Impact of urban canopy parametrization from TERRA_URB on air quality in urban regions in Germany

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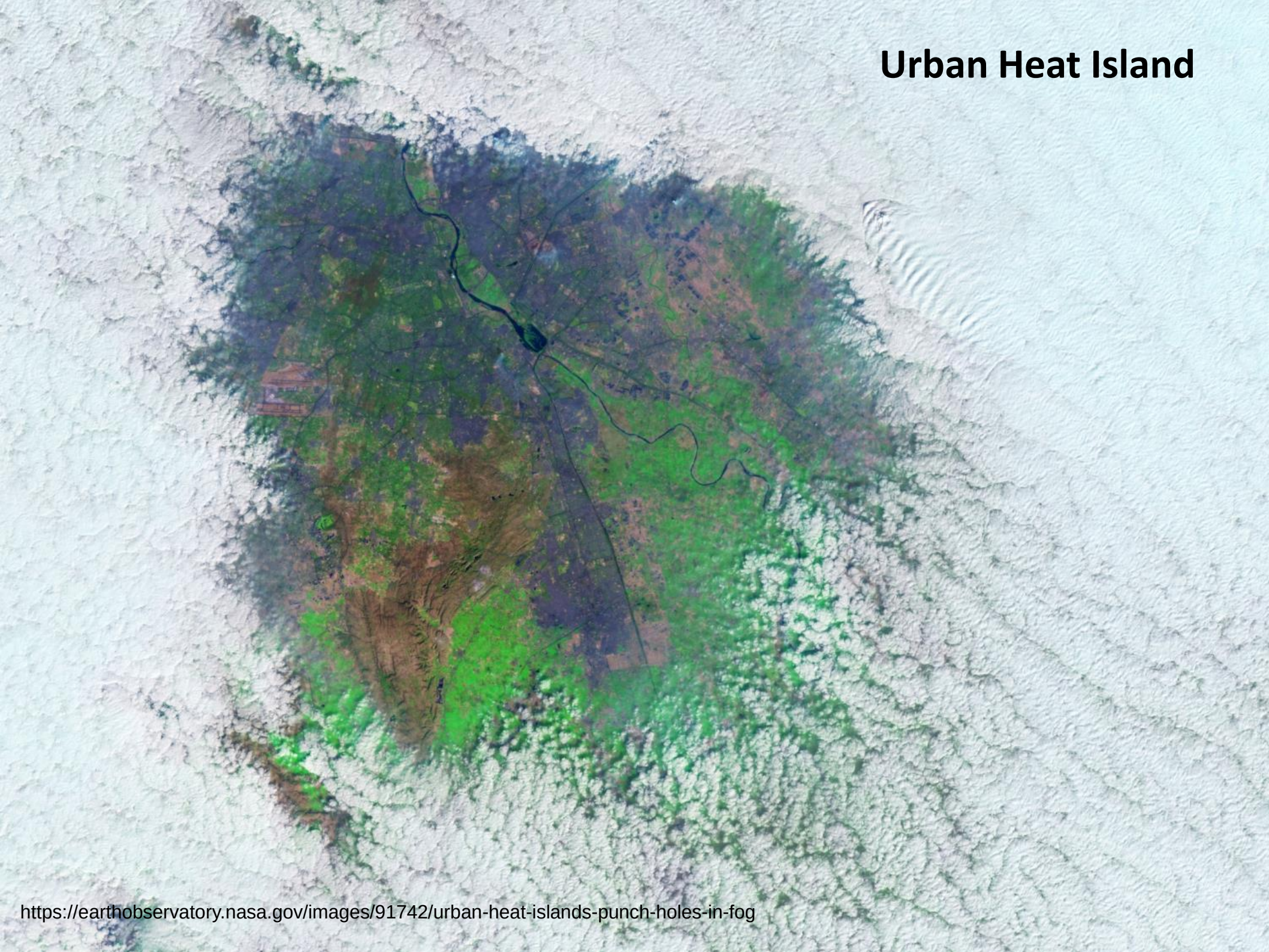
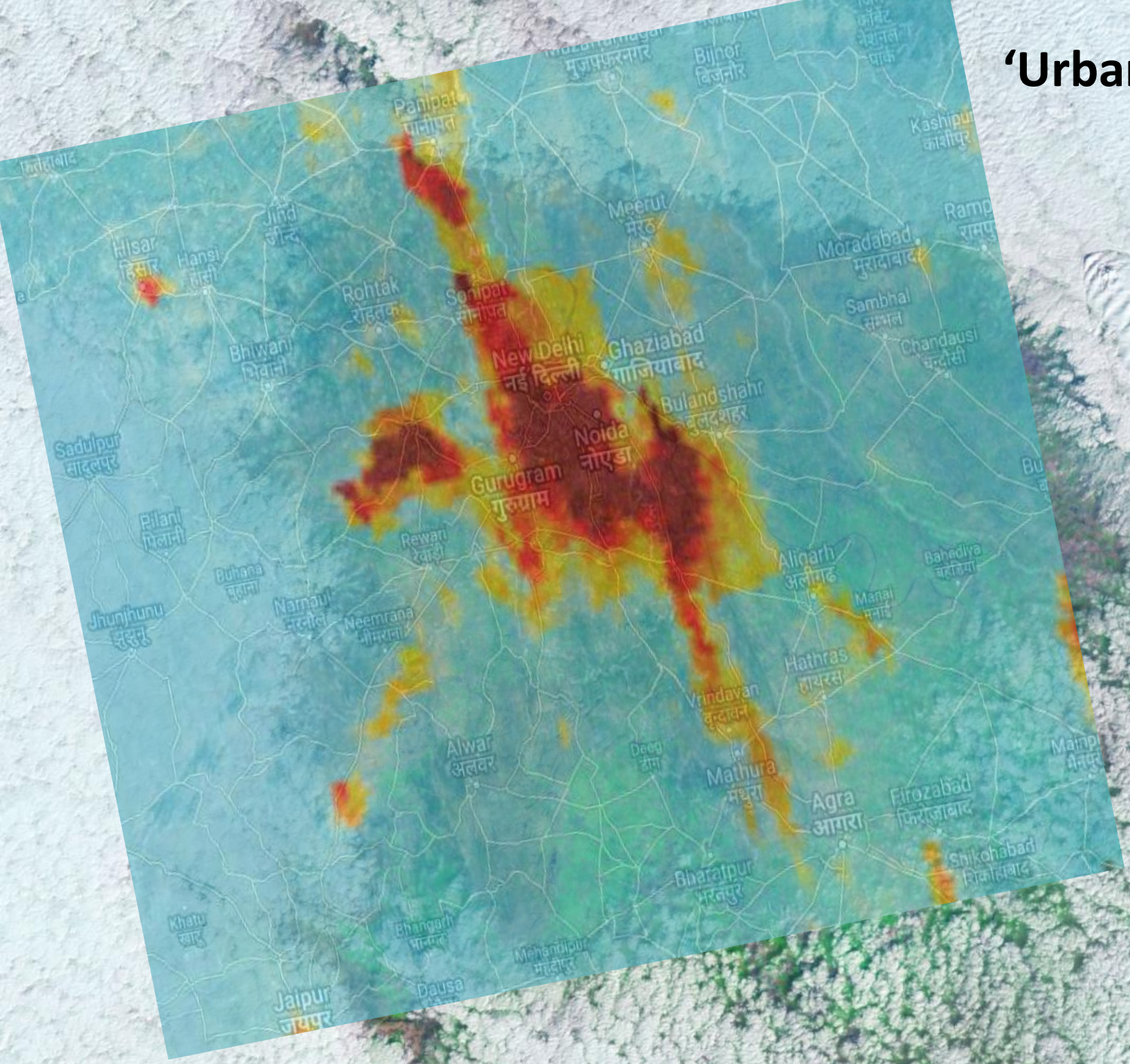
CLM-Community Assembly 2020

Urban Heat Island



https://earthobservatory.nasa.gov/images/91742/urban-heat-islands-punch-holes-in-fog

‘Urban Pollution Island’



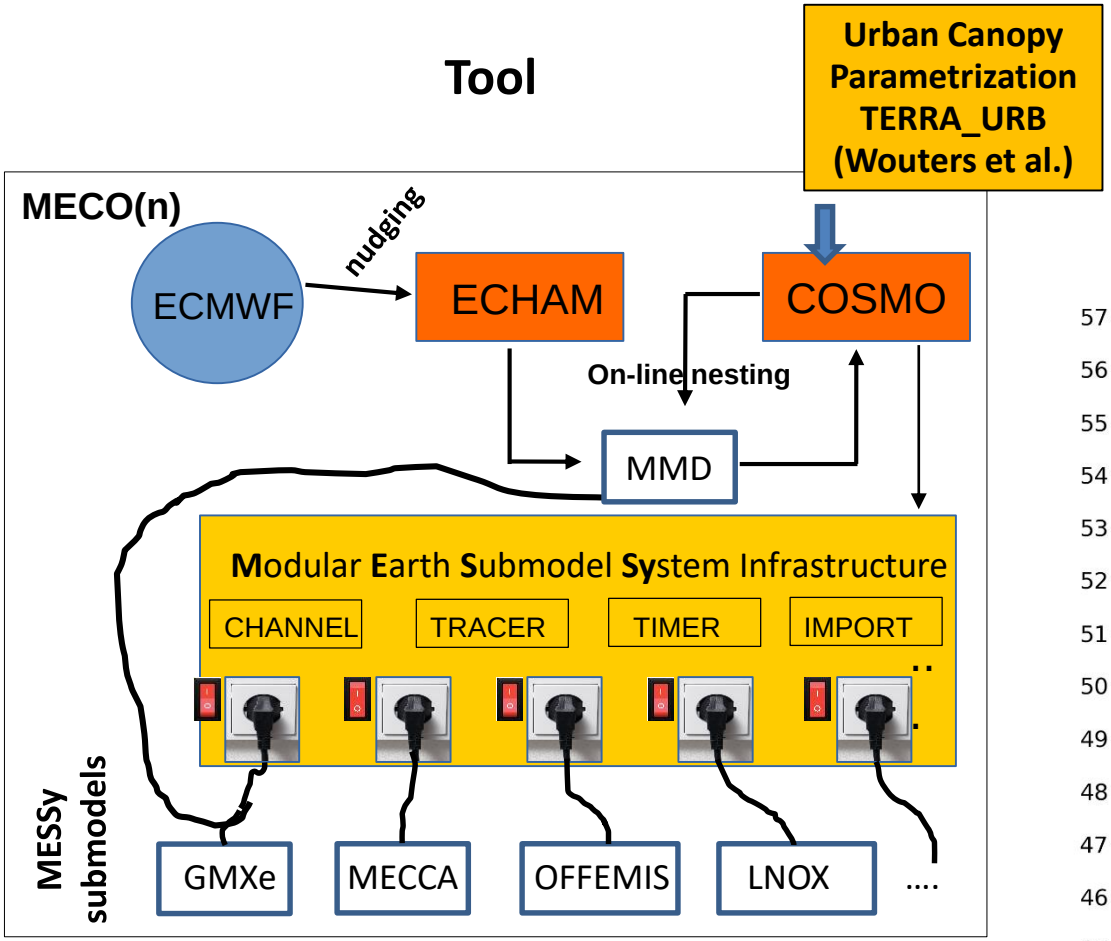
NO2 from Sentinel P5 (Novemver 2017)

Low High

https://www.esa.int/ESA_Multimedia/Images/2017/12/Pollution_over_Delhi_from_Sentinel-5P

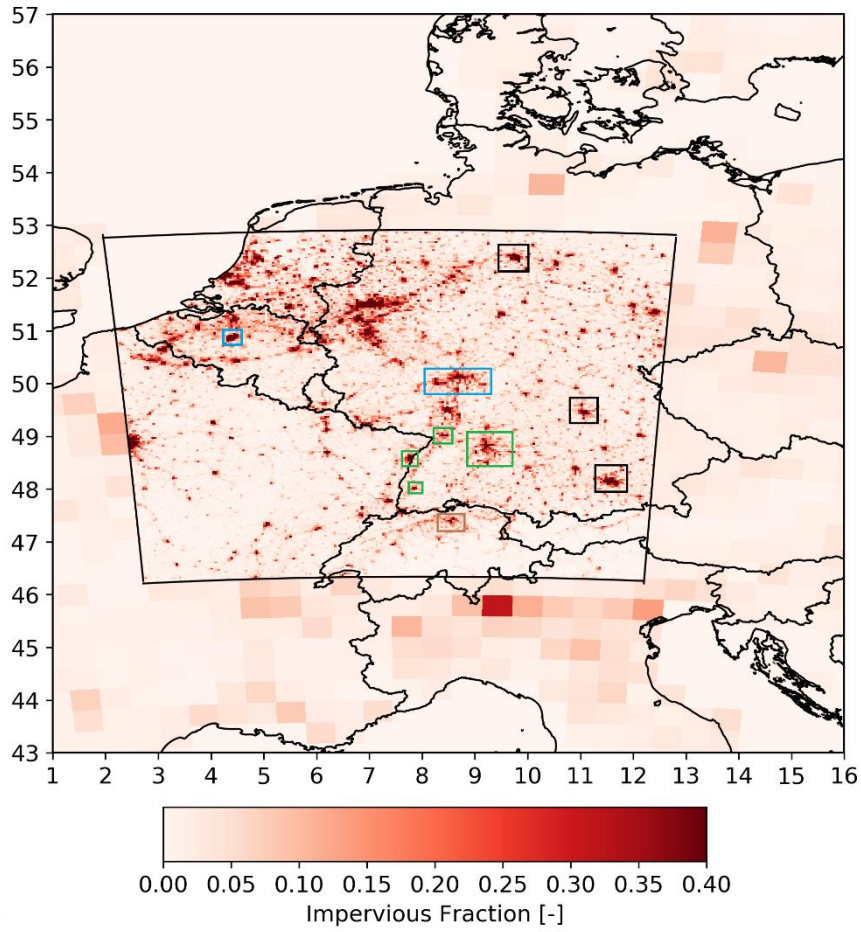
COSMO-MESSy: MECO(n) with TERRA_URB

Tool



Thanks to Astrid Kerkweg ☺

Model domain



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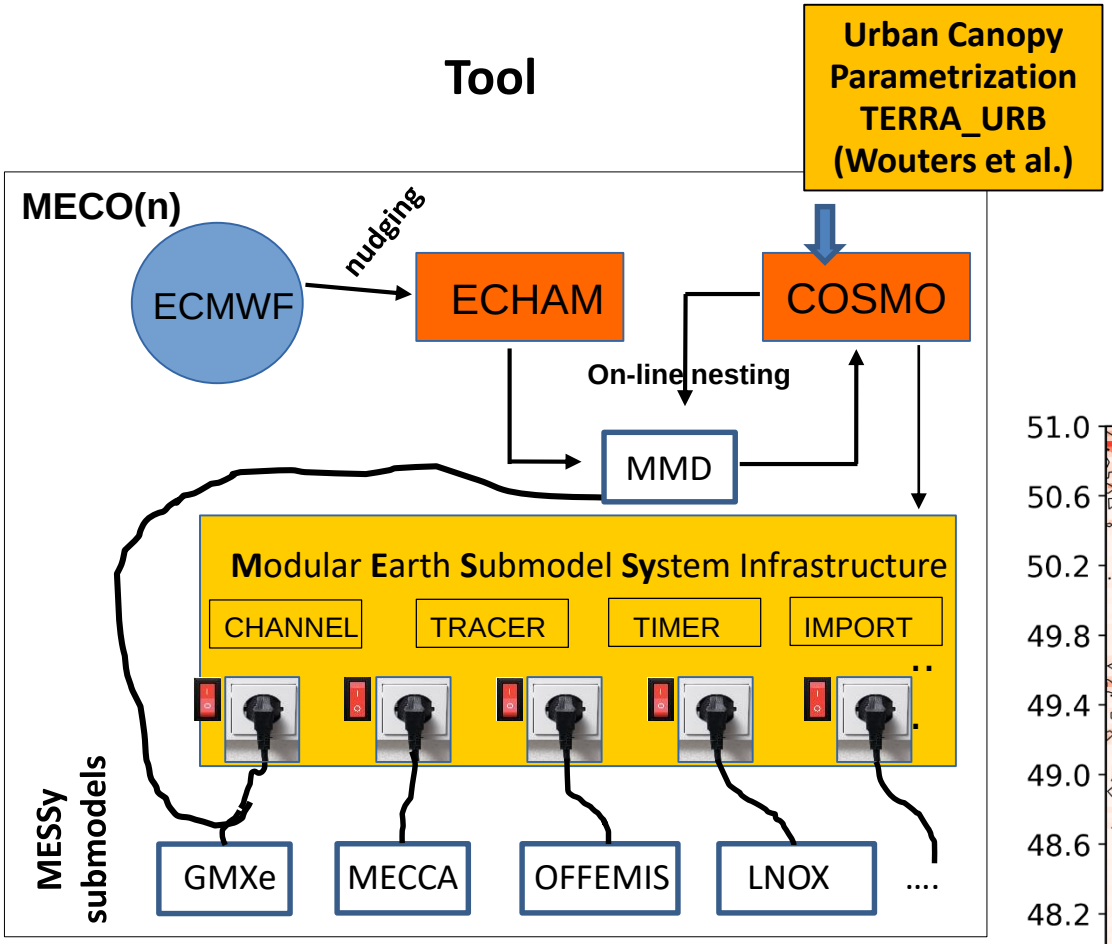
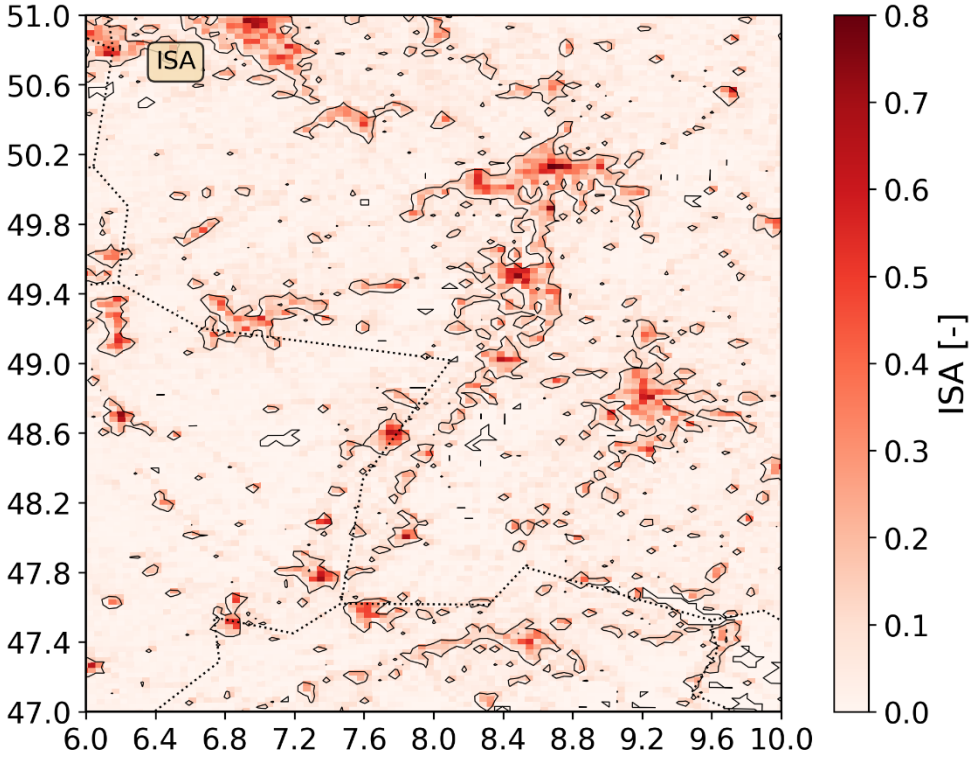
COSMO-MESSy: MECO(n) with TERRA_URB

Tool

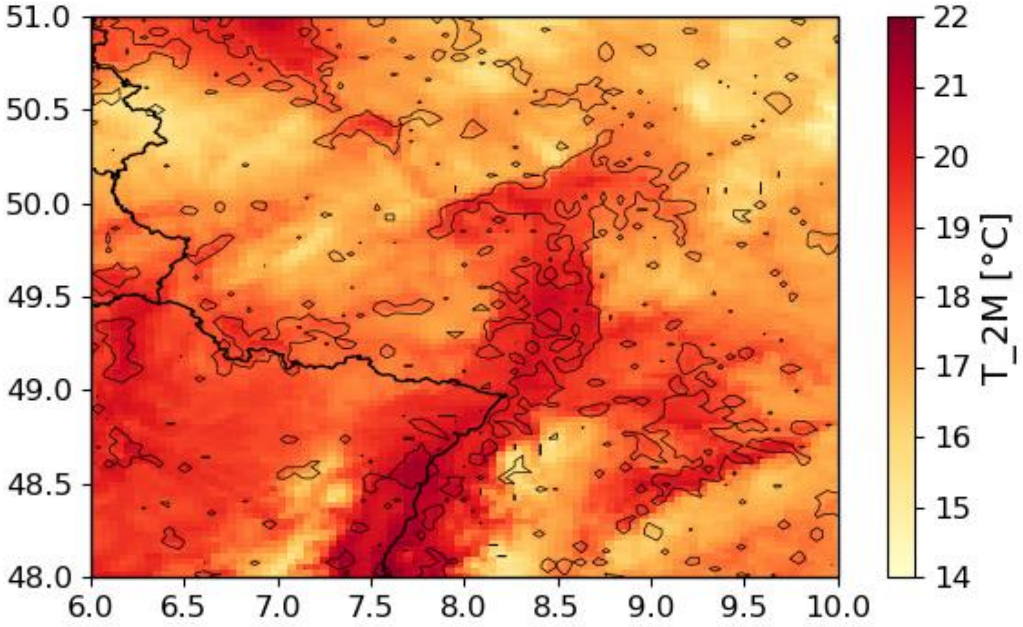


Model domain

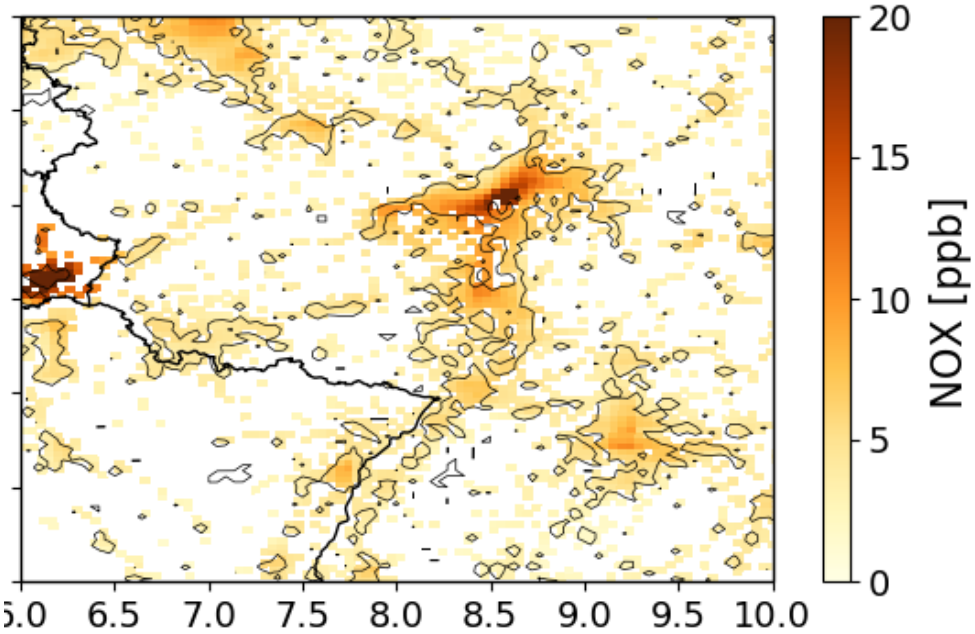


Rhine-Main metropolitan area case study July 2018

Temperature



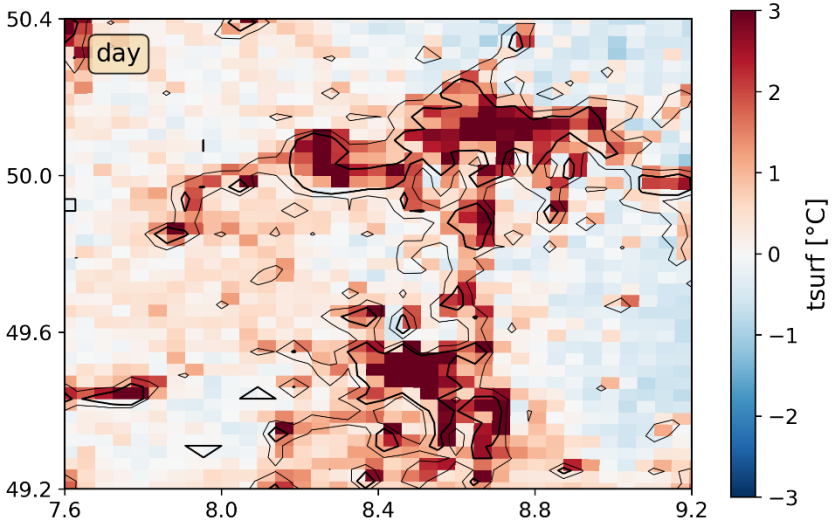
Air Pollution (NO2)

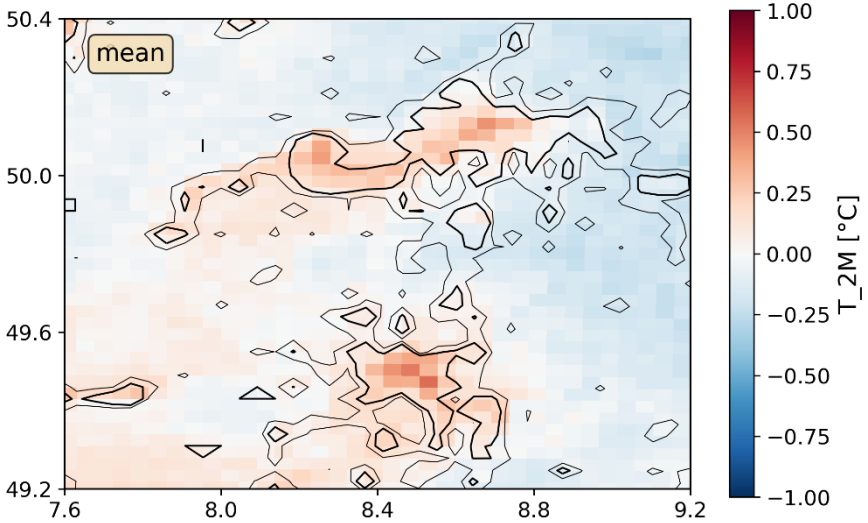


Mean 1-10 July 2018

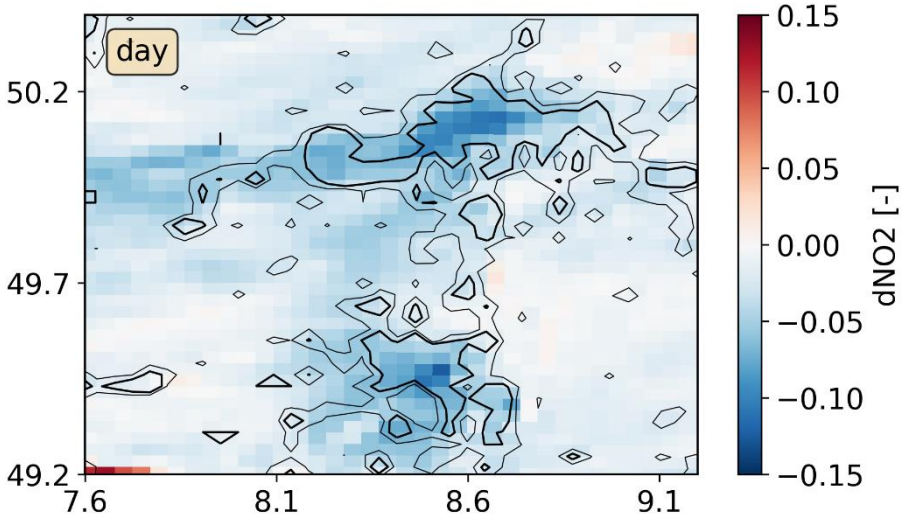
Impact of TERRA_URB (On-Off: mean over 1-10 July 2018)

Temperature



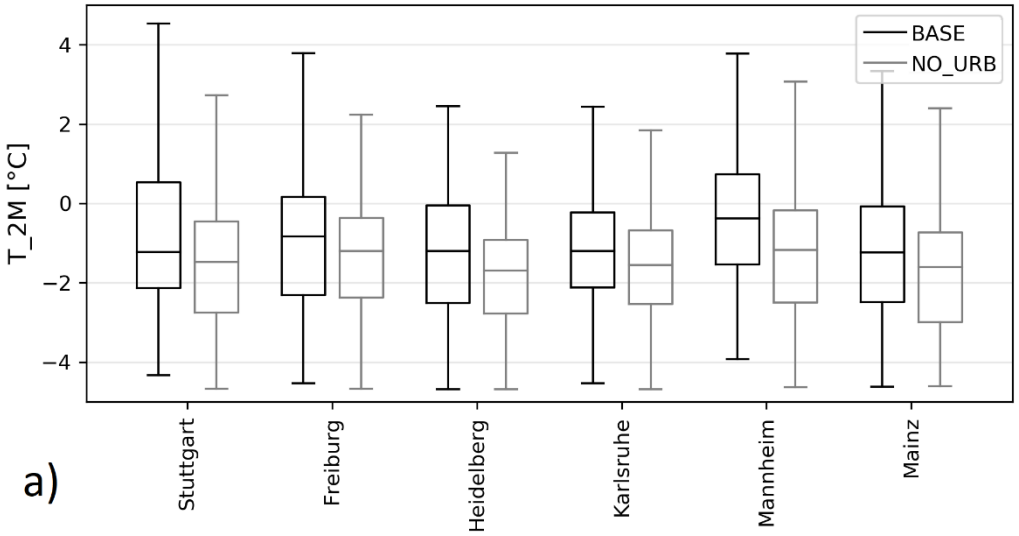


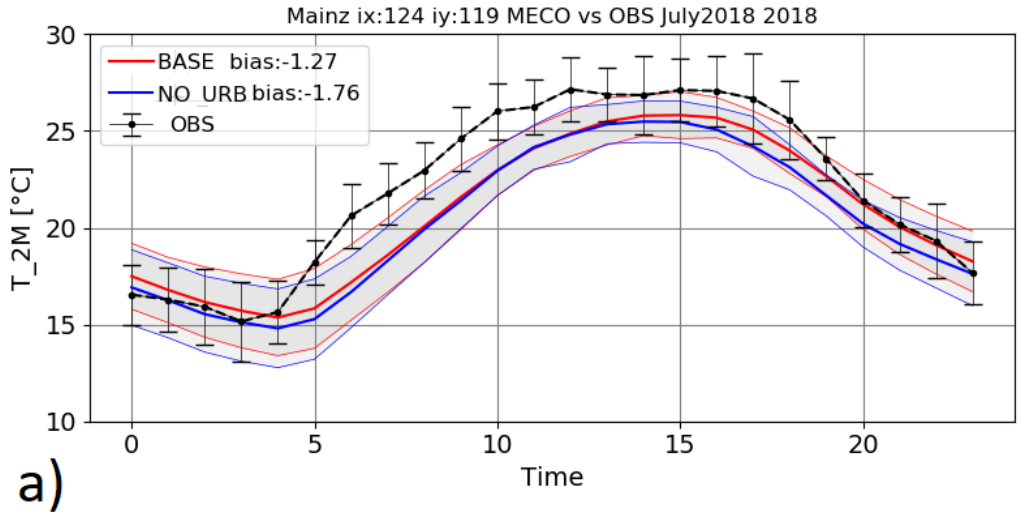
Air Pollution (NO2)



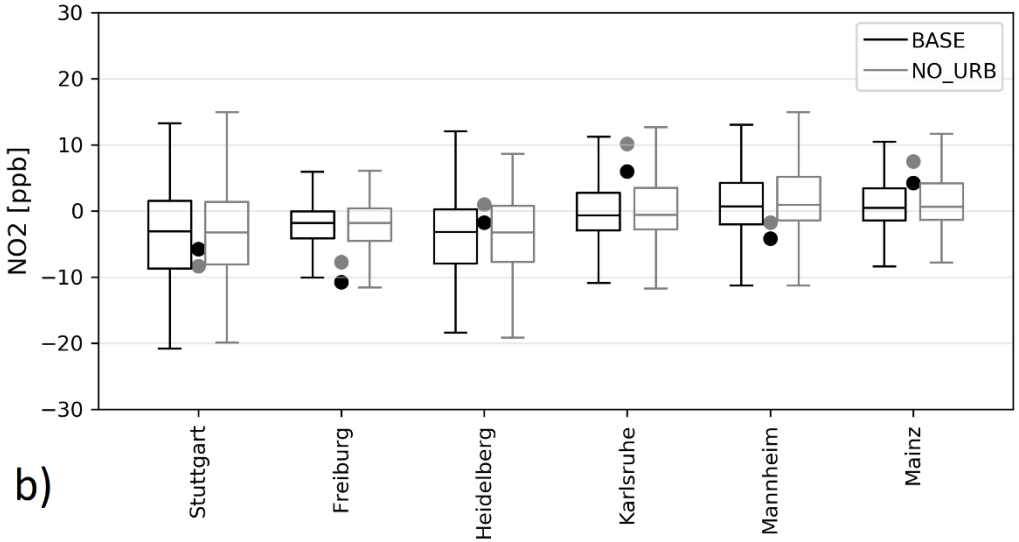
Evaluation for 6 urban background stations (top) and Mainz Mombach (bottom)

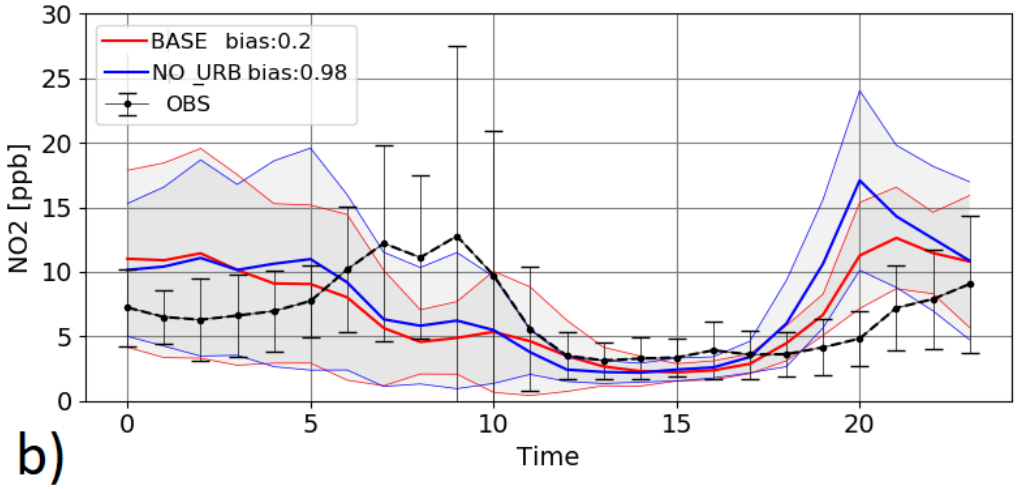
Temperature





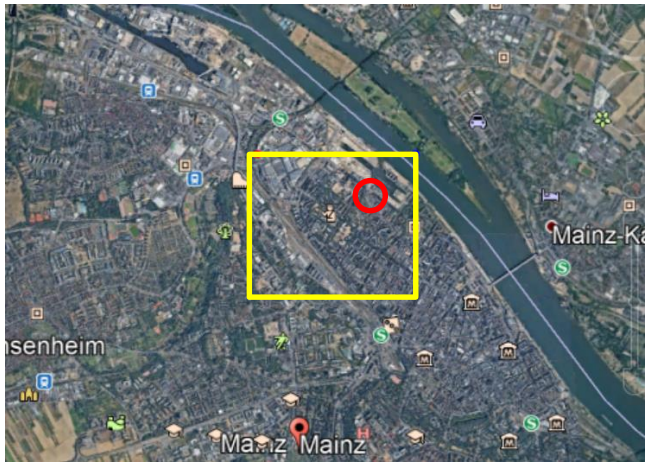
Air Pollution (NO2)



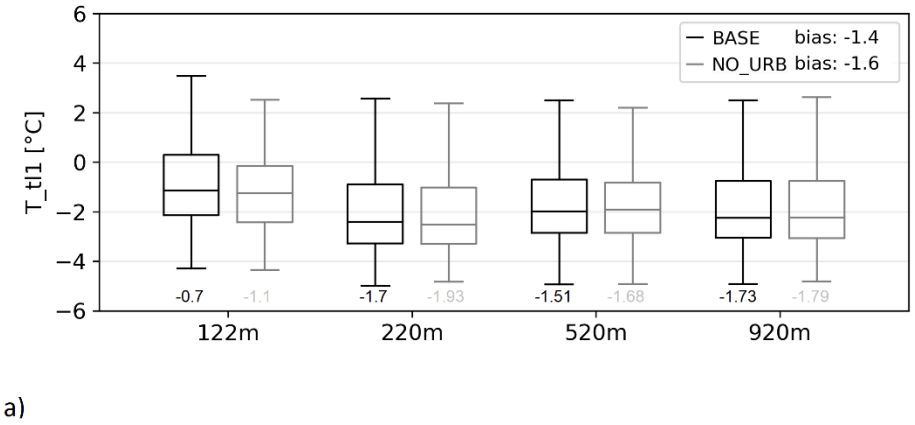


Boundary Layer Evaluation – Passive Microwave Data

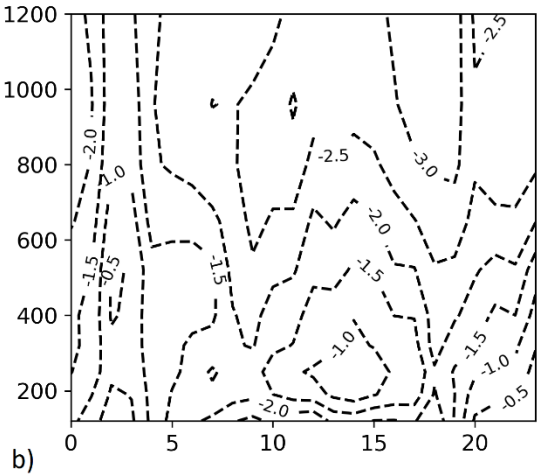
https://luft.rlp.de/fileadmin/_processed_/8/b/csm_lfu_radiometer_9d54c20417.jpg



Delta [°C]: Temperature in the boundary layer

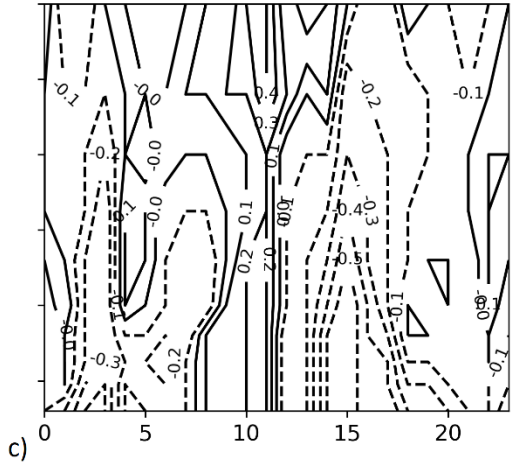


a)



b)

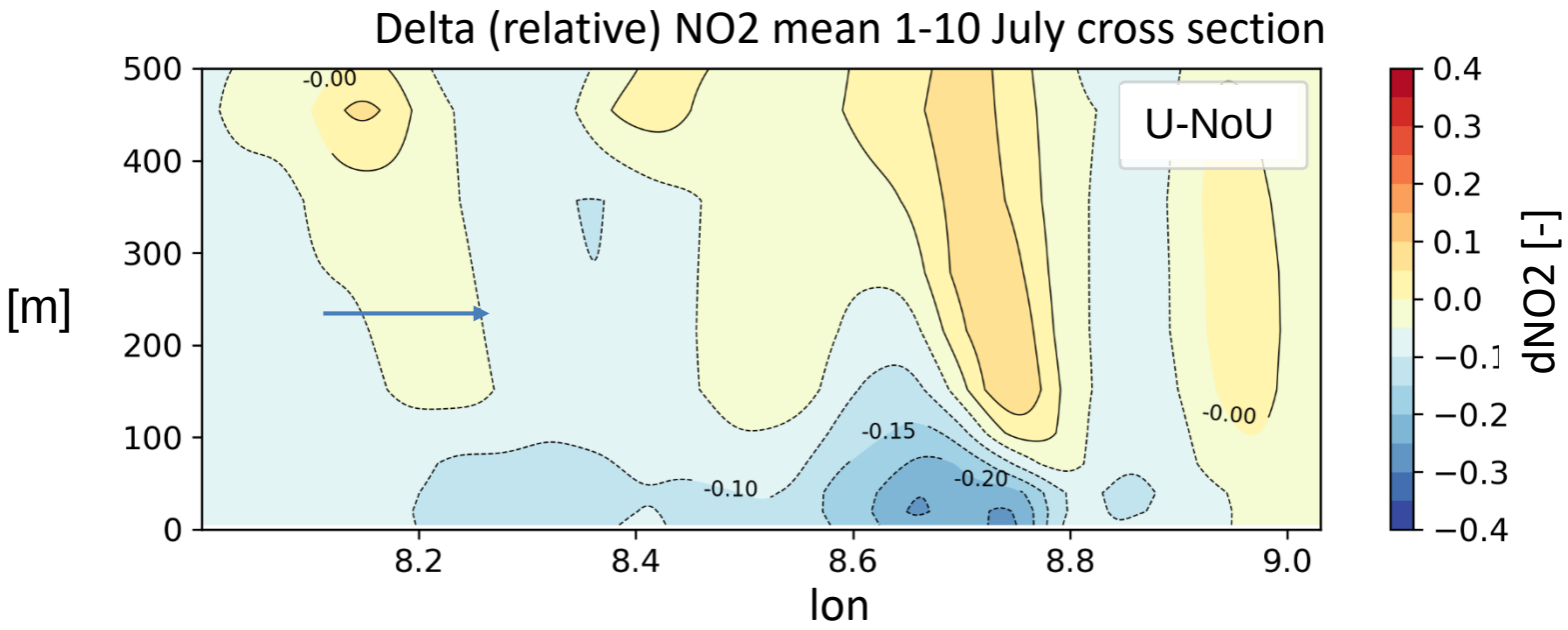
bias

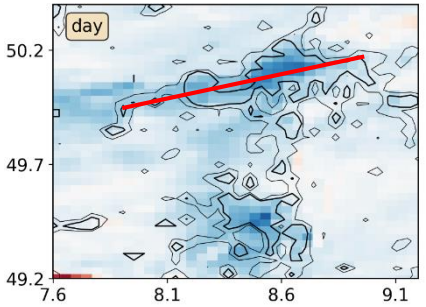


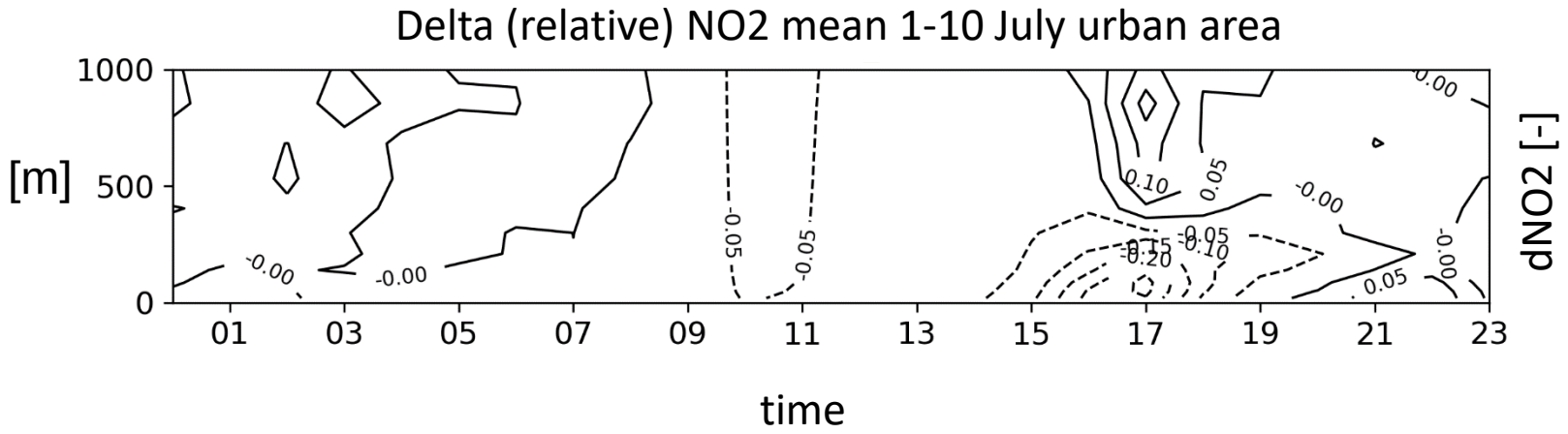
c)

change in bias

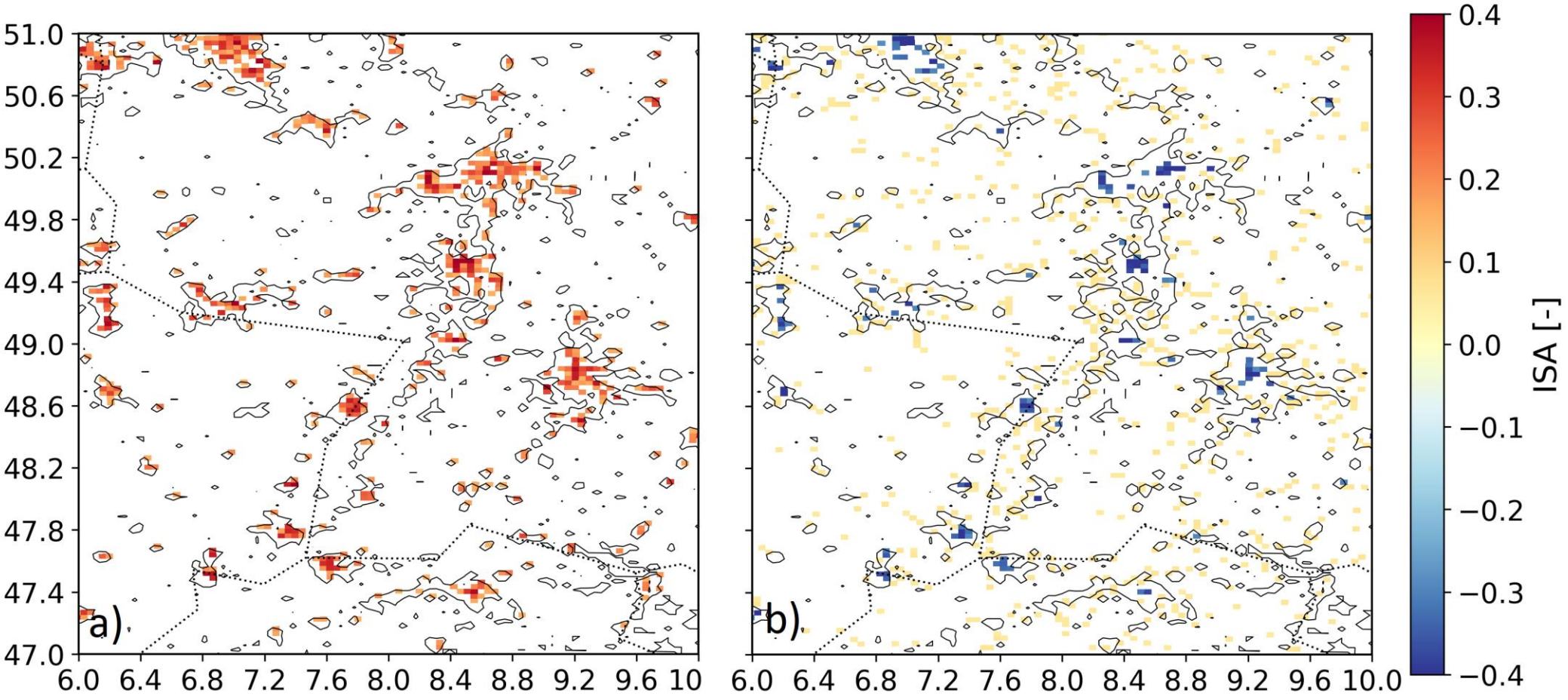
Boundary Layer Processes



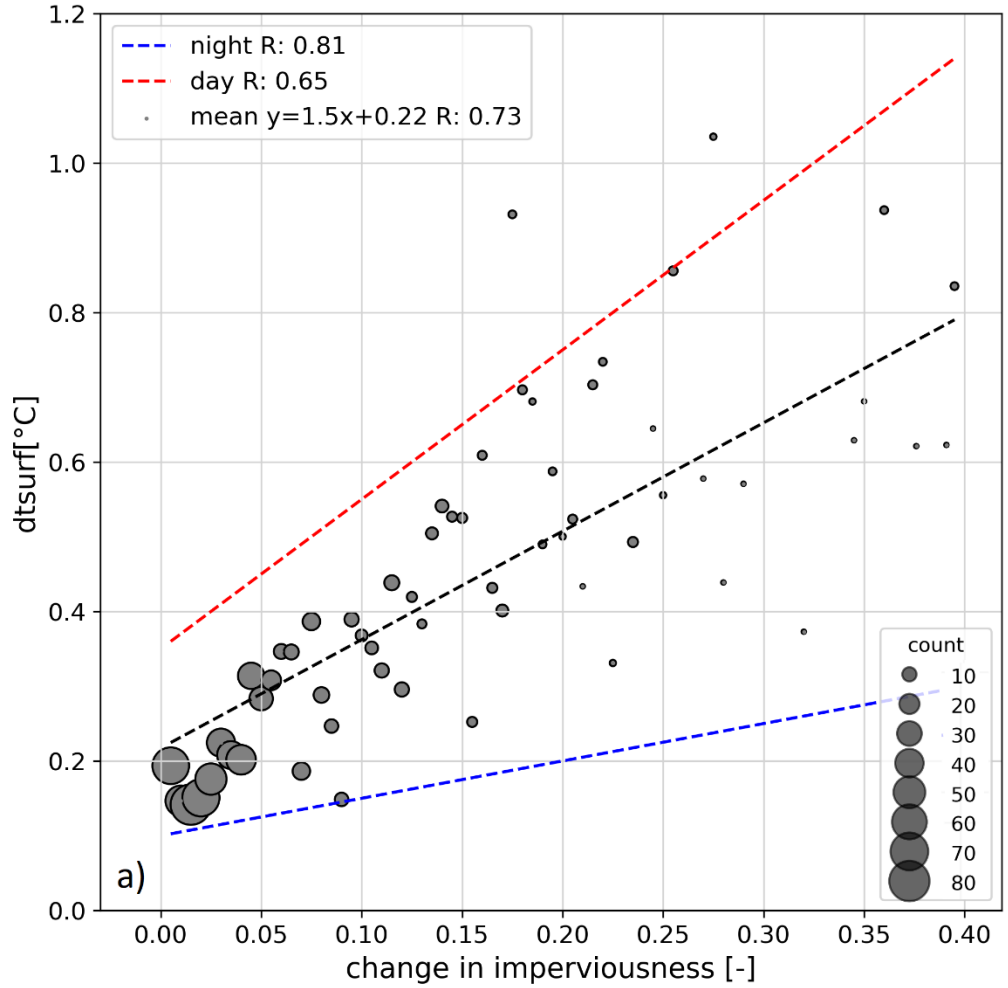


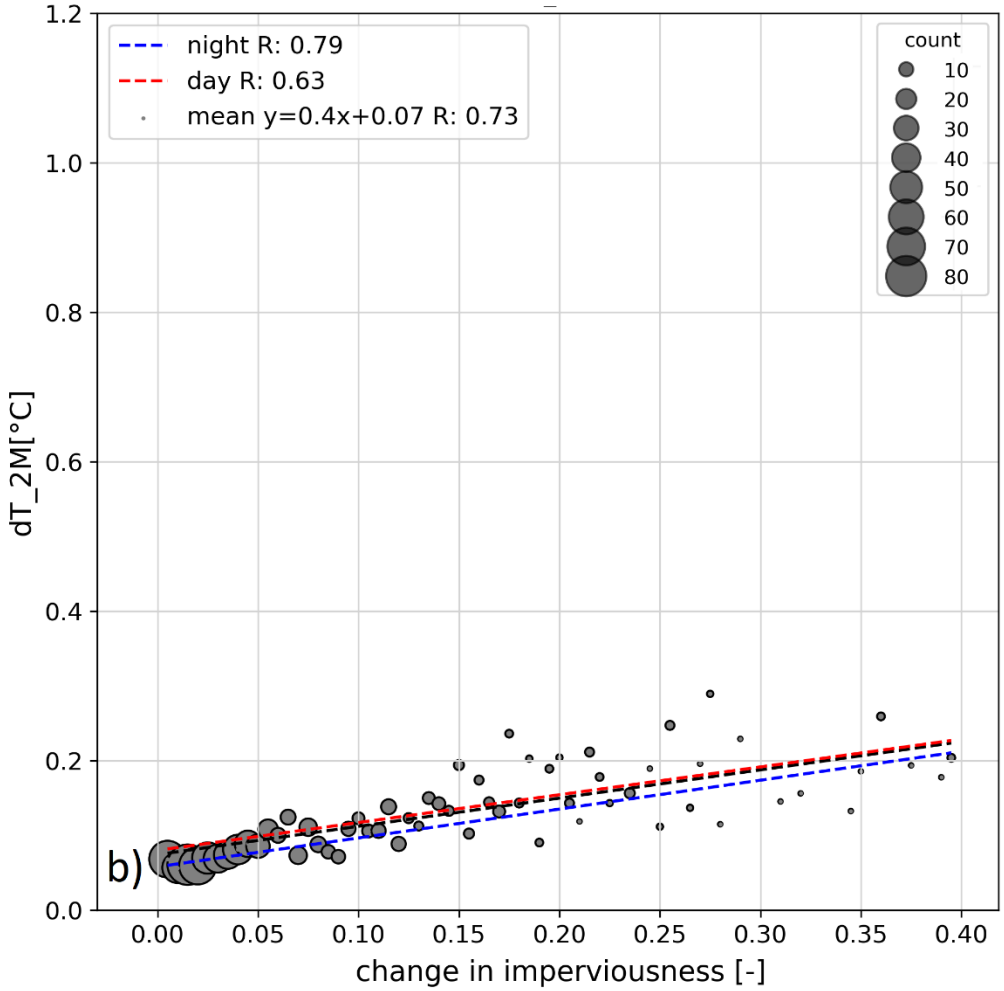


Case Study: Densification or Urban Sprawl



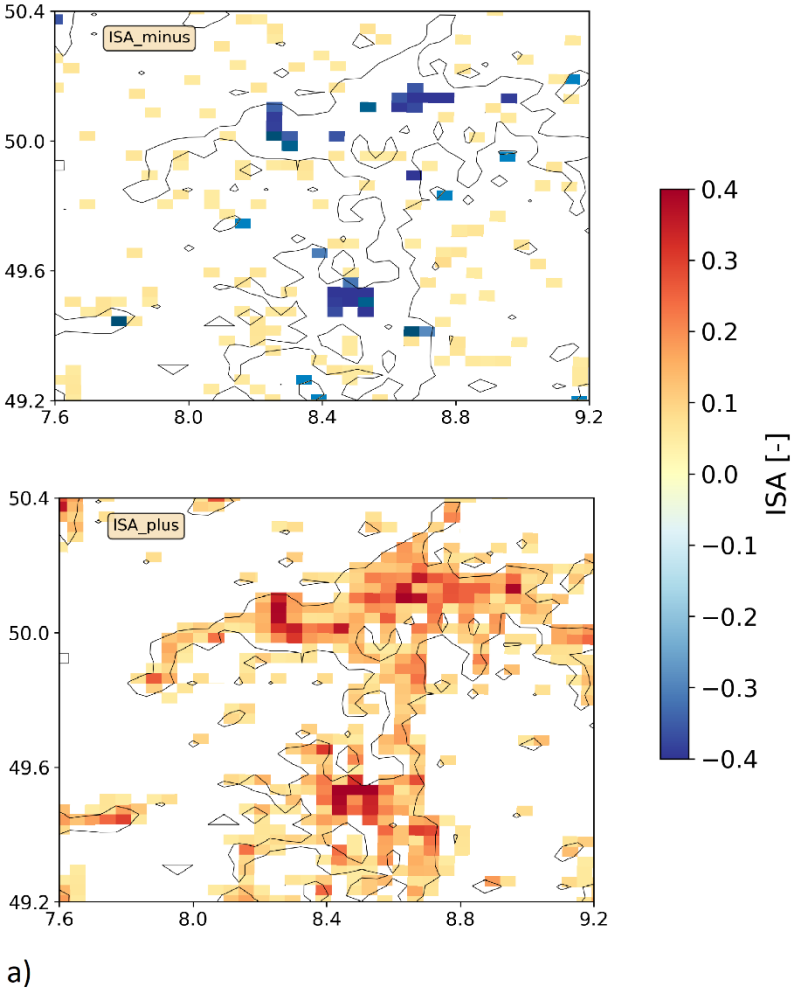
Sensitivity of temperature change to change in surface sealing





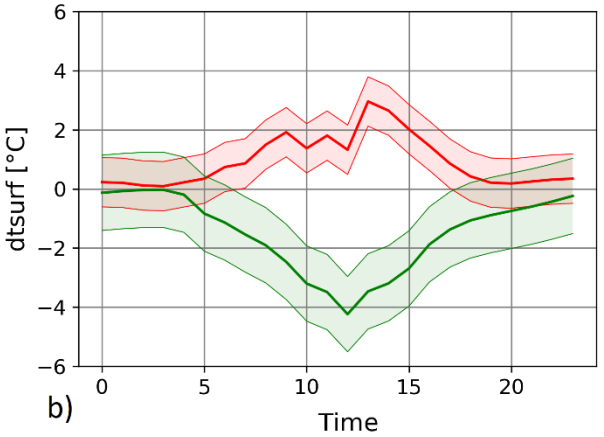
Impact on temperature

Delta impervious fraction

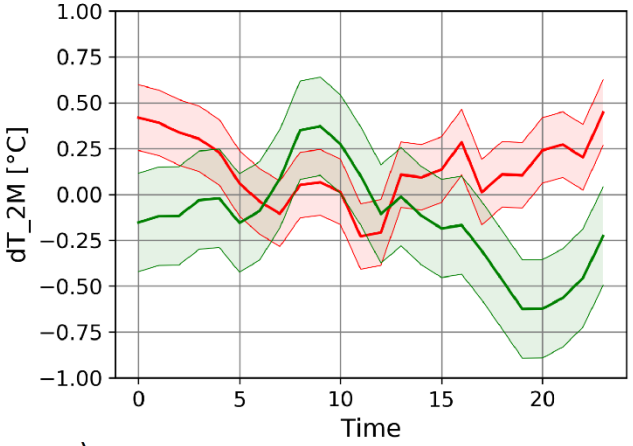


a)

Delta urban temperature



b)

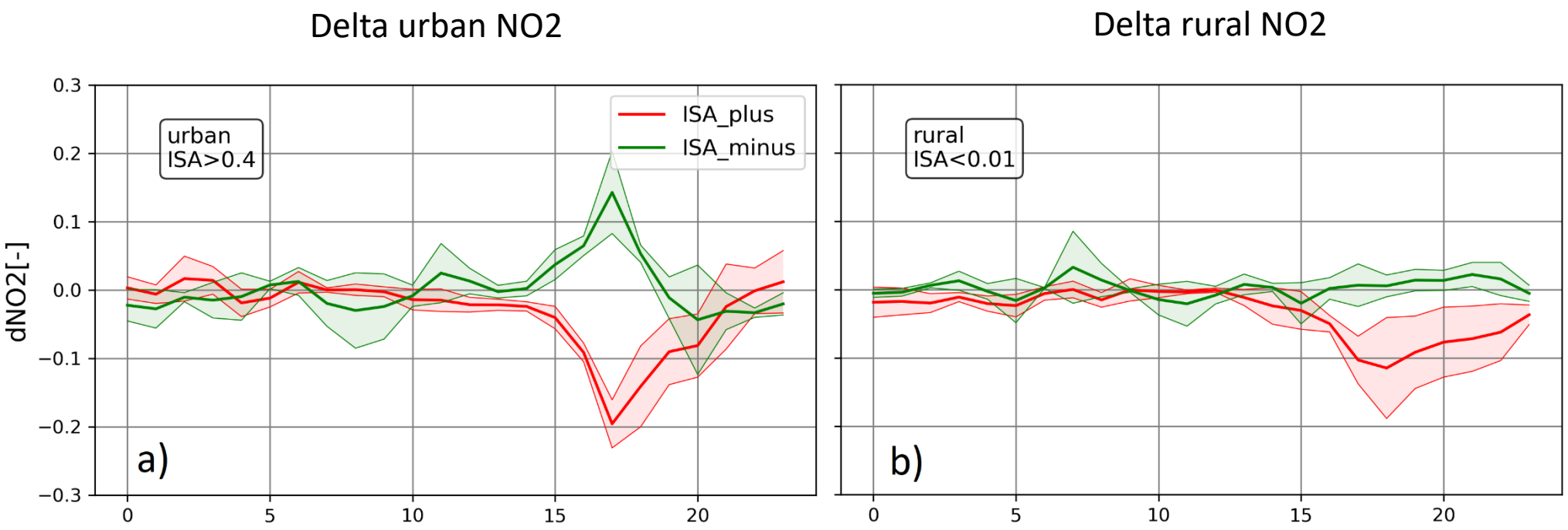


c)

ISA_plus

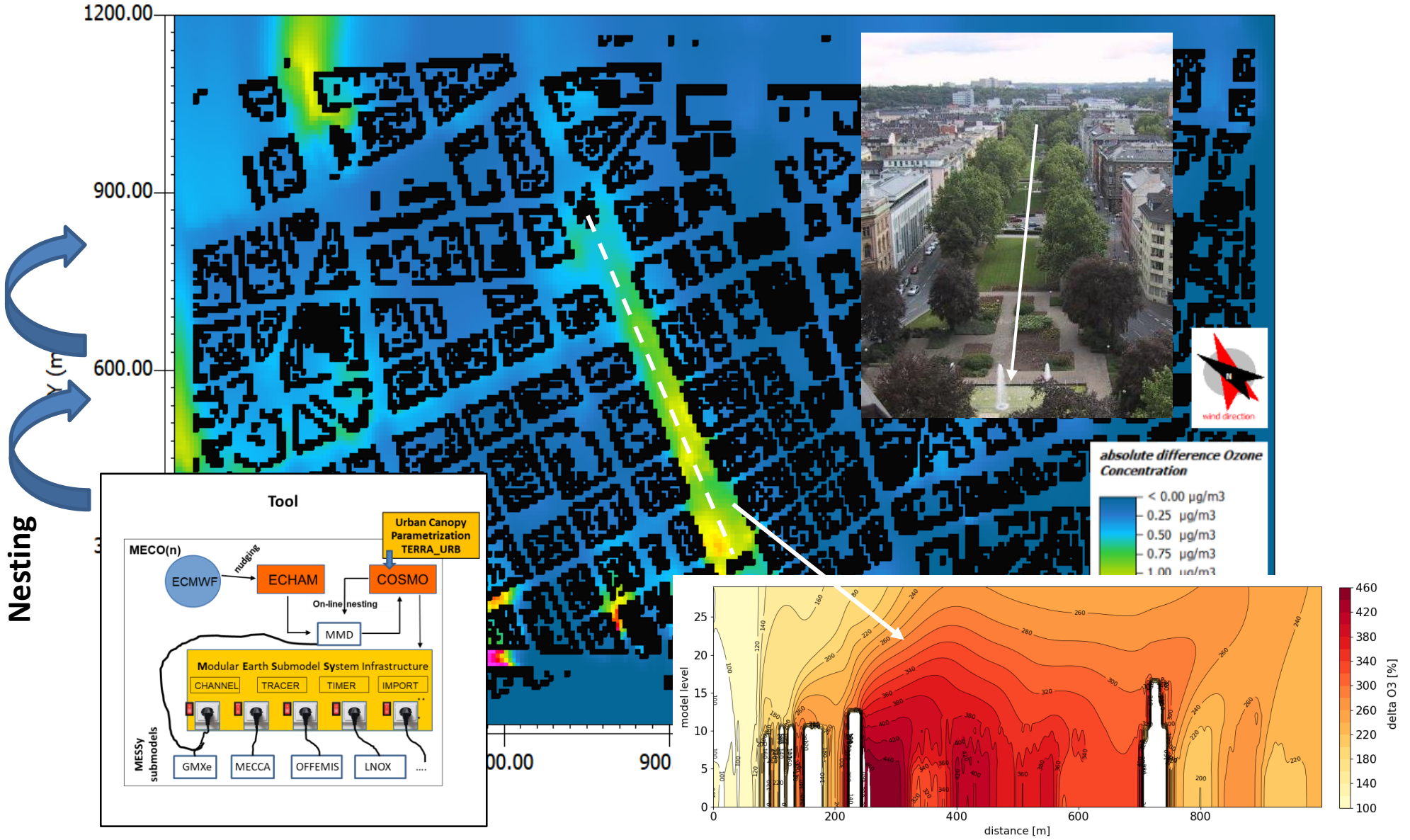
ISA_minus

Impact on air chemistry



Outlook: Application - Finding the right tree for urban planning

Relative Increase in Ozone [ug/m³] *between high- and low- emitter*



Preparatory work: Simon, H.; Fallmann, J.; Kropp, T.; Tost, H.; Bruse, M. Urban Trees and Their Impact on Local Ozone Concentration—A Microclimate Modelling Study. *Atmosphere* **2019**, *10*, 154.

Thank you!