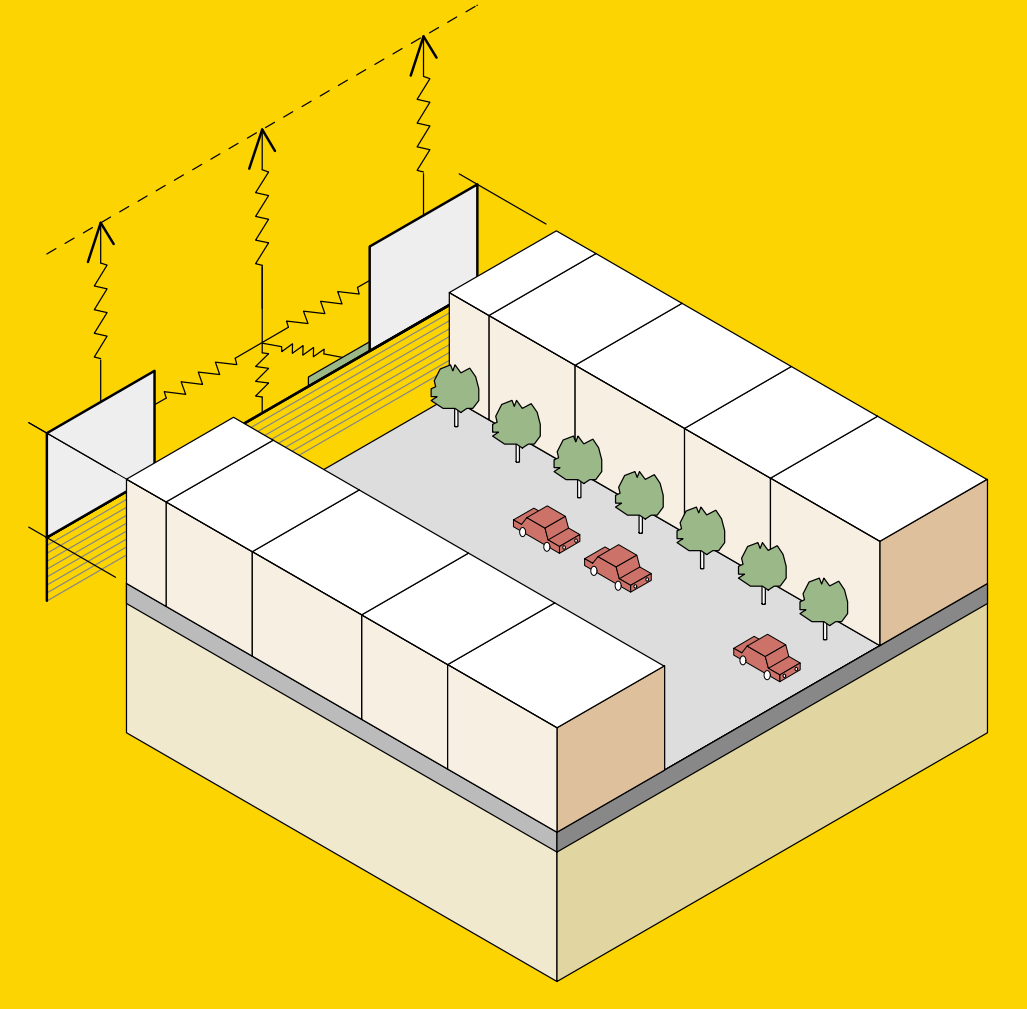


# Developments in the aTEB Urban Land Surface Model

Mathew Lipson (UNSW) – [mlipson@unsw.edu.au](mailto:mlipson@unsw.edu.au)

Supervisors: Melissa Hart (UNSW), Marcus Thatcher (CSIRO), Andy Pitman (UNSW)



Never Stand Still

Faculty of Science

School of Biological Earth & Env. Science

Climate Change Research Centre

## Summary

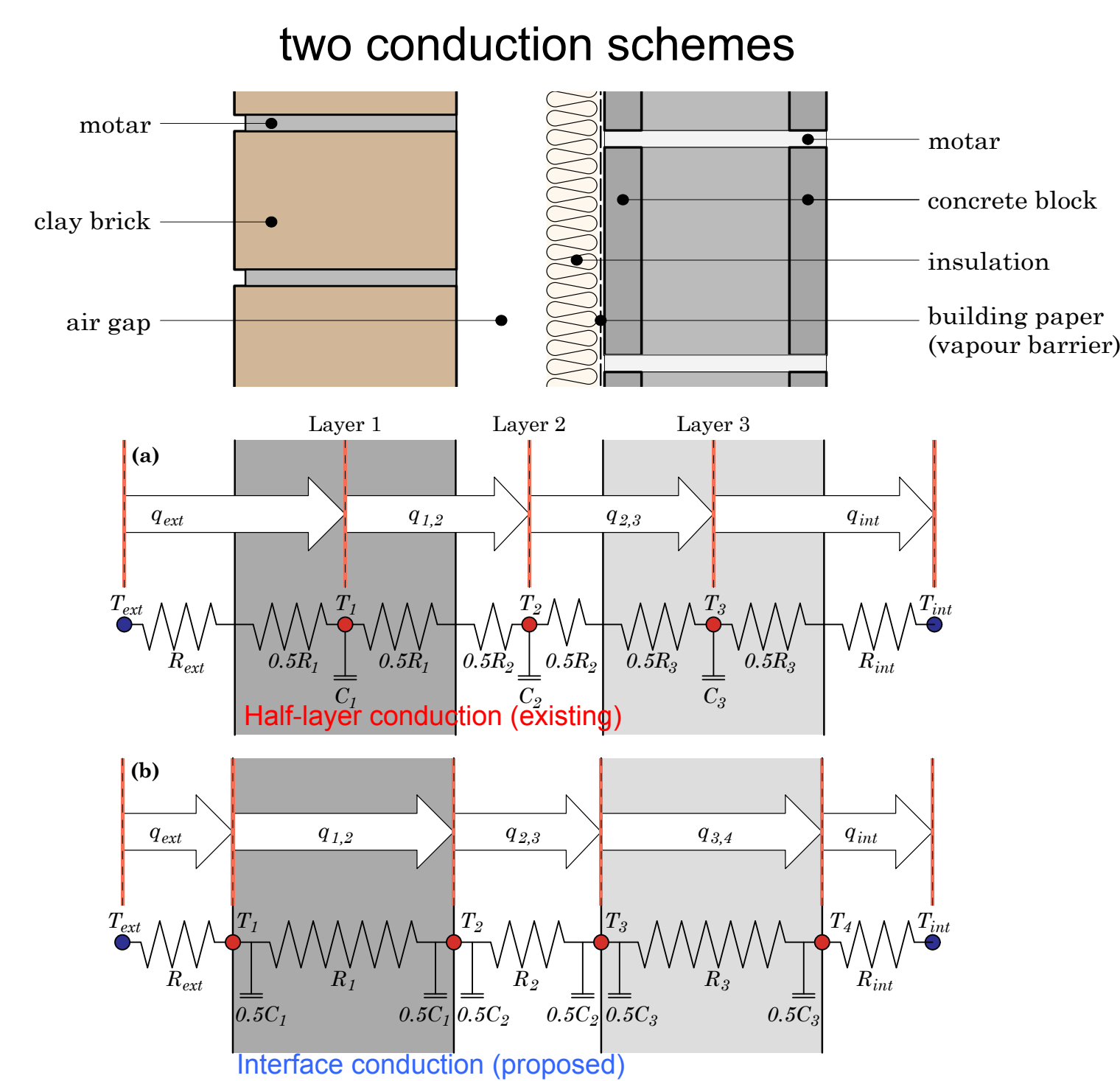
- Aim to reduce systematic errors in heat storage at the neighborhood/ city scale.
- Stage 1 (complete) introduced a more accurate representation of conduction through roofs and walls.
- Stage 2 (underway) will introduce internal thermal processes component to simulate conditions inside buildings.
- Addition benefits will include ability to simulate internal air temperatures (health/comfort) and building heating/cooling requirements (energy efficiency).

## Background

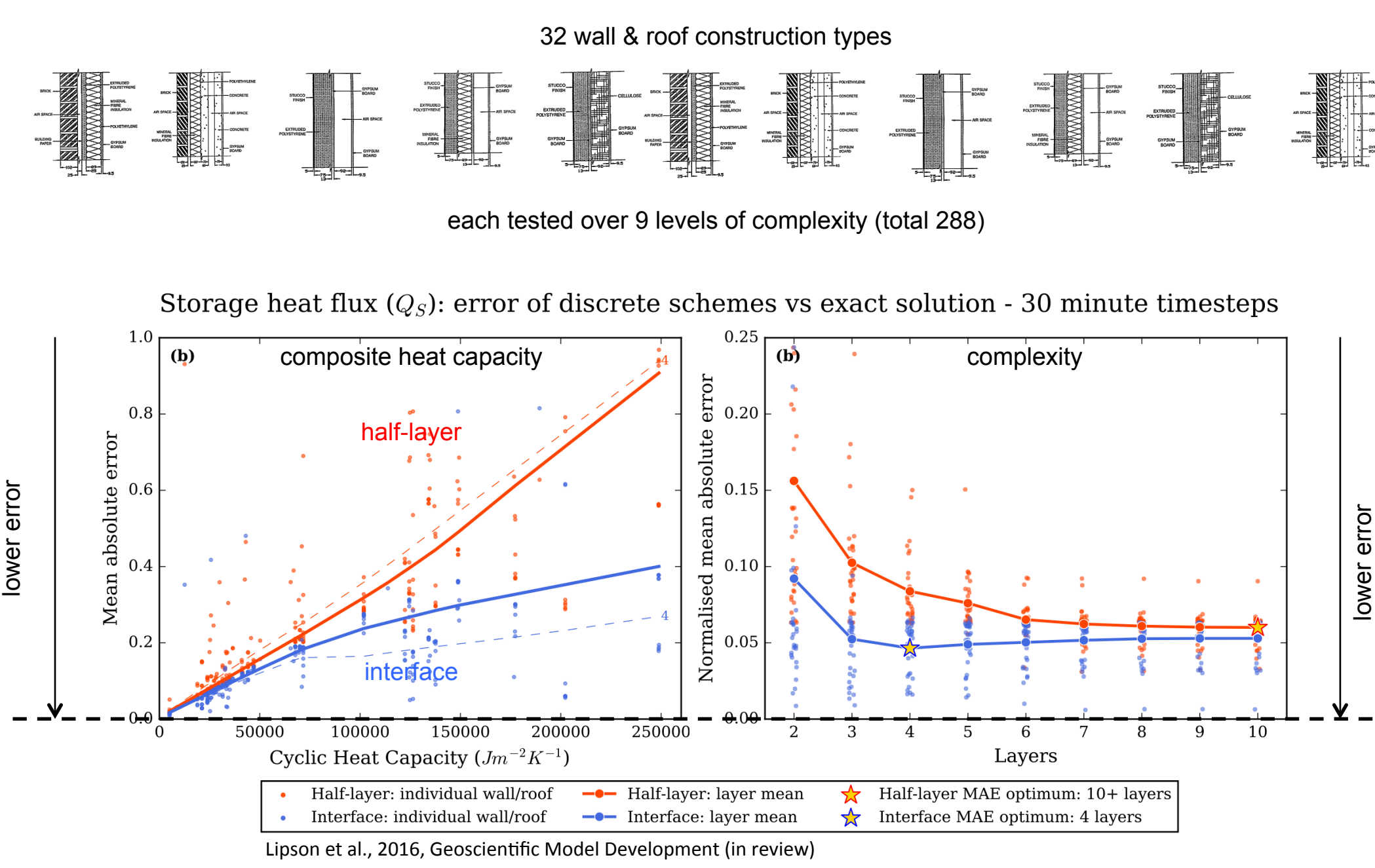
- Hong Kong (left) has a smaller observed urban heat island than Preston, Melbourne (right) – why?
- Urban climate is affected by both local scale effects (building geometry, materials, vegetation) and large-scale circulation (sea-breeze, atmospheric stability).
- Building-averaged urban models capture important local processes, but their simplicity allows coupling to large scale circulation models for dynamic effects.



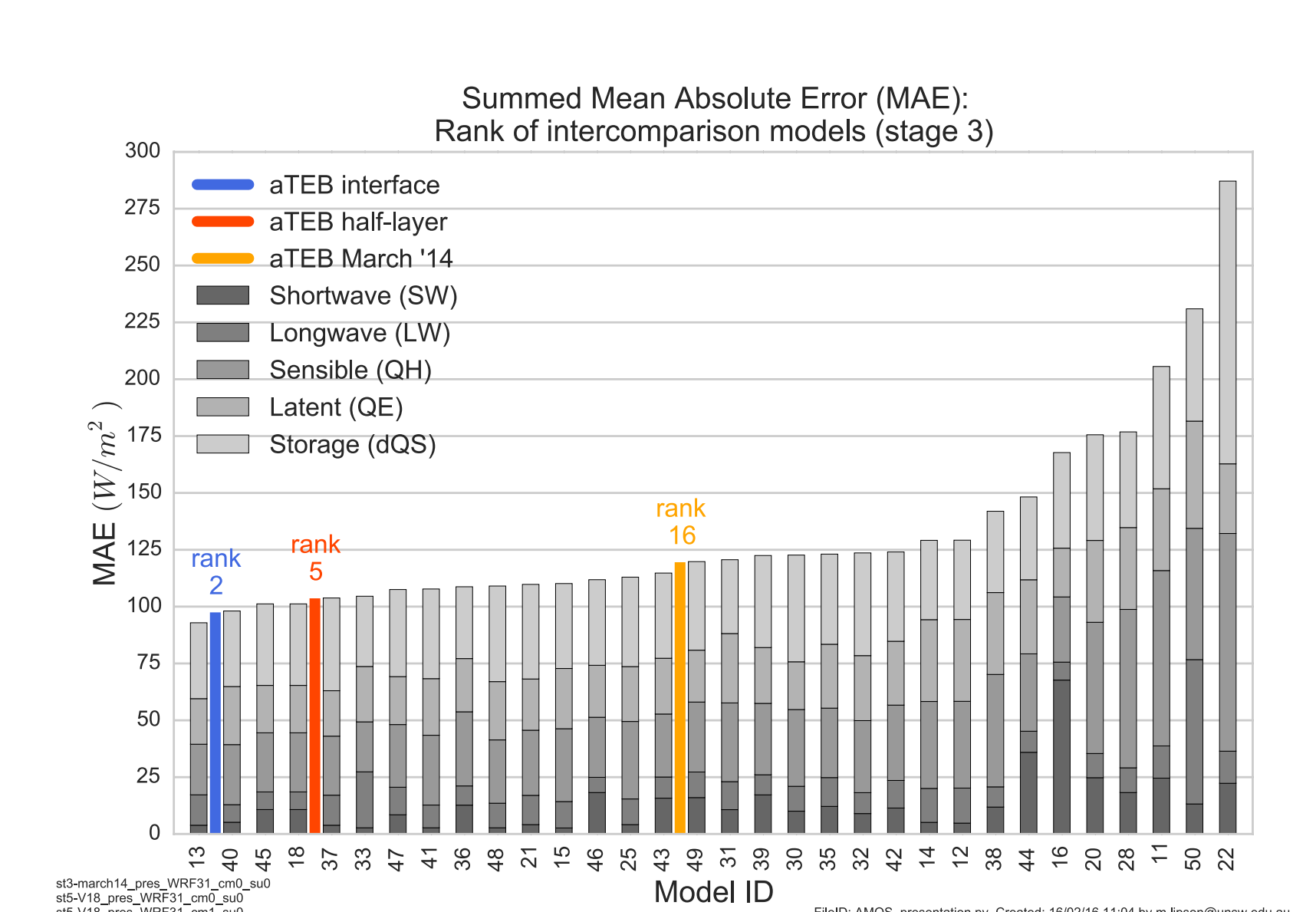
## Stage 1: New Conduction Parameterisation



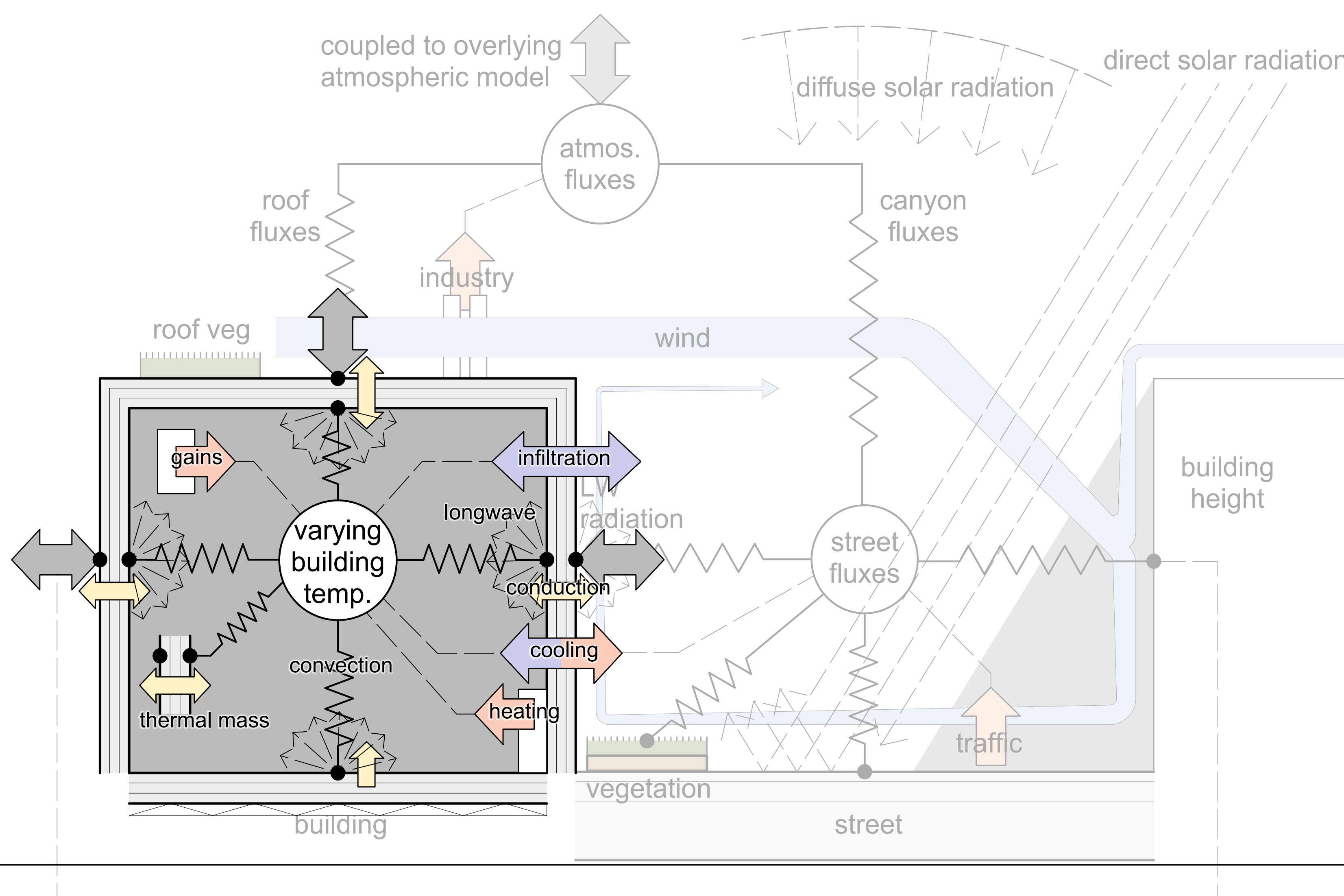
exact solutions to heat transfer – idealised study



effect within aTEB – observational

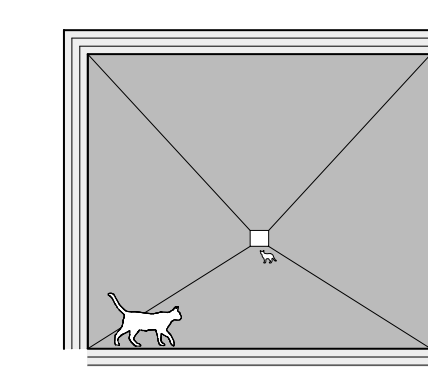


## Stage 2: Internal Thermal Processes

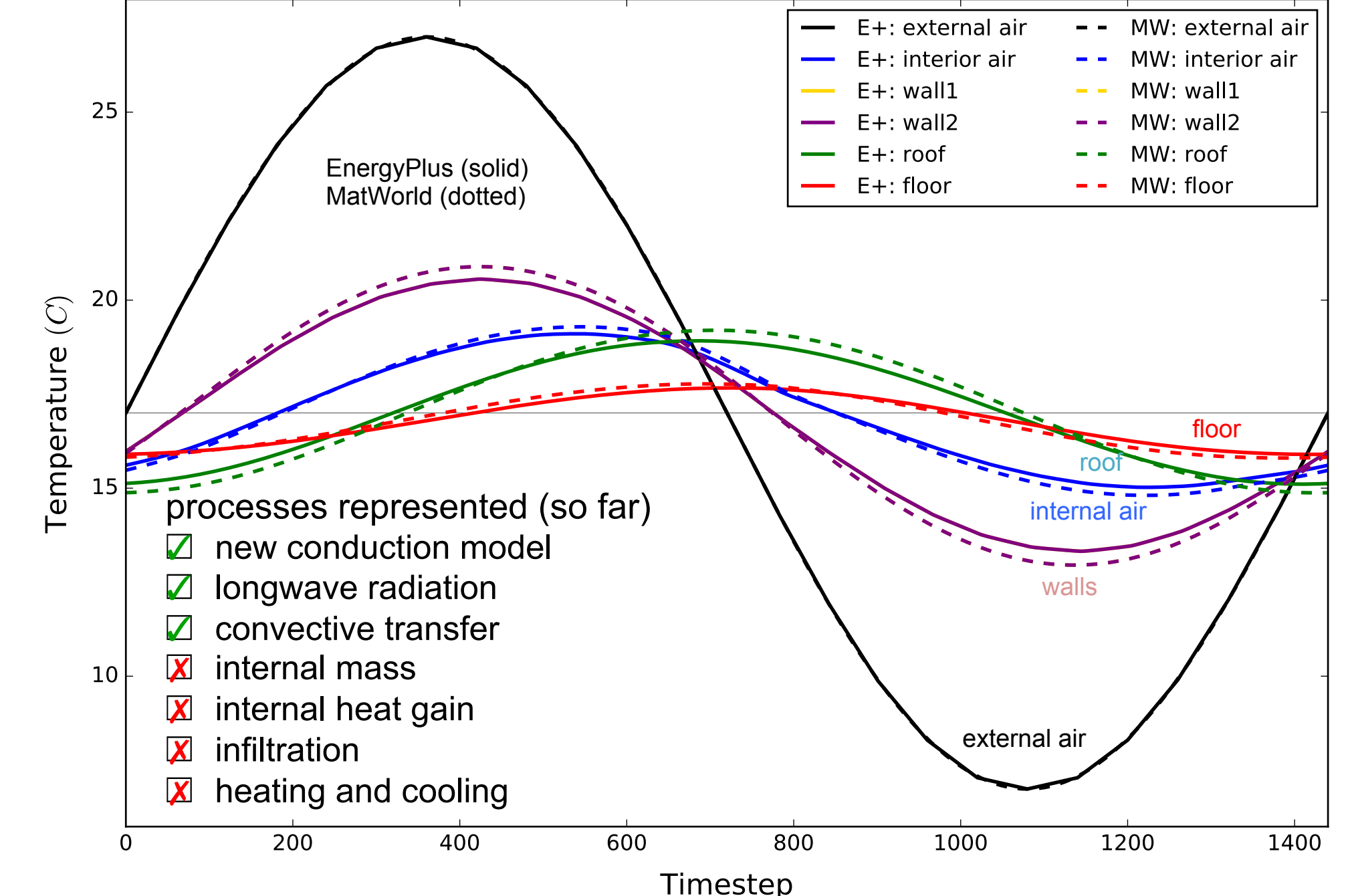


evaluation of internal module (ongoing)

compare response of simple module to fully featured and established building energy model (EnergyPlus)



Surface Temperatures: EnergyPlus (E+) vs MatWorld (MW)



## Future Work

- Code remaining internal processes and evaluate performance with fully featured 3D building energy model.
- Incorporate internal model into aTEB, and then couple aTEB to the atmospheric model WRF through LIS.
- Run coupled internal-urban-atmosphere simulations to assess energy use impacts in Sydney/ Melbourne.