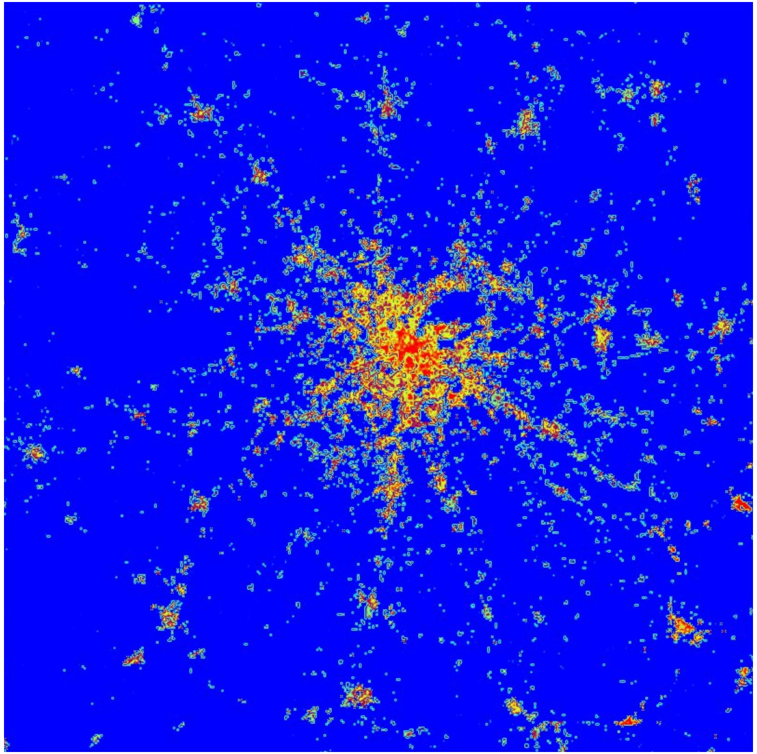
TABLE 4. Values of thermal, radiative, and metabolic properties for local climate zones. All values are representative of the local scale.

Local climate zone (LCZ)	Surface admittance[a]	Surface albedo[b]	Anthropogenic heat output[c]
LCZ 1 *Compact high-rise*	1,500–1,800	0.10–0.20	50–300
LCZ 2 *Compact midrise*	1,500–2,200	0.10–0.20	<75
LCZ 3 *Compact low-rise*	1,200–1,800	0.10–0.20	<75
LCZ 4 *Open high-rise*	1,400–1,800	0.12–0.25	<50
LCZ 5 *Open midrise*	1,400–2,000	0.12–0.25	<25
LCZ 6 *Open low-rise*	1,200–1,800	0.12–0.25	<25
LCZ 7 *Lightweight low-rise*	800–1,500	0.15–0.35	<35
LCZ 8 *Large low-rise*	1,200–1,800	0.15–0.25	<50
LCZ 9 *Sparsely built*	1,000–1,800	0.12–0.25	<10
LCZ 10 *Heavy industry*	1,000–2,500	0.12–0.20	>300

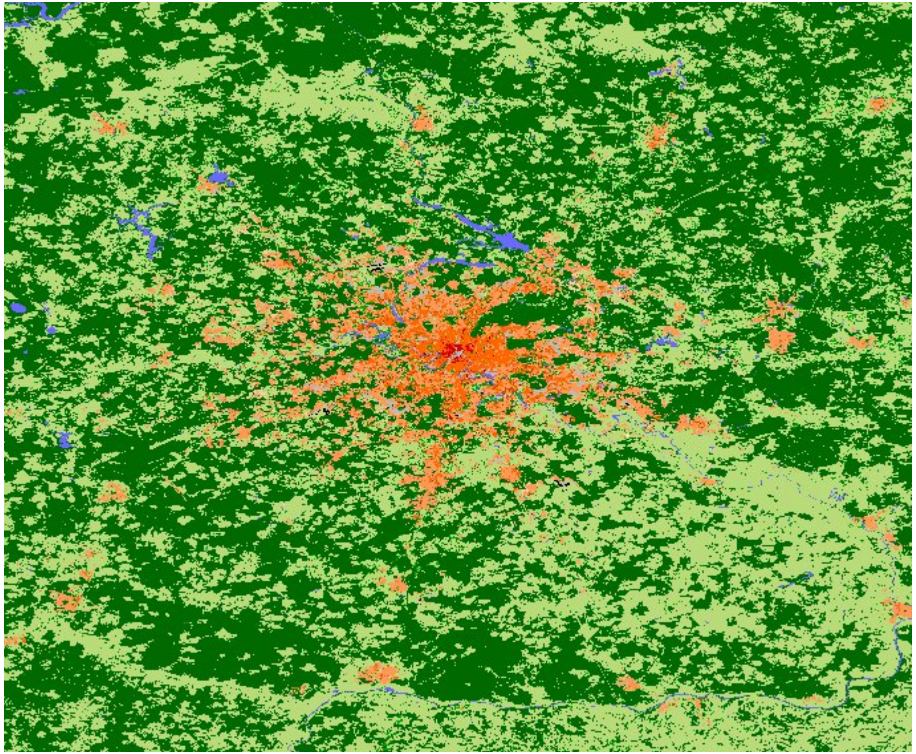
Stewart & Oke (2012)

Proof of concept: Moscow

Step 1: LCZ map covering region of high-res COSMO-CLM domain file



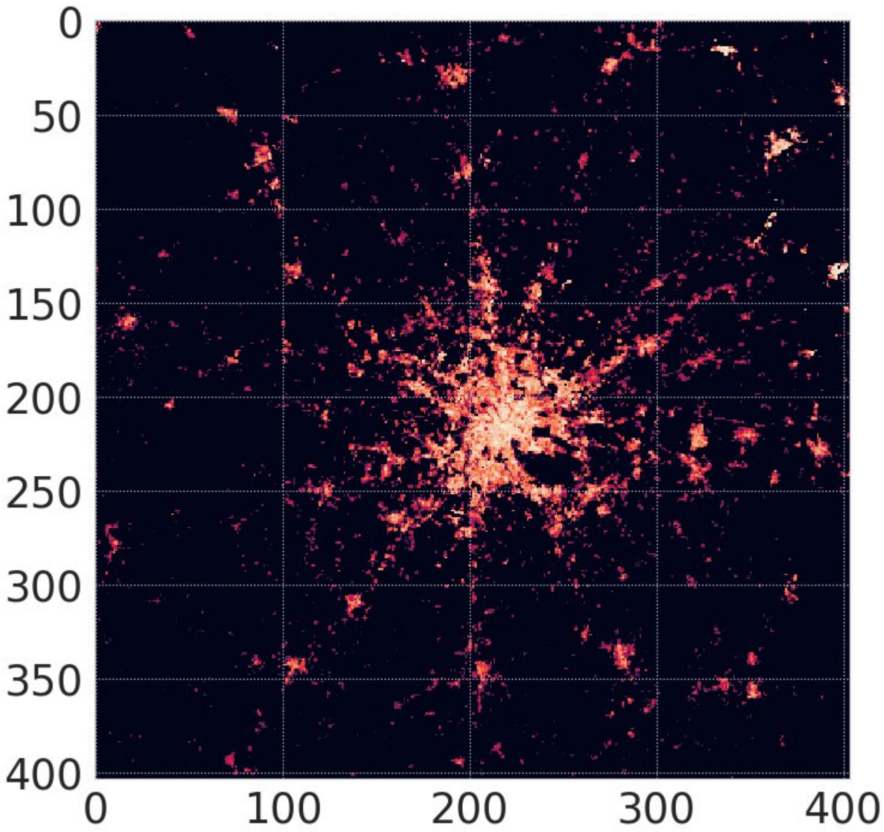
ISA from MSK_0.0045_Globcover_osmurb_v2c.nc



LCZ map Moscow clipped from global LCZ map (beta), 100m

Proof of concept: Moscow

Step 2: Translate LCZ map to COSMO-CLM urban parameters: 'ISA', 'FR_PAVED', 'AHF', 'URB_BLDH', 'URB_BLDFR', 'URB_H2W', 'CVS', 'URB_SALB','URB_TALB'



Example for **FR_Paved**.
(left) Cosmo file, (right) from LCZ map

Proof of concept: Moscow

Step 3: Regrid to COSMO grid

Proof of concept: Moscow

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RMetS
Royal Meteorological Society

Implications of employing detailed urban canopy parameters for mesoscale climate modelling: a comparison between WUDAPT and GIS databases over Vienna, Austria

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ABSTRACT: One of the major obstacles to using numerical weather prediction models for guidance on mitigating urbanization's impact on local and regional climate is the lack of detailed and model ready morphological data at urban scale. The World Urban Database and Access Portal Tool (WUDAPT) is a recent project developed to extract climate relevant information on urban areas, in the form of local climate zones (LCZs), out of remote sensing imagery. This description of the urban landscape has been tested and used for parameterization of different urban canopy models (UCM) for mesoscale studies. As detailed information is usually bounded within cities' centres, crowdsourced and remote sensing data offer the possibility to move beyond the old barriers of urban climate investigations by studying the full range of variation from the urban core to the periphery and its related impacts on local climate. Thus, for this study we sought to compare the relative impact of using the WUDAPT methodology *versus* a simplified definition of the urban morphology extracted out of detailed GIS information to initialize a regional weather model and compare the output against official and crowdsourced weather station networks. A case study over Vienna, Austria was conducted using the weather research forecasting (WRF) model, coupled with the building effect parameterization and building energy models (BEP–BEM) in five distinct seasonal periods. Results demonstrated that using detailed GIS data to derive morphological descriptions of LCZs for mesoscale studies provided only a marginal overall improvement over using the default WUDAPT parameters based on the ranges proposed by Stewart and Oke (2012). The findings also highlighted the importance of developing techniques that are better at capturing the morphological heterogeneity across the entire urban landscape and thus improve our understandings of UCM performance over urban areas.

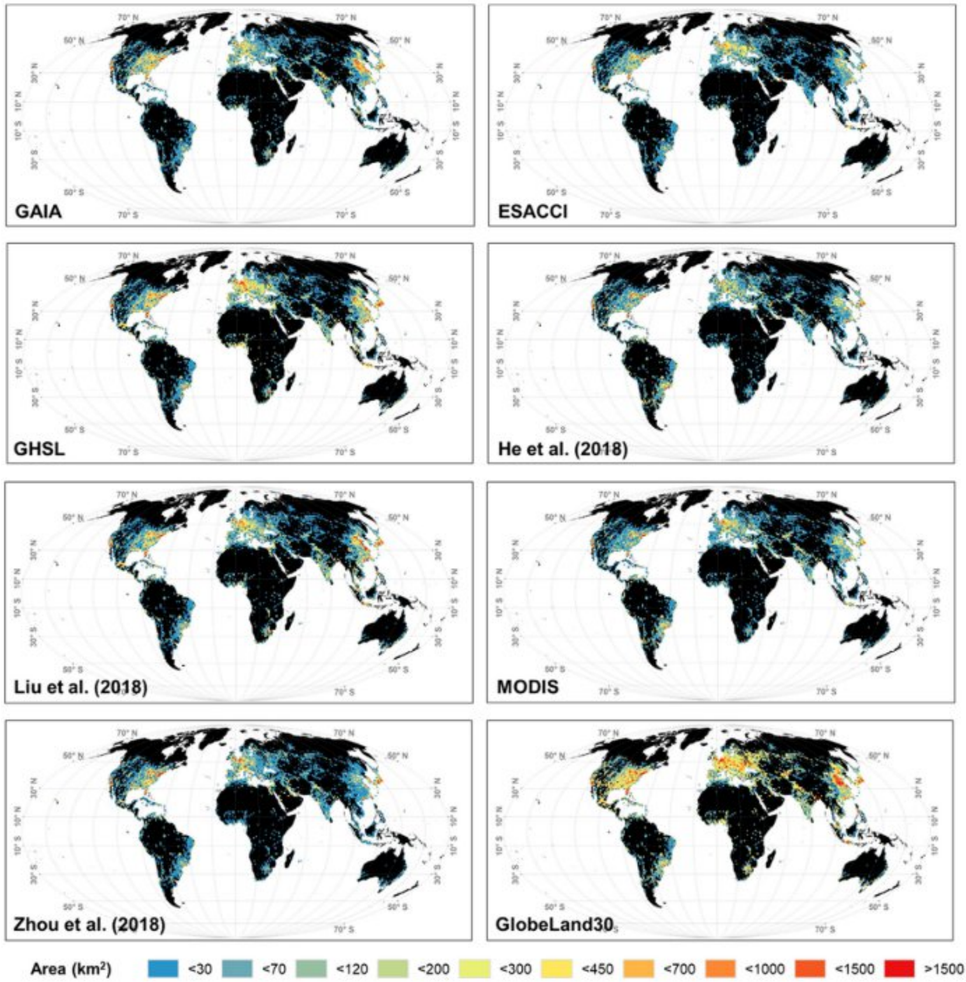
Questions

- When a final version of the Global LCZ map is available, can this translation between LCZ classes and urban parameters be integrated in extpar?
- Do we need to develop a stand-alone tool for the time being? Similar to the WUDAPT 2 WRF tool?
- Other questions?

Other low hanging fruit ...

Suggestions to replace urban fields currently available in extpar:

- Update EEA imperviousness with new products (100m, state of 2006, 2009, 2012, 2015) (EUROPE)
- global artificial impervious area (GAIA) (30m, globally, 1985-2018, paper, download)
- ESA CCI urban land cover (300m, per year from 1992-2018) (viewer) (Global)
- Copernicus Global Land Cover (100m, 2015) (viewer) (GLOBAL)
- Explore use of Dong et al. (2017) anthropogenic heat flux (hourly, ~1km, state of 2013)



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