

# Urban Climate Modelling using Local Climate Zones and COSMO – TERRA URB over a tropical city. The case of Kampala, Uganda

O. Brousse, M. Demuzere, H. Wouters, M. Demuzere, W. Thiery, J. Van de Walle and N. P. M. van Lipzig



20 09 2018



**KU LEUVEN**



Oscar Brousse  
for CLM Assembly

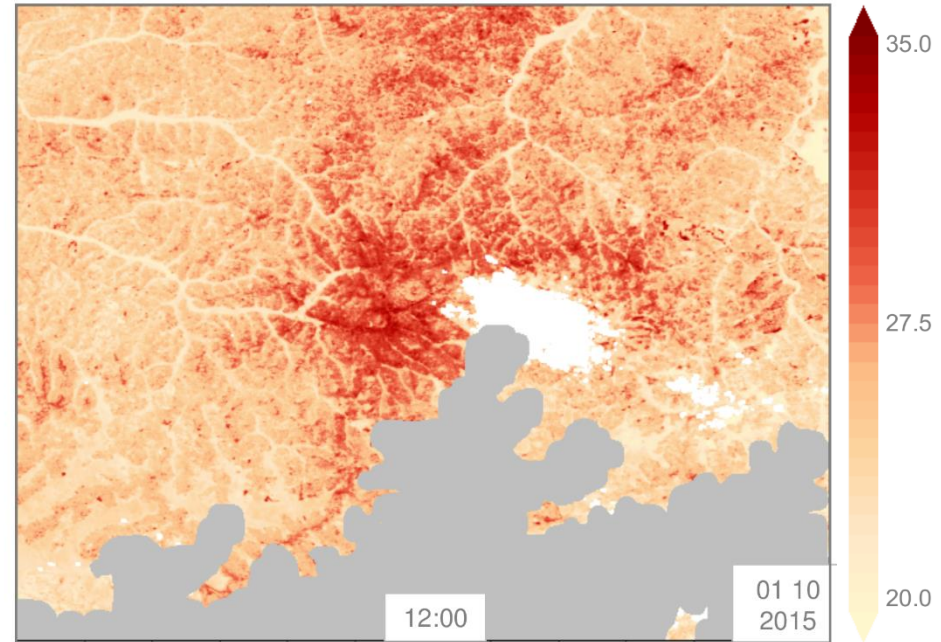
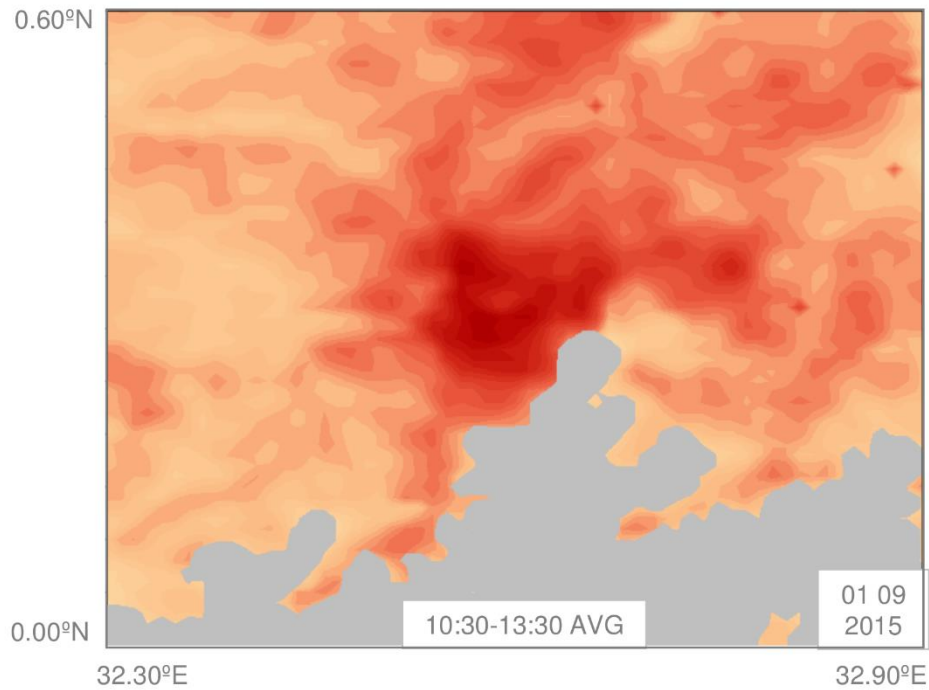
# Kampala and the African Great Lakes

Kampala Morning Land Surface Temperature Captured by Satellite

MODIS

Landsat 8

LST(°C)



# Kampala and the African Great Lakes

---

Very densely populated areas

Rapid land use change

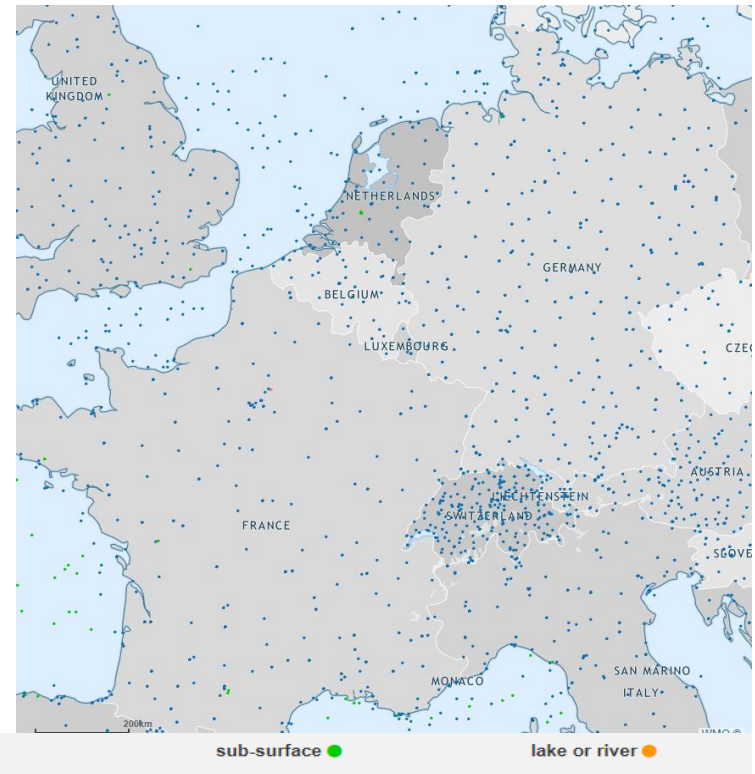
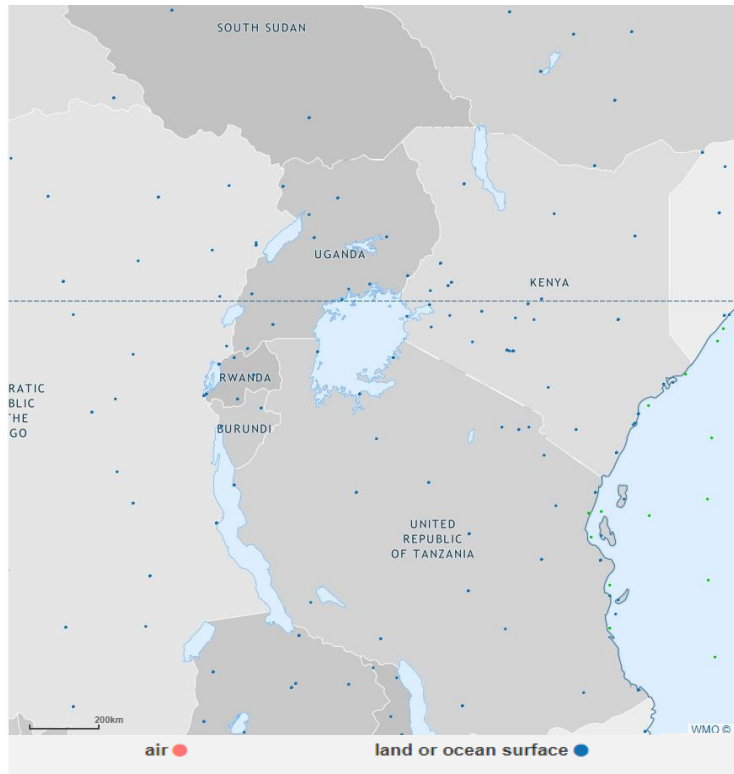
Evidence of urban heat island

Interesting lake and land interactions

High vulnerability to climate change impacts

Poorly studied and complex regions

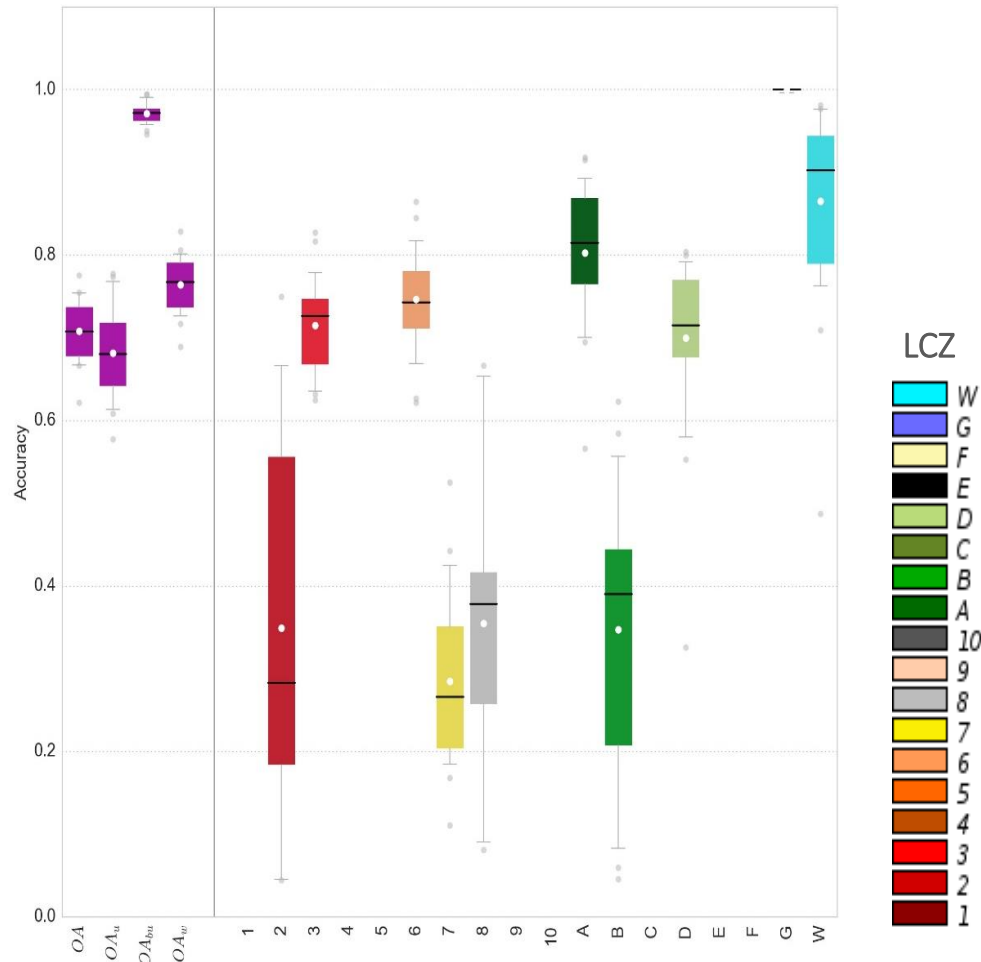
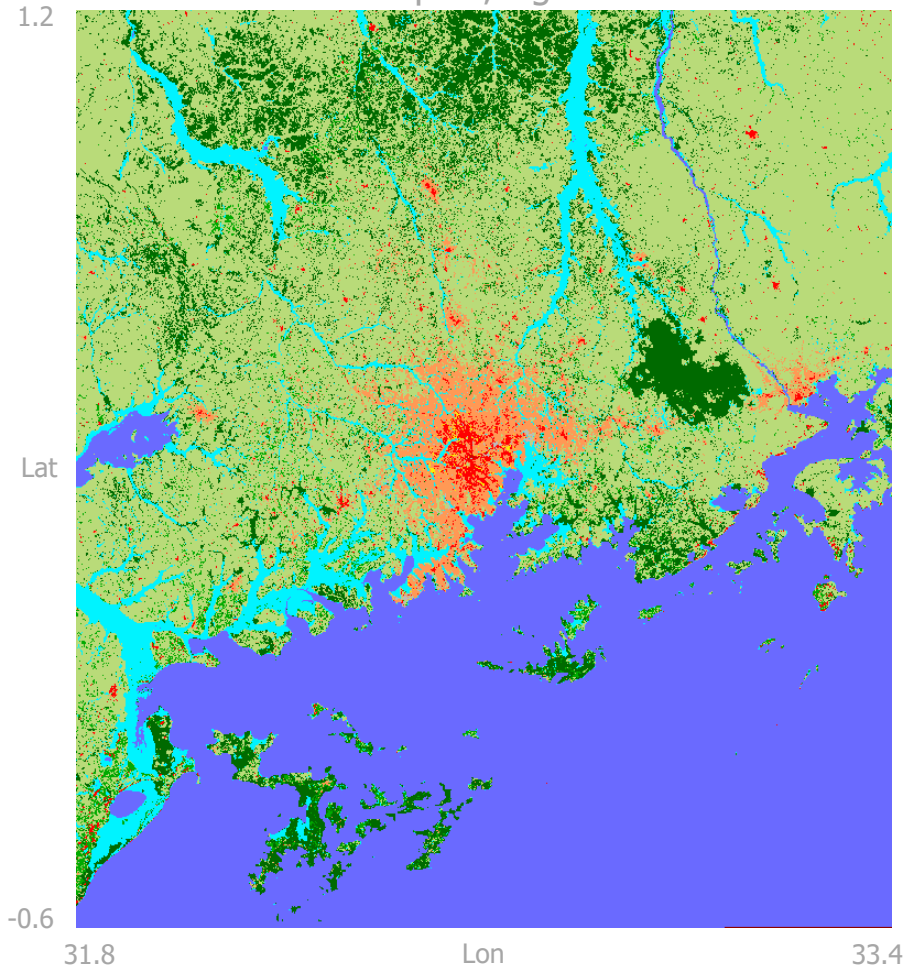
# Data scarce times



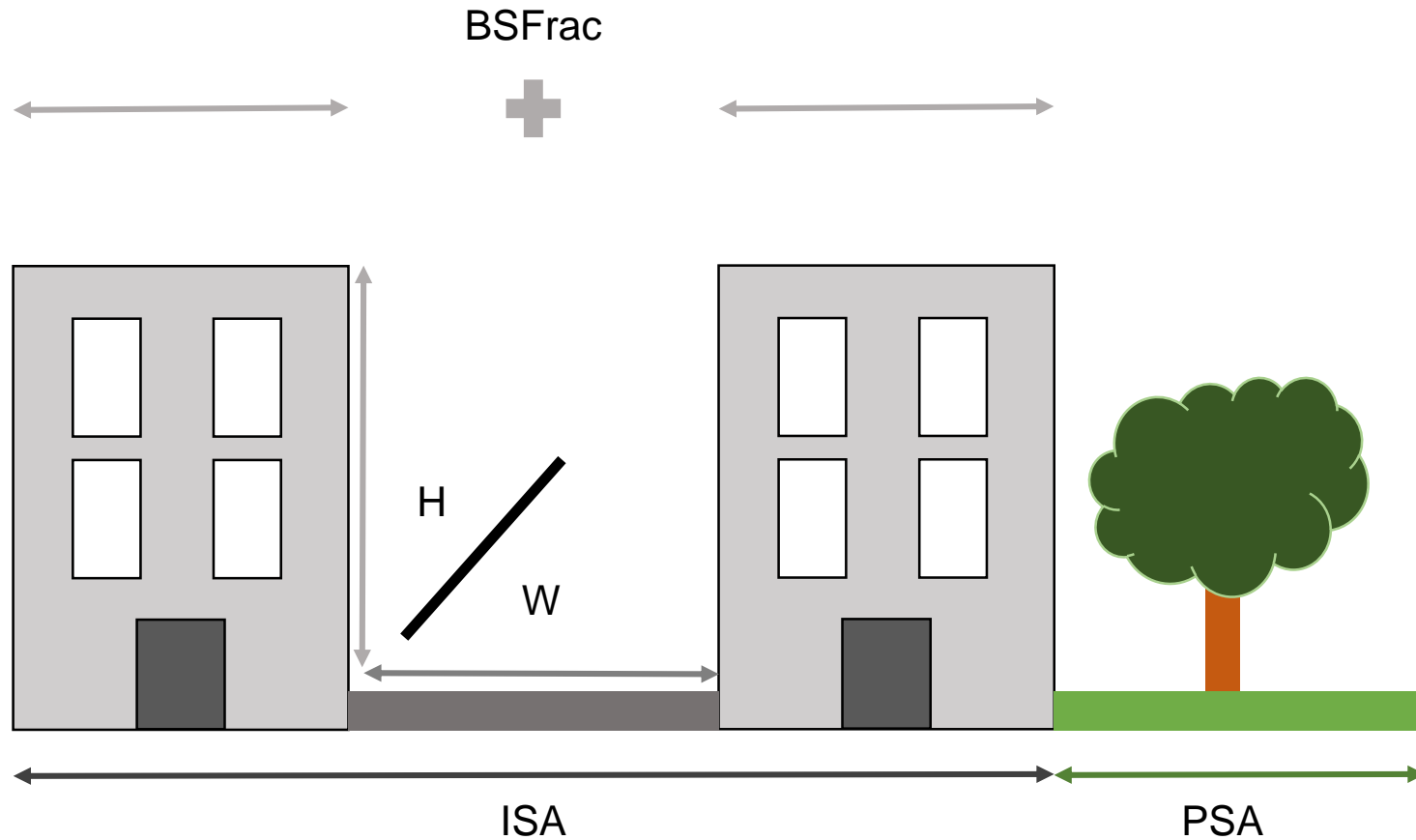
Weather stations recorded by the WMO

# Applying LCZ in Sub Saharan Africa

Kampala, Uganda



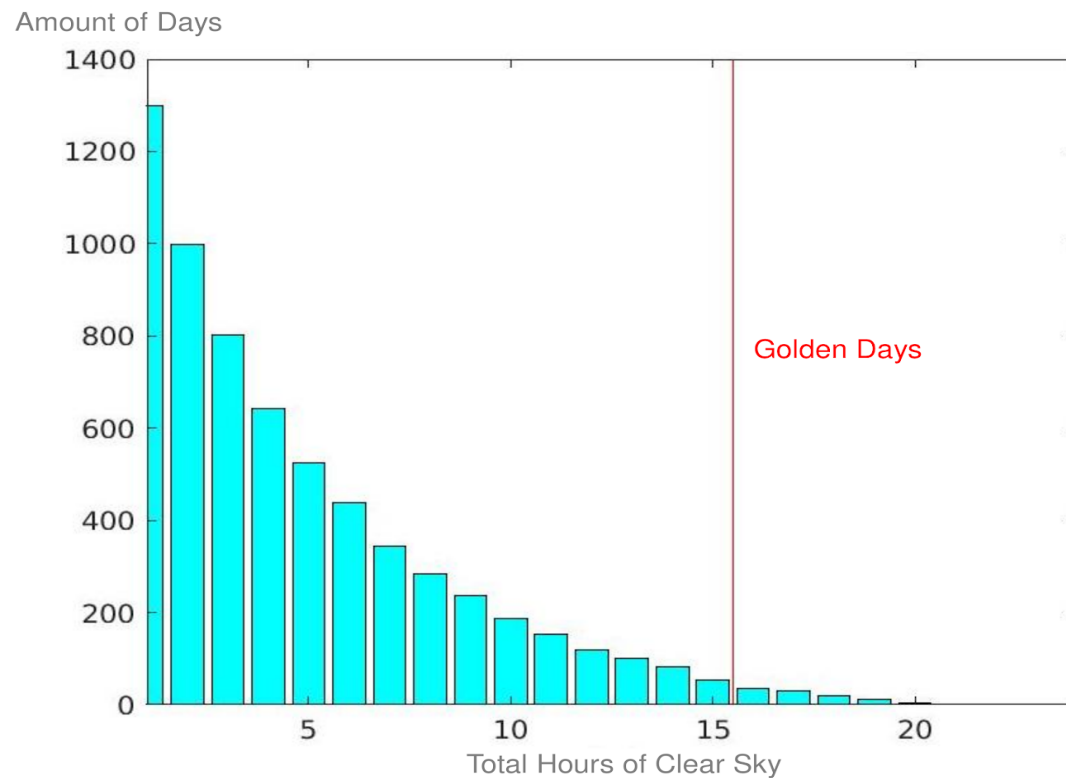
# Modelling the urban climate using LCZ COSMO-CLM / TERRA\_URB



# Coping with data scarcity by using remote sensing LST data

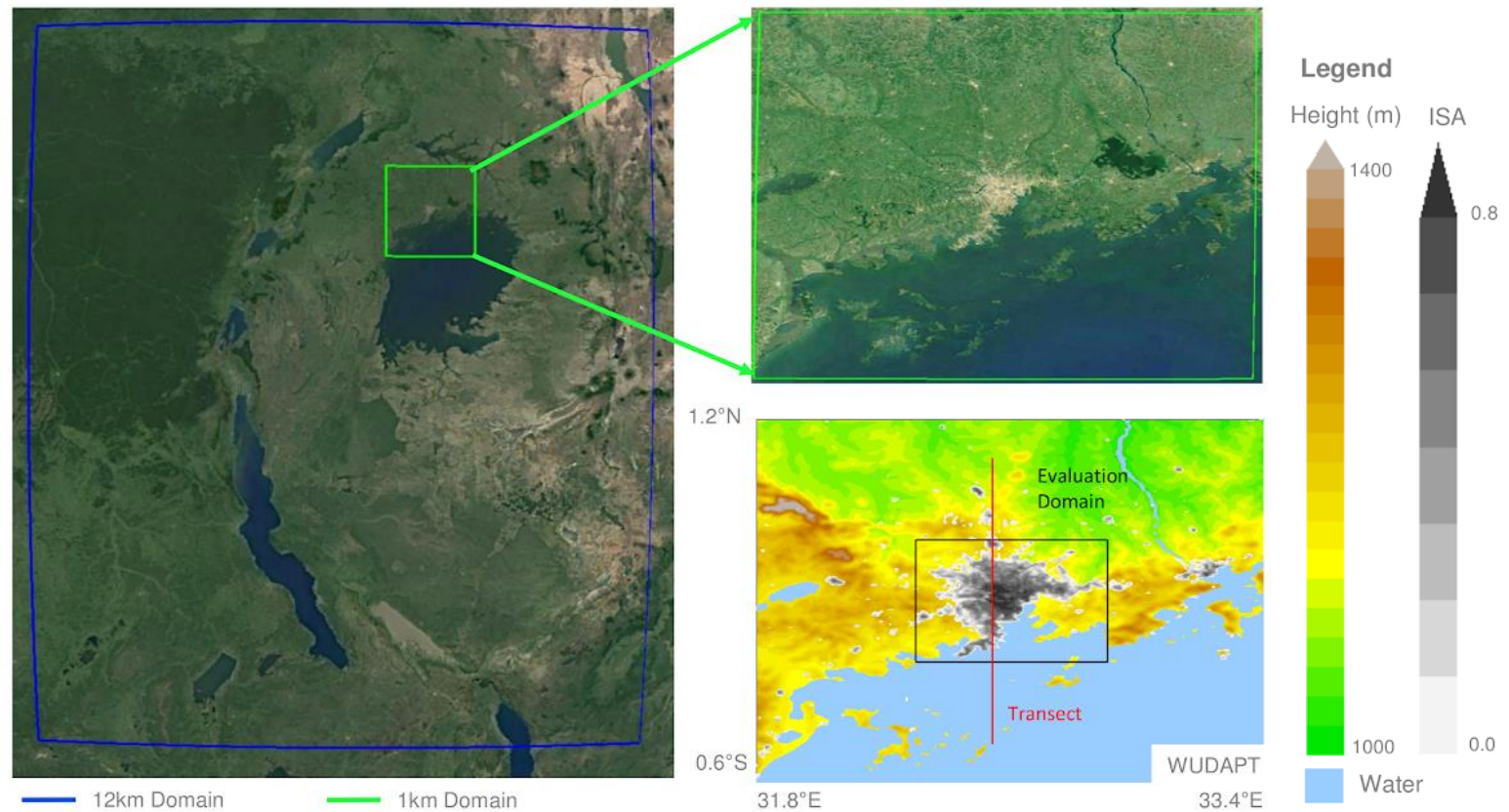
Defining optimal clear-sky conditions :

20 - 21 Feb 2005 / 23 - 27 Jan 2006 / 12 - 13 Dec 2008 / 31 Jan - 1 Feb 2012



# Domain definition

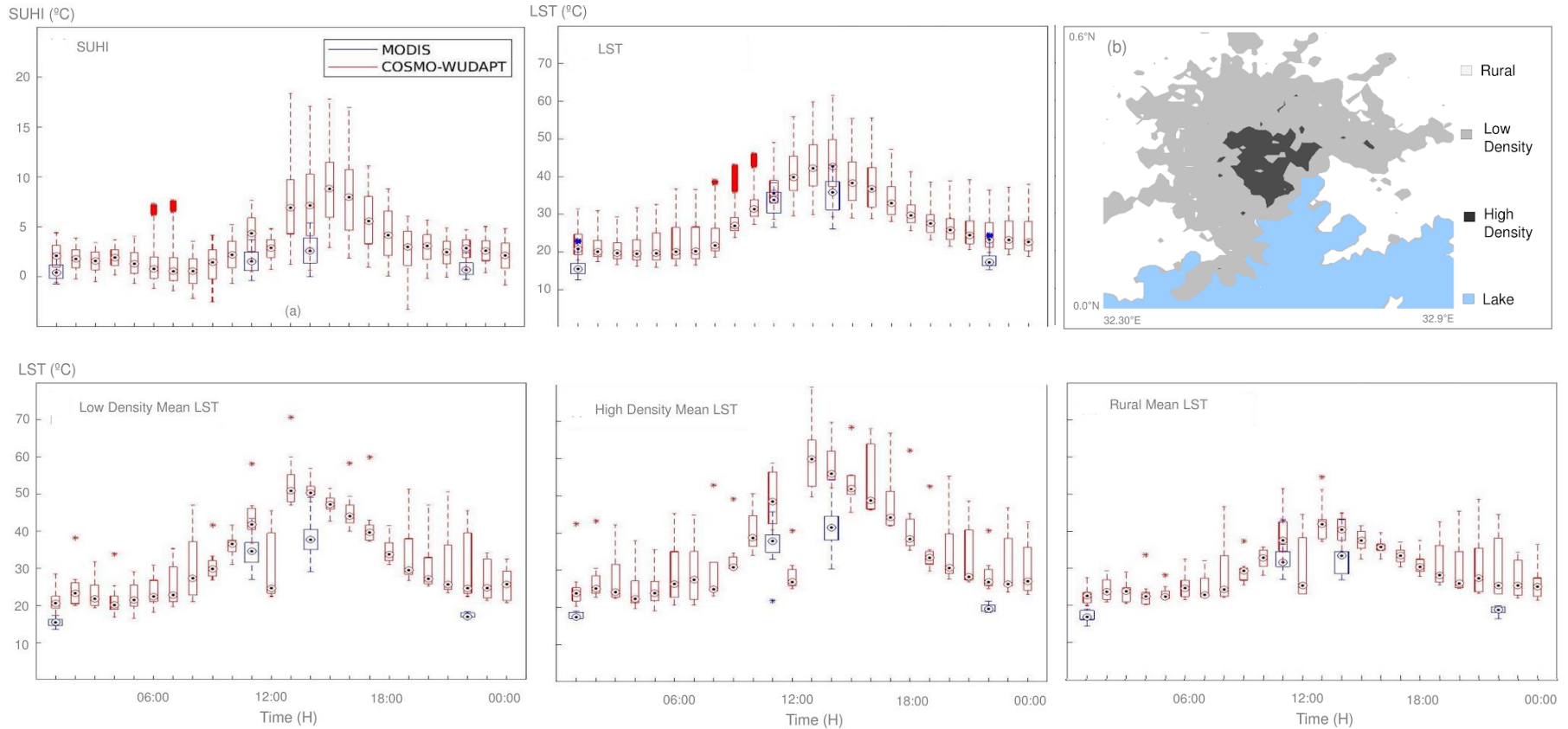
Nested and Evaluative Domains over Kampala, Uganda, with relative Impervious Surface Area fractions





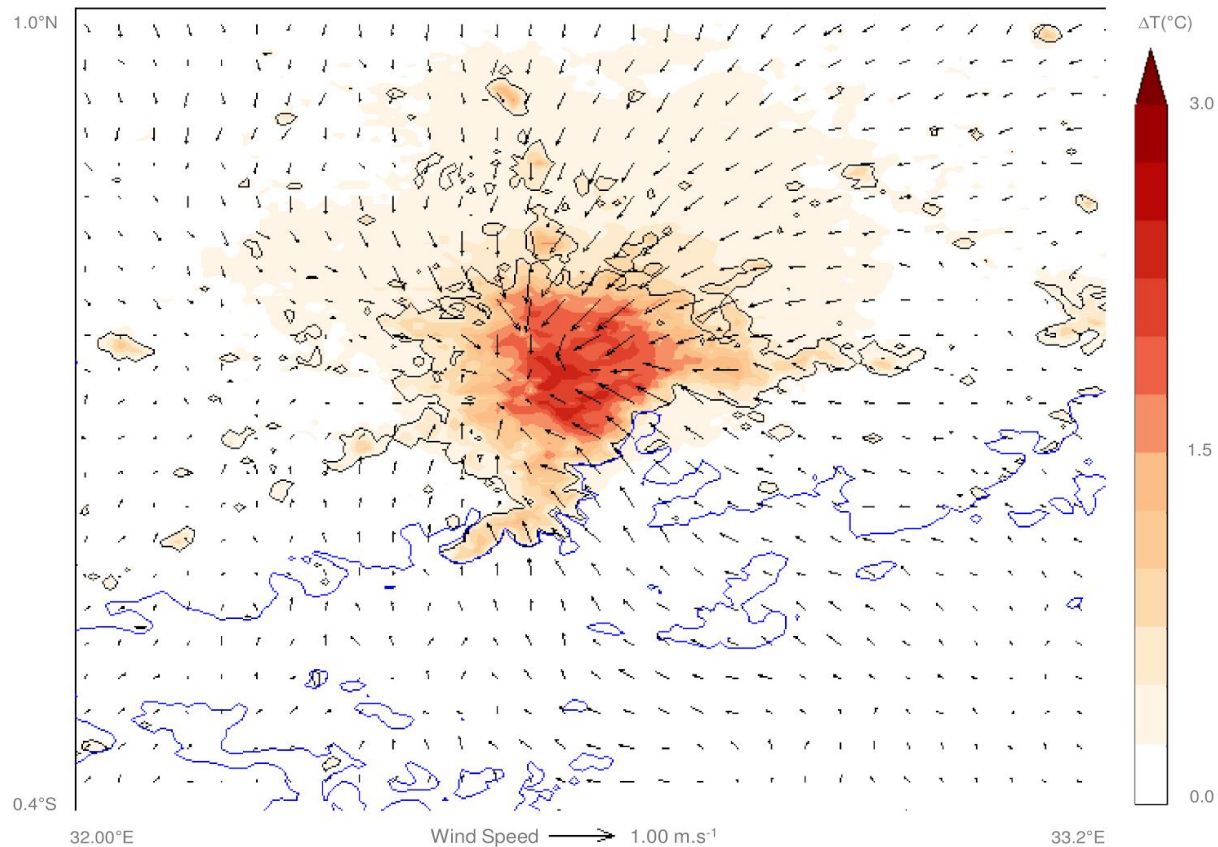
# Model evaluation using remote sensing LST data

## Captured and Modelled Golden Days LST and SUHI over Kampala



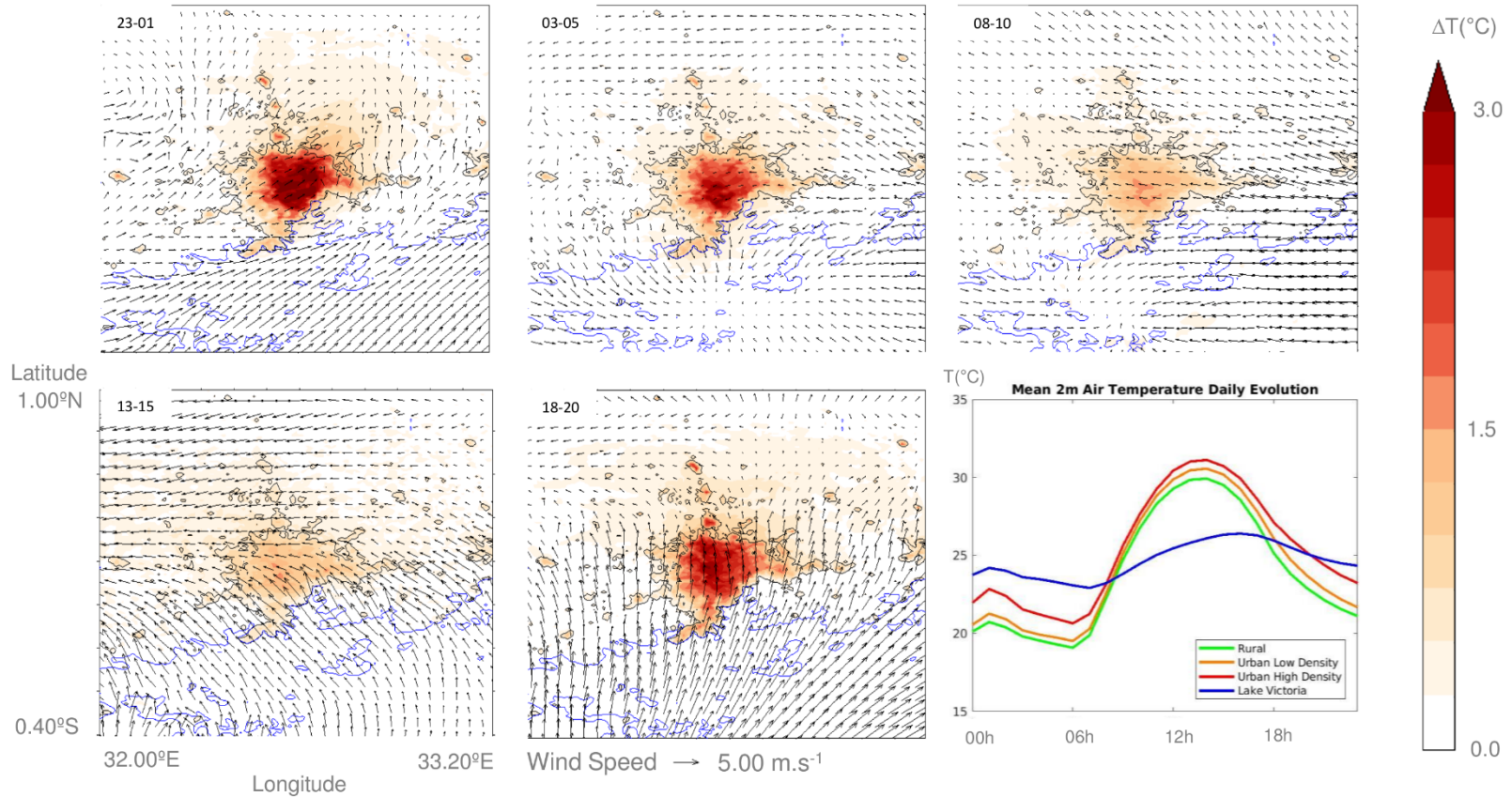
# Modelling Kampala Climate

Mean Air Temperature and Wind Regime Anomalies induced by Kampala during Golden Days



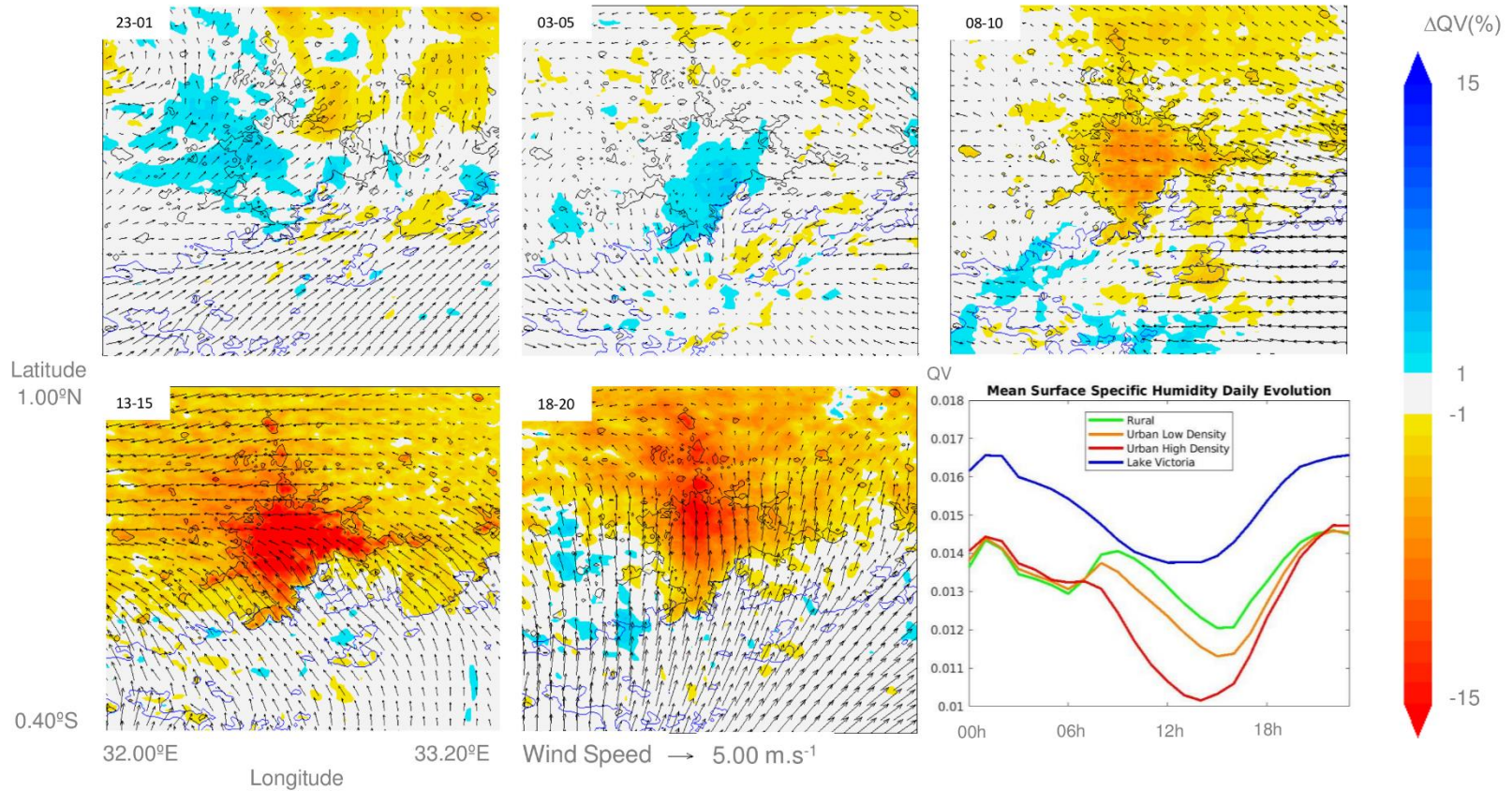
# Urban – Lake climate interactions

Modelled Impact of the Kampala city for Golden Days on Air Temperature



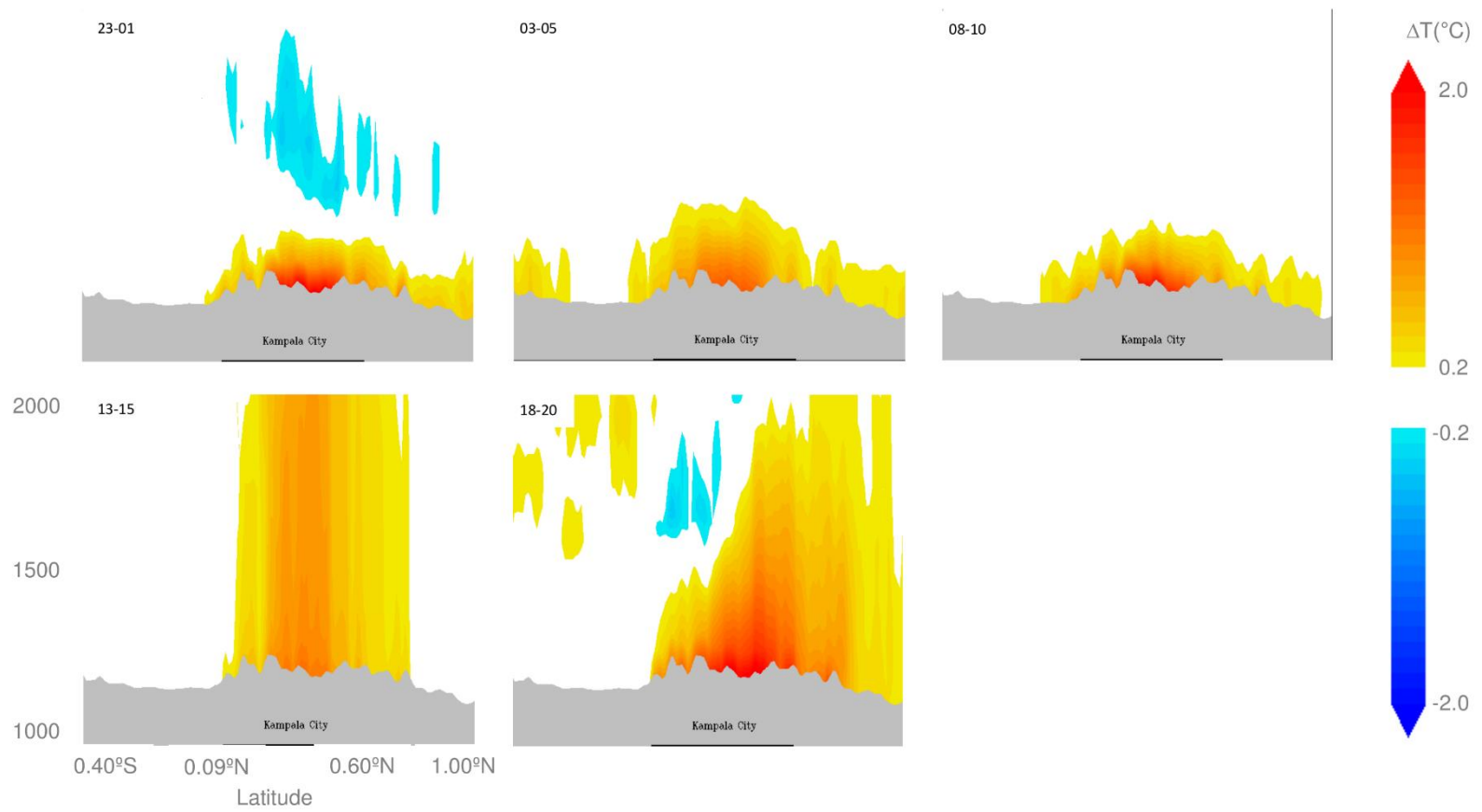
# Urban – Lake climate interactions

Modelled Impact of the kampala City for Golden Days on Specific Humidity



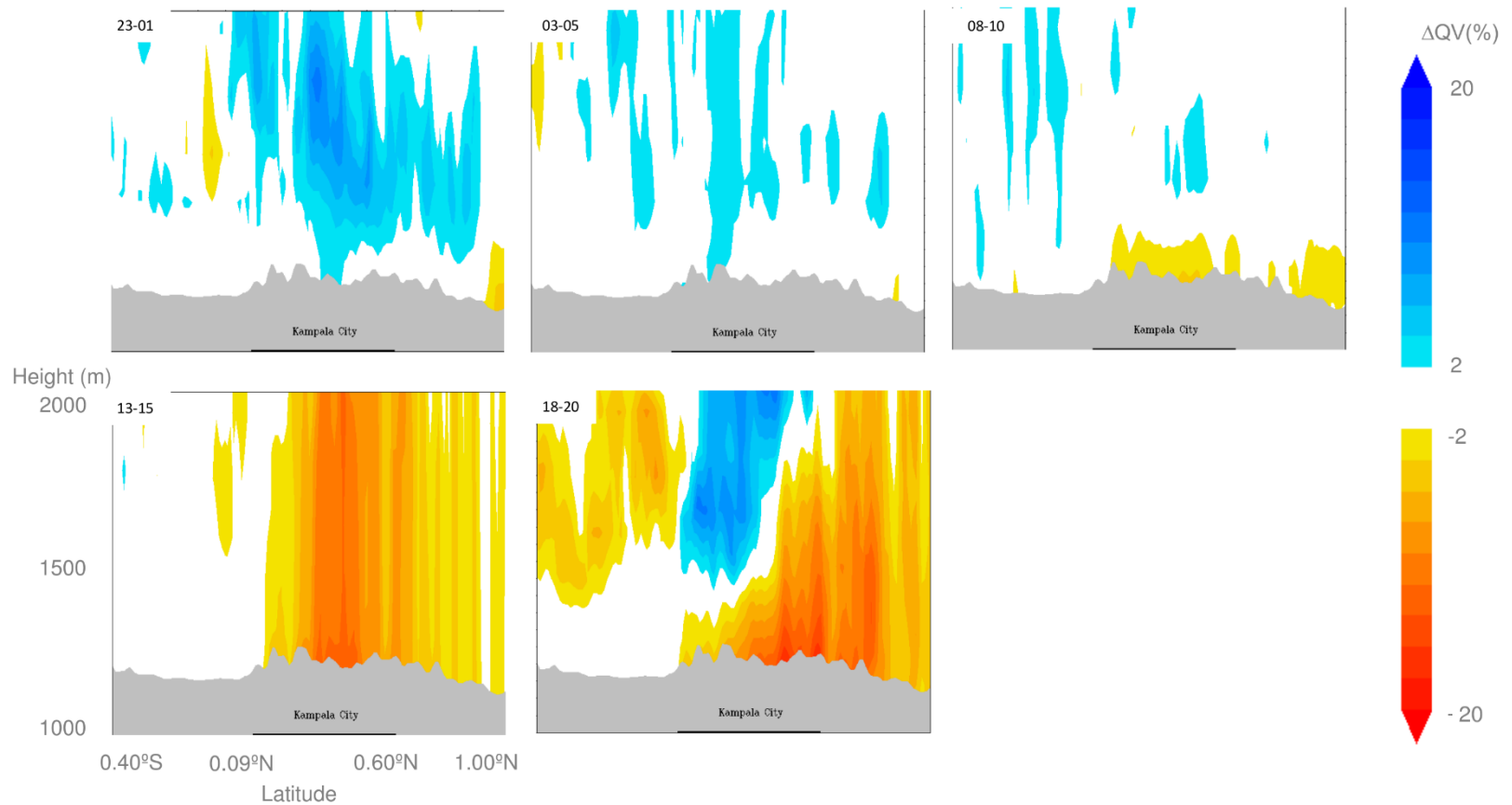
# Urban – Lake climate interactions

Modelled Impact of the Kampala city for Golden Days on Air Temperature



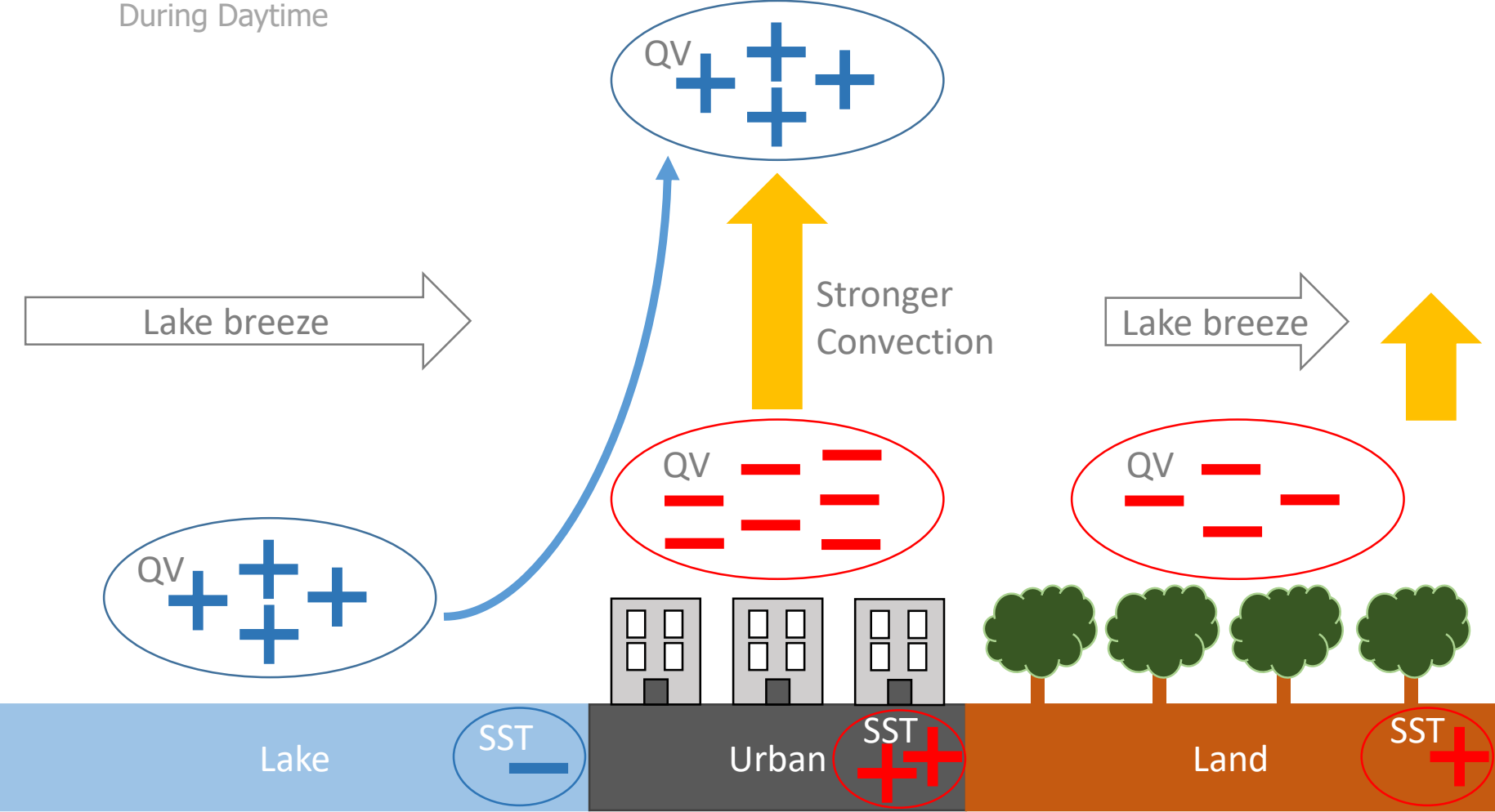
# Urban – Lake climate interactions

Modelled Impact of the Kampala City for Golden Days on Specific Humidity



# Mechanism scheme

During Daytime



# Crowdsourcing data for LCZ improvement and data gap filling in SSA

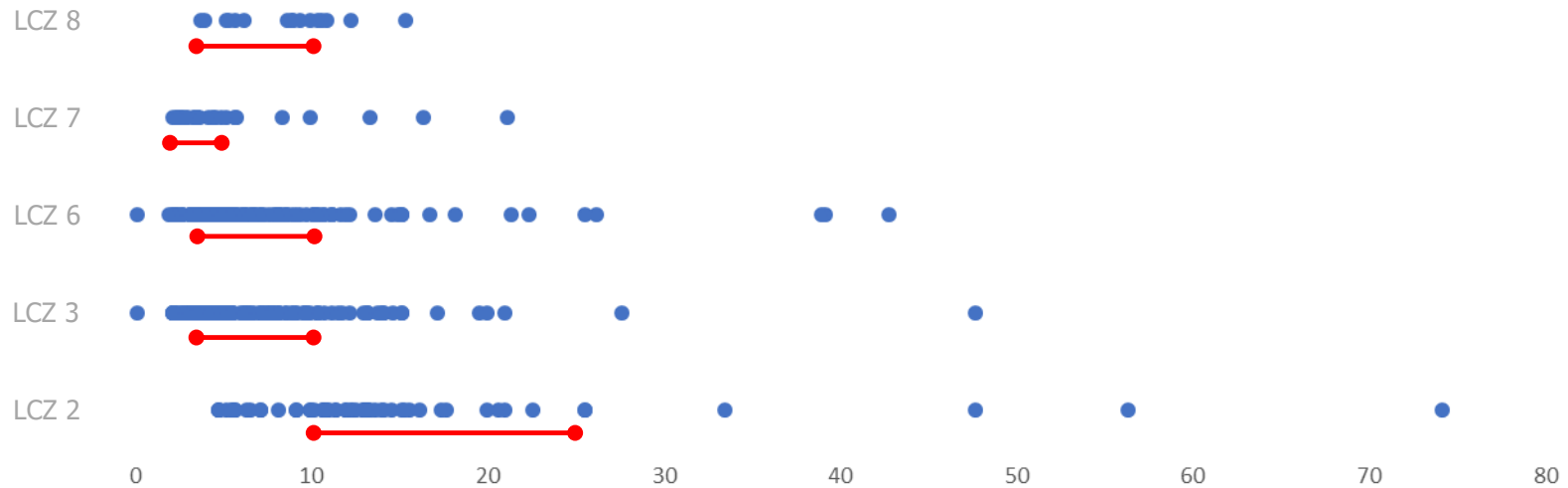
Example over Kampala Field Work (Summer 2018)





# Crowdsourcing data for LCZ improvement and data gap filling in SSA

Example over Kampala Field Work (Summer 2018)





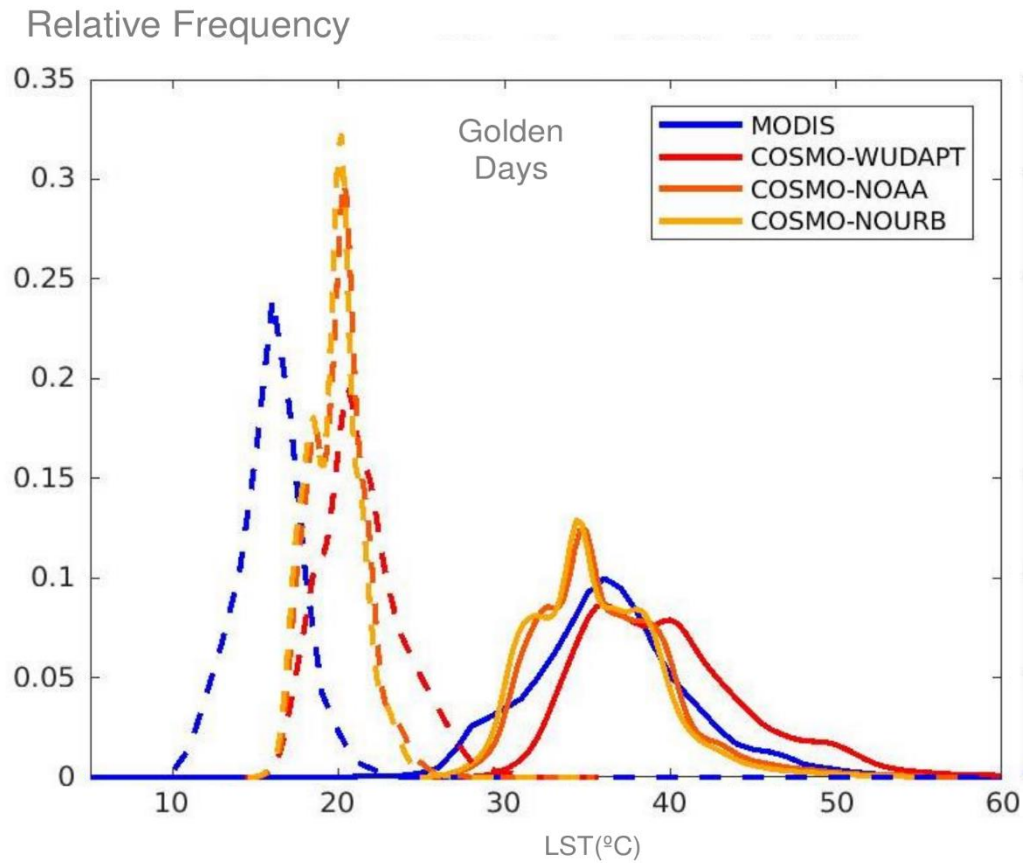
Thank you!

**We still know  
nothing...**

Reference : Brousse et al. (2018), "Urbanization climate impact during clear-sky conditions in African cities - The case of Kampala, Uganda", Climate Dynamics, To be submitted

# Annex

Probabilistic Distribution of LST over Kampala City



# Annex

Potential Impact of Default Urban Emissivity Prescription on MODIS LST Measurement

