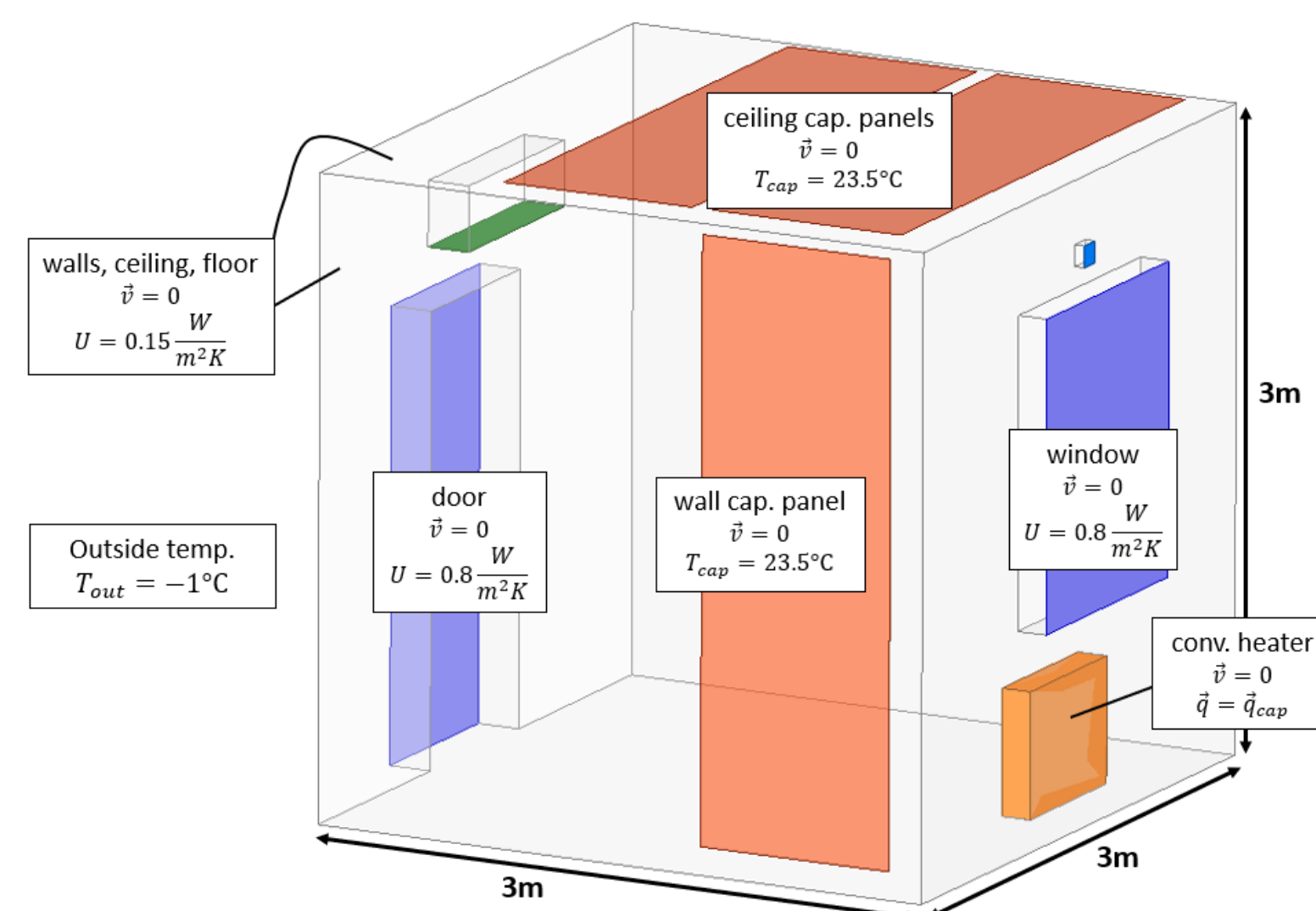


Radiant capillary heaters produce less convection, radiant asymmetry and are more energy-efficient when used with heat pumps.

Numerical model in Ansys CFX

Boussinesq approximation ($T_{ref} = 20^\circ\text{C}$), k- ω SST turbulence model, Discrete Transfer radiation model (air is transparent, emissivity of all surfaces $\varepsilon = 0.9$).



Acknowledgement

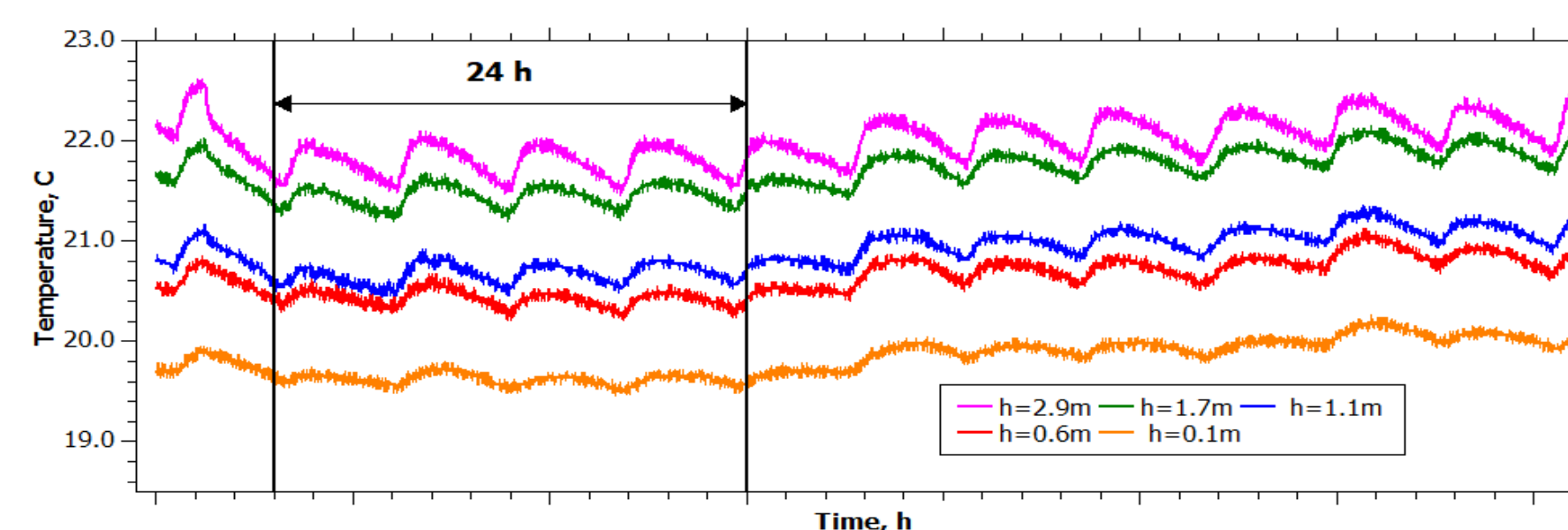
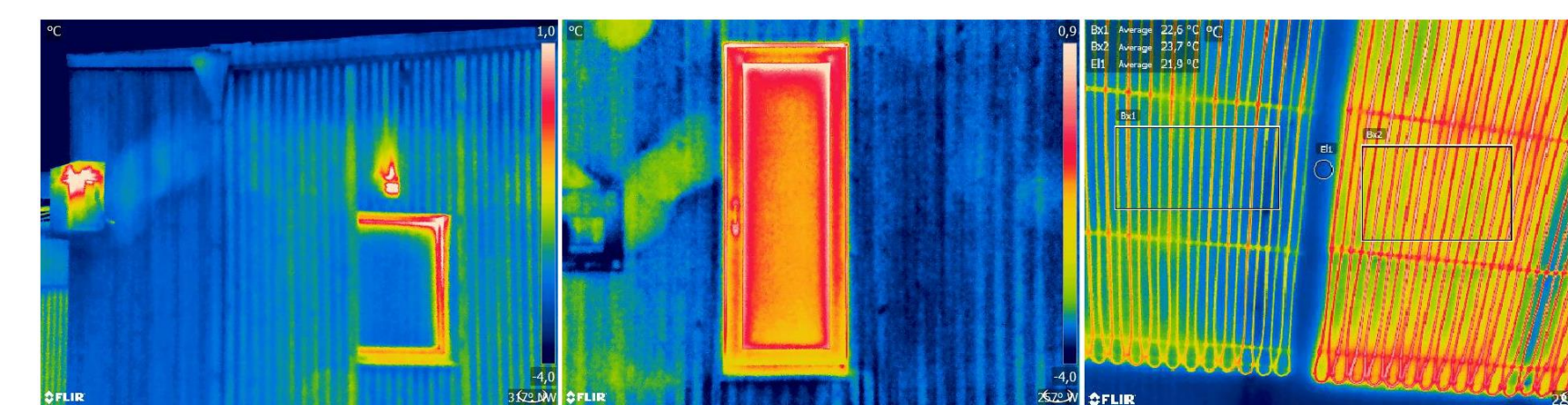
This work has been financially supported by the ERDF project "Development of methodology for calculating the heating/cooling capacity of the capillary water heat exchanger, taking into account the building, climate and performance characteristics" No. 1.1.1.1/19/A/102

Introduction

Due to lower working temperature, capillary heating systems are more energy-efficient when used with heat pumps compared to convective heaters. We compare thermal conditions with both heating systems in a model room.

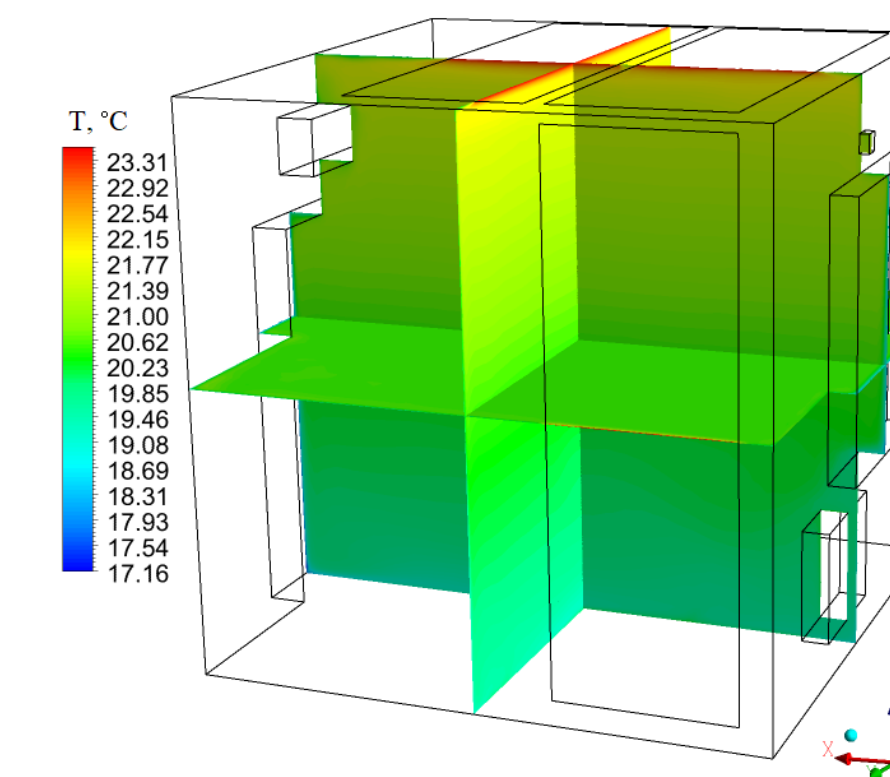
Experimental model

Model buildings at the LU Botanical Garden in Riga. Capillary mats along with different sensors for long-term monitoring are set up in one building.

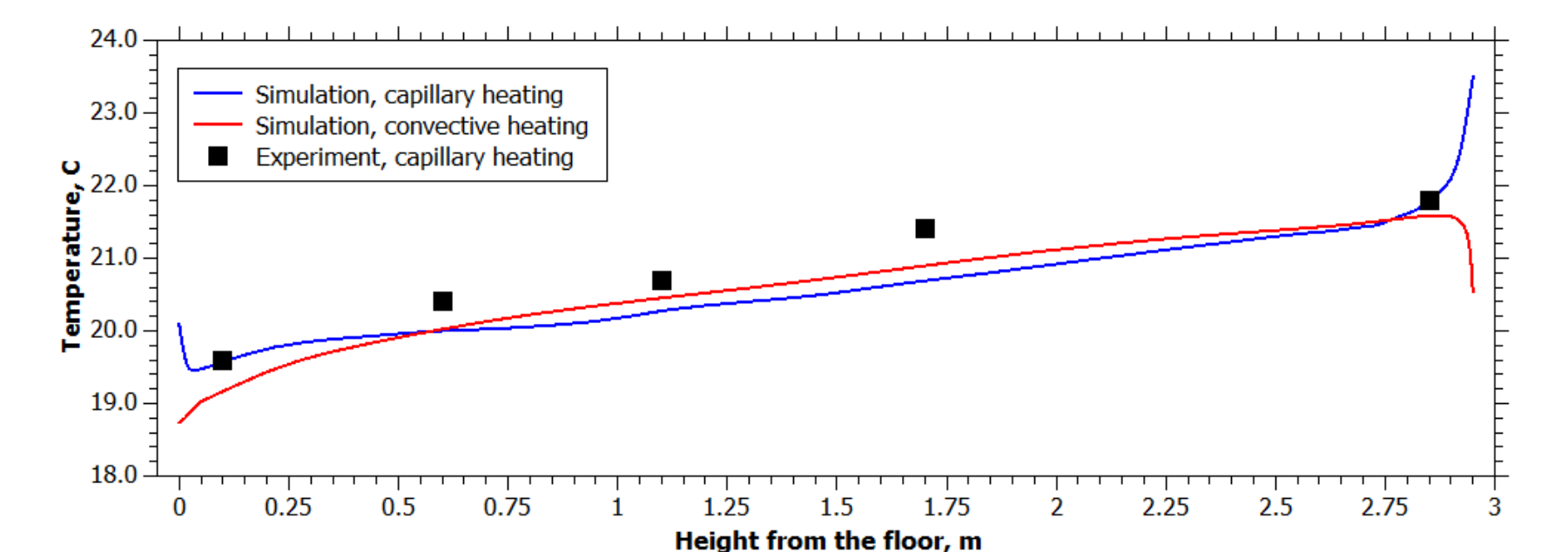
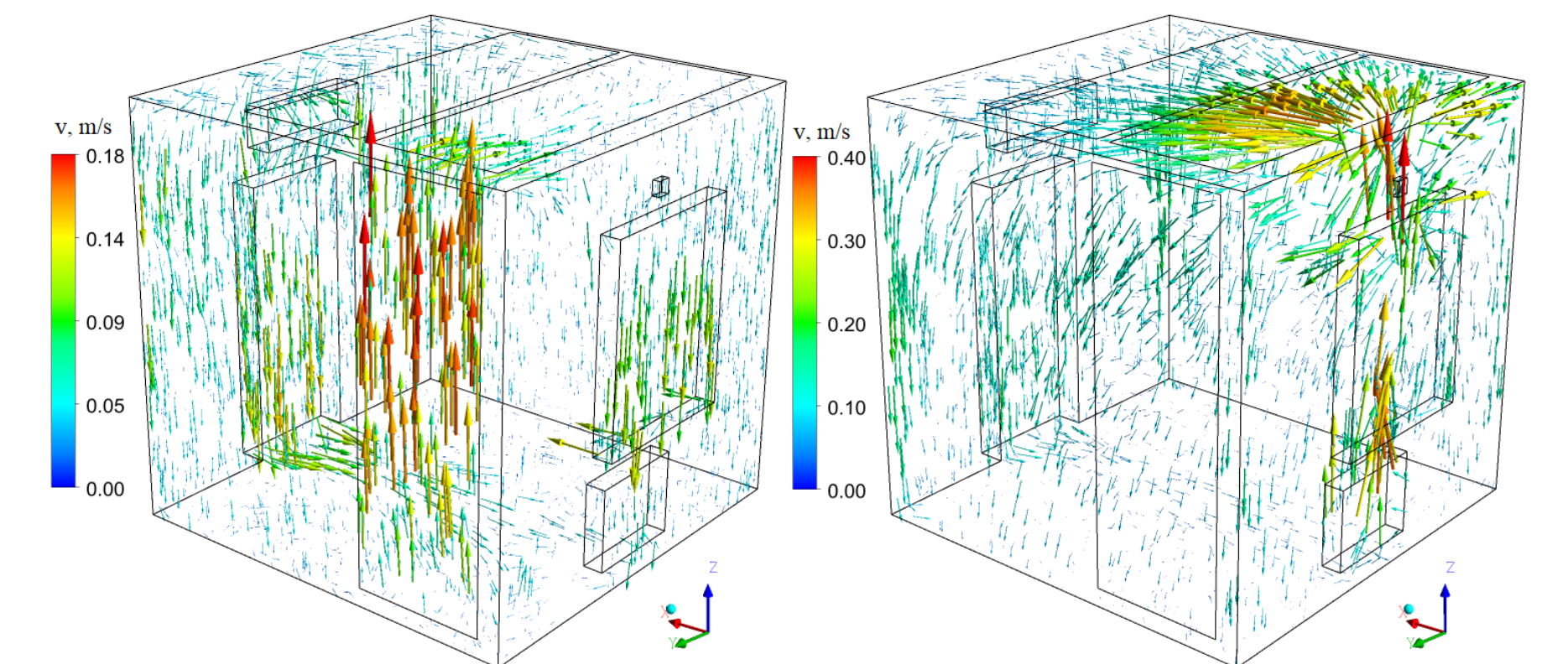
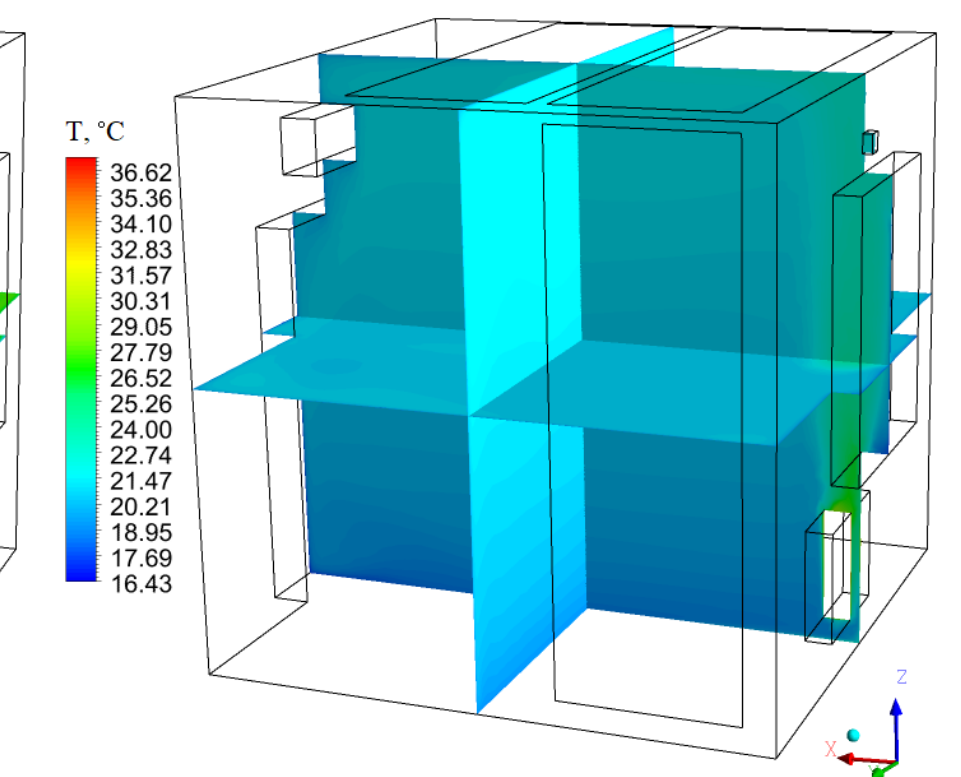


Results

Capillary heating



Convective heating



Conclusions

With 200 W energy input, average temperature is 20°C , vertical temp. difference $\Delta T = 2.2^\circ\text{C}$ with both heating systems. Conv. heating has larger convection and horizontal temperature assymetry.