→ MAPPING URBAN AREAS FROM SPACE CONFERENCE

Mapping urban surface characteristics for urban energy flux modelling

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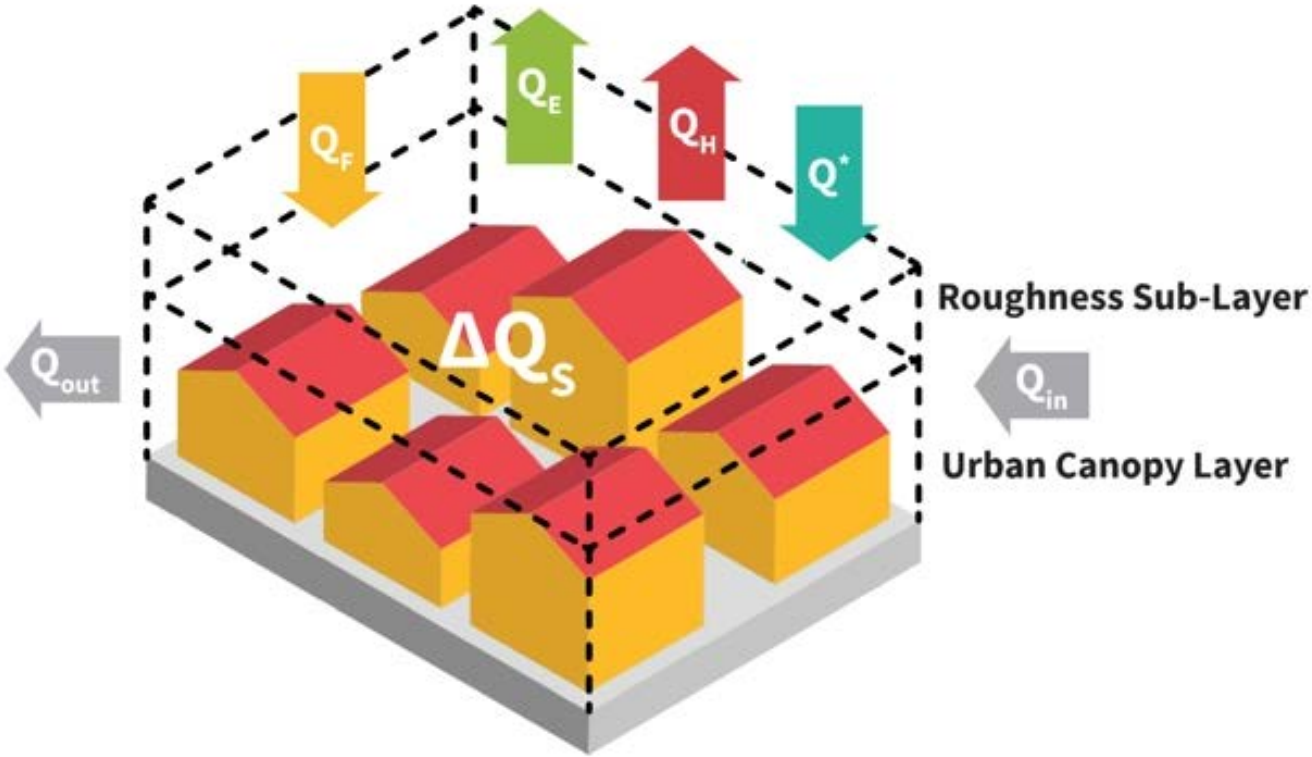
Introduction

urban energy flux modelling



Introduction

- Surface properties influence the urban energy flux

→ mapping surface properties

- Changing surface properties result in changing energy flux

→updating of surface properties maps

- Remote sensing data as source for surface properties

Requirements

Urban morphology (3D structure)

- High spatial resolution to respresent urban variation
- Main data sources: LiDAR or stereo imagery
- Main products
  - Digital surface model
  - Mean building height
  - Sky view factor

Requirements

Surface characteristics

- Spatial resolution depending on parameter and data source
- High temporal resolution important for vegetation related parameters
- Main data sources: optical and thermal satellite data
- Main products:
  - Land cover
  - Impervious surface
  - Phenology parameters (e.g. NDVI)
  - Surface temperature

Requirements

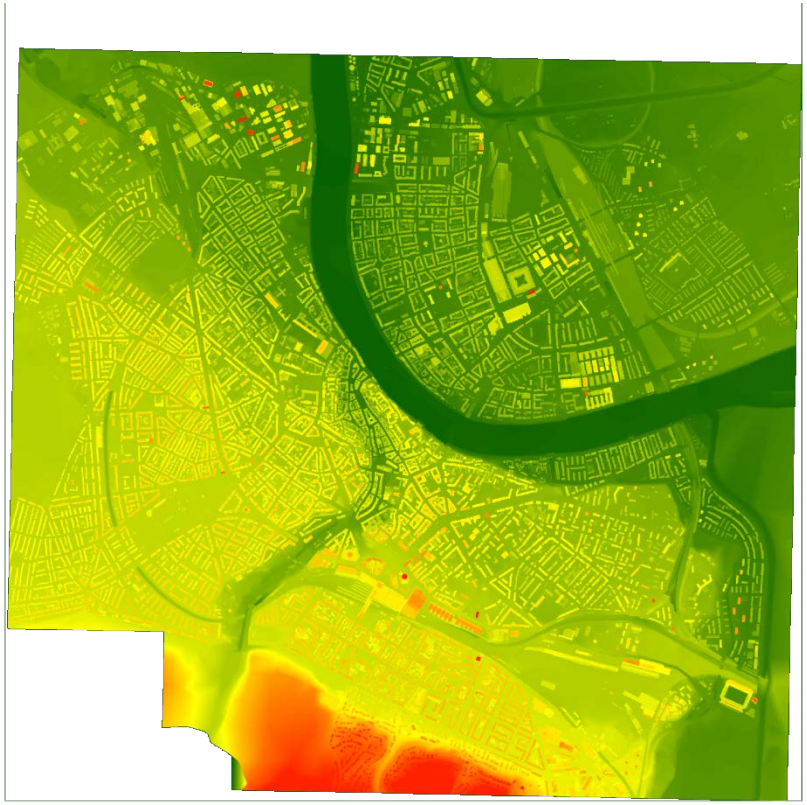
- Methodology transferable to Sentinel satellites

- 100 m grid for URBANFLUXES subsequent modelling
- UTM projection
- TIF data format

Urban morphology

DSM

source: LiDAR



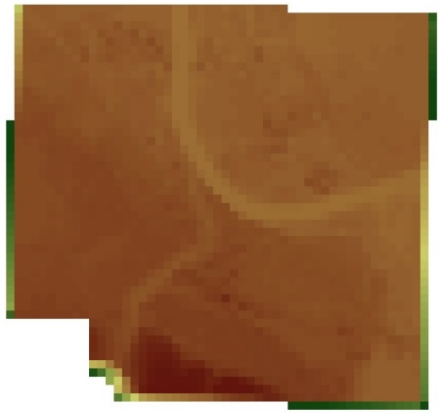
DEM (Surface incl. buildings)

DSM (only buildings)

Urban morphology

Mean building height

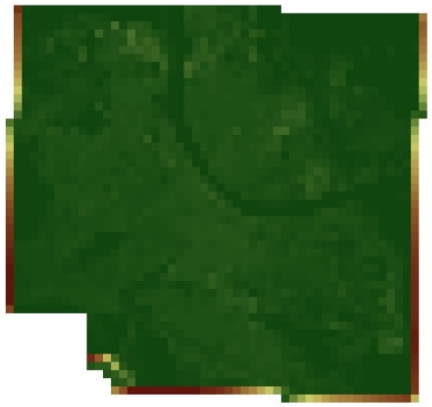
Source: LiDAR, 100 m mean, standard deviation, minimum and maximum



Mean

336 m

0 m



Stdev

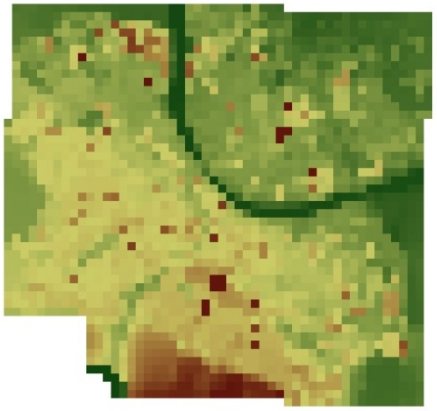
159 m

0 m

Min.

332 m

0 m



Max.

370 m

0 m

Urban Morphology

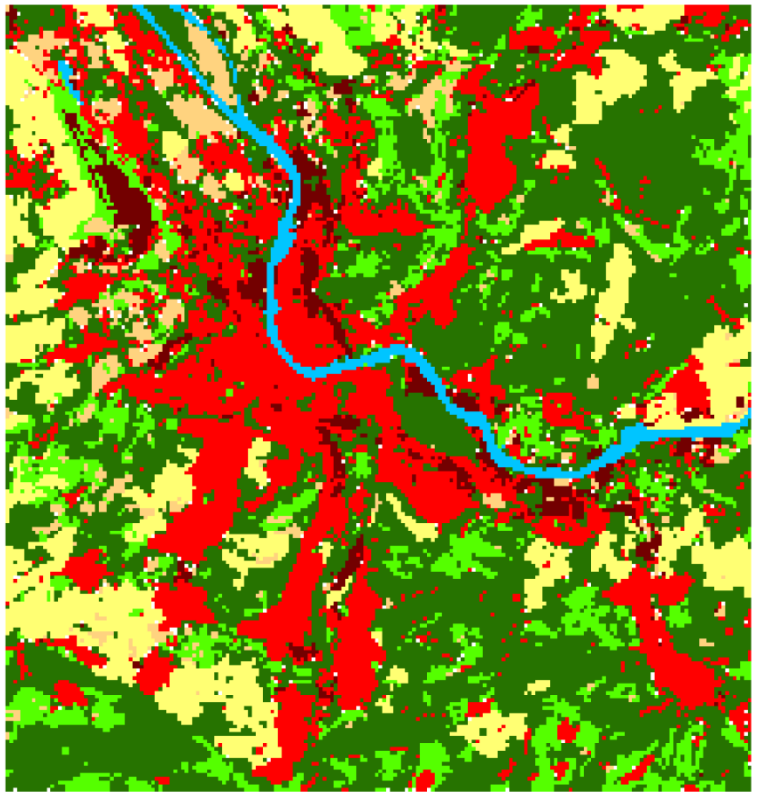
Sky View Factor

Source: LiDAR, UMEP method by Lindberg et al. (2010)

Surface characteristics

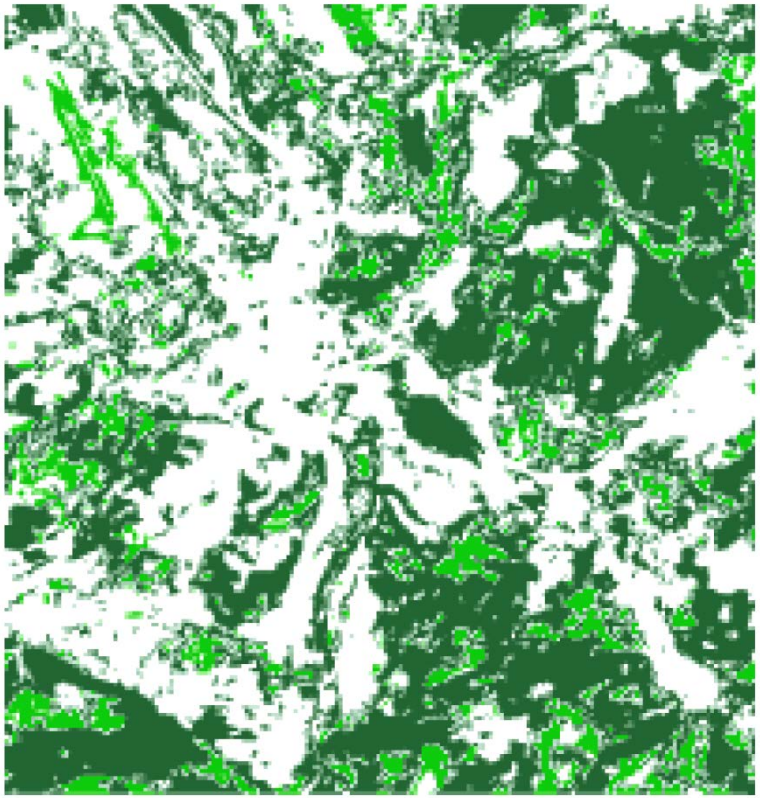
Land Cover

Source: Landsat 8, neural network method by Del Frate et al. (2007)



Urban
Industrial
Bare Soil
Agriculture
Low vegetation
Forest (high veg.)
Water

Dominant land cover

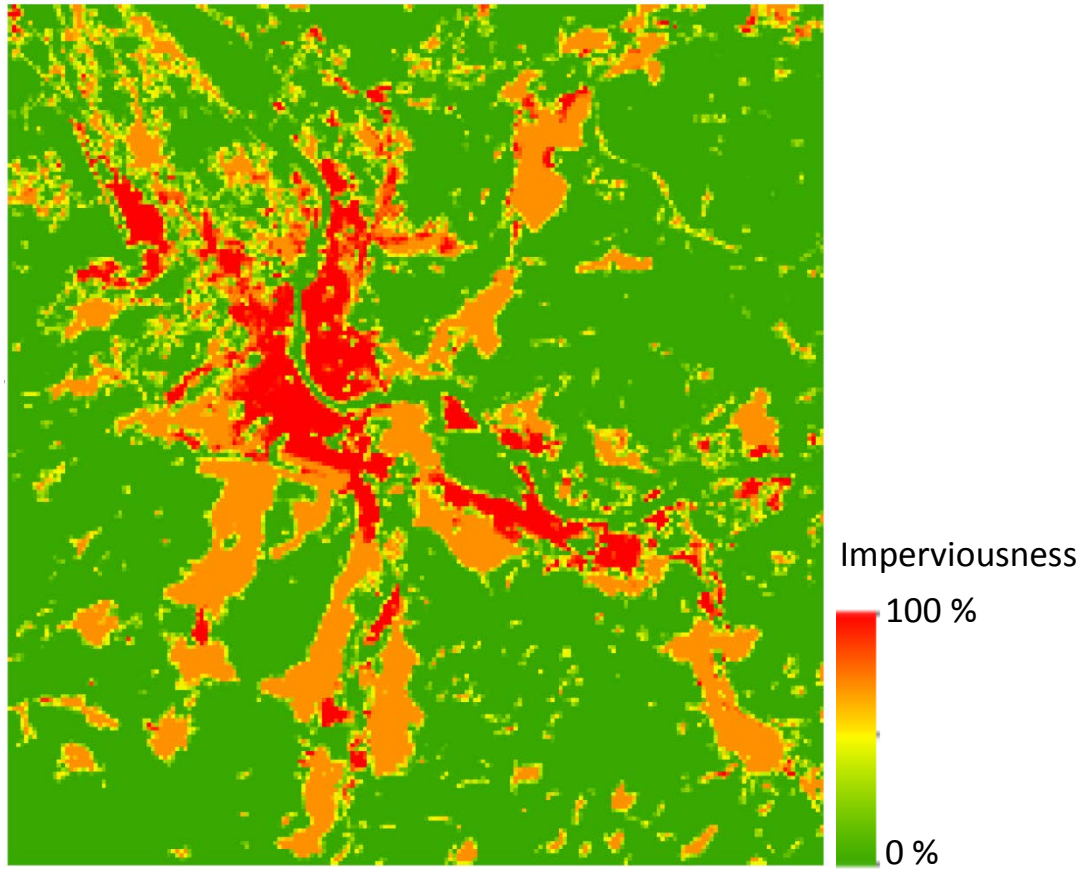


Fractional land cover of vegetation

Surface characteristics

Imperviousness

Source: land cover (Landsat 8). Method: abundance of urban and industrial

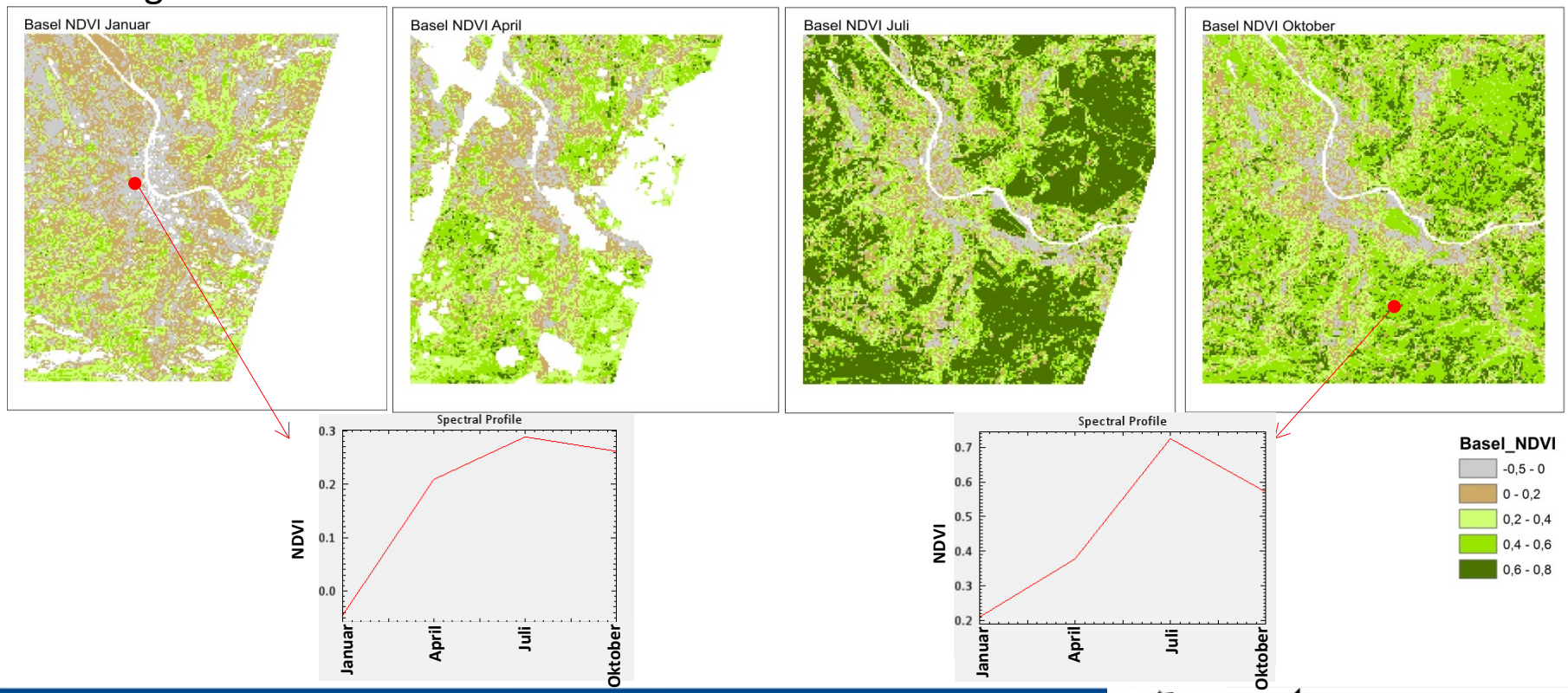


Surface characteristics

Phenology: NDVI

Source: landsat 8 time series 2014

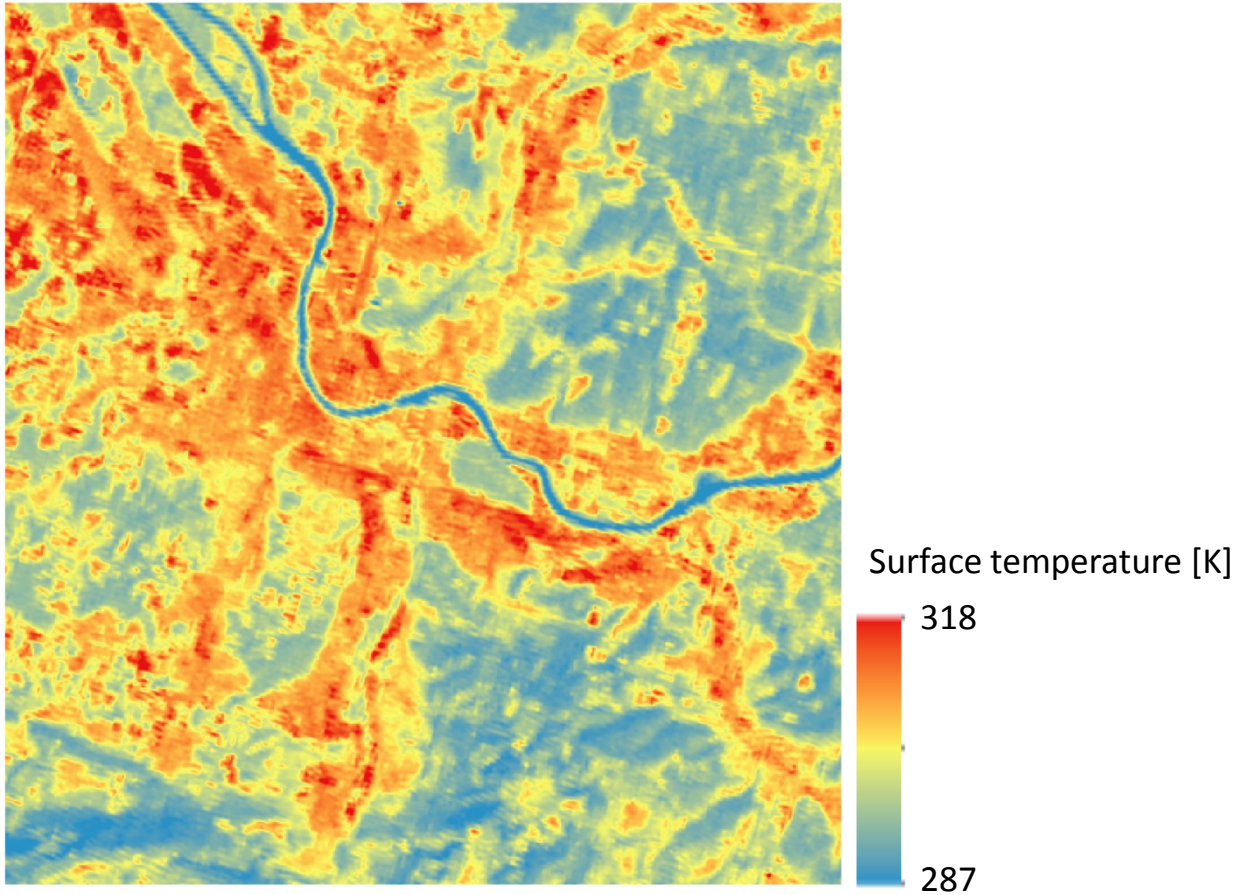
Method: convert to reflectance, cloud mask calculation(fMask), NDVI calculation, cloud masking



Surface characteristics

Surface temperature

Source: Landsat 8, Method: ATCOR



Summary & conclusions

- Input parameters for urban energy flux modelling could be derived from remote sensing (Talk N. Chrysoulakis)
- Automated methods have been applied that will be able to handle future Sentinel data
- Resulting maps will be used for the mapping of local climate zones (Talk Z. Mitraka)

Outlook

- Improvement of the derived products
  - Improved resolution of surface characteristics (SPOT 5, Sentinel 2)
  - Feedback from energy flux modellers in the URBANFLUXES project

- Development of updating approaches
  - Land cover (using Sentinel 2)
  - DSM (using Sentinel 1)

Thank you for your attention!