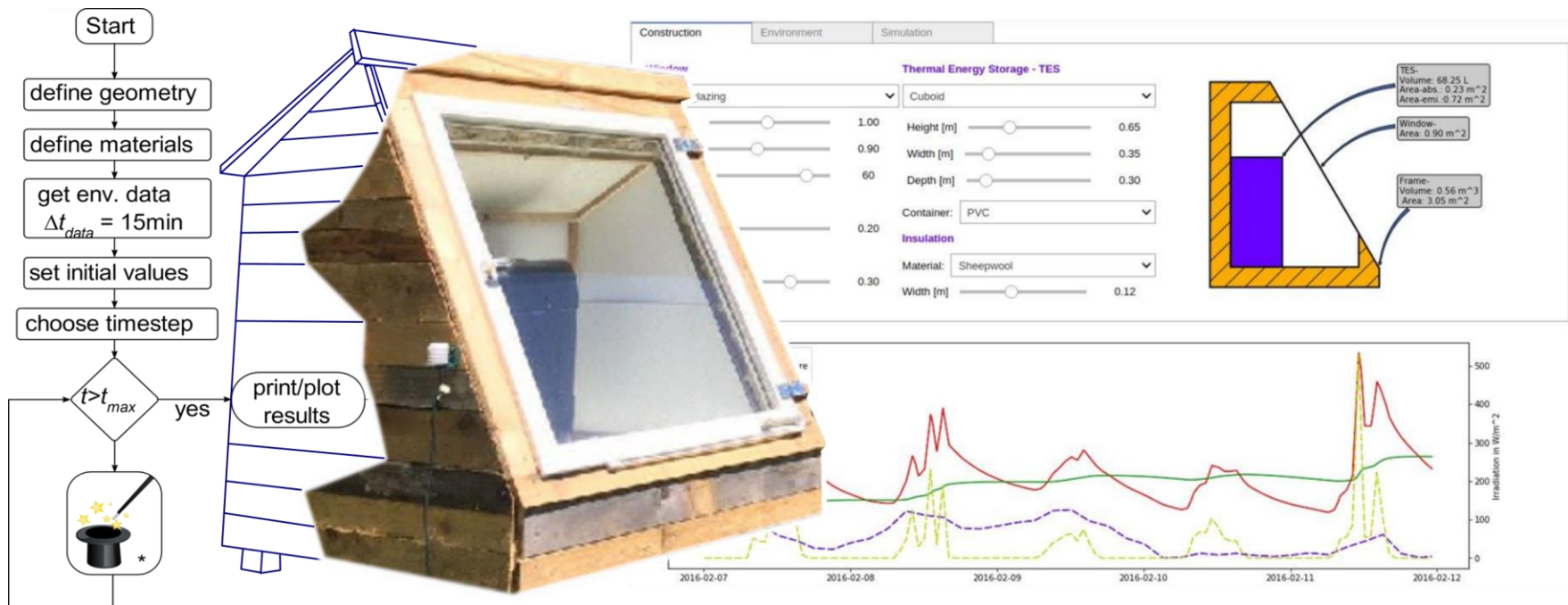


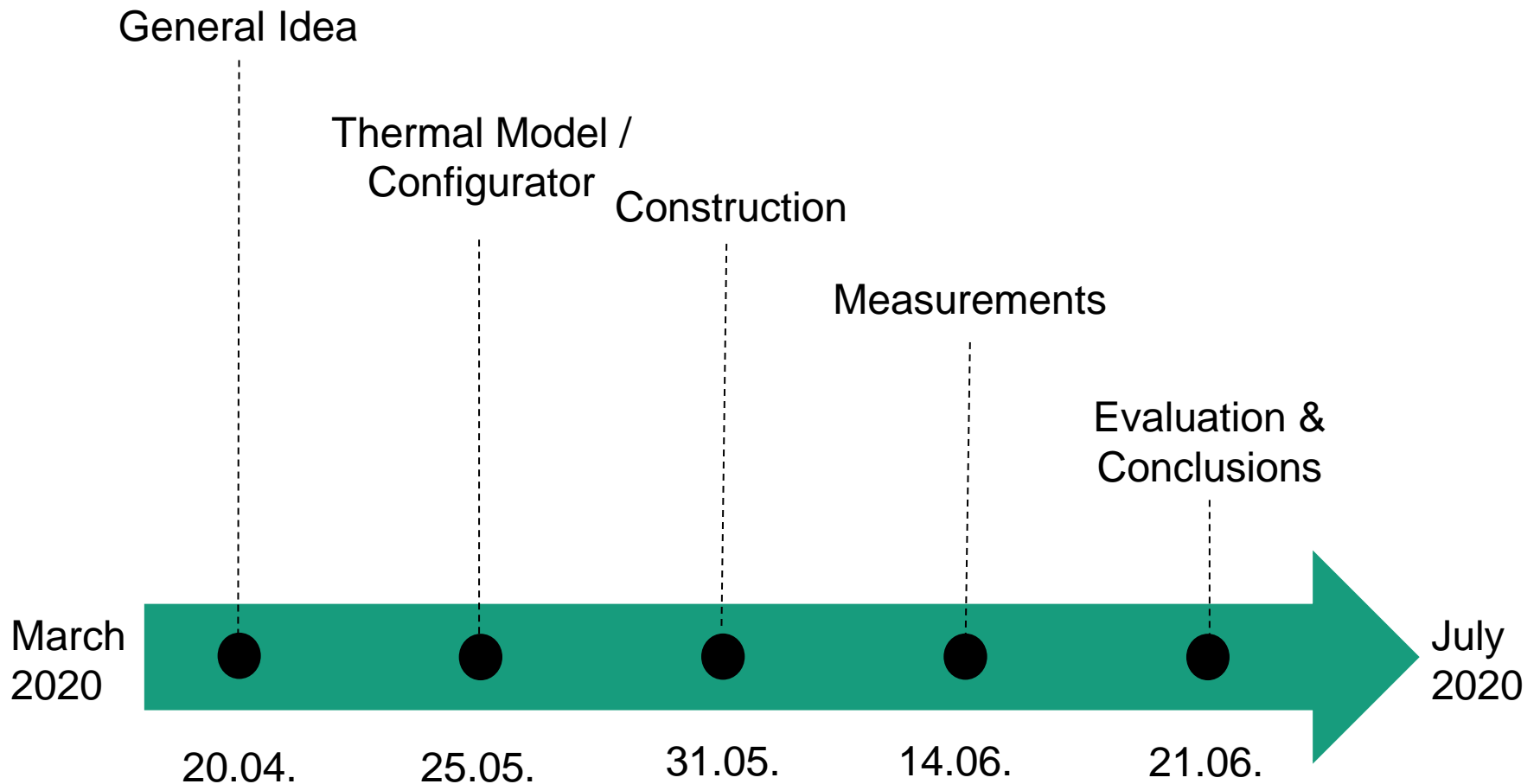
SOLAR GREENHOUSE

Group
Lukas Kaupenjohann & Katrin Scharf

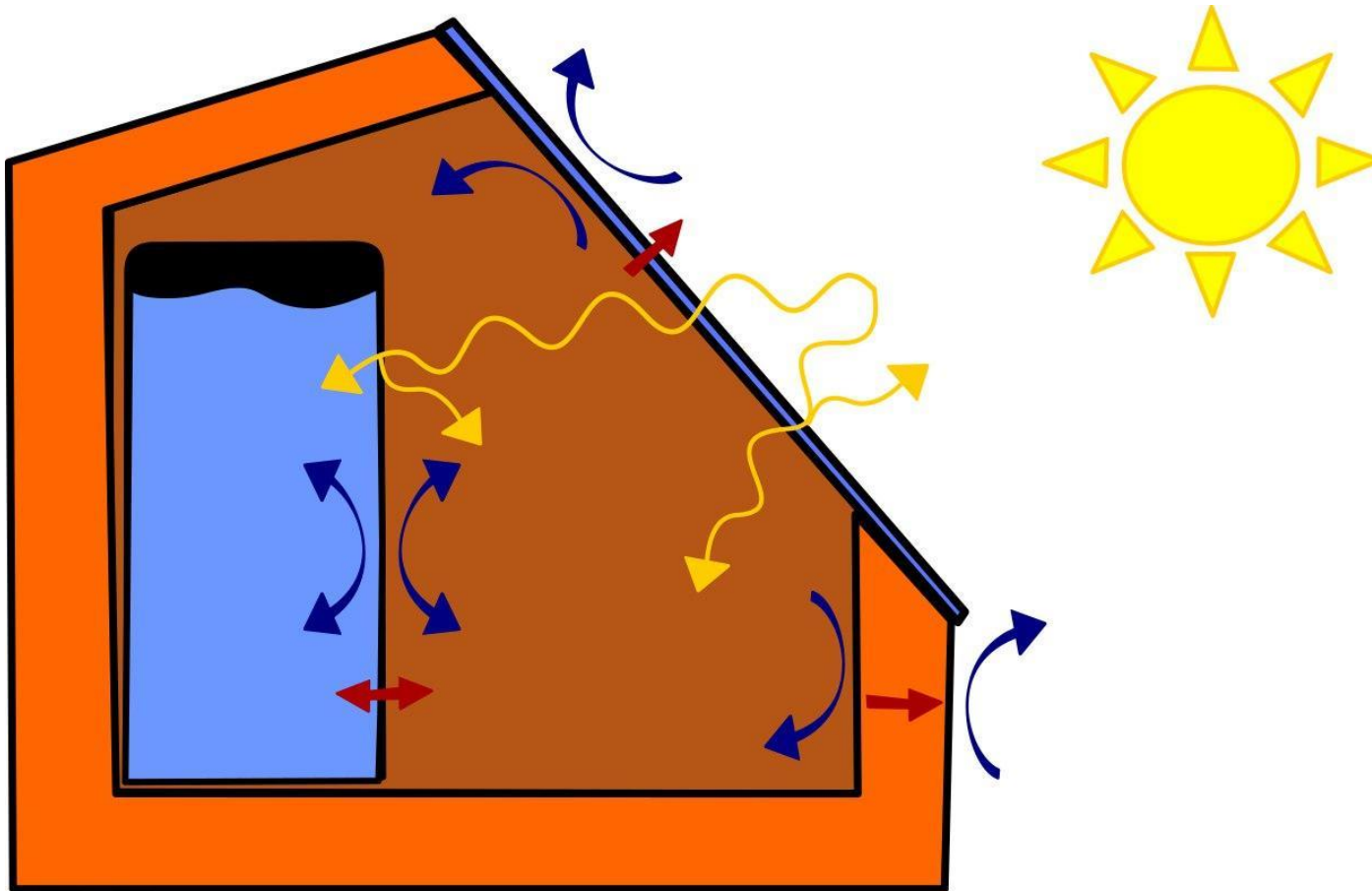
Supervisor
Dr. Stefan Hess



Content

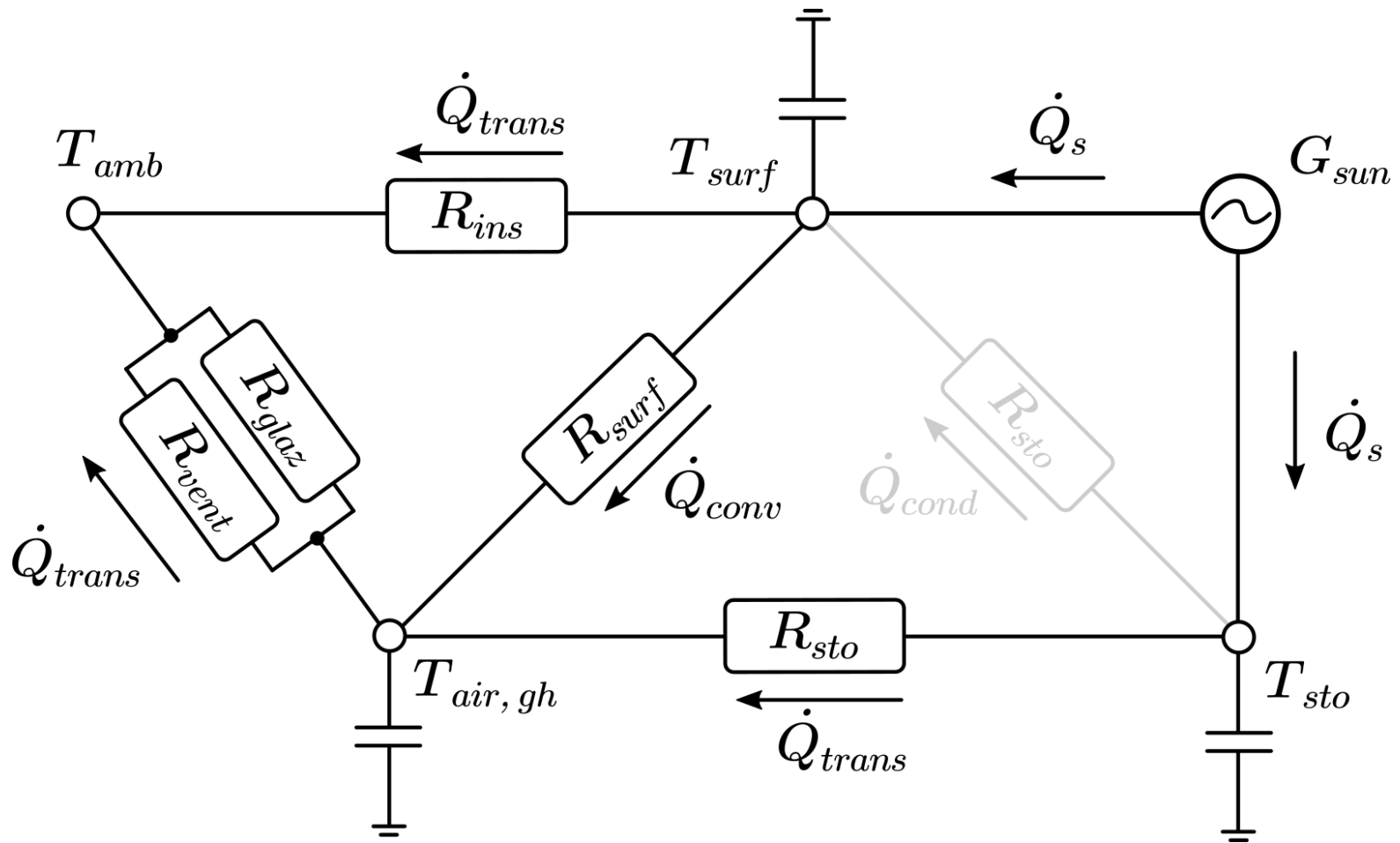


Thermal Model

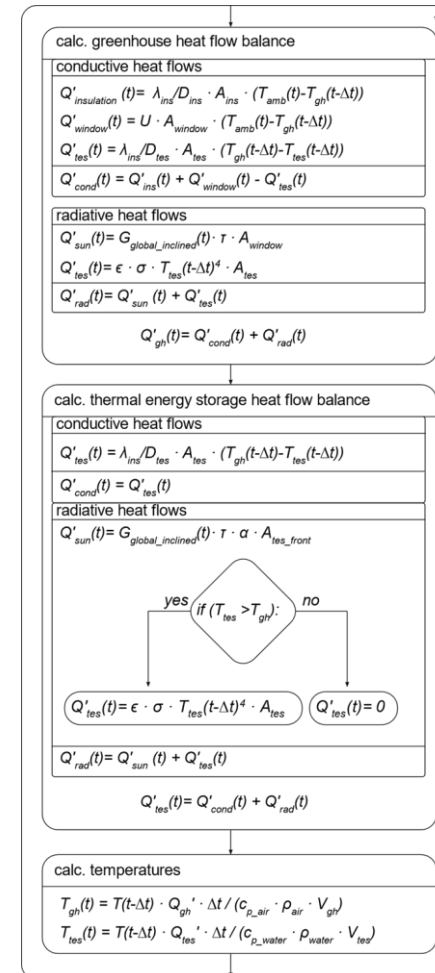
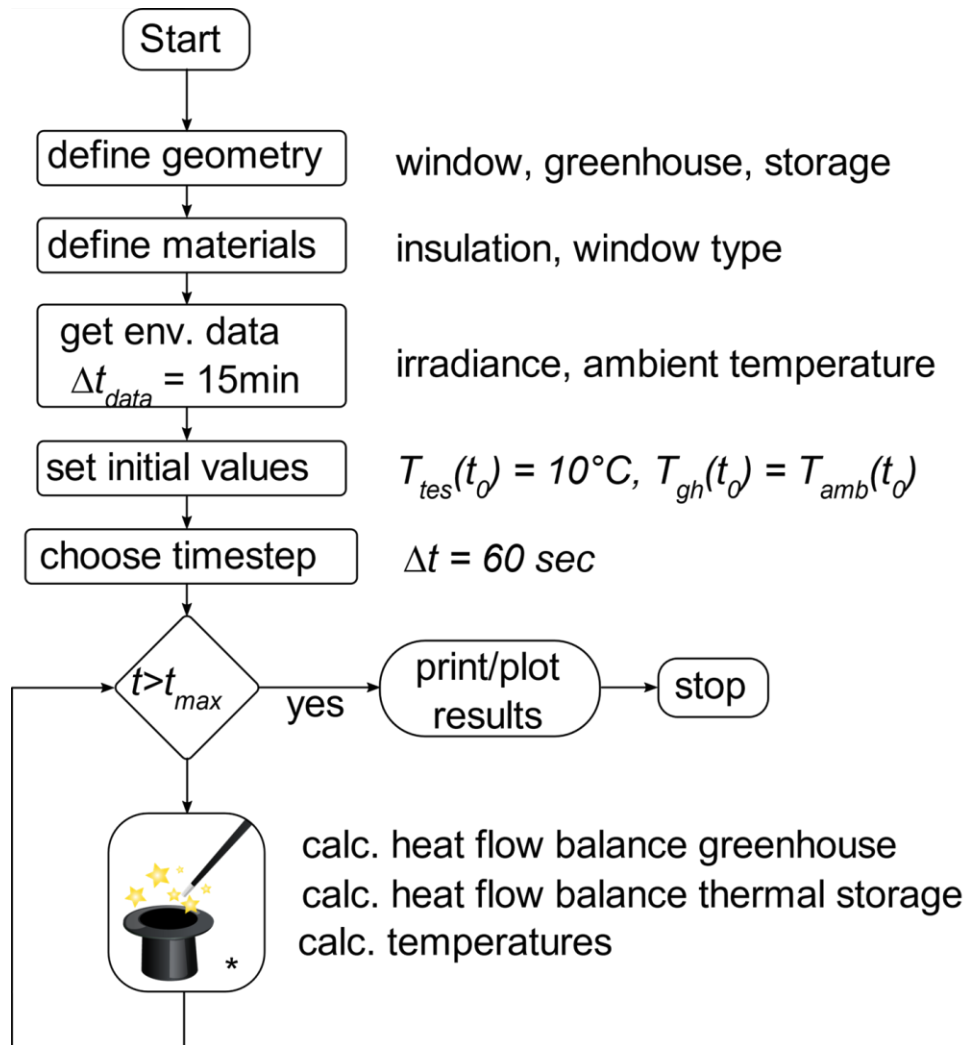


Heat transfer: **conduction**, **convection** and **radiation**

Thermal Model



Configurator - Flow Chart



Configurator - Interactive Jupyter Notebook

Construction Environment Simulation

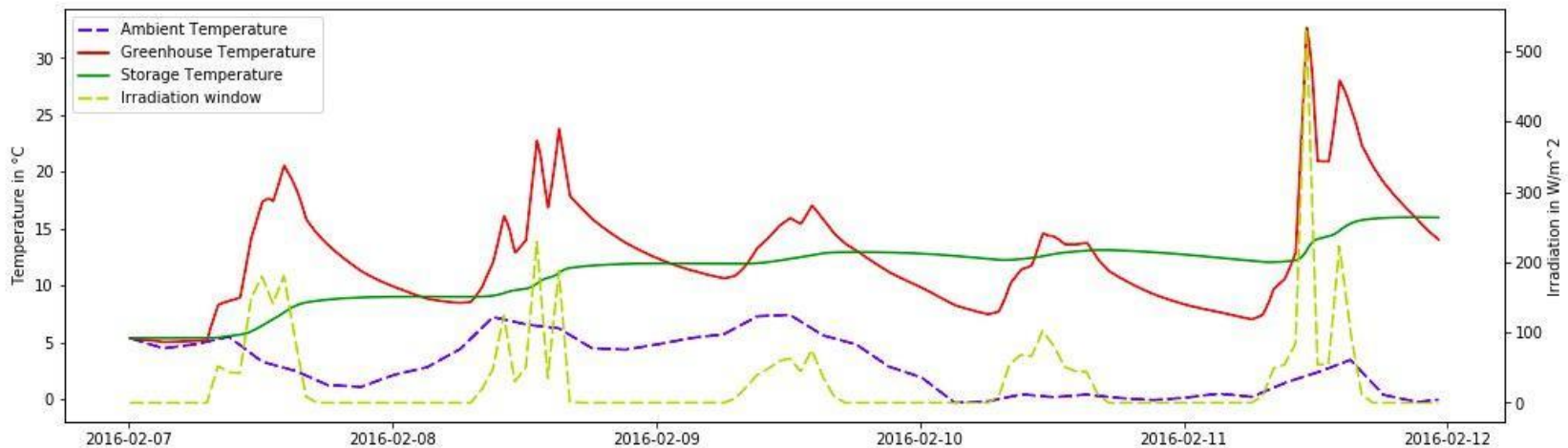
Window
Double glazing
Length [m] 1.00
Width [m] 0.90
Angle [deg] 60
Soil
Depth [m] 0.20
Frame
Width (top) [m] 0.30

Thermal Energy Storage - TES
Cuboid
Height [m] 0.65
Width [m] 0.35
Depth [m] 0.30
Container: PVC
Insulation
Material: Sheepwool
Width [m] 0.12

TES-
Volume: 68.25 L
Area-abs.: 0.23 m²
Area-eml.: 0.72 m²

Window-
Area: 0.90 m²

Frame-
Volume: 0.56 m³
Area: 3.05 m²



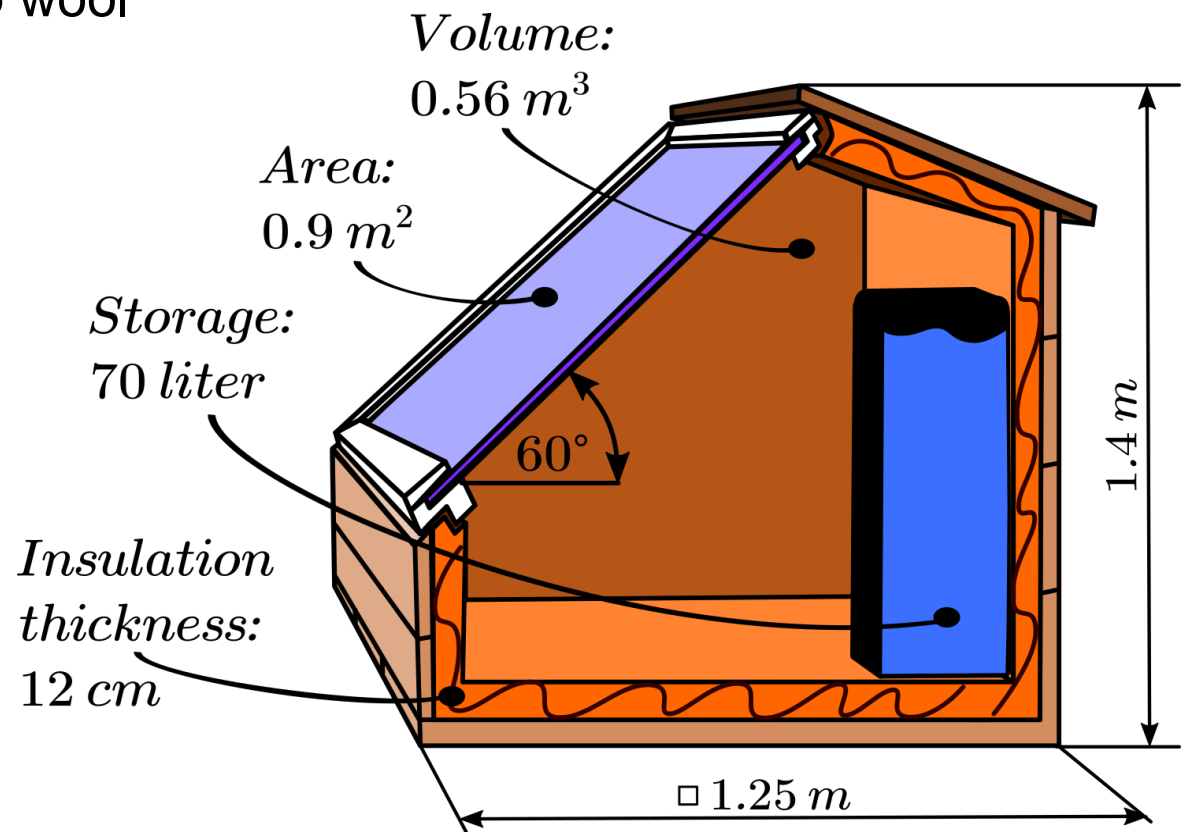
Construction

Window: double glazing

Insulation: sheep wool

Envelope: wood

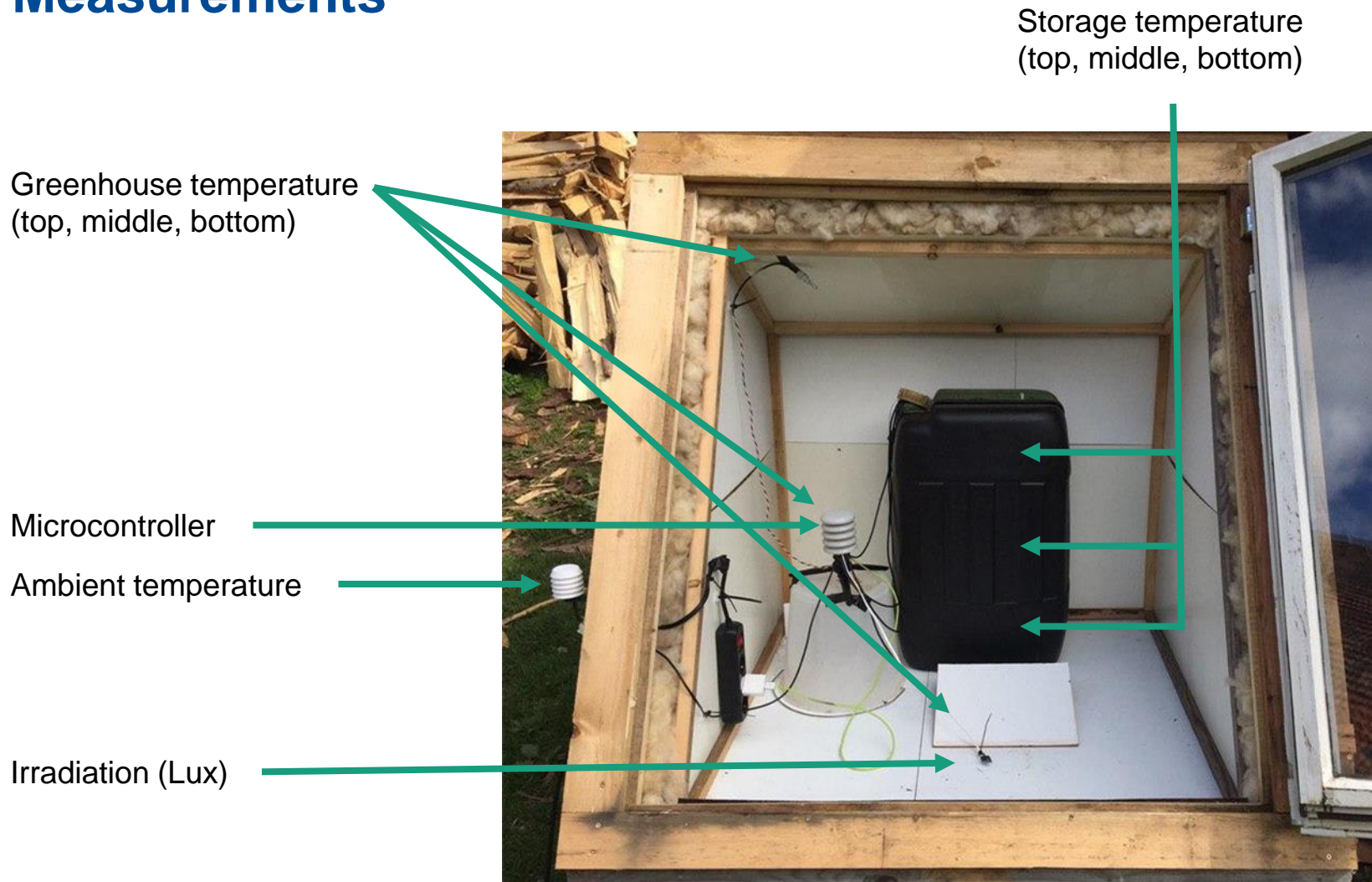
Storage: PVC



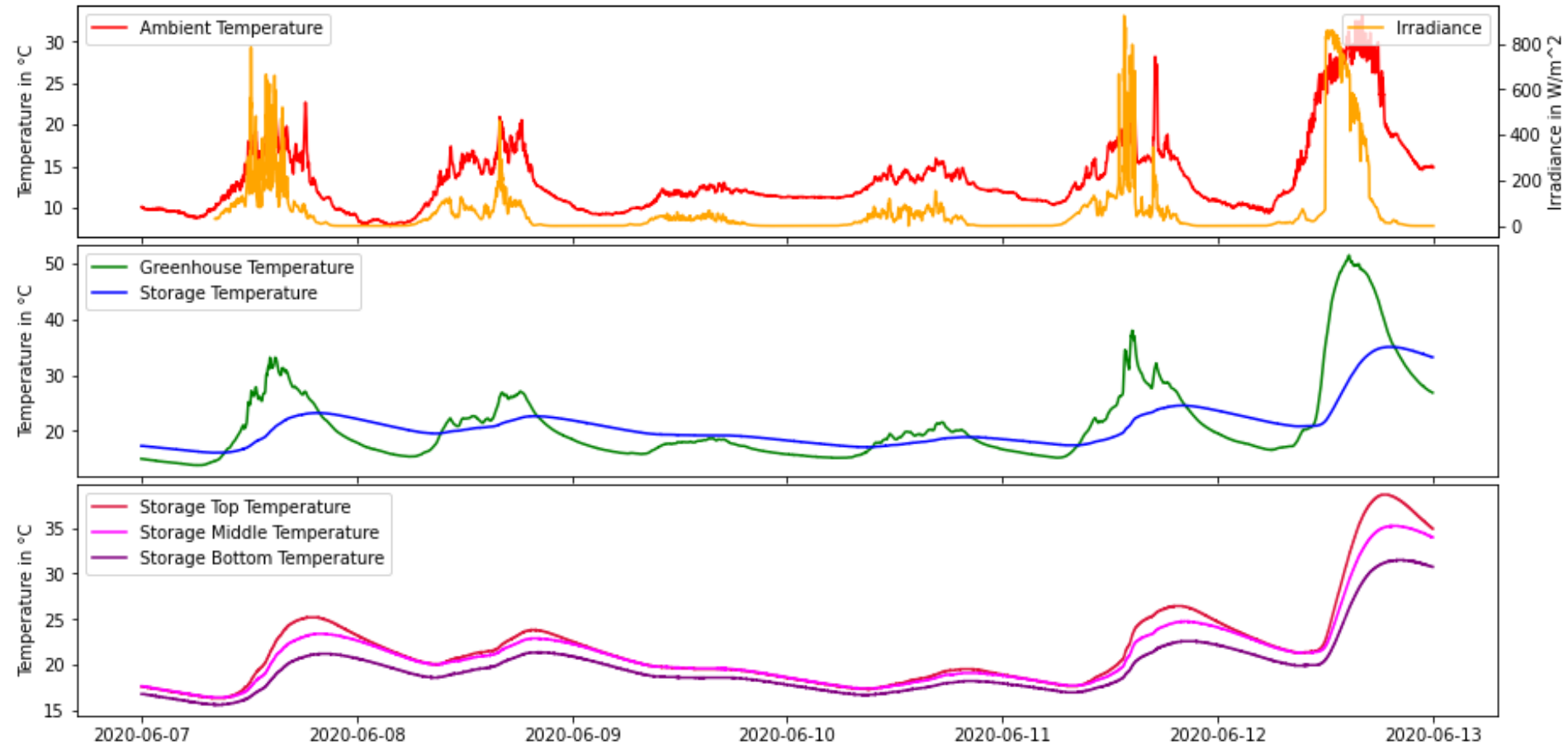
Construction



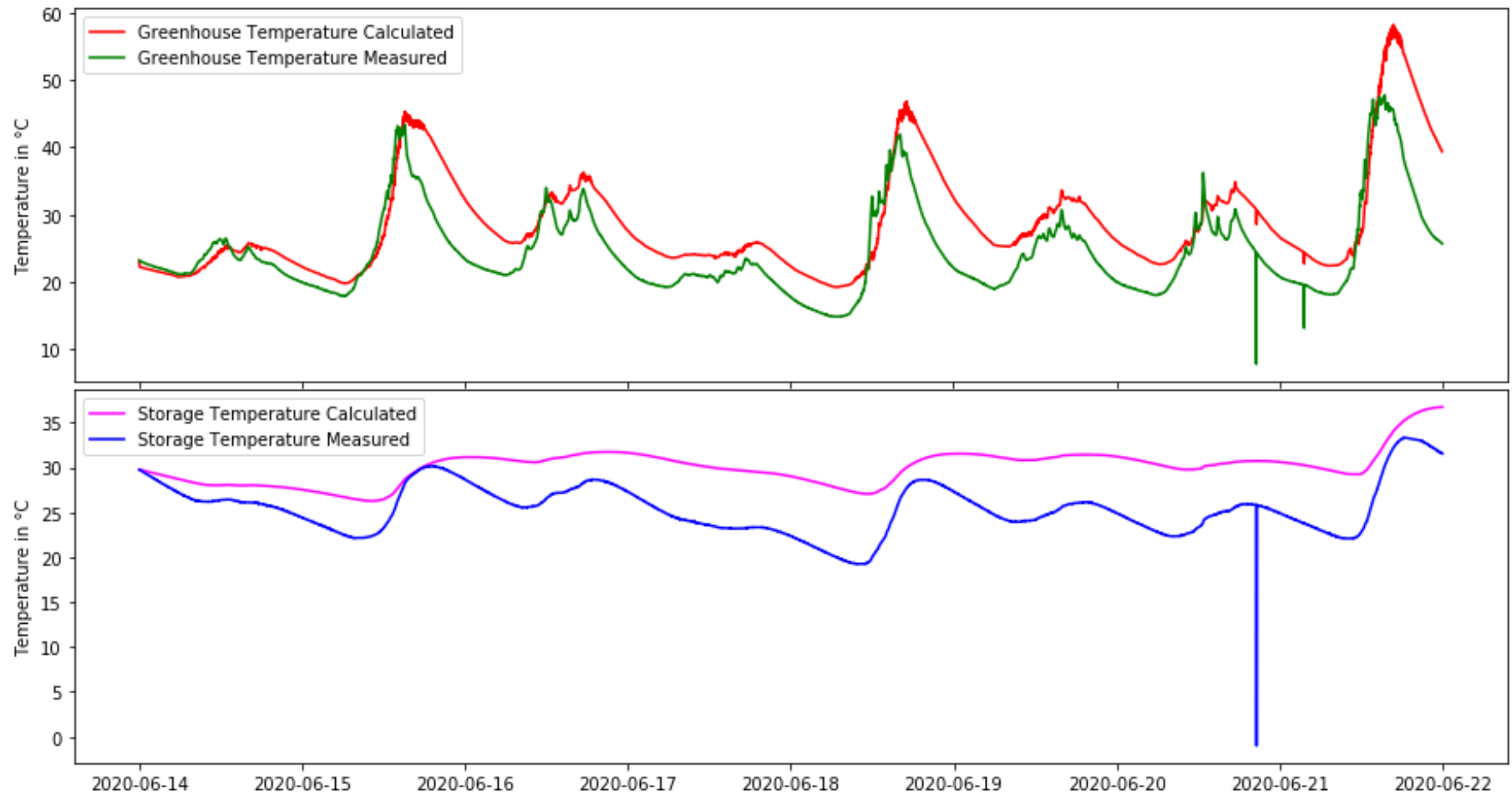
Measurements



Measurements



Evaluation



Conclusions

Deviations due to ...

- Constructive differences (e. g. geometry, material parameters)
- Neglected / uncertain thermal processes (e.g. ventilation number)
- Approximated irradiance measurement

Achievements

- Solar greenhouse with sustainable component acquisition
- Interactive configurator tool (Jupyter notebook) available on:
<https://github.com/Taubenstrohhalm/SolarThermalColdframe>

Thanks a lot for your attention!

