Ongoing activities at CMCC on urban parameterization

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PT AEVUS 2 web meeting

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Centro Euro-Mediterraneo sui Cambiamenti Climatici

Framework

External parameters

AHF: Anthropogenic Heat Flux

ISA: Impervious Surface Area

SURY parameters

Bulk albedo (a_{bulk})

$$\alpha_{bulk} = \frac{\left[\alpha_{road} + 2\frac{h}{w}\alpha_{wall}\right]}{\left(1+2\frac{h}{w}\right)}\psi_c(1-R) + \alpha_{roof}R$$

Bulk emissivity (e_{bulk})

$$\varepsilon_{bulk} = 1-(1-\varepsilon)\left[\psi_c(1-R)+R\right]$$

Bulk thermal conductivity (l_{bulk})

$$\lambda_{bulk} = \left(\lambda_{road} + 2\frac{h}{w}\lambda_{wall}\right)(1-R) + \lambda_{roof}R$$

Bulk heat capacity (C_{bulk})

$$C_{bulk} = \left(C_{road} + 2\frac{h}{w}C_{wall}\right)(1-R) + C_{roof}R$$

$\alpha_{road/wall/roof}$ = road/wall/roof albedo
$\varepsilon_{road/wall/roof}$ = road/wall/roof emissivity
$\lambda_{road/wall/roof}$ = road/wall/roof thermal conductivity
$C_{road/wall/roof}$ = road/wall/roof heat capacity
h = building height
h/w = canyon height-to-width ratio
ψ_c = canyon albedo reduction factor
R = roof fraction

Pan-European level

Copernicus Europe's eyes on Earth — Land Monitoring Service

CLC2018

1. ARTIFICIAL SURFACES
1.1 Urban fabric
1.2 Industrial, commercial and transport units
1.3 Mine, dump and construction sites
1.4 Artificial, non-agricultural vegetated areas

2. AGRICULTURAL AREAS
2.1 Arable land
2.2 Permanent crops
2.3 Pastures
2.4 Heterogeneous agricultural areas

3. FOREST AND SEMI NATURAL AREAS
3.1 Forests
3.2 Scrub and/or herbaceous vegetation associations
3.3 Open spaces with little or no vegetation

4. WETLANDS
4.1 Inland wetlands
4.2 Maritime wetlands

4. WATER BODIES
4.1 Inland water
4.2 Marine water

Local level

Copernicus Europe's eyes on Earth — Land Monitoring Service

capitals in EU28 + EFTA

URBAN ATLAS
Building height [res.: 10 m]

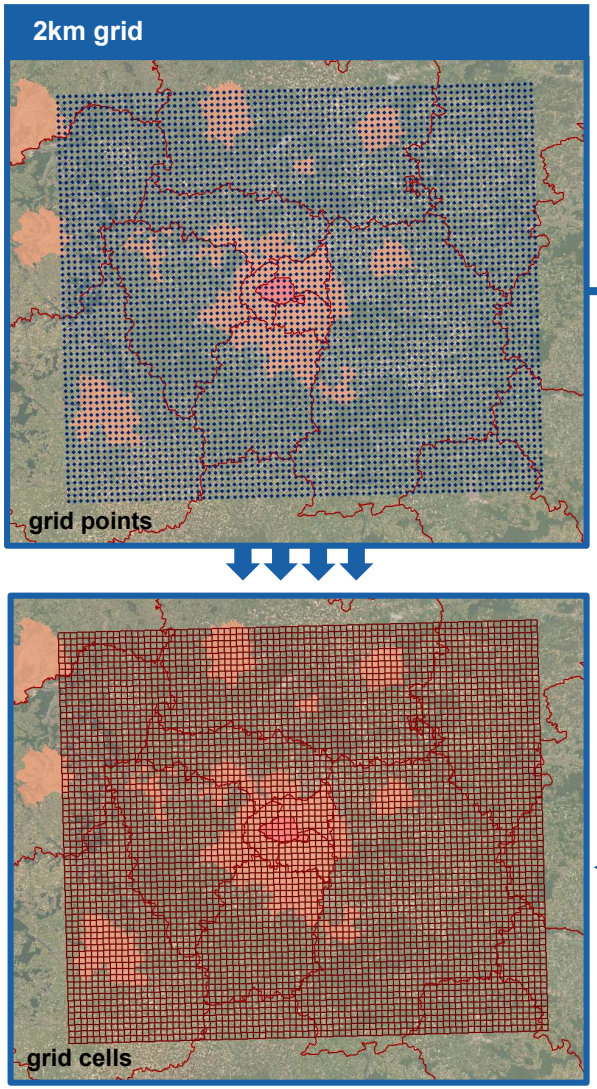
SATELLITE DATA
Roof material
Roof fraction

Freely available data - wide European coverage

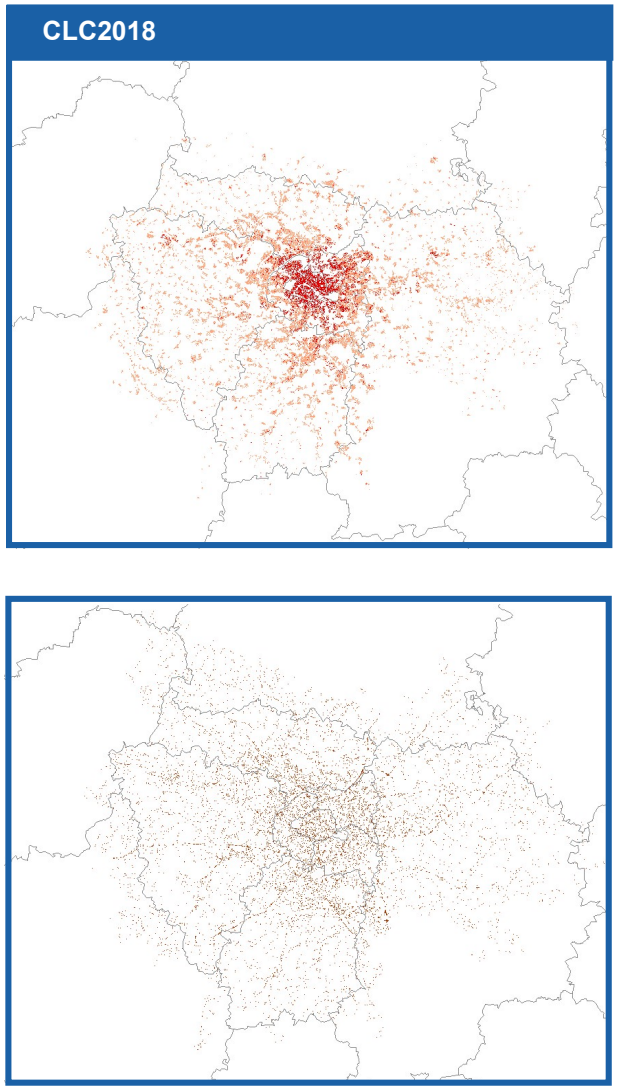
Support the development, testing and implementation of adaptation strategies

Comparing EXTPAR-ISA with ISA derived processing CLC2018

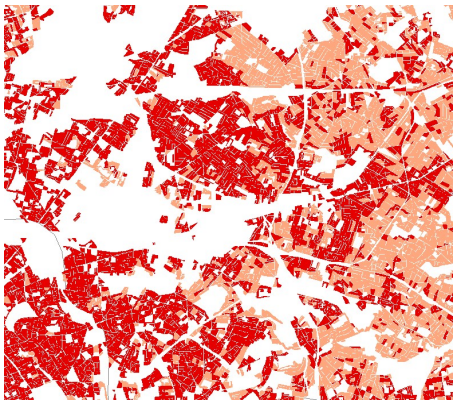
Step 1: creating a 2km grid cells from ERA5 grid points



Step 2: extracting artificial surfaces from CLC2018



City of Paris

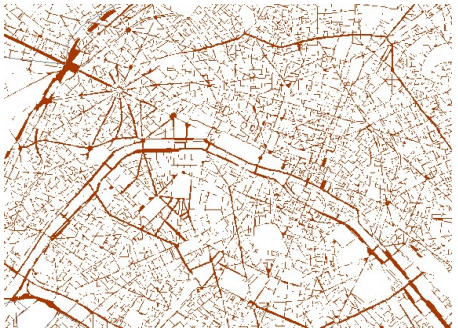


1. ARTIFICIAL SURFACES

1.1 Urban fabric

1.1.1 Continuous urban fabric

1.1.2 Discontinuous urban fabric



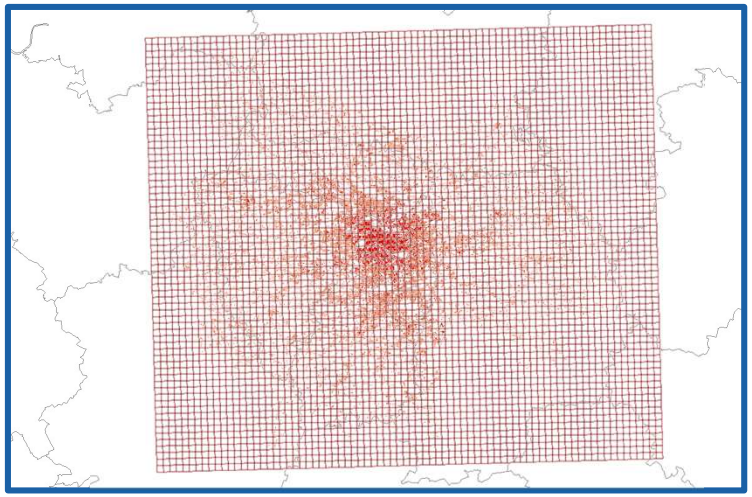
1. ARTIFICIAL SURFACES

1.2 Industrial, commercial and transport units

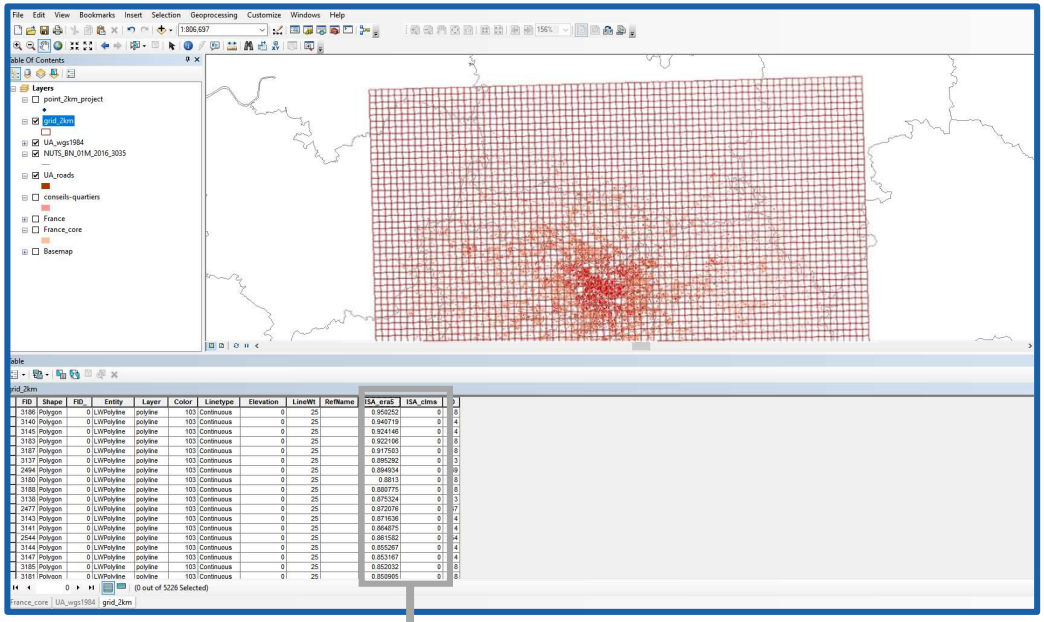
1.2.2 Road and rail networks and associated land

Comparing EXTPAR-ISA with ISA derived processing CLC2018

Step 3: union of ERA5 grid cells and CLC2018 polygons



Step 4: Computation of ISA for each cell and comparison of ISA values from ERA5 and CLC2018



ISA_era5	ISA_clms
0.950252	0
0.940719	0
0.924146	0
0.922106	0
0.917503	0
0.895292	0
0.894934	0
0.8813	0
0.880775	0
0.875324	0
0.872076	0
0.871636	0
0.864875	0
0.861582	0
0.855267	0

Ongoing activity!

Scheduled future investigations

- Deriving **thermal properties** (e.g. albedo, emissivity, thermal conductivity, heat capacity) to each class of CLC2018 and computation of **bulk parameters** for each cell on the basis of the actual city features (e.g., road, wall, roof materials)
- Deriving **building height** from Urban Atlas and attributing mean H/W ratio to each cell

Any suggestions and contributions are welcome!

Our contacts for desired interactions with you:

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