15 year re-analysis of the urban climate of Amsterdam using WRF

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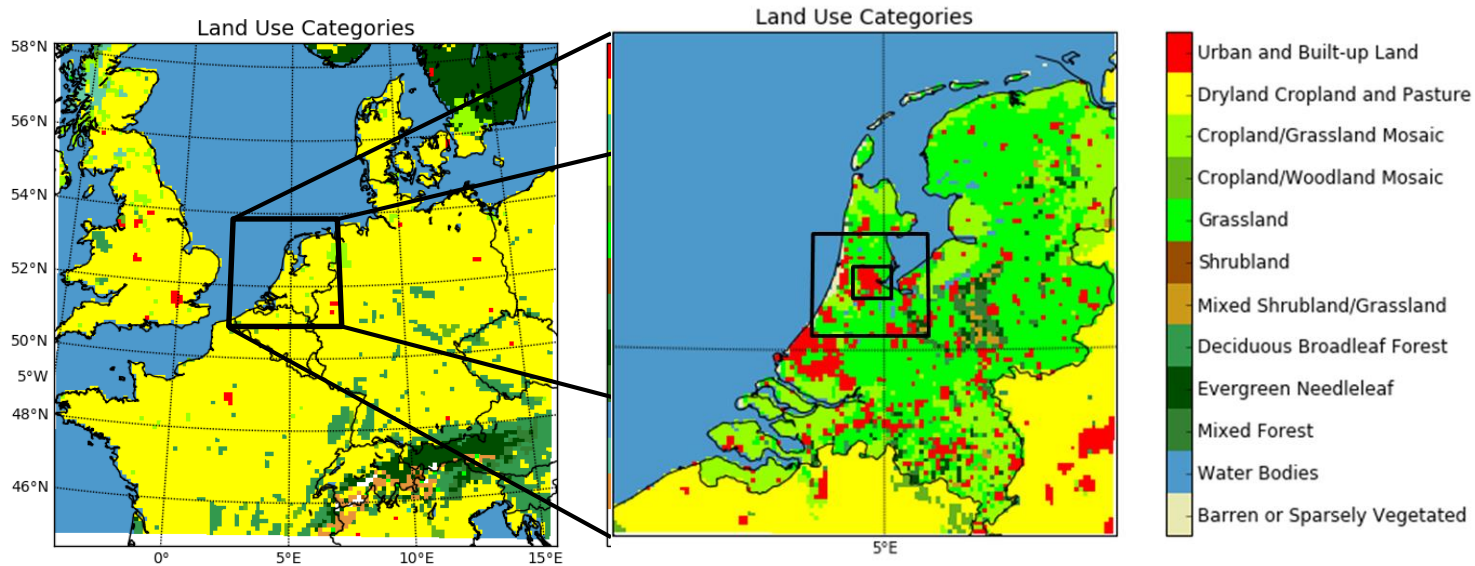
Goals

- Set up a WRF modelling environment at 100 m resolution for Amsterdam
- Use data assimilation of WMO records, rain radar and crowdsourced weather observations
- Develop a 15 y re-analysis product for the city of Amsterdam

Domains WRF model

- 4 Domains with 12500:2500:500:100 m resolutions
- Use ECMWF boundaries every 6 hours, 0.5⁰ x 0.5⁰



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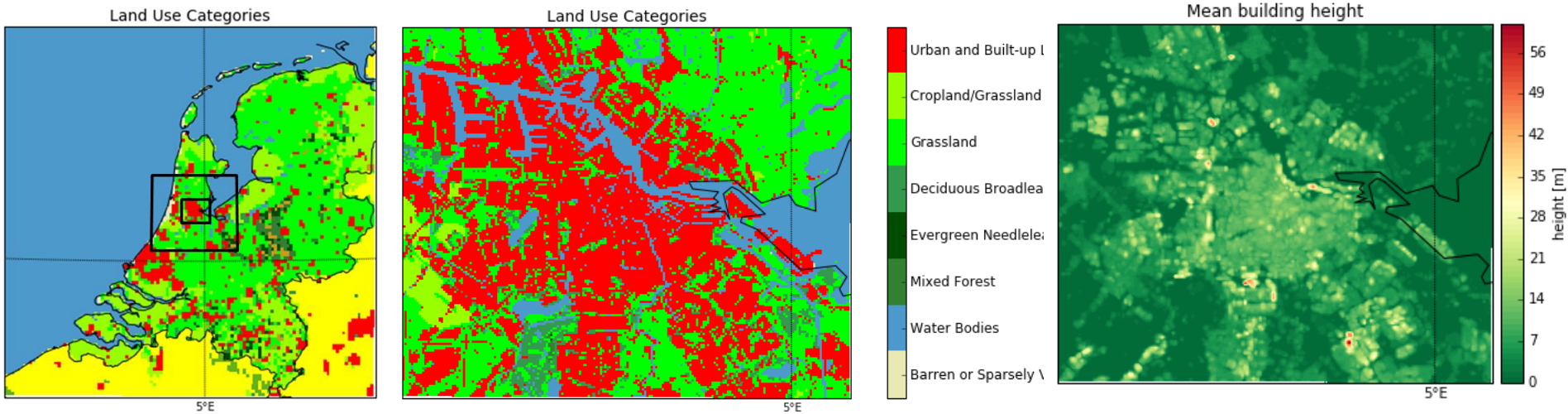
How to forecast? WRF at 100 m resolution



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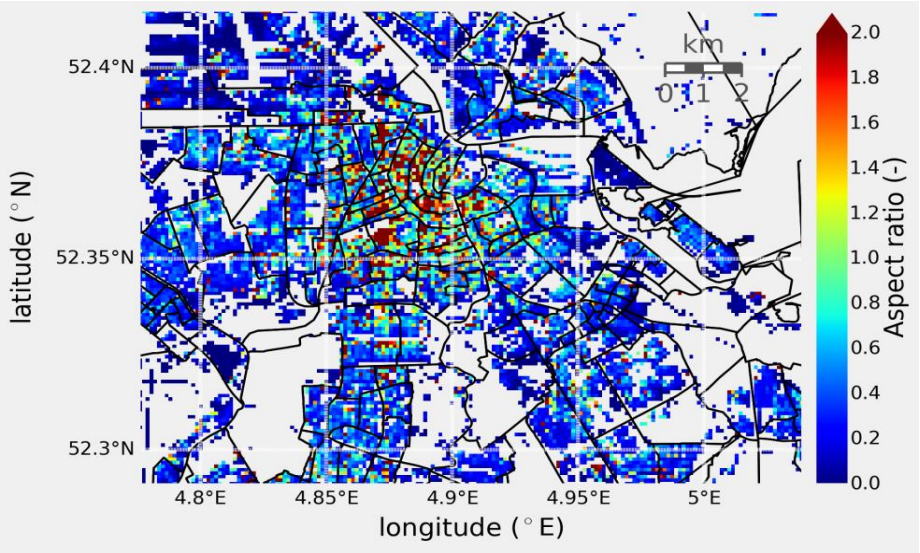
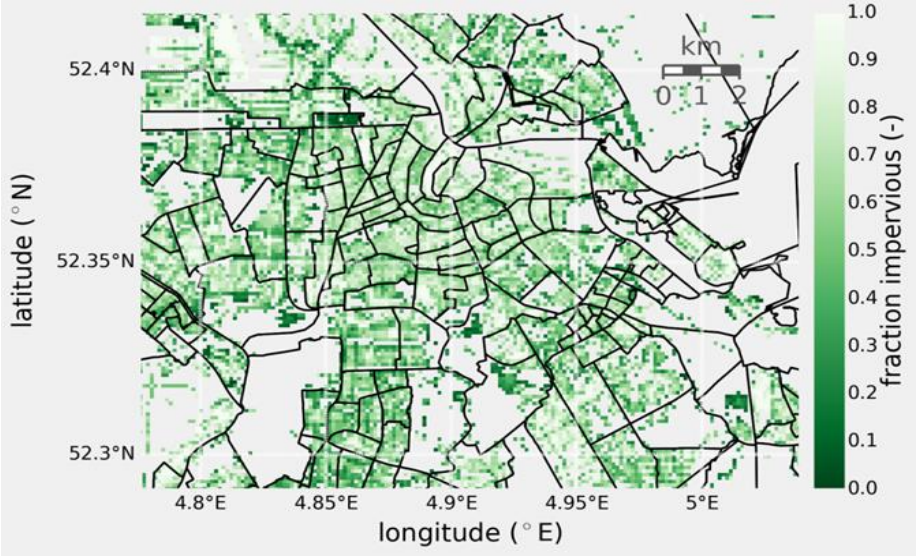
Urban morphology

Aspect ratio (H/W)



Impervious fraction



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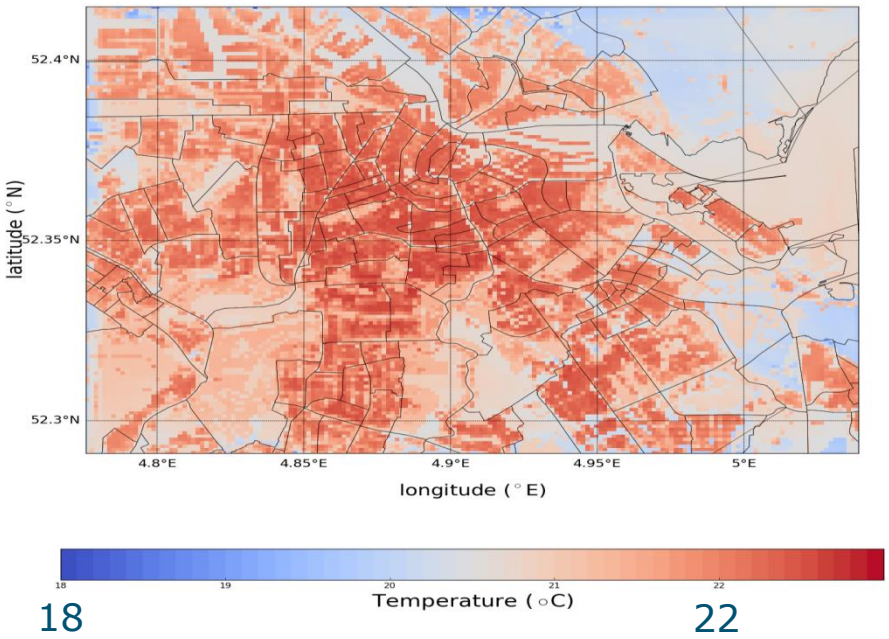
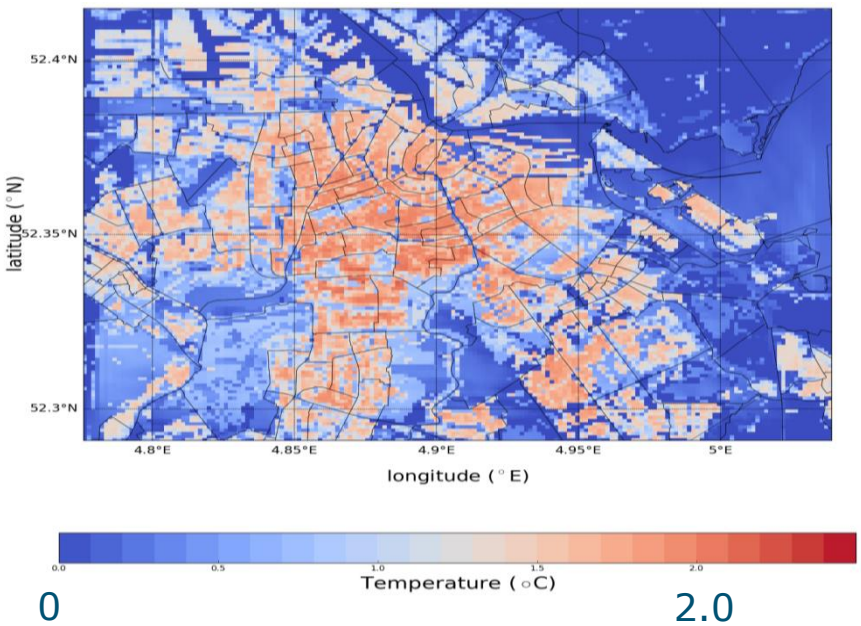
Evening temperature and UHI for JJA 2015 averaged

Temperature



18 22

UHI



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Weather Research and Forecasting model at 100 m resolution for a complete summer

Ronda et al 2017

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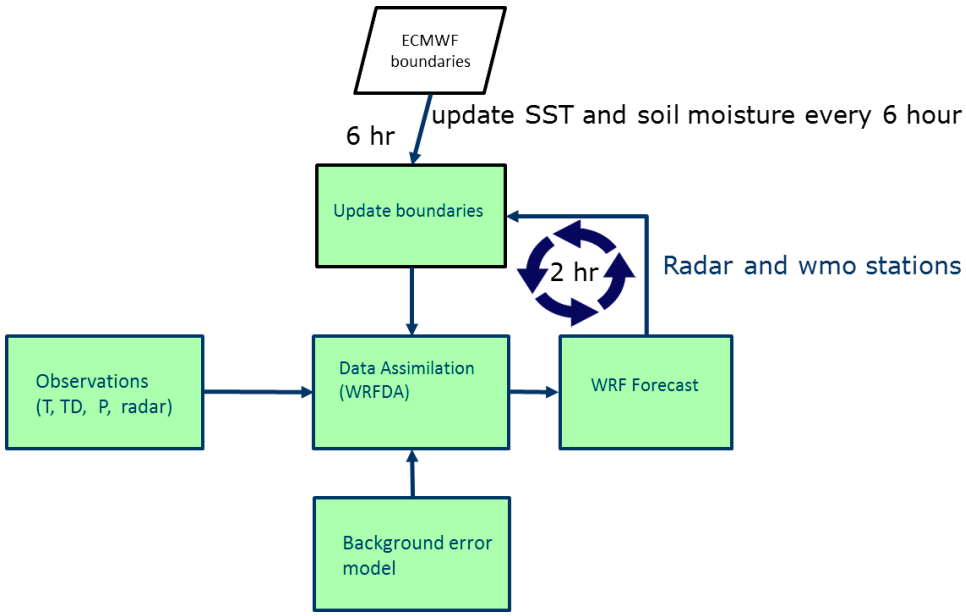
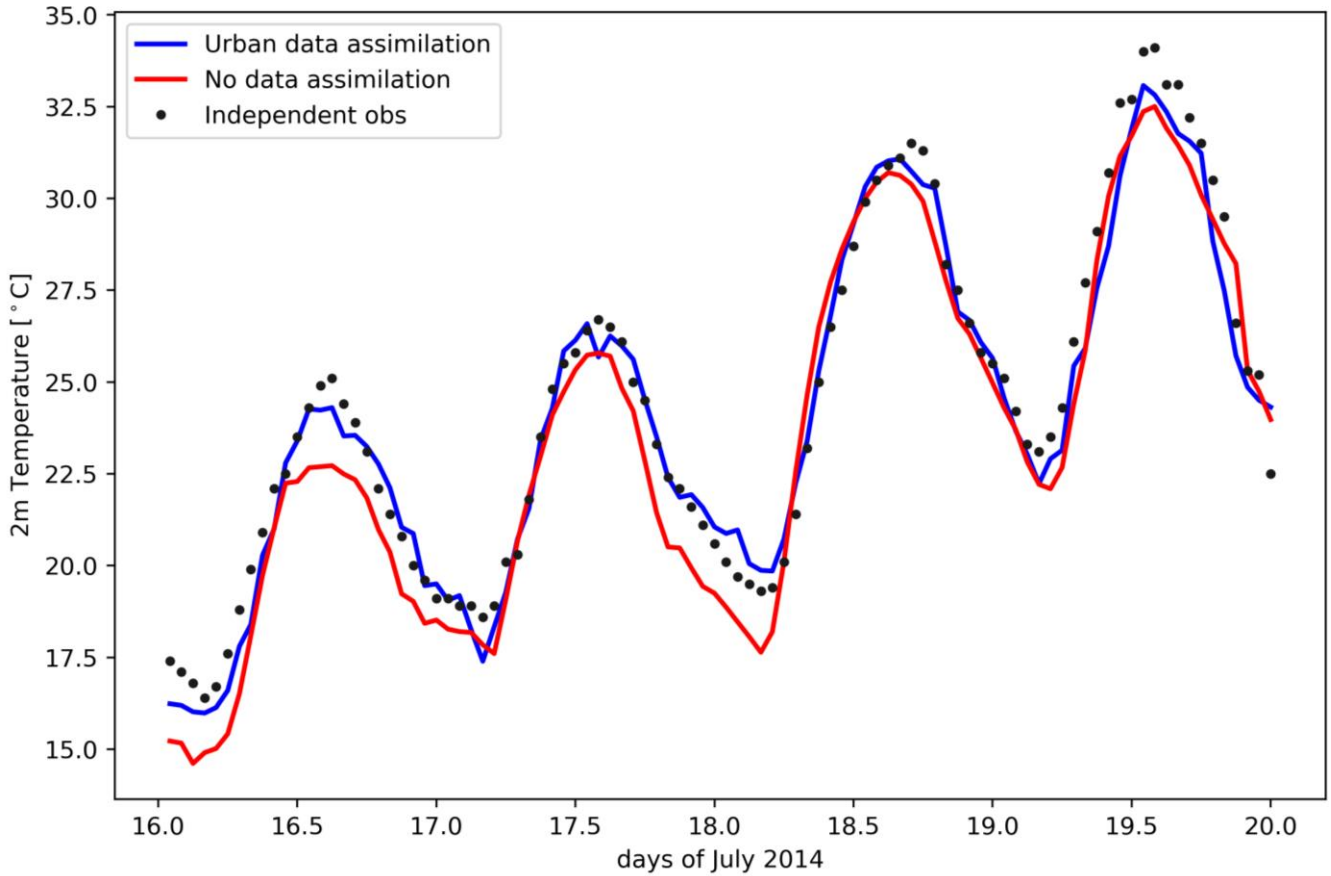
15 y re-analysis product for Adam at 167 m

- Test model set-up with data-assimilation for Amsterdam
- 2 hourly 3D VAR with WMO data + urban observations assimilated in urban scheme.
- Assimilate: WMO data
  KNMI radar
  Hobby stations in city

ERA-urban: 15 y re-analysis product for Adam at 167 m



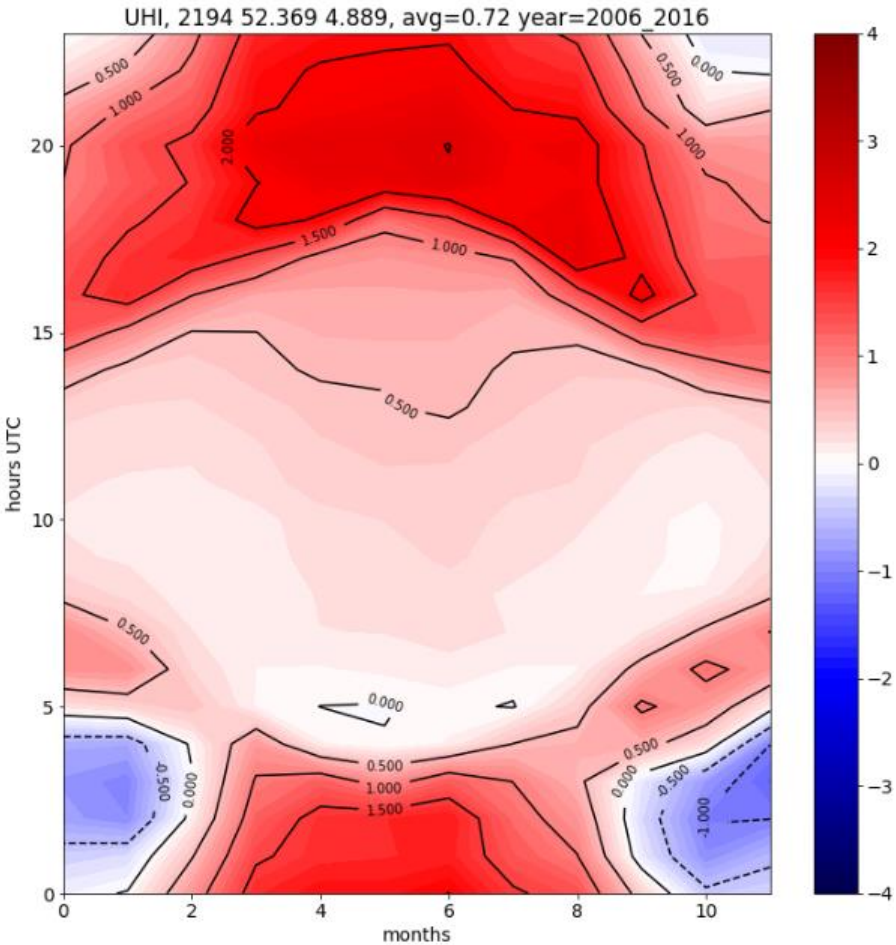
ERA-urban: 15 y re-analysis product for Adam at 167 m



Example hot summer week

Isopleths: *Urban heat island* middle rise neighbourhood (center)

URB_FRAC = 0.84



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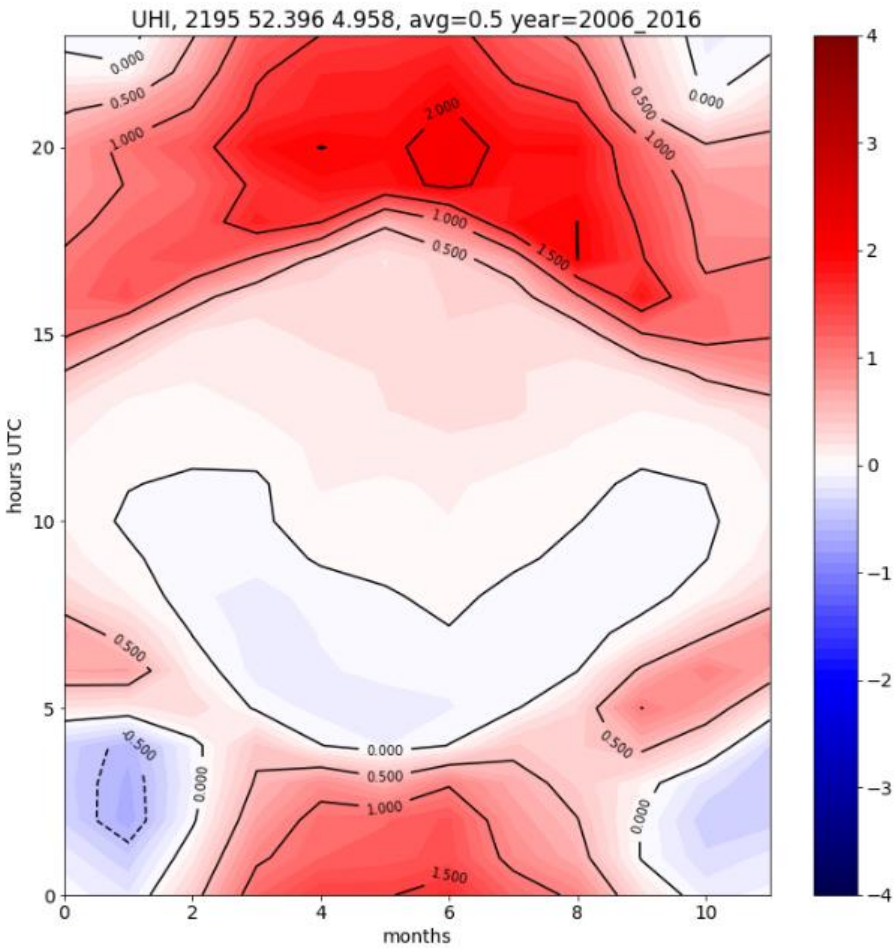
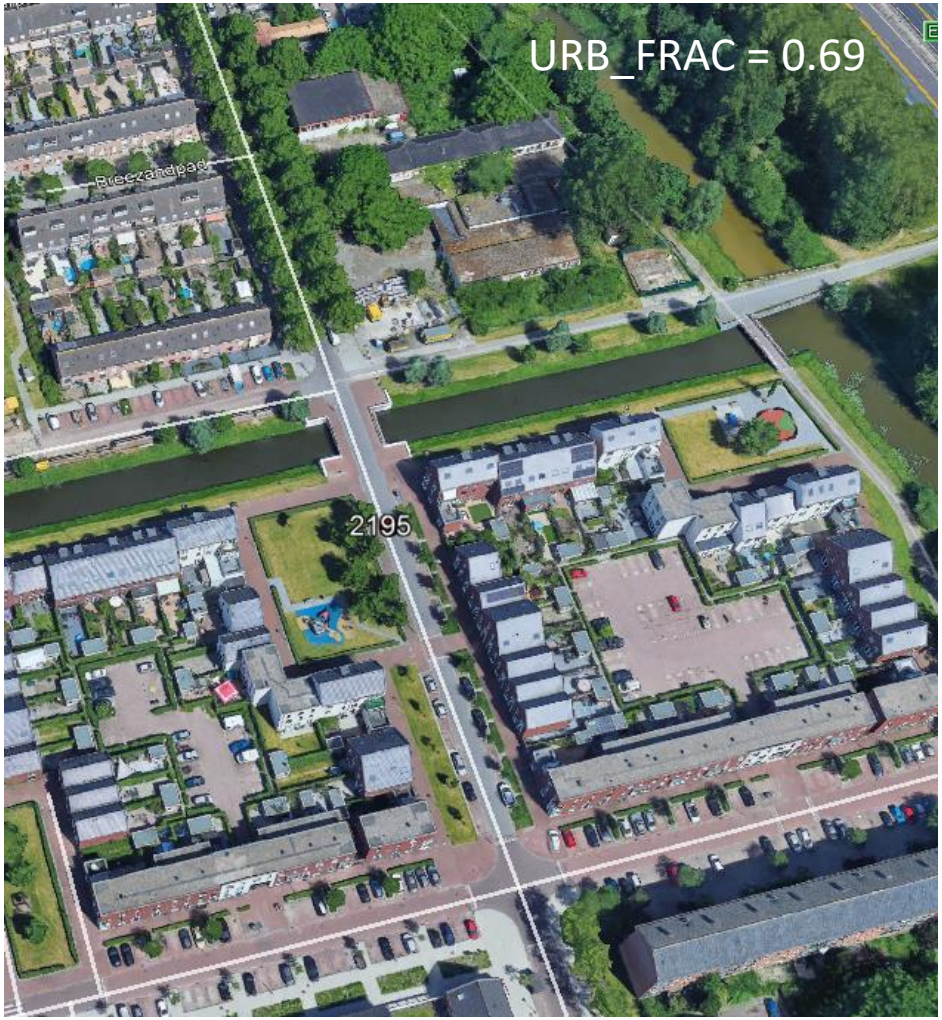
Isopleths: *Urban heat island* low rise neighbourhood (east)





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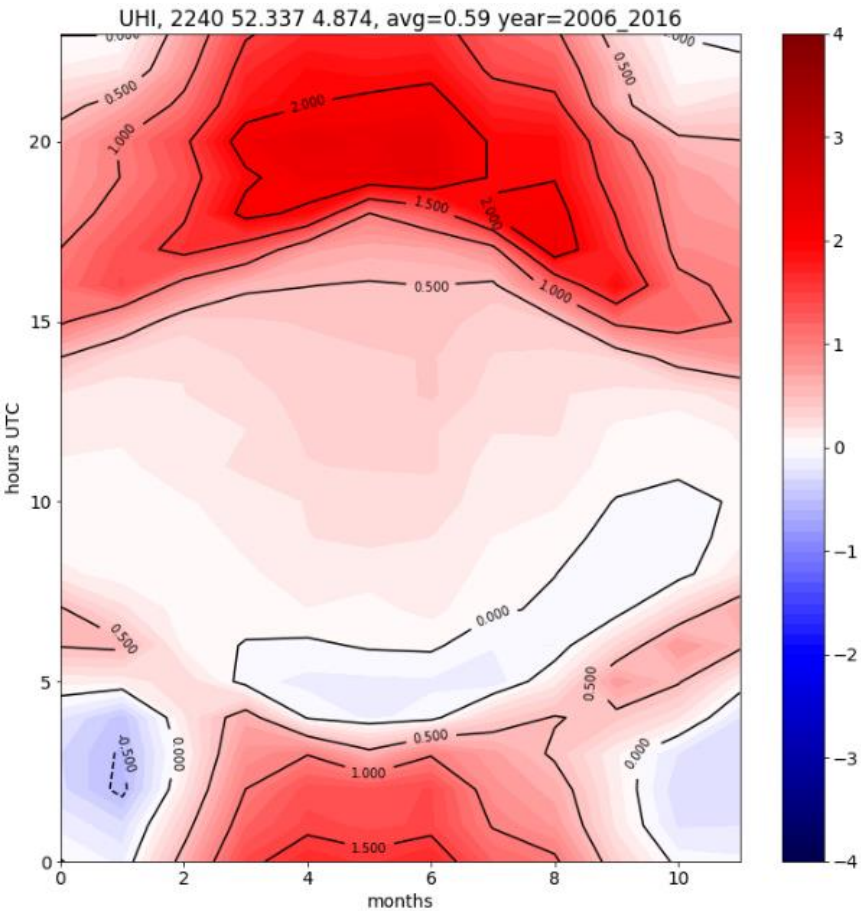
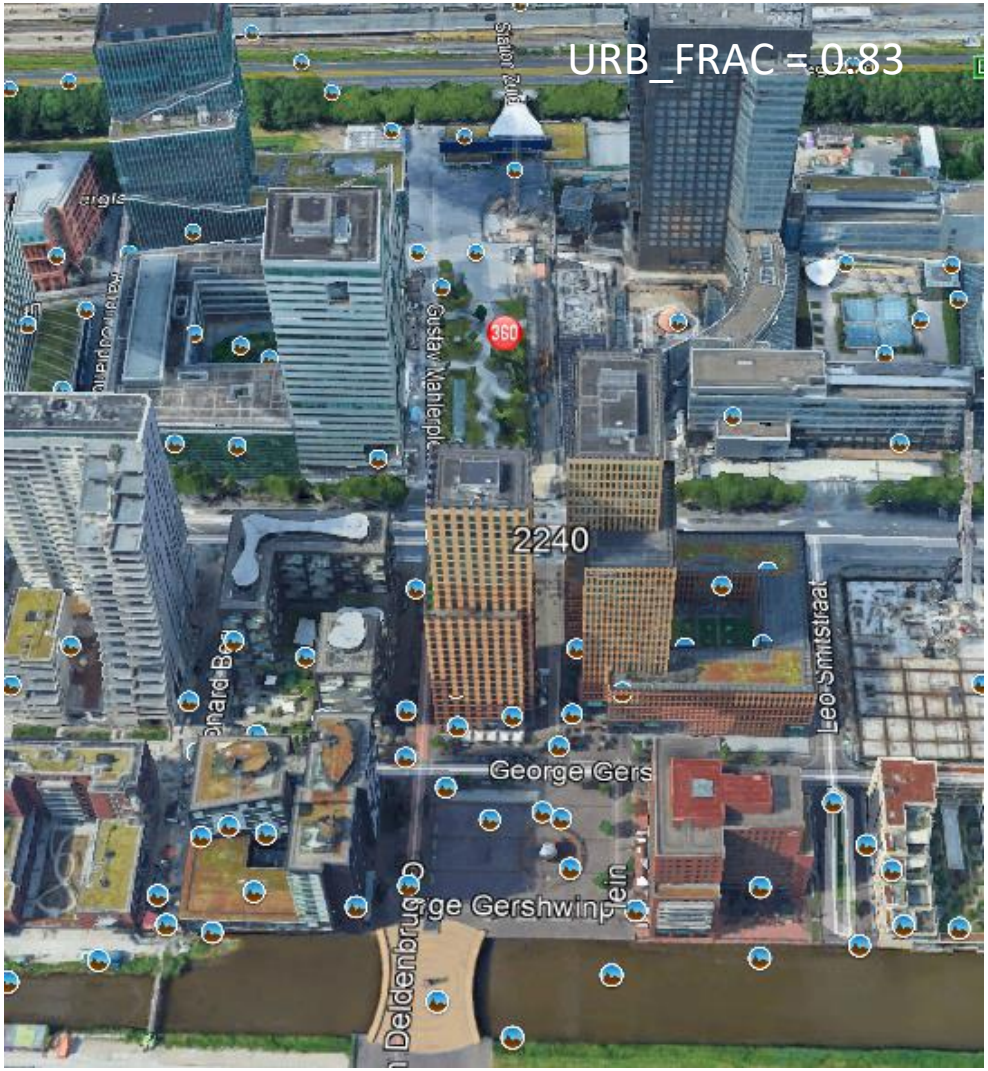
Isopleths: *Urban heat island* high rise neighbourhood (south)





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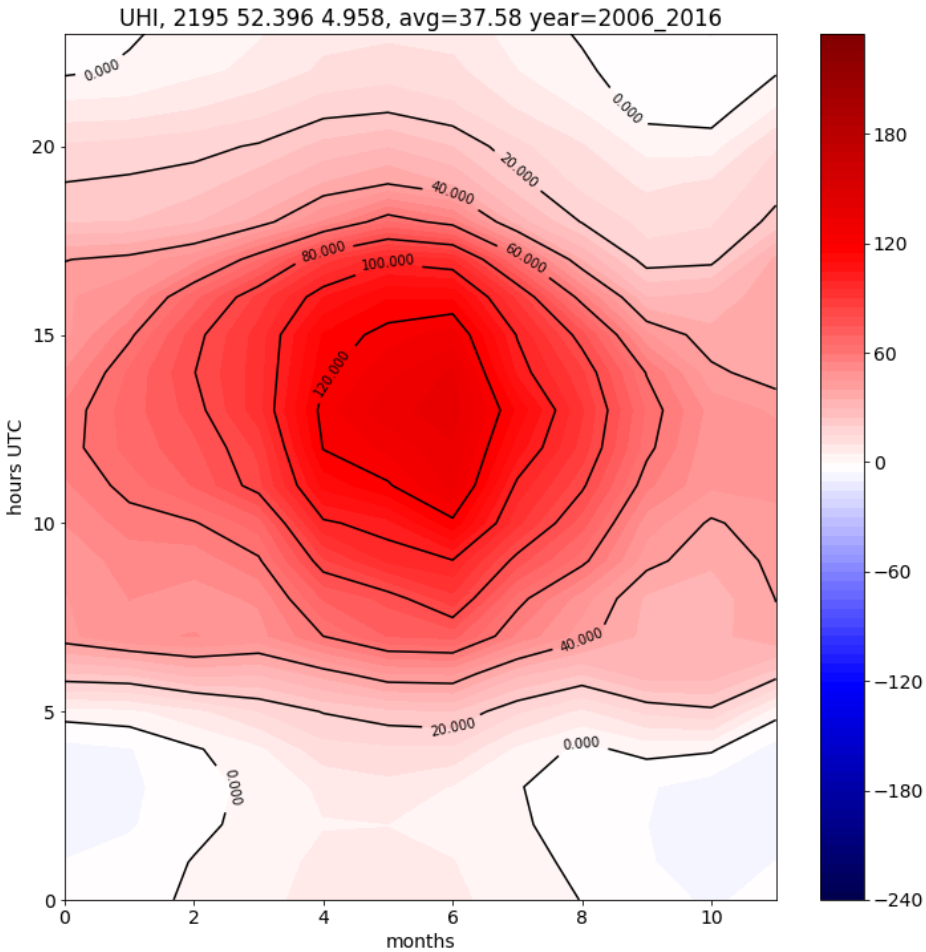
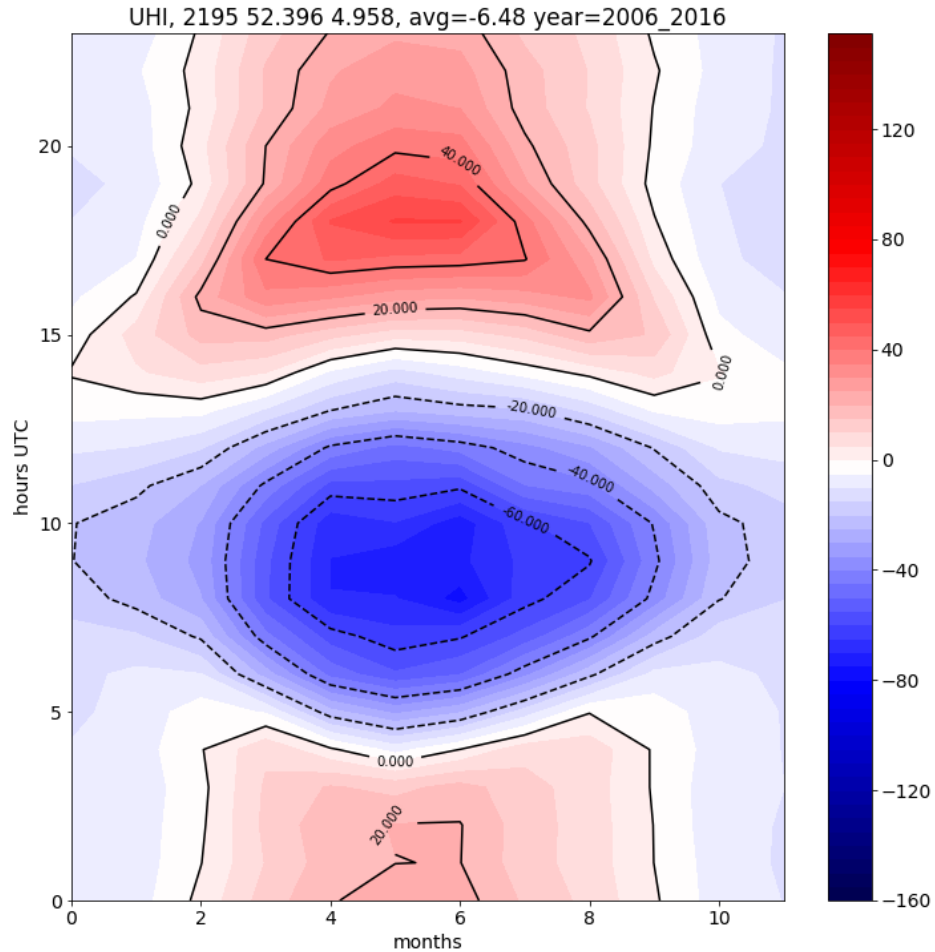
Isopleths: Sensible heat and storage flux



Sensible heat flux



Storage flux

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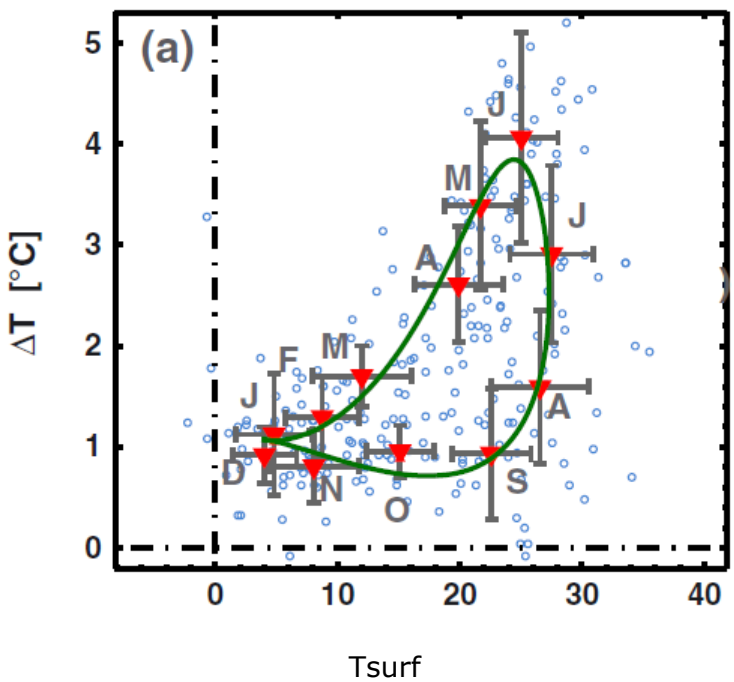
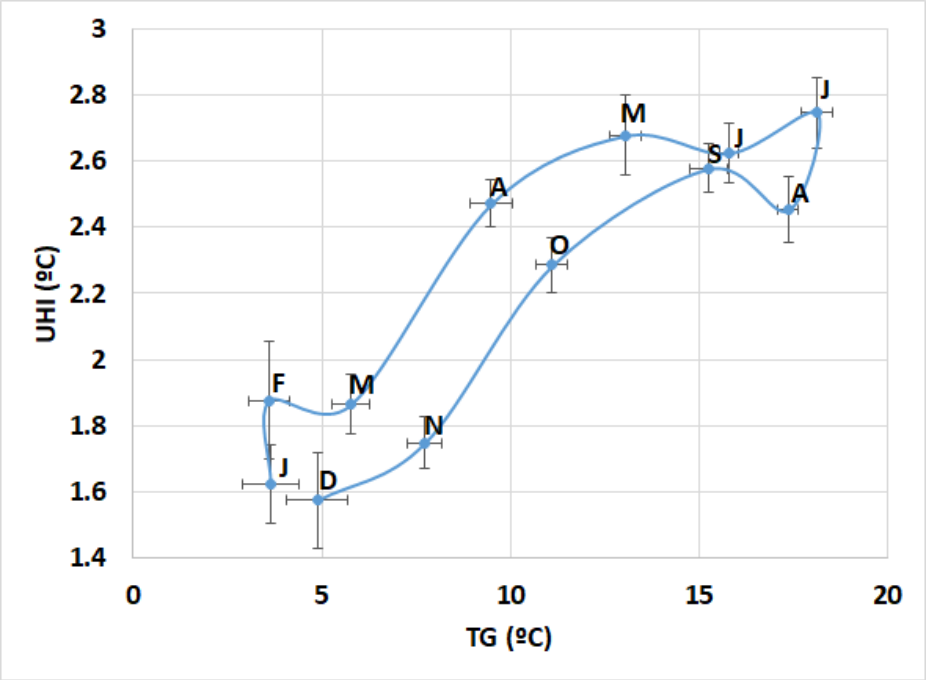
Hysteresis of UHI visible in re-analysis



Obs Paris (Zhou et al, 2013)



Re-analysis results

A hysteresis loop appears also to be present also in re-analysis results

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Thanks

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