UrbanAIR

Natalie Theeuwes

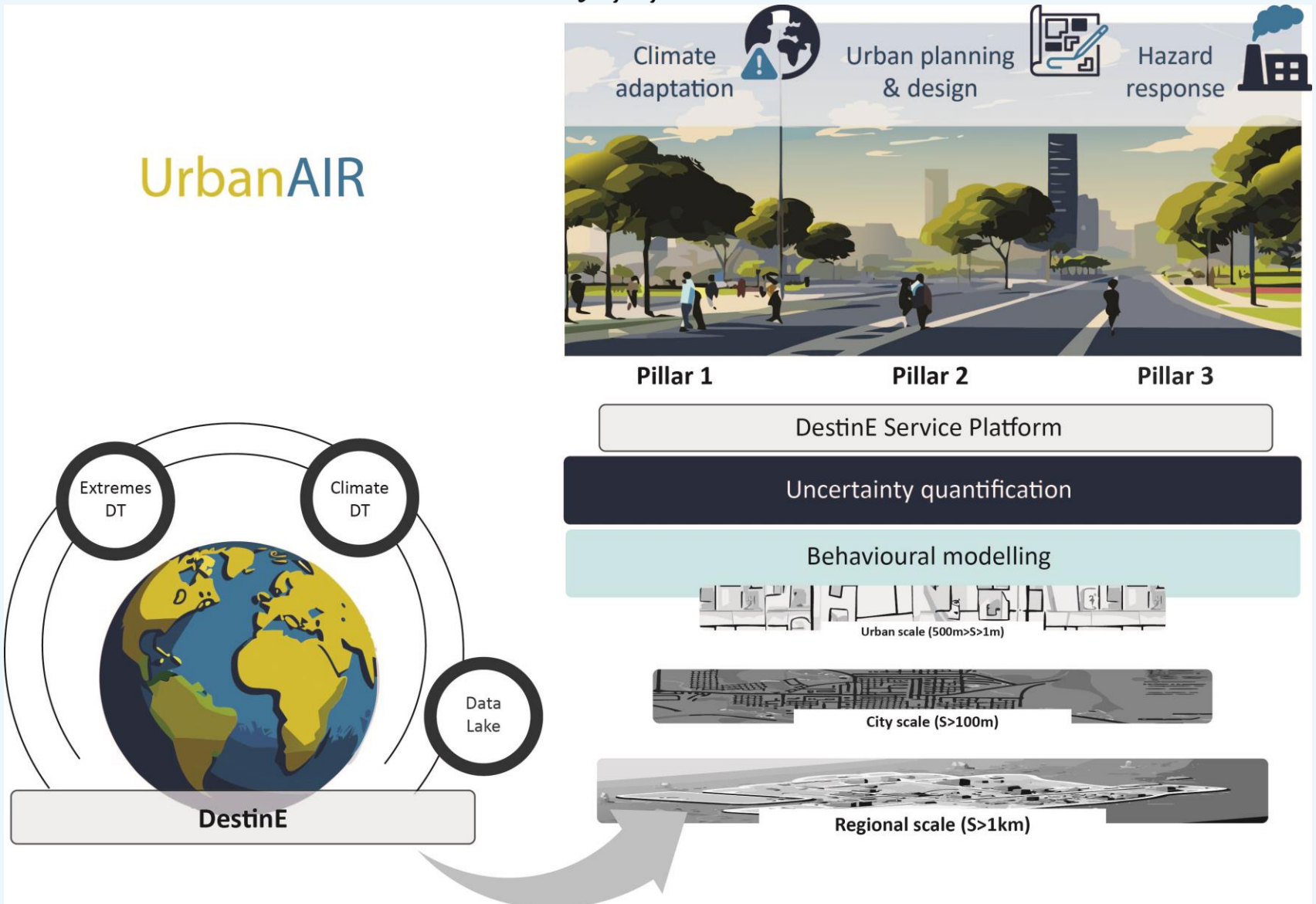
Lead: Femke Vossepoel (TU Delft)

ACCORD-based team: Metodija Shapkalijevski, Ulf Andrae (SMHI), Eric Bazile, Ludovic Auger, Valéry Masson (MF), Geert Lenderink, Pier Siebesma (KNMI)

HORIZON-INFRA-2024-TECH-01-03

URBAN simulation for AIr quality and heat Resilience strategies

Royal Netherlands Meteorological Institute
Ministry of Infrastructure



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BSC Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat

METEO FRANCE

UNIVERSITÉ TOULOUSE III PAUL SABATIER

Imperial College London

UNI FREIBURG

FH

TECHNISCHE UNIVERSITÄT ILMENAU

NORCE

Leibniz Universität Hannover

ARUP

UKRI

CERFACS

RESILIENT CITIES NETWORK

FN future needs

SMHI

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Ministry of Infrastructure
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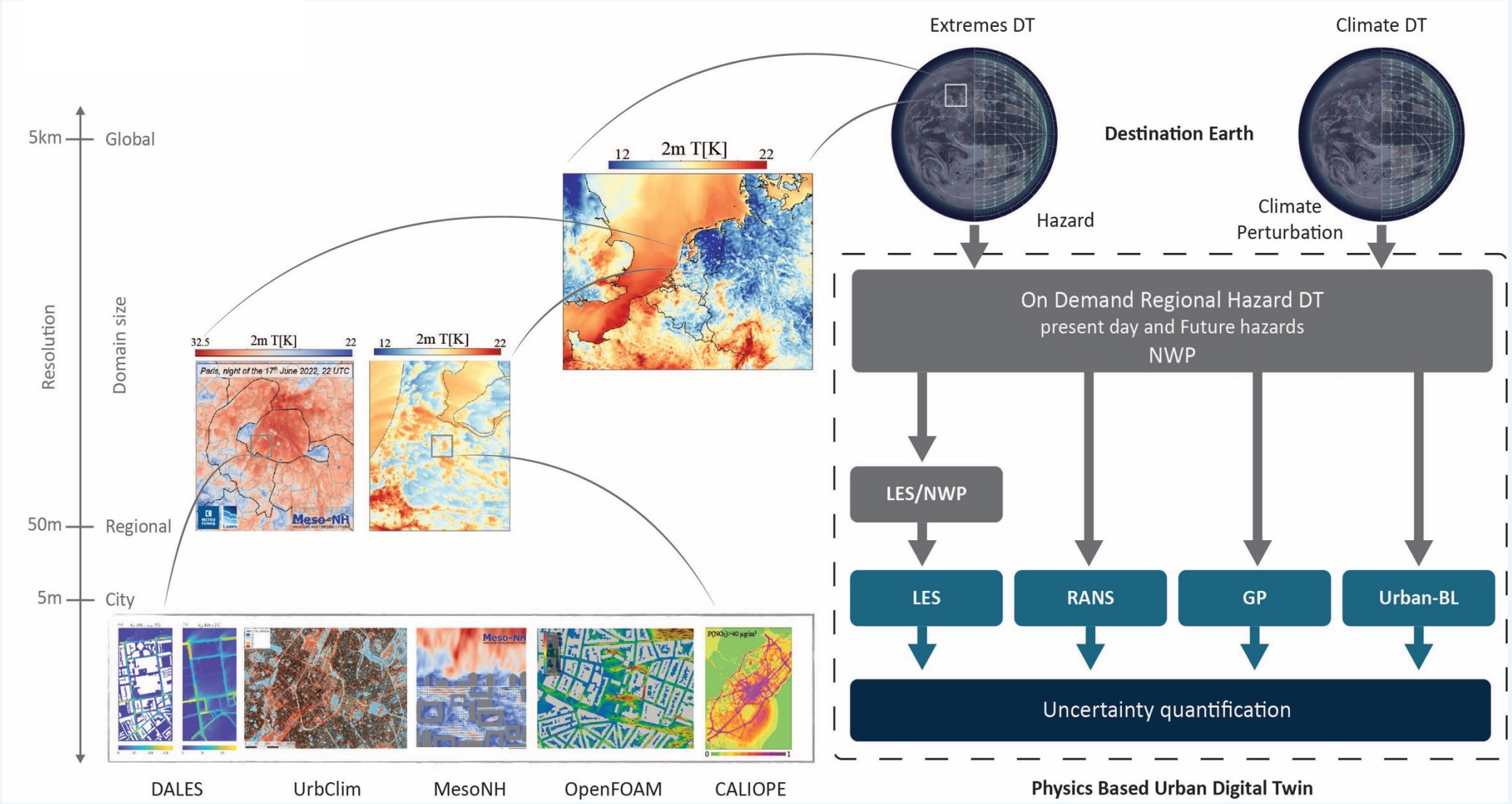
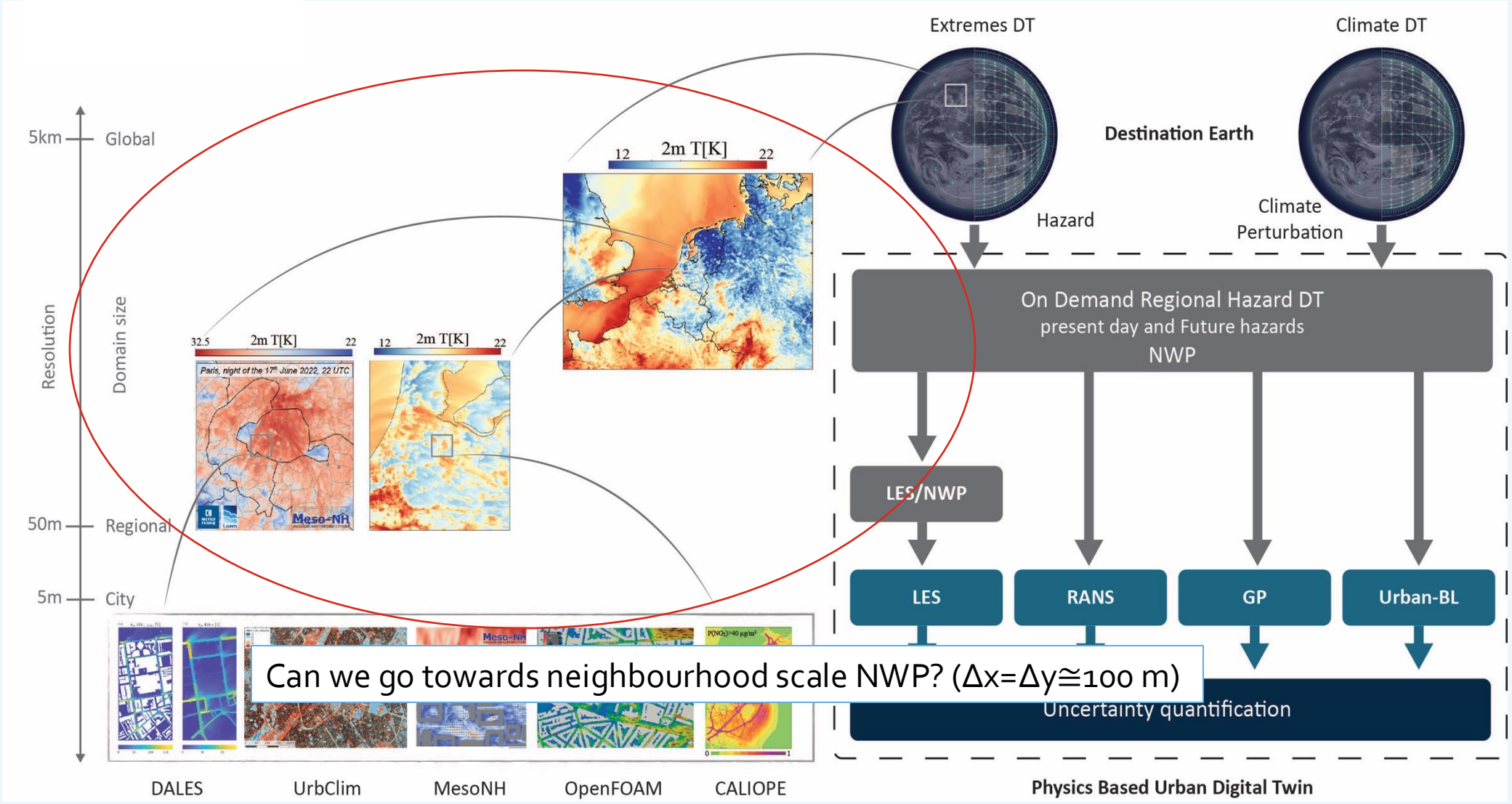
Cascading atmospheric models

Royal Netherlands Meteorological Institute
Ministry of Infrastructure and Water Management



Cascading atmospheric models

Royal Netherlands Meteorological Institute
Ministry of Infrastructure and Water Management



What's the plan?

- Improve representation of turbulent transport in NWP's
- Spin-up turbulence and convection at boundaries and improve nesting frequency
- Improve representation of urban processes
- *Add climate signal through pseudo-global warming*

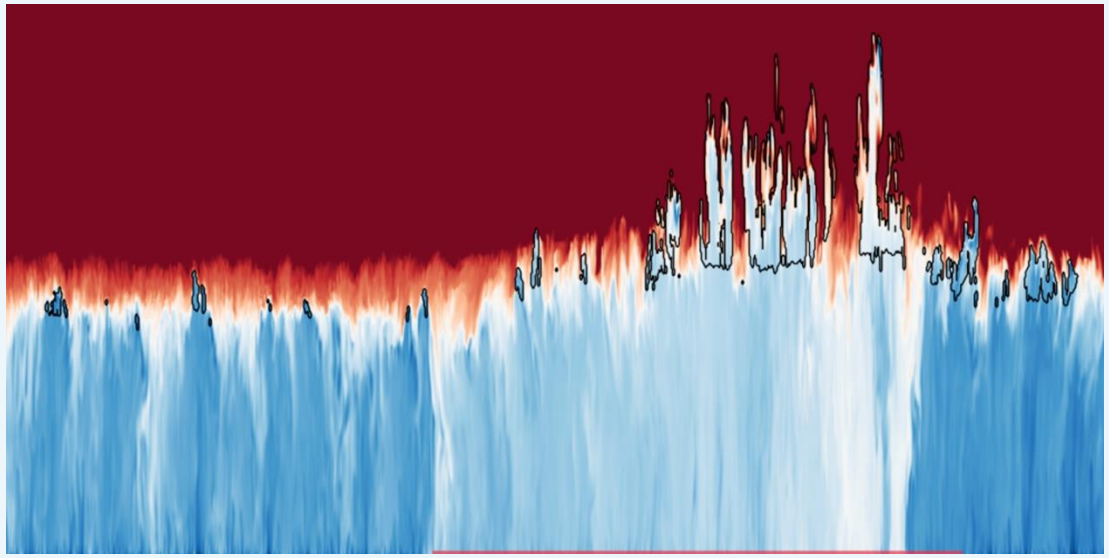
~5 post docs divided between KNMI, SMHI, and Météo France

Improved turbulent transport, to 3-D or not to 3-D?

- Add and improve the 3D and pseudo 3d turbulence schemes (AROME + HARMONIE-AROME)

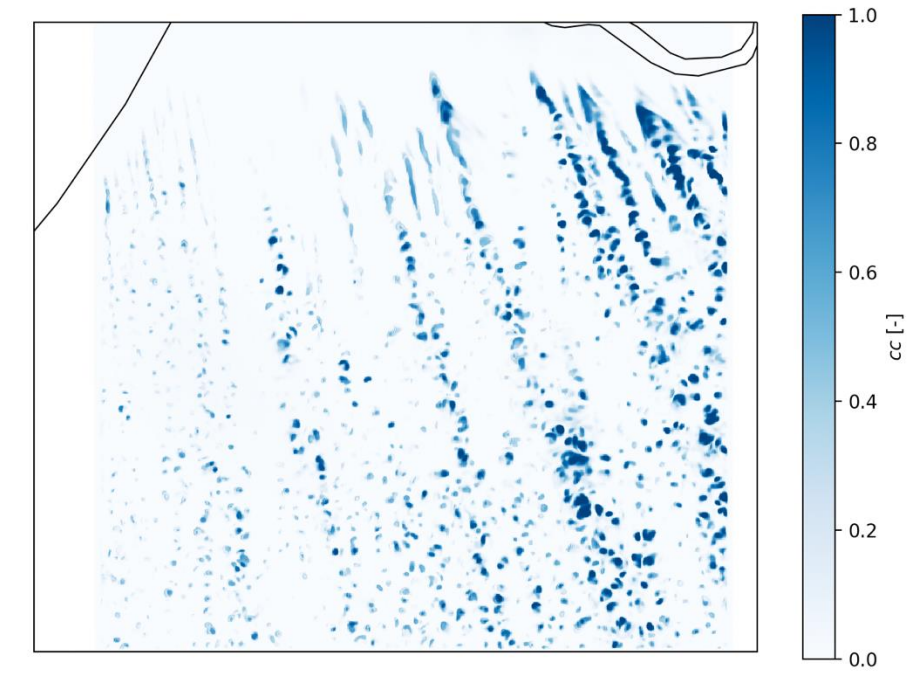
- Investigate when it is needed

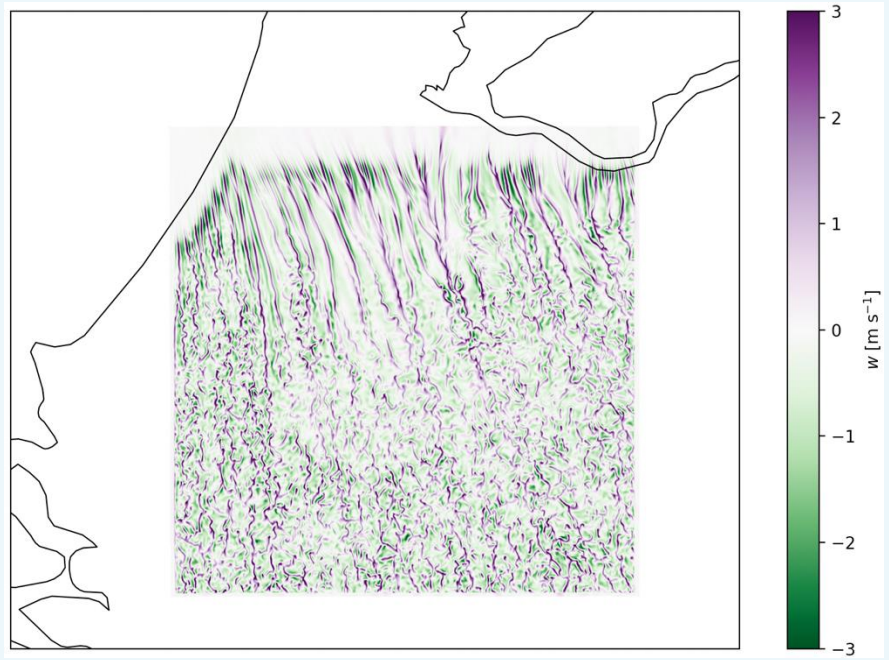
  (as a function of resolution and heterogeneity)



Spinup of convection and turbulence

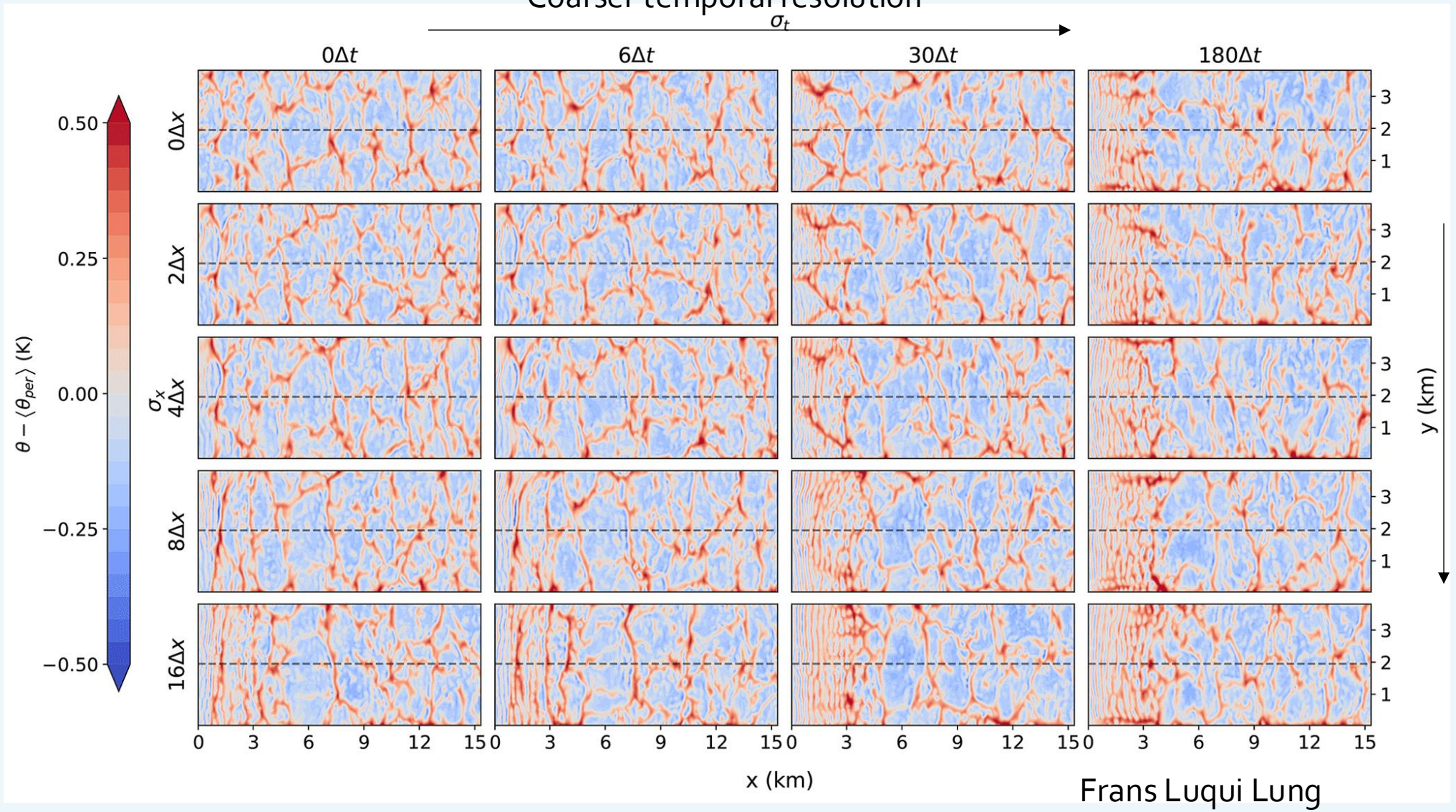
- Loose >1/3rd of your domain due to this spinup
- Options to elevate this need to be explored
  - Coupling frequency
  - Synthetic turbulence/pertubations





HARMONIE-AROME @100 m over Cabauw
16 July 2022

Coarser temporal resolution

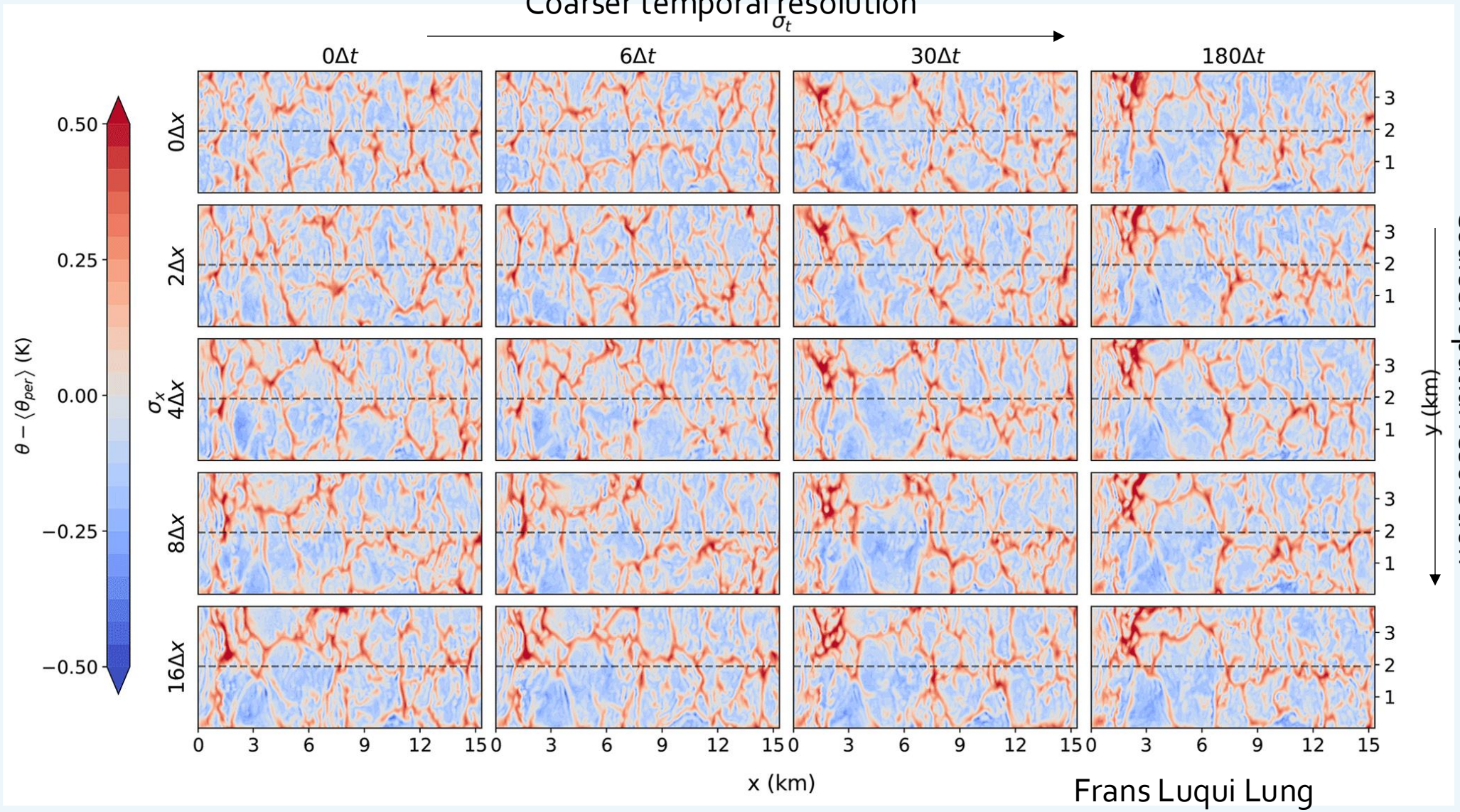


Coarser spatial resolution

Frans Luqui Lung

Liqui Lung et al 2024 GMD

Adding synthetic turbulence

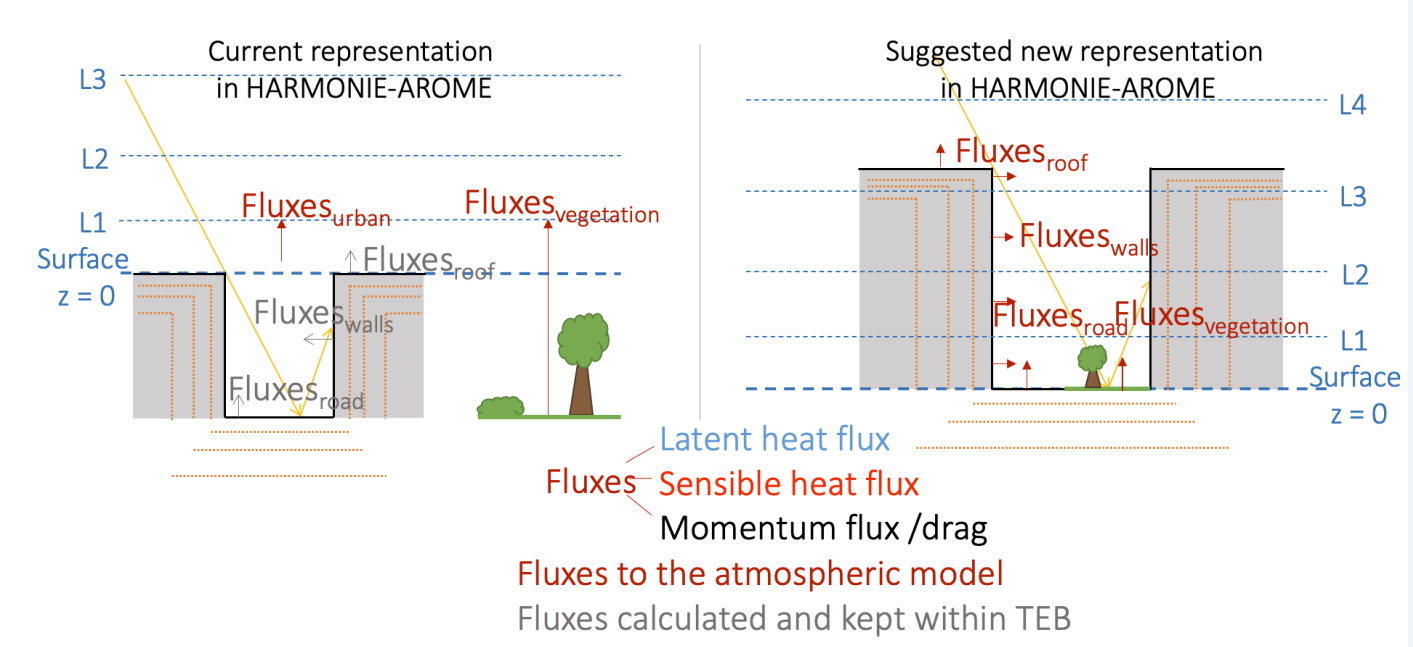


Frans Luqui Lung

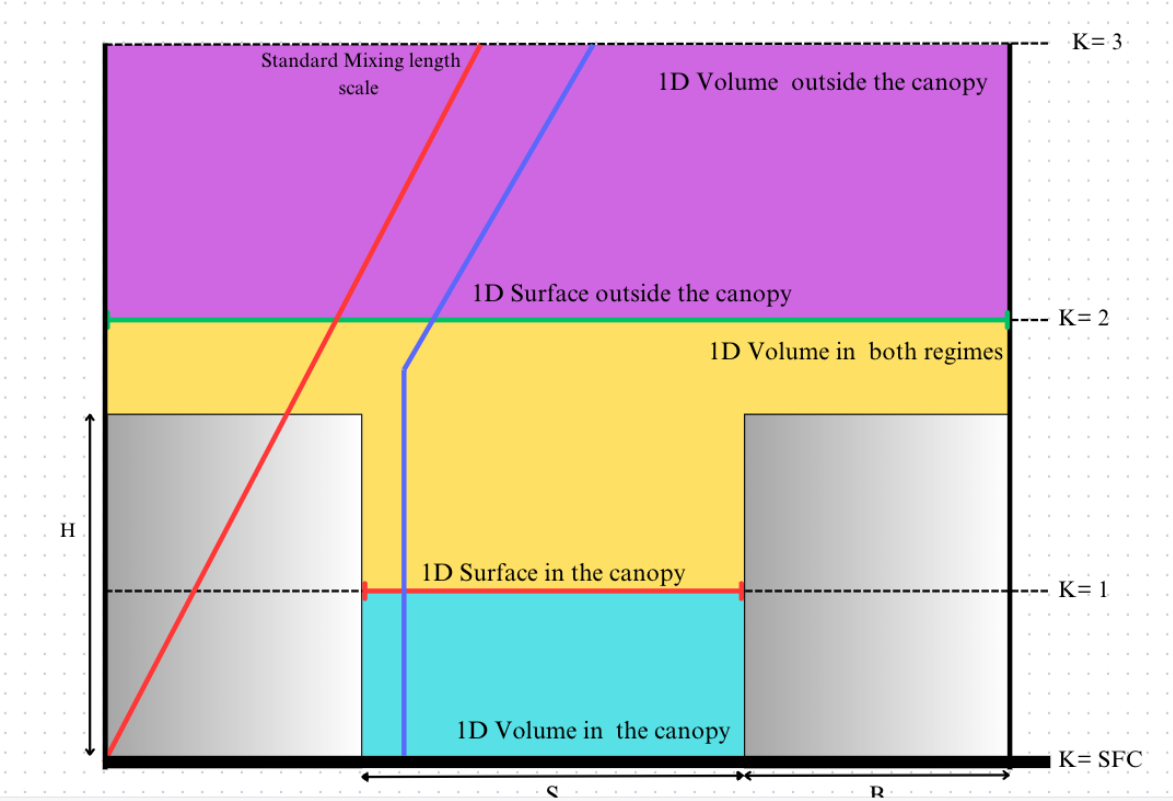
Liqui Lung et al 2024 GMD

Representation of urban processes

- Integrate the buildings in the atmospheric layers
- Interaction between buildings and turbulence

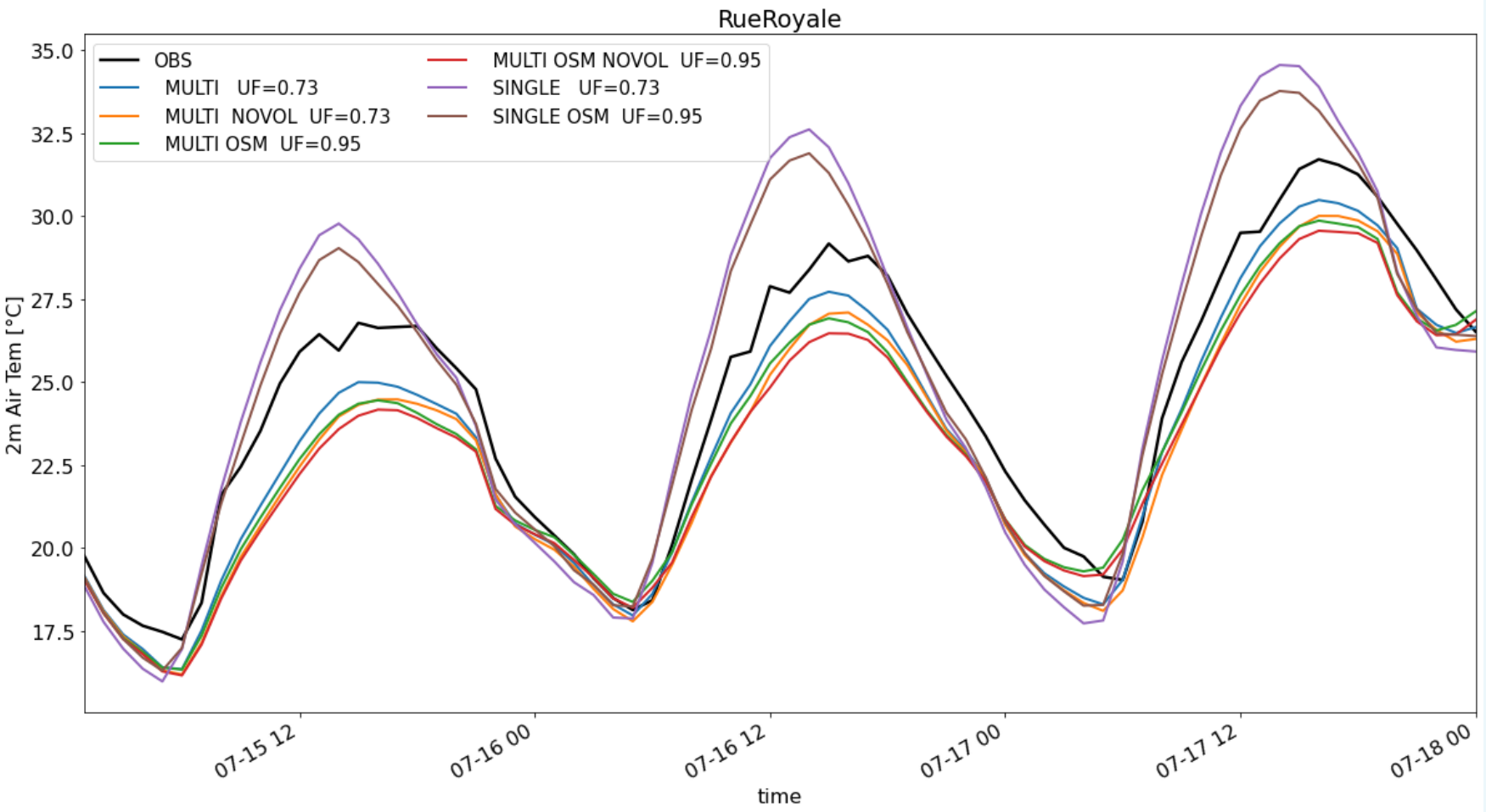


First work already started (Andrea Zonato)



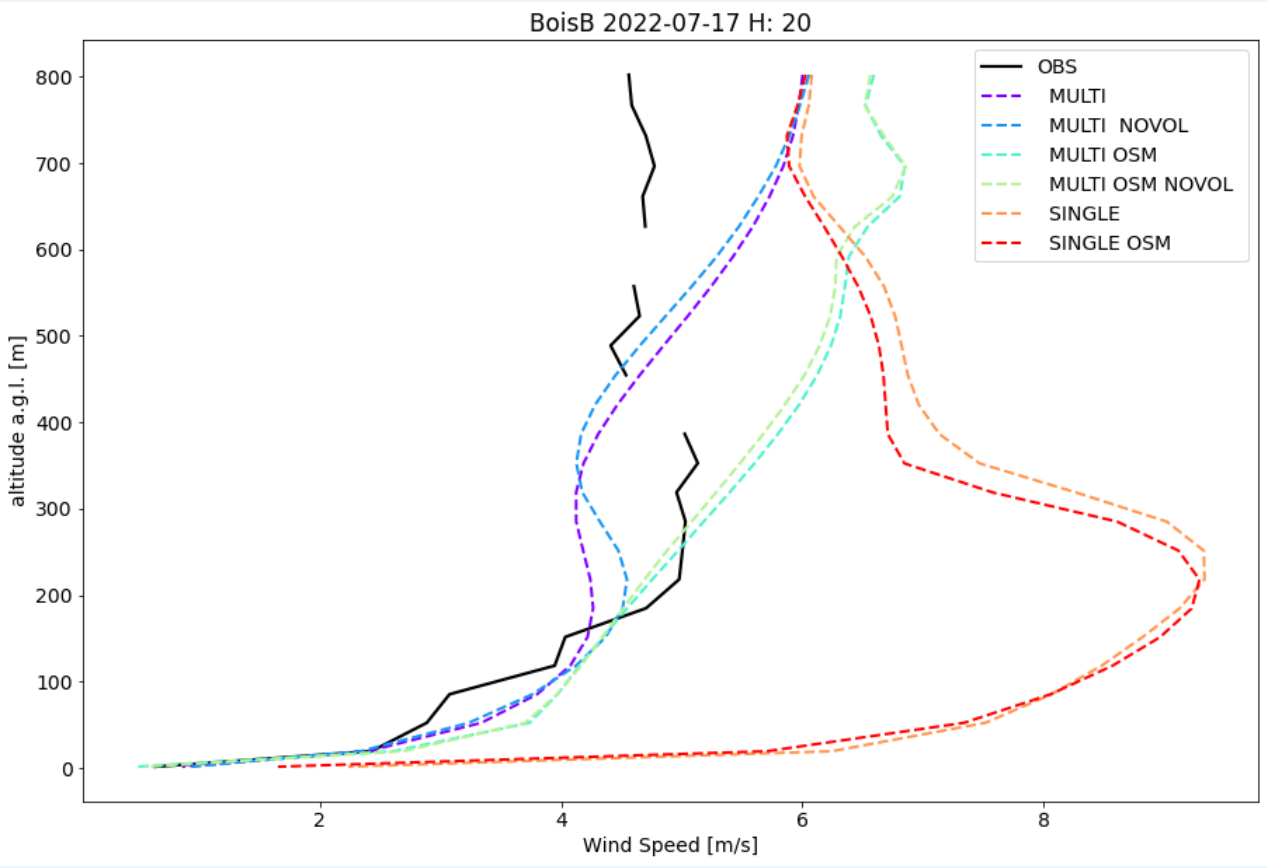
- SURFEX V9 coupled to Harmonie-AROME Cy46h1
- Coupling in MSE
- Issues remaining:
  - N Patches with LGARDEN
  - ECOCLIMAP SG
  - ISBA-DIFF scheme

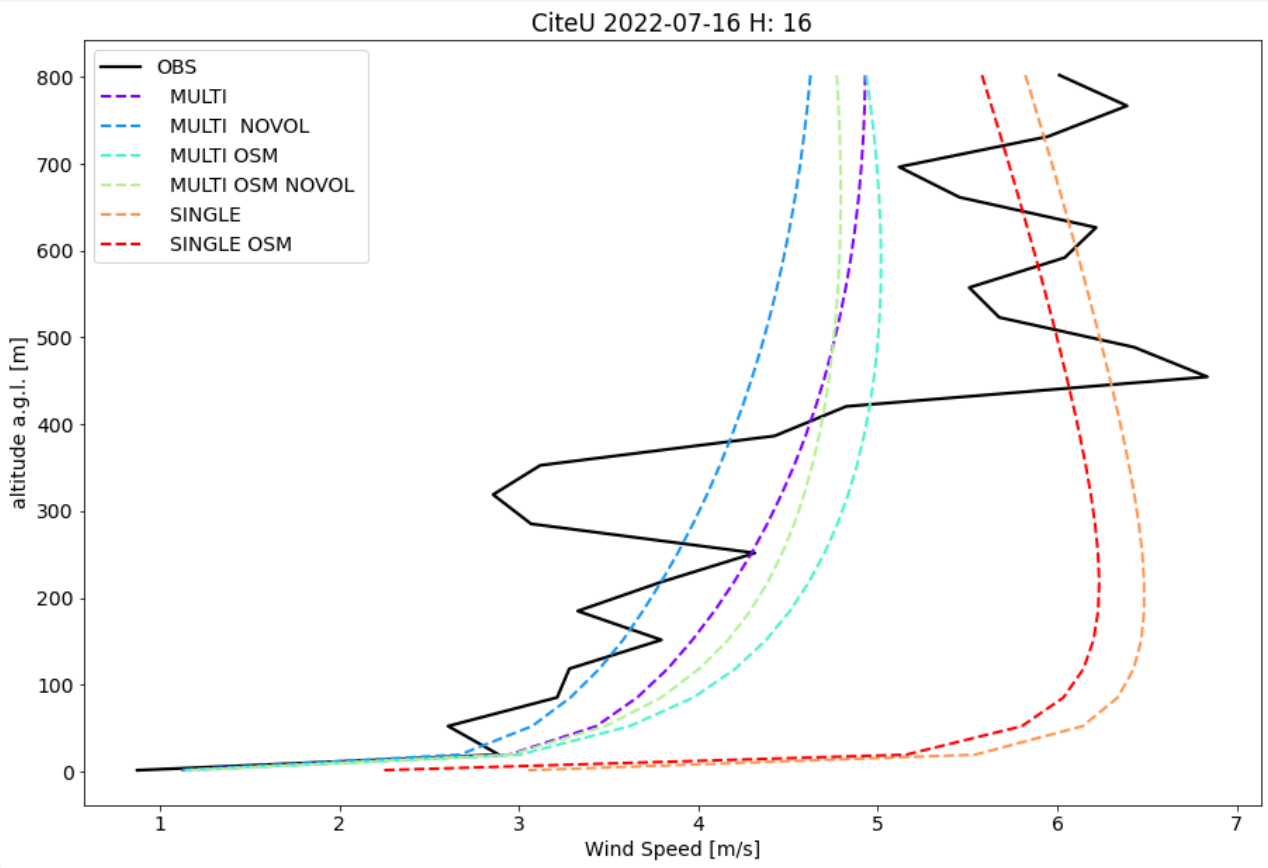
Temperature in centre of Paris



(Andrea Zonato)

Wind profiles (comparing radiosondes)



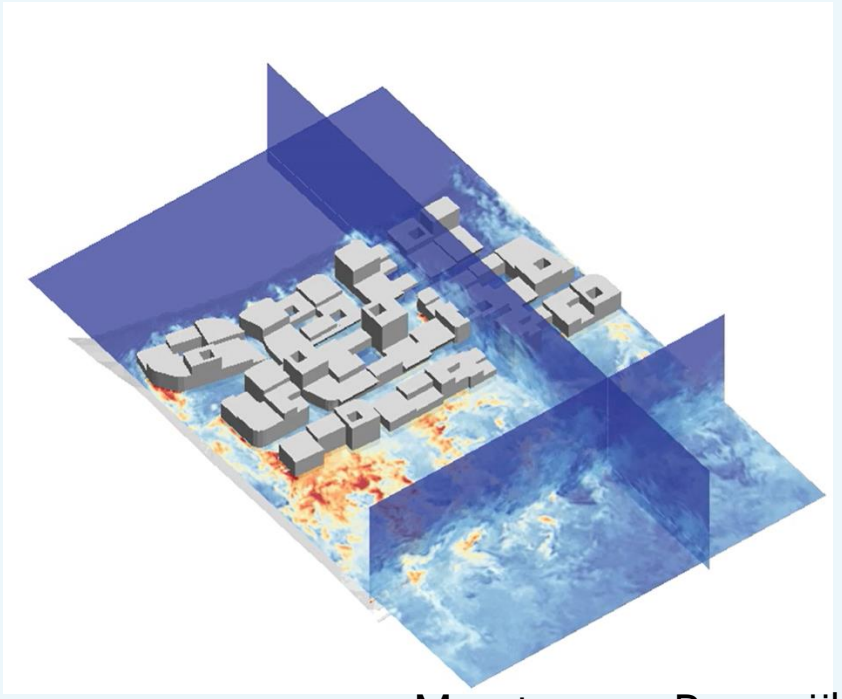


(Andrea Zonato)

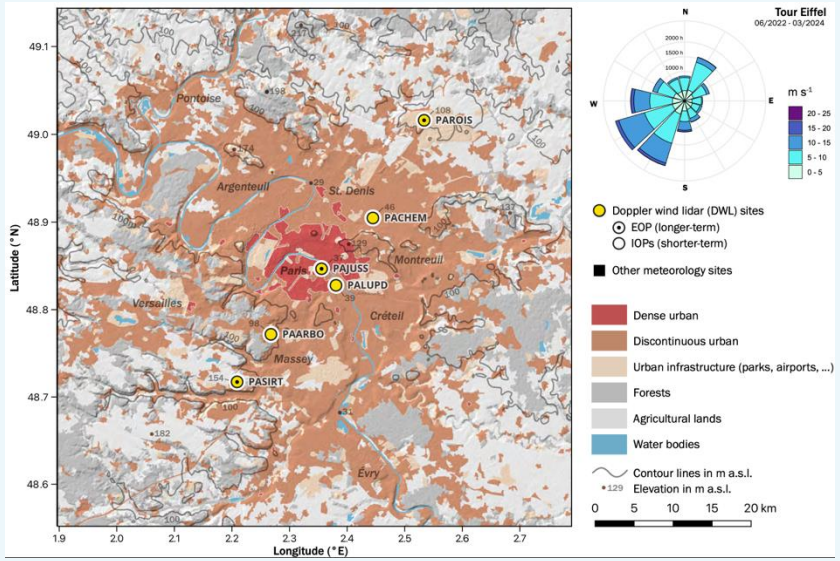
Outlook

Lots of opportunities

- Very very high-resolution LES simulations (~2 m resolution)
- Measurements from Urbisphere
  - Paris lidars already available: https://zenodo.org/records/14761504
  - Bristol campaign (ASSURE)



Maarten van Reeuwijk



William Morrison

Other relevant campaigns

Berlin (Urbisphere)

Fenner et al, 2024 (BAMS)