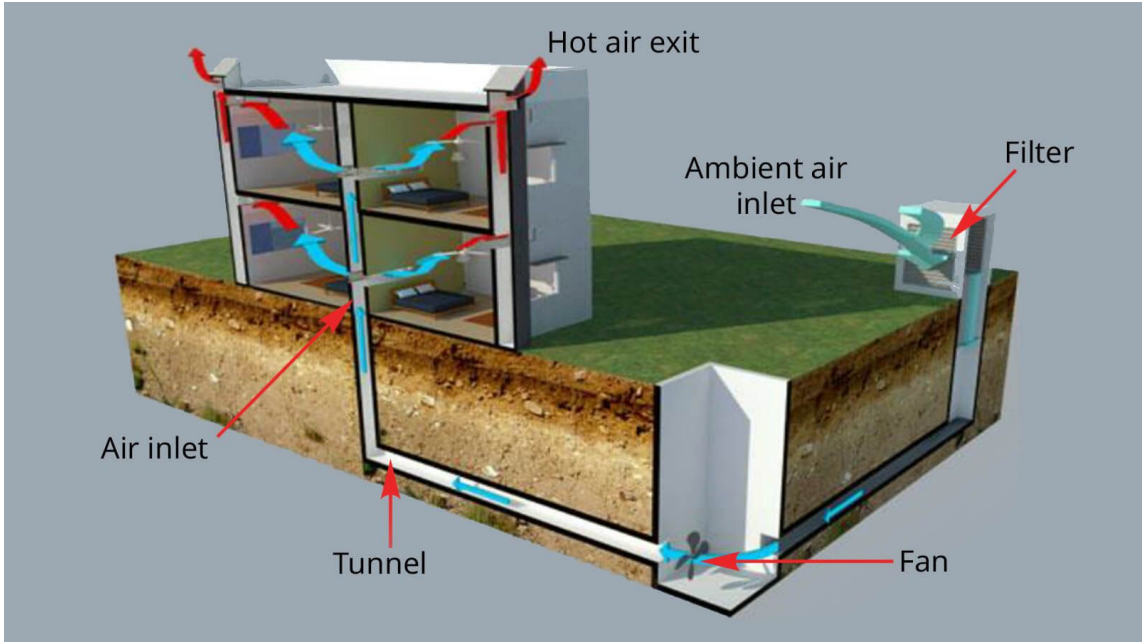
- **Earth-air heat exchanger system(EAHE)** on model



Earth - air heat exchanger system

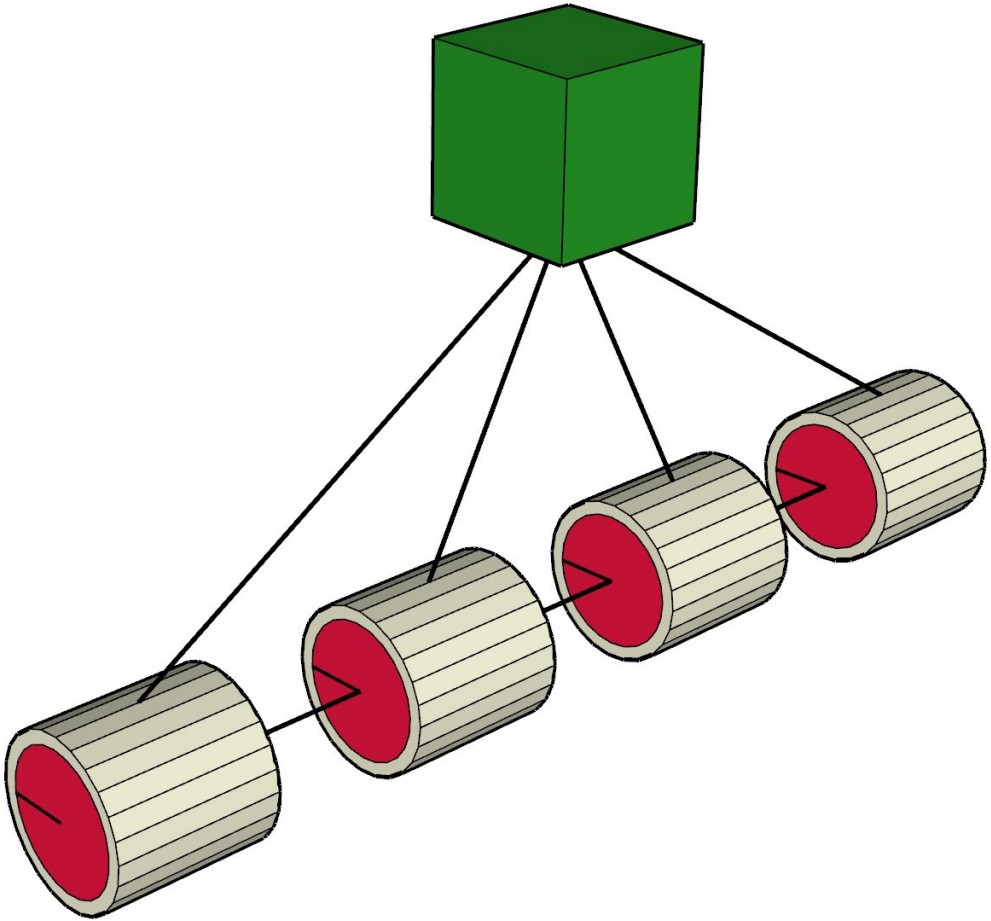
Assumptions

1. Assumptions (added)

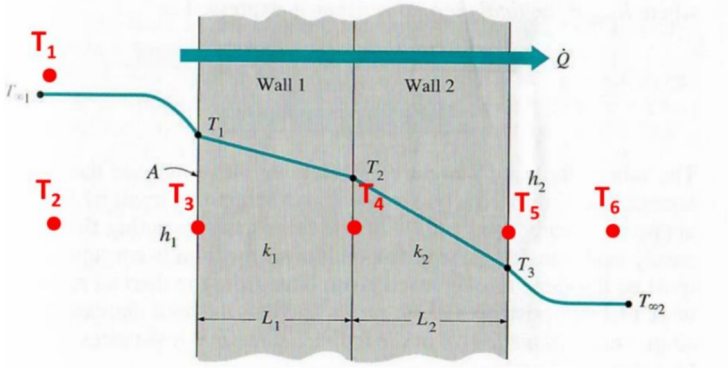
1. The thickness of the circular air duct is negligible.
2. Air is vented from the outside atmosphere to the inside of the room by a constant amount of air change per hour.
3. The temperature change of ground 1m away from the air duct is negligible.
4. Air ducts consist only of PVC materials and are homogeneous.
5. There is only a convection heat exchange between the air passing through the air duct and the wall of the air duct, and a conduction heat exchange between the air duct and the ground.
6. Disregard any errors caused by the bending of the duct after the inlet and before the outlet.

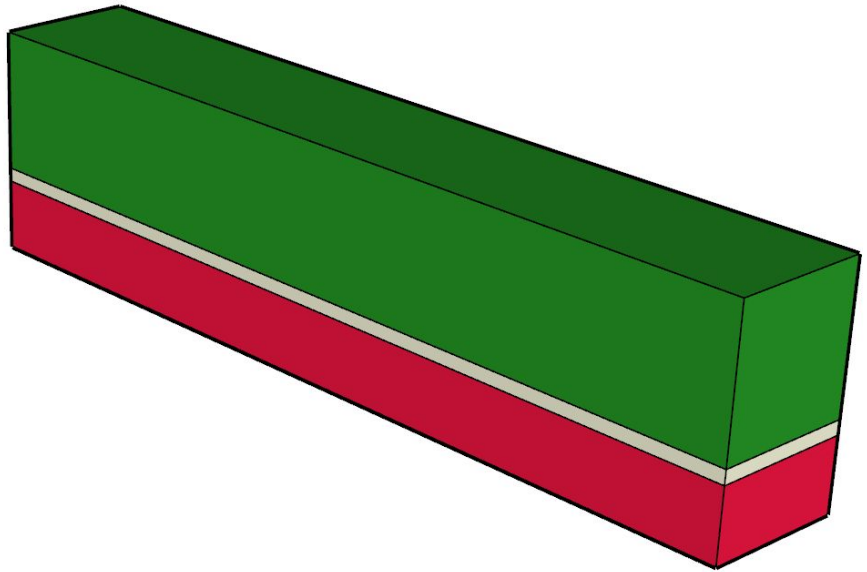
Concept

1. Concept

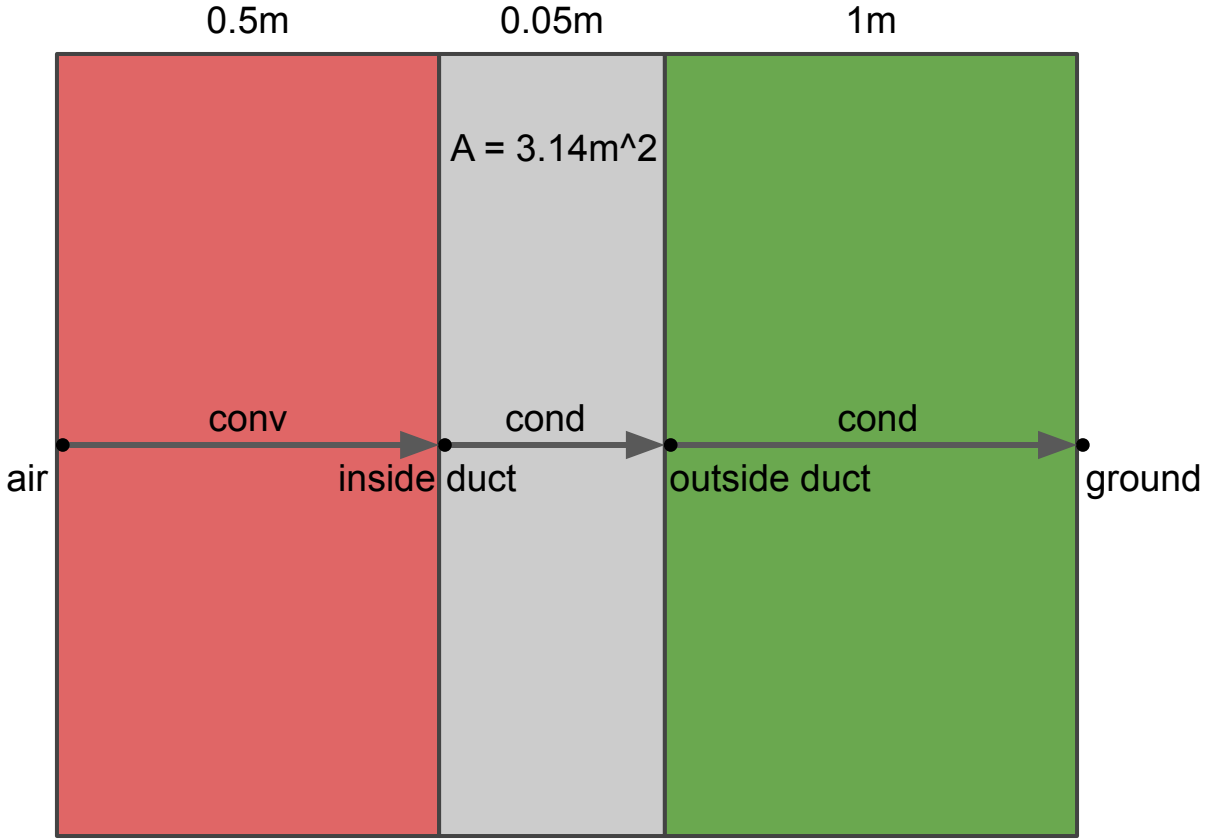


1. Concept





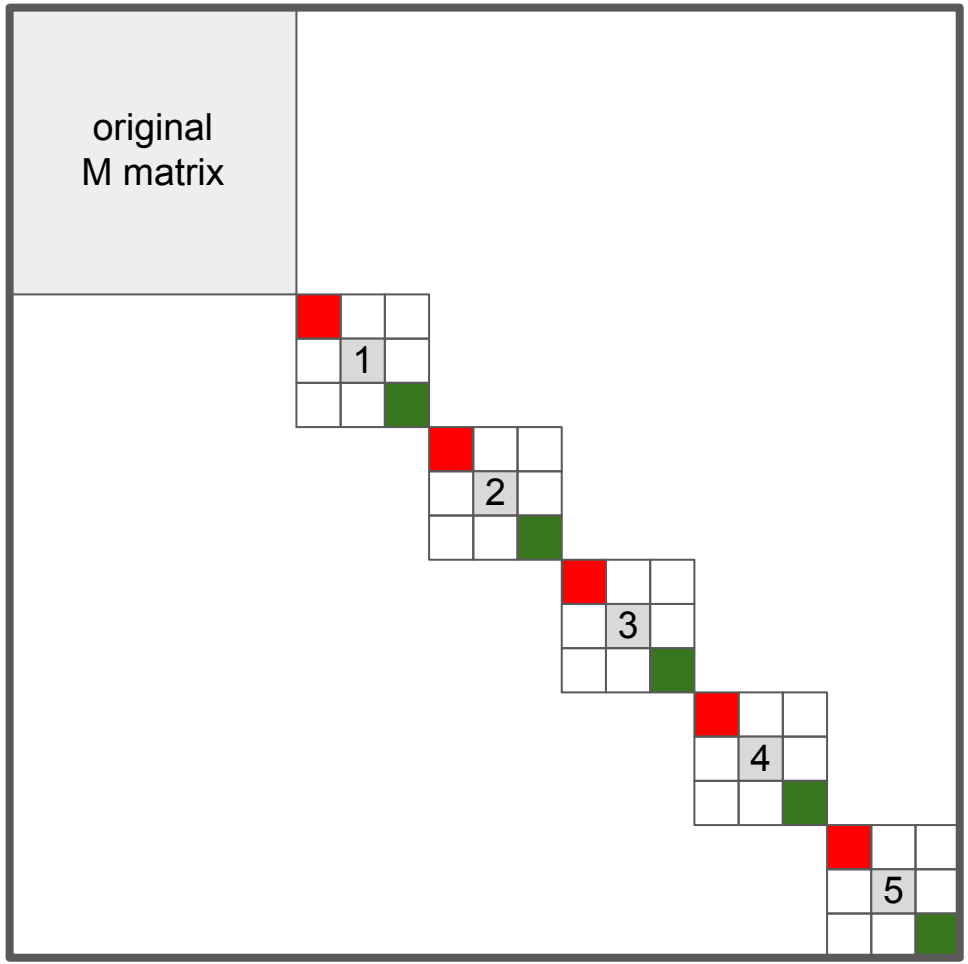
1) Heat transfer



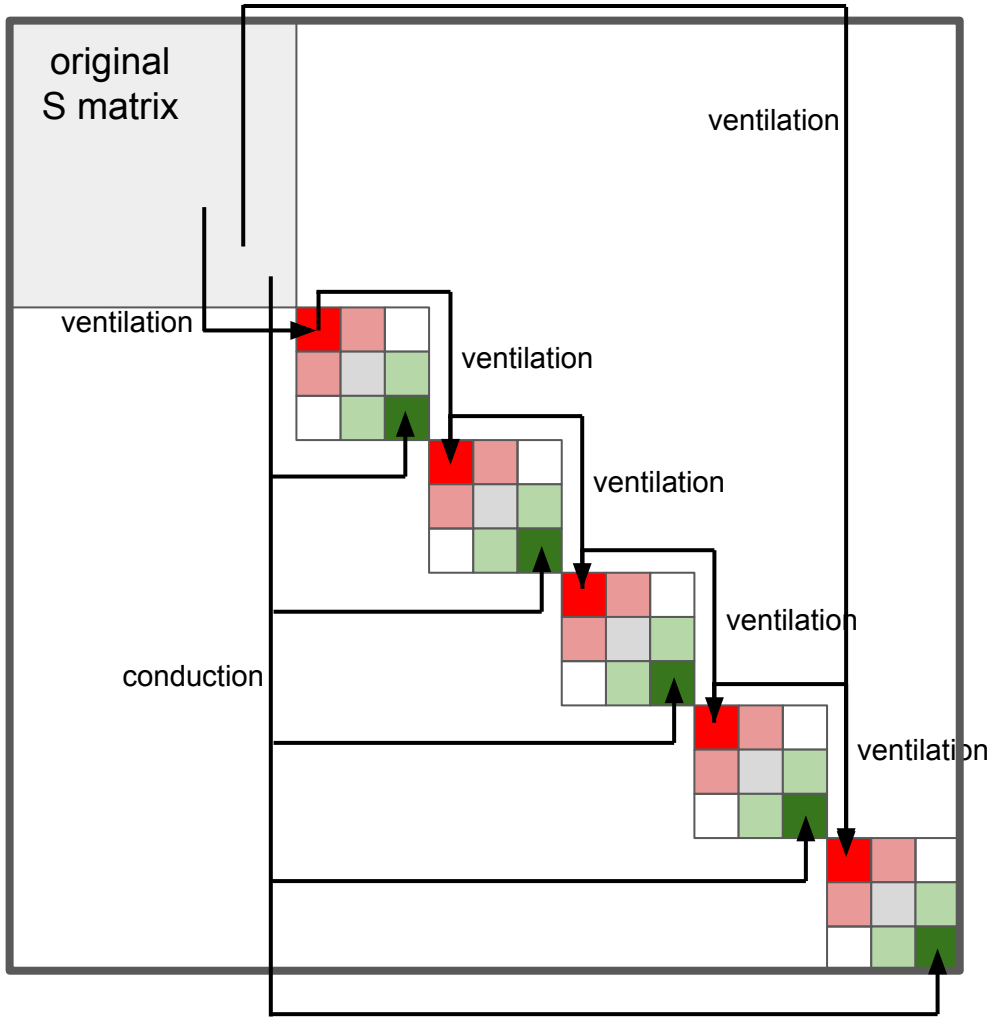
•

M, S, f matrix

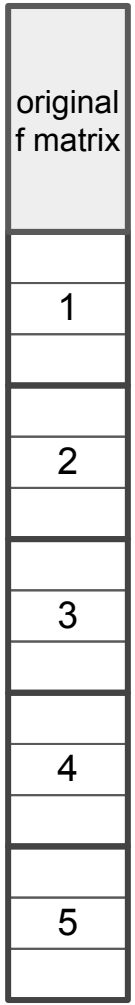
2) M matrix



2) S matrix


original
S matrix
ventilation
ventilation
ventilation
ventilation
ventilation
ventilation
conduction

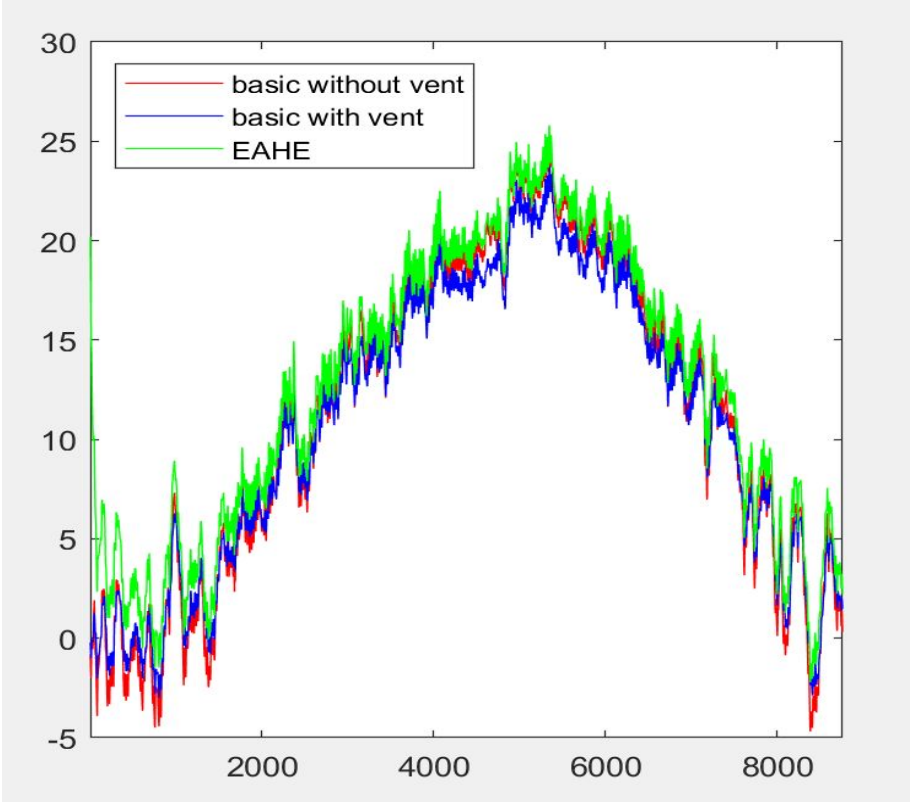
2) f matrix



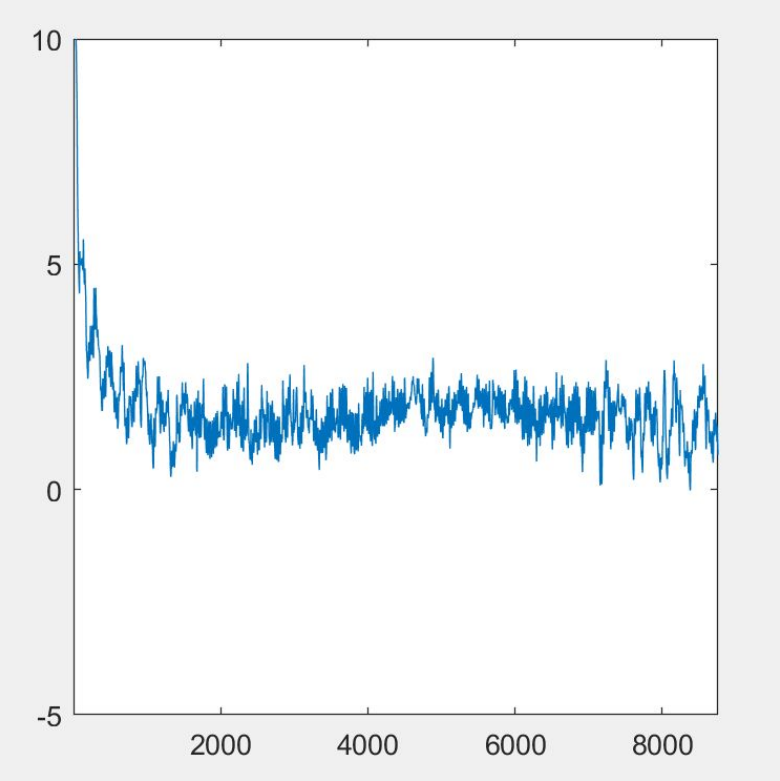
•

result

3. result

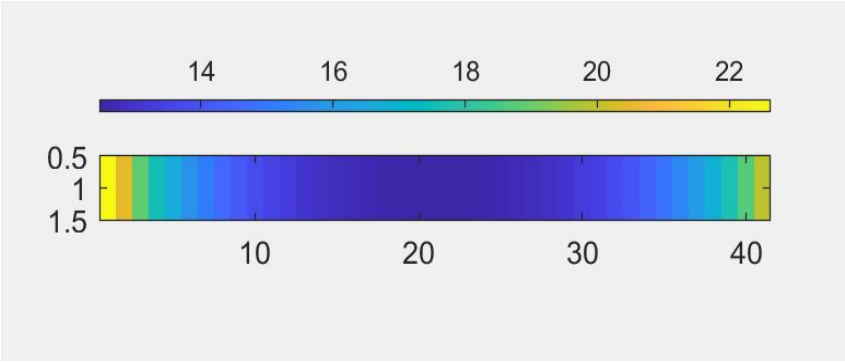

basic without vent
basic with vent
EAHE
30
25
20
15
10
5
0
-5
2000
4000
6000
8000

3. result

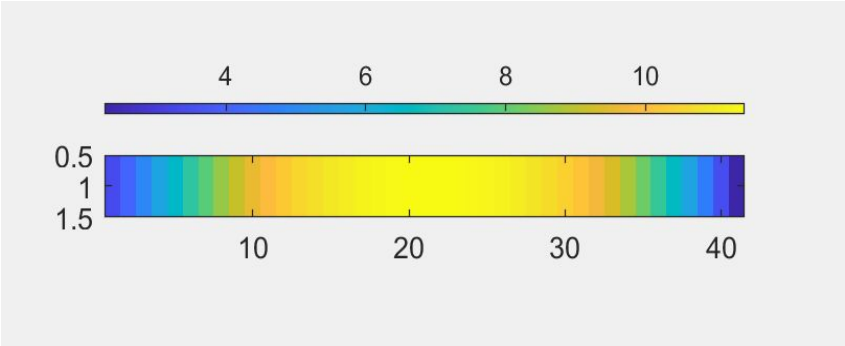


indoor temp difference,
EAHE model - basic model

3. result

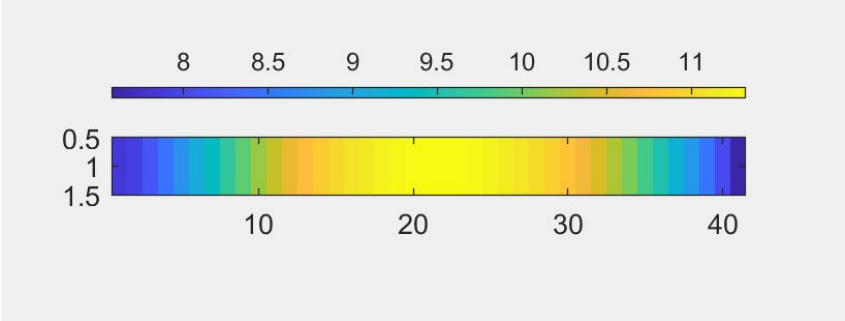


summer (6/21, 13')
total diff : 9.5 degC

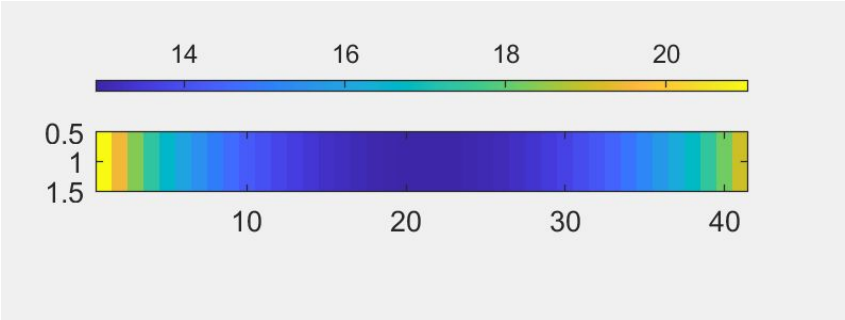


winter (12/21, 13')
total diff : 8 degC

3. result



3/21, 13’
total diff : 5 degC



9/21, 13’
total diff : 7 degC