



CONSTRUCT

U.PORTO

FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

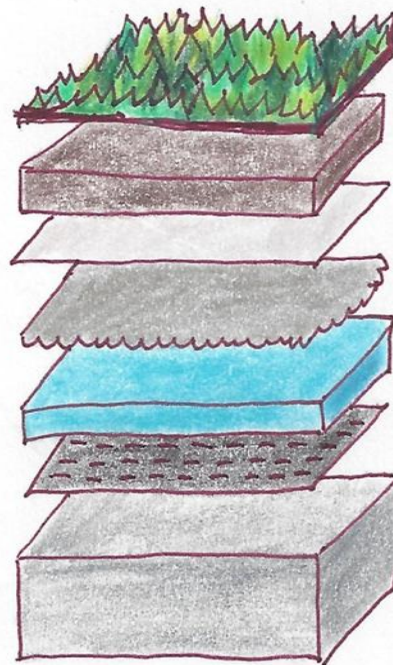
Green Roofs Hygrothermal Behaviour

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Supervisor: Nuno Ramos

Co-supervisor: Hartwig Künzle

2017



VEGETATION

SUBSTRATE

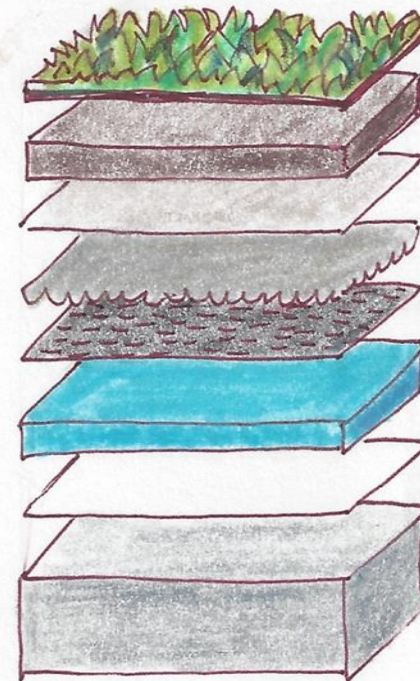
FILTER LAYER

DRAINAGE LAYER

INSULATION

WATERPROOFING
MEMBRANE

STRUCTURE



VEGETATION

SUBSTRATE

FILTER LAYER

DRAINAGE LAYER

WATERPROOFING
MEMBRANE

INSULATION

VAPOUR BARRIER

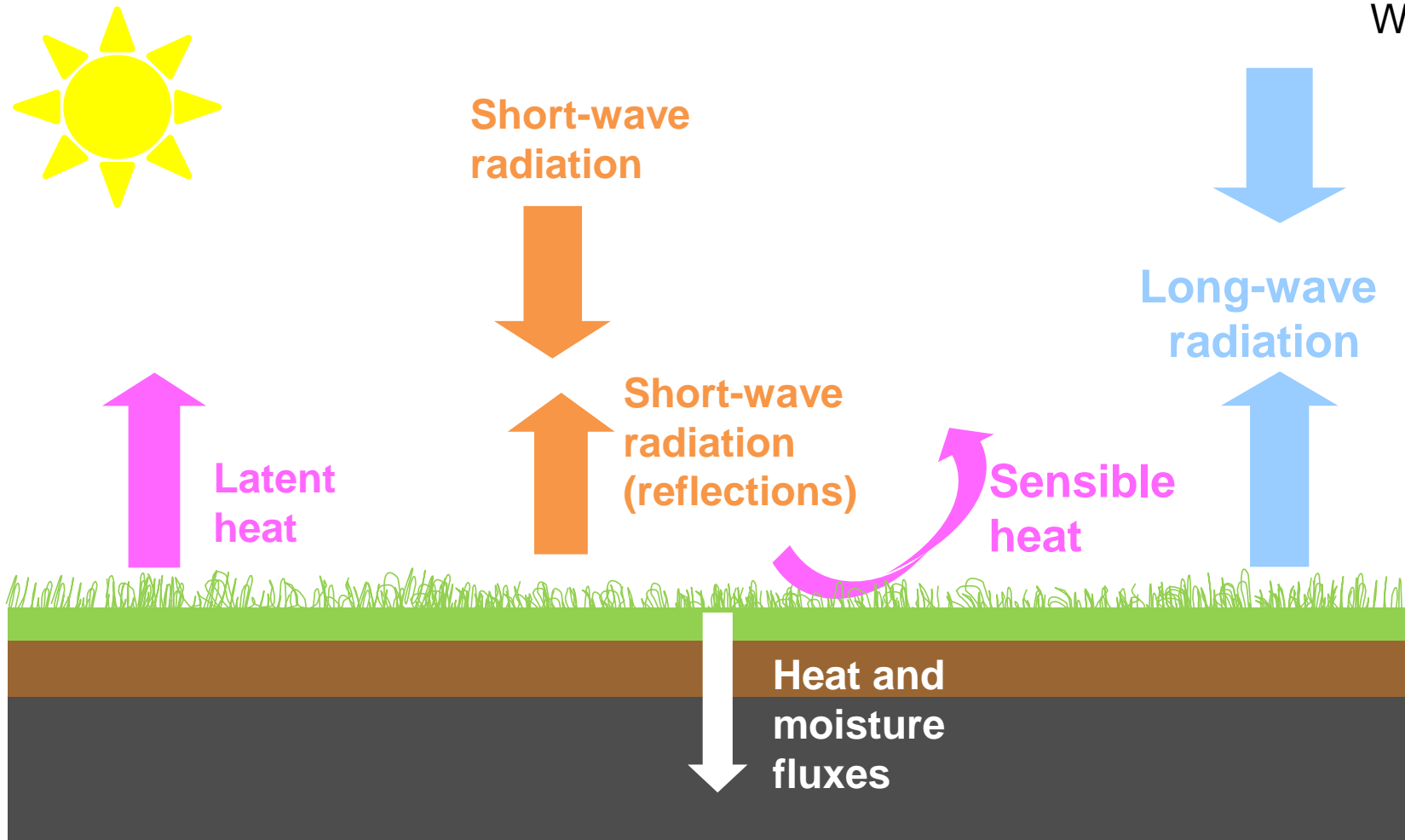
STRUCTURE

quantitative benefits evaluation
(building, “comfort” and city)

best technical and economic solution

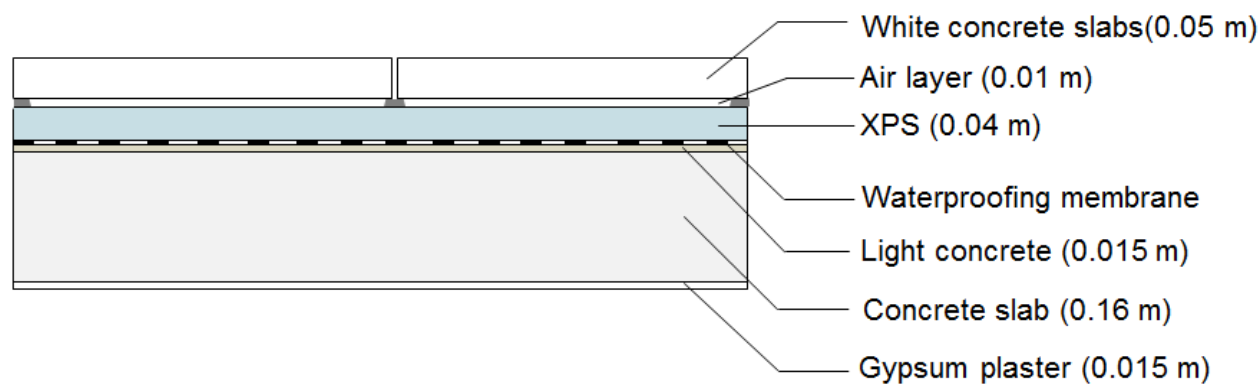
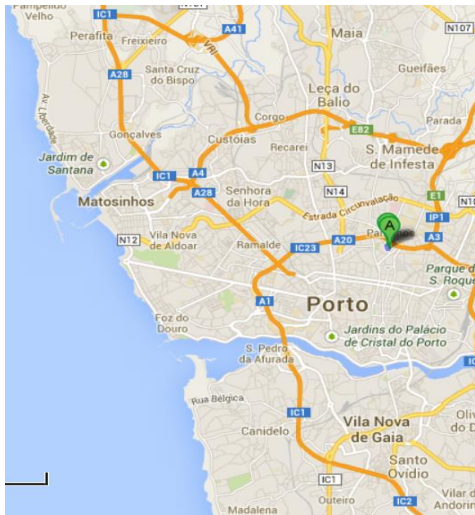


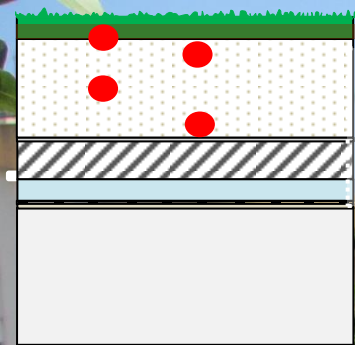
Green roof hygrothermal modelling





Experimental assessment of green roofs performance

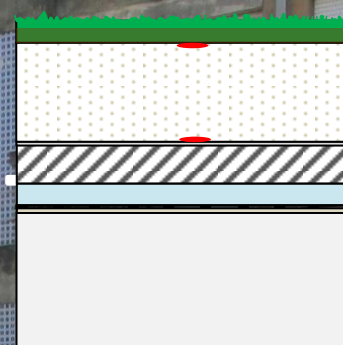




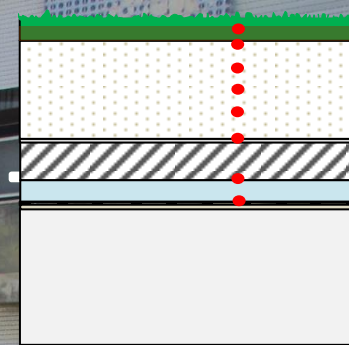
**Water
content**



**Temperature
Profile 1**

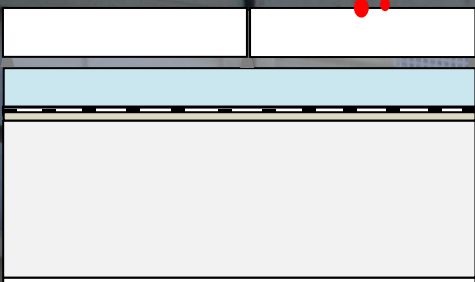


Heat fluxes

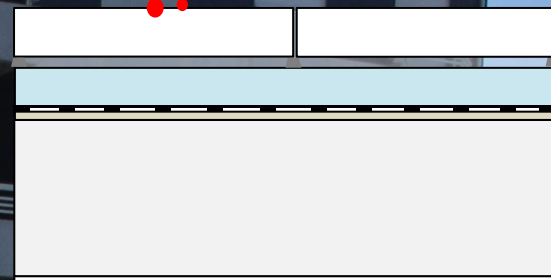


**Temperature
Profile 2**





**Temperature
Profile 1**

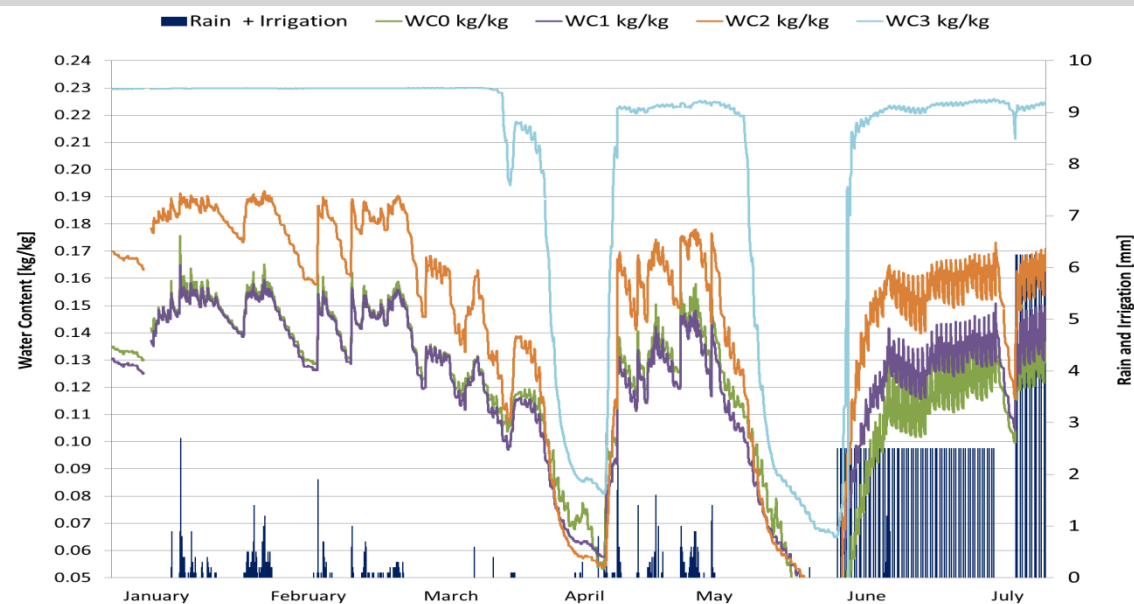
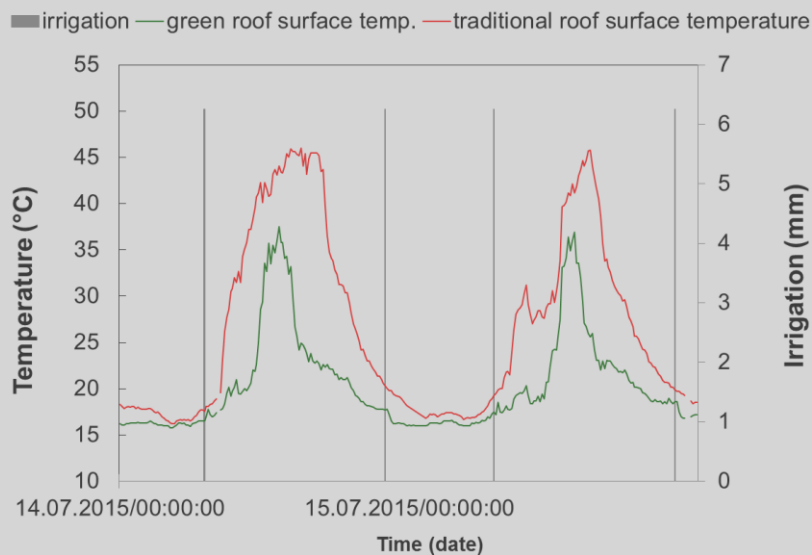
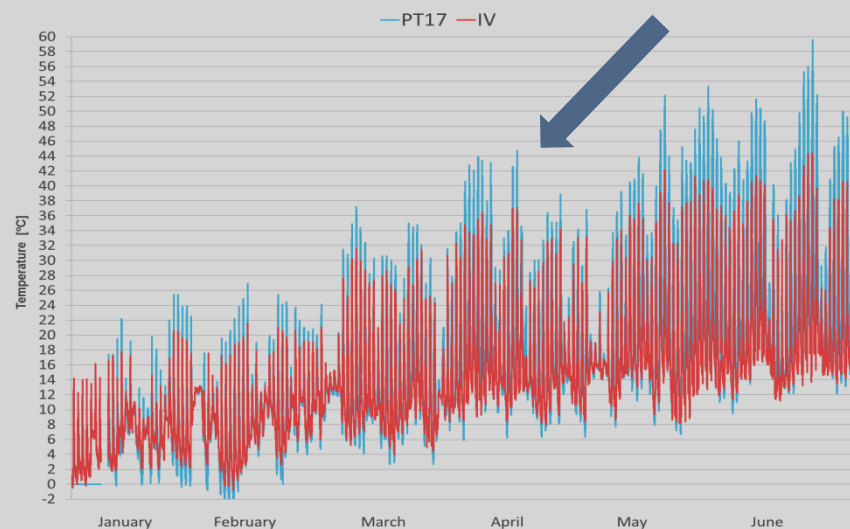


**Temperature
Profile 2**

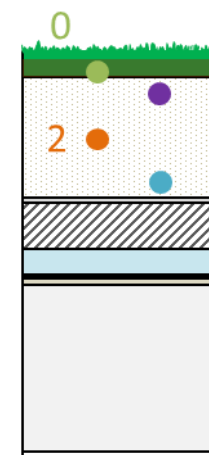




Measured Surface Temperatures



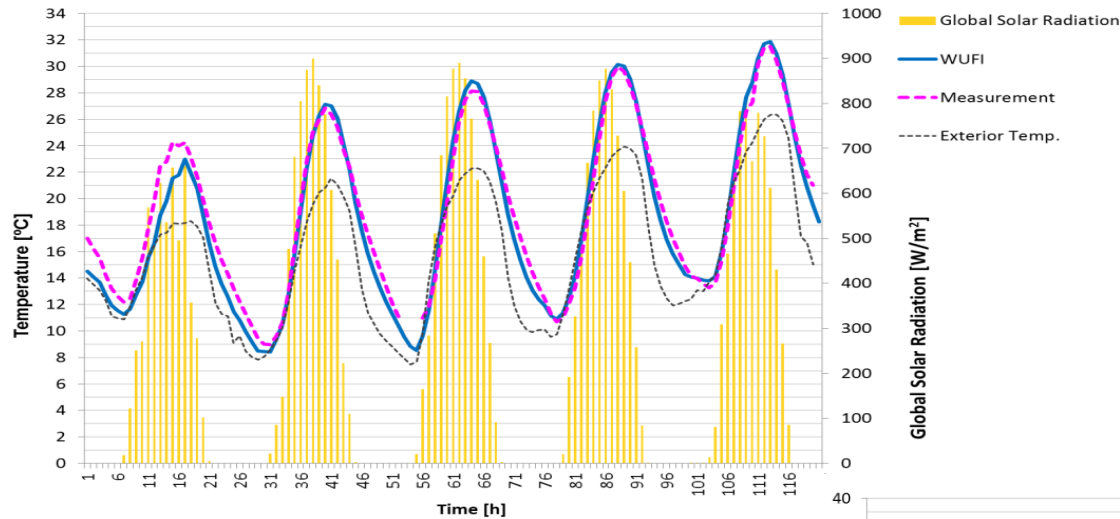
irrigation





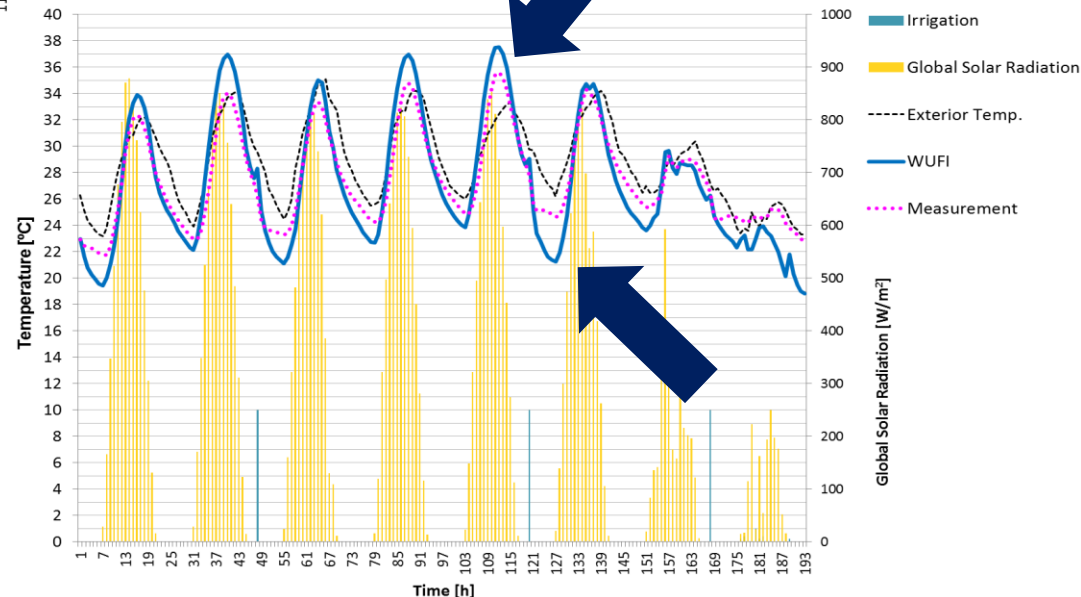
Green Roof Numerical Simulations

Measured vs simulated – near surface temperature



without rain events

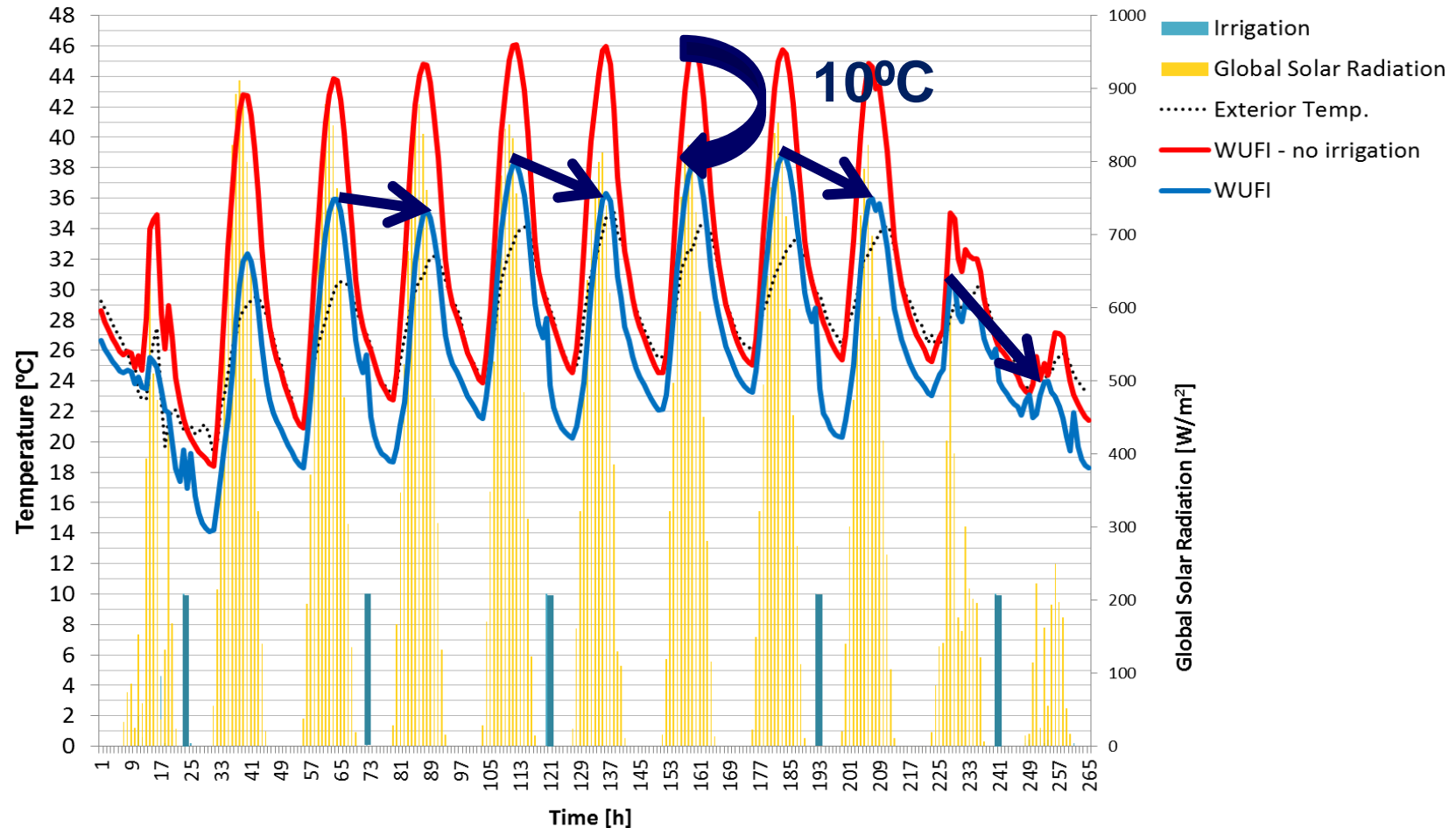
with irrigation events



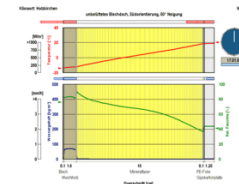
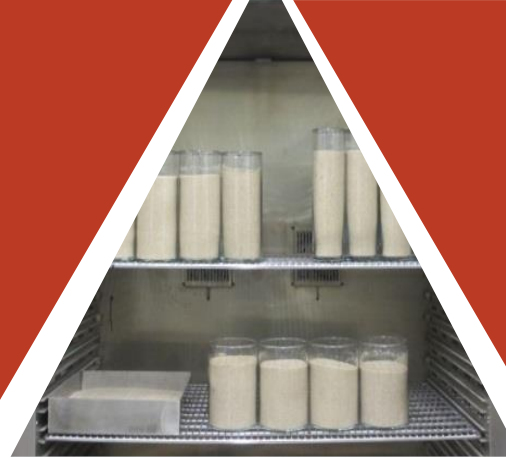
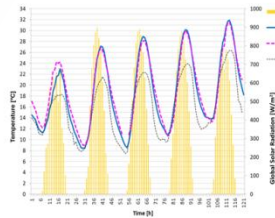
Numerical Simulations

Simulated Surface Temperatures

irrigation vs no irrigation



Conclusions



irrigation
scenarios

