Simulation of weathered colour change on an untreated aspen façade

Thomas Thiis, Petter Stefansson, Stergiani Charisi, Ingunn Burud

Norwegian University of Life Sciences,

Department of Mathematical Sciences and Technology

Ås High school

- Untreated aspen facade
- 10 years old

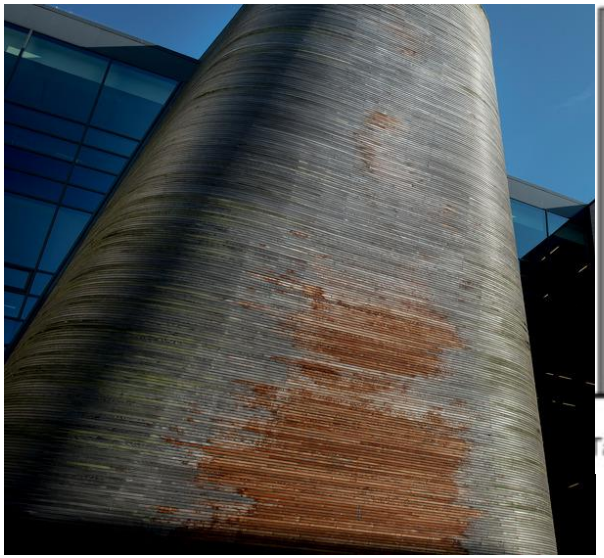
Relevant climatic loads

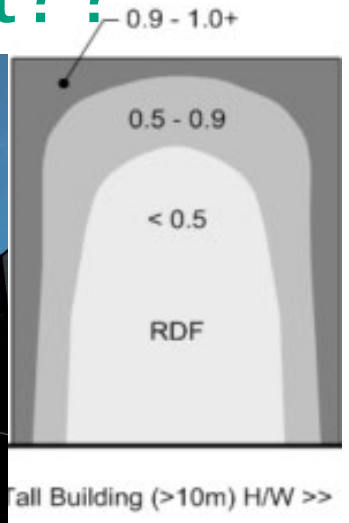
- Temperature (dimensional stability, cracking, moulding)
- Moisture (dimensional stability, cracking, moulding)
- Driving rain, wind (Moisture, erosion)
- Solar radiation (ligning degradation, temperature, moisture)

Department of Mathematical Sciences and Technology

Which parameter is most important??

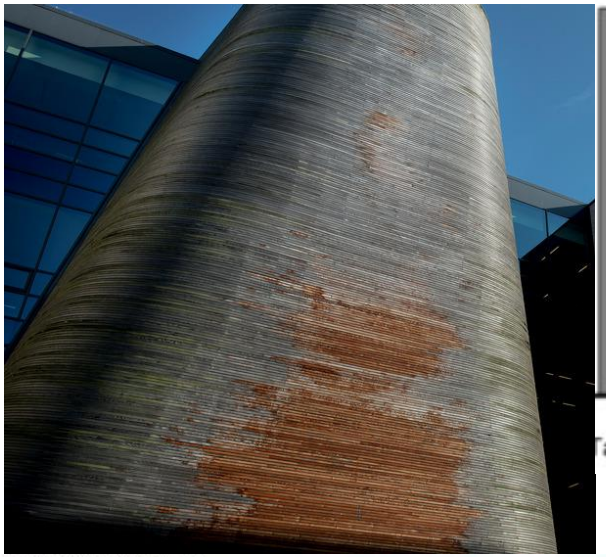
- Rain?

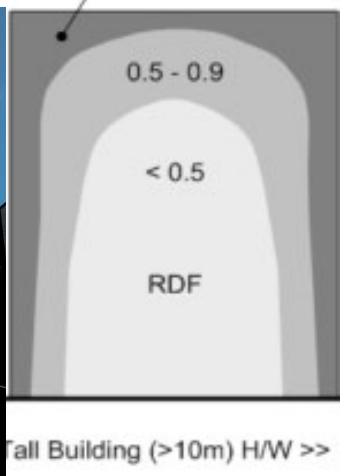




Which parameter is most important??

- Rain?





- Temperature?

Which parameter is responible??

- Solar radiation?

Statement:

The multitude of degradation effects makes it difficult (-impossible ?) to make an analytic model for color change

Solution:

Regression model

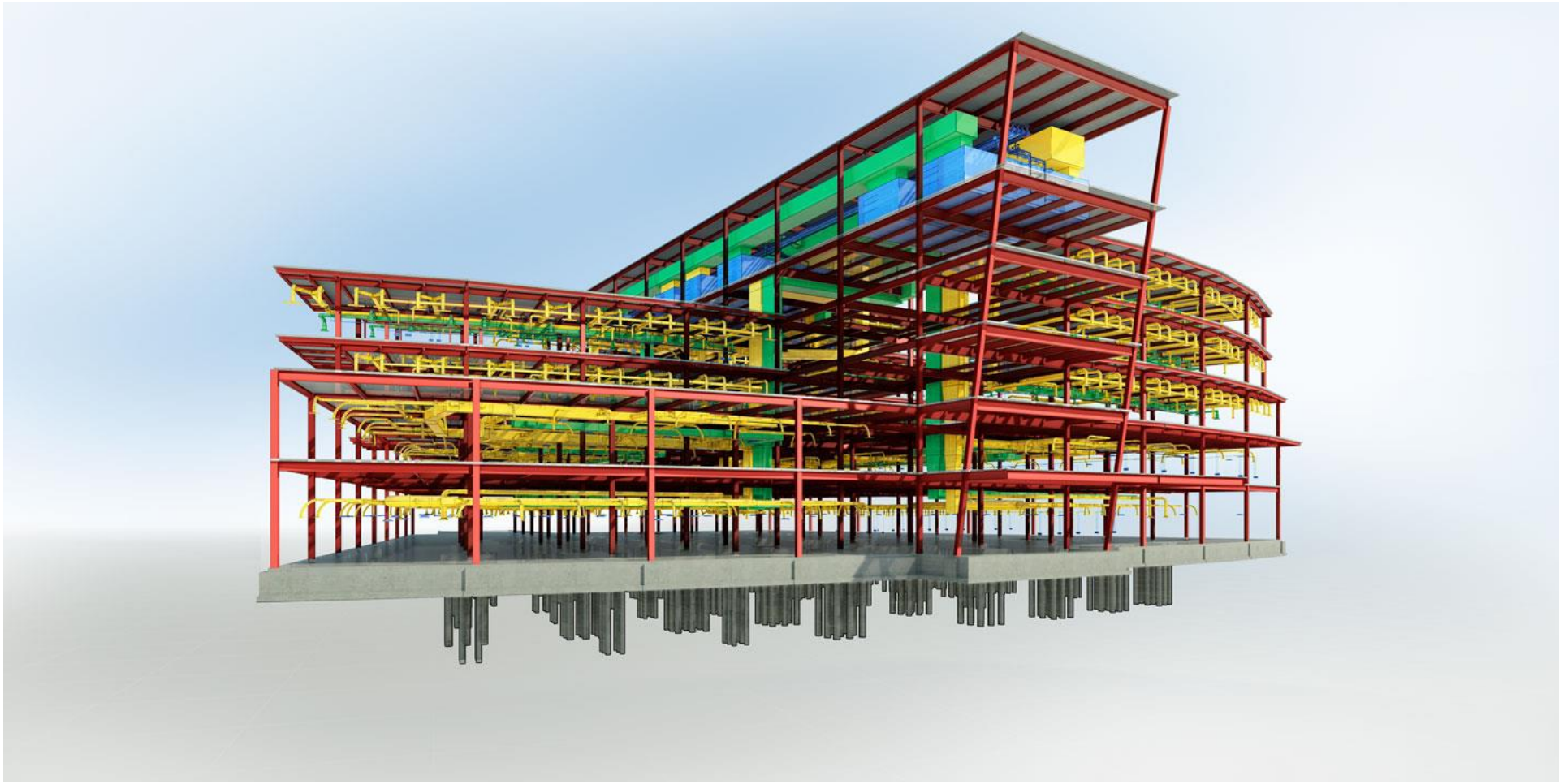
Regression model is trained by:

- Surface climate
- Wood colour

Regression model is trained by:

- Surface climate
- Wood colour

Building Information Model (BIM)



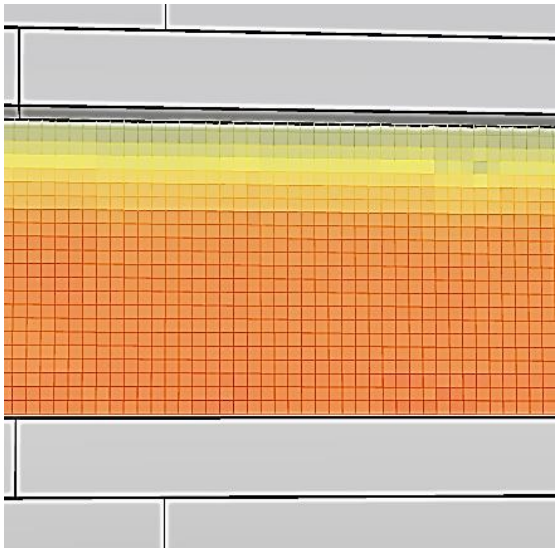
Ås High School

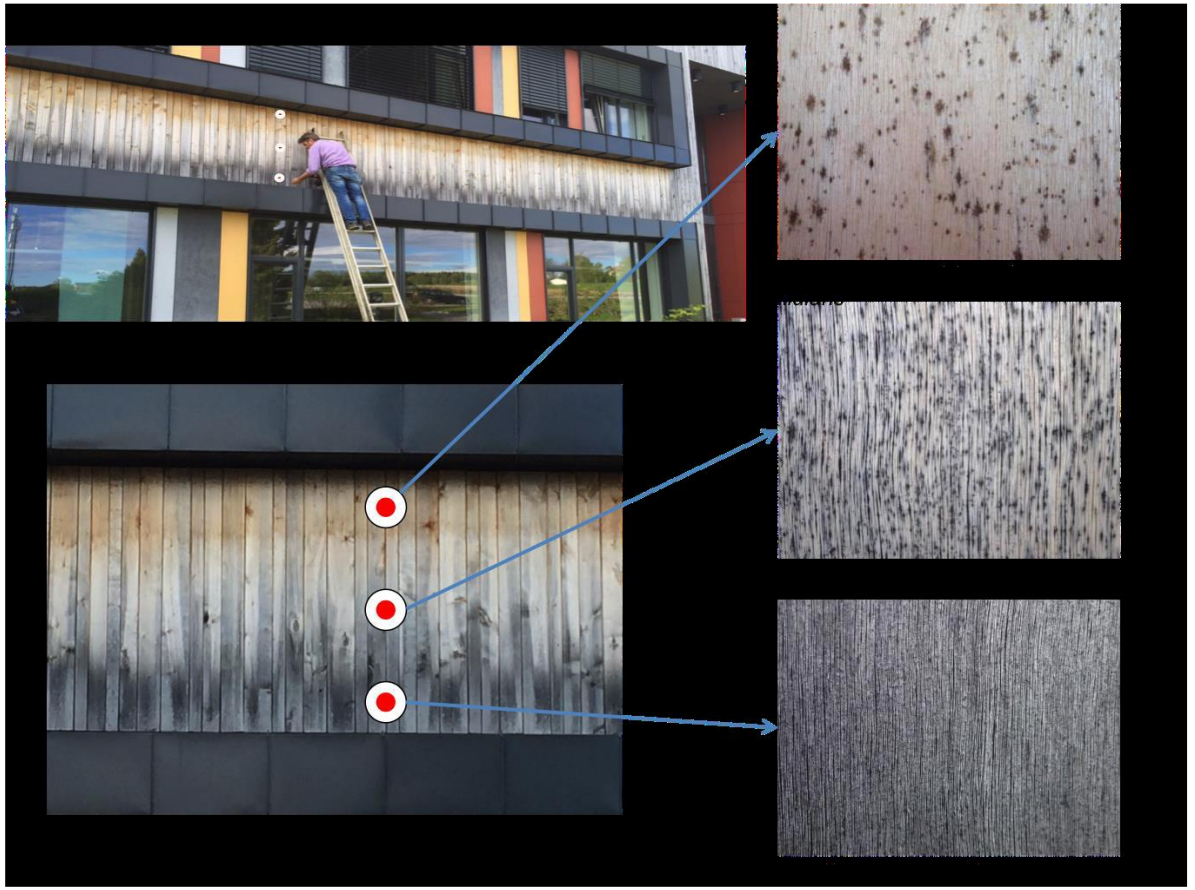
Ås High School

Surface meteorological models

- Model for surface meteorological conditions is driven by ambient meterological data (ambient temperature, solar radiation, Relative Humidity (RH), precipitation and wind)
- Results in high resolution spatial and temporal meteorological data (hourly data, 10 cm grid).
- Used for modelling wood moisture and temperature

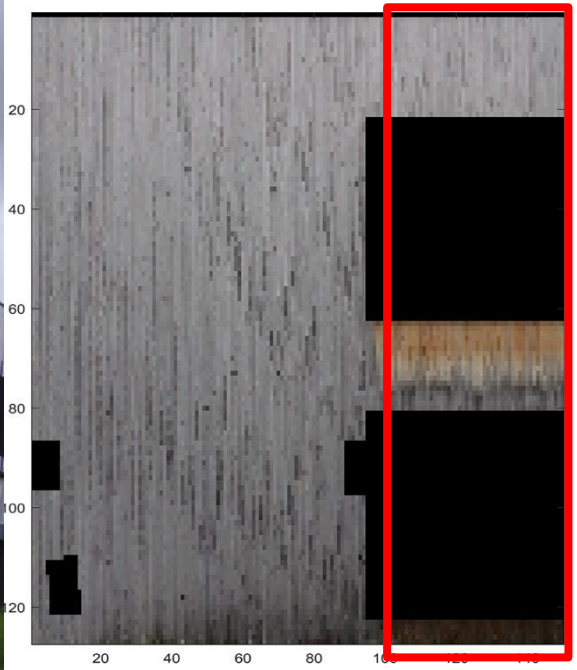
Simulation grid





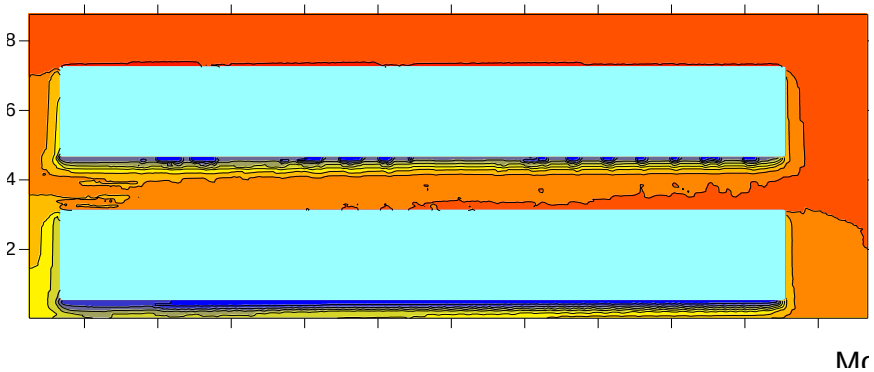
Surface colour

- RGB photo



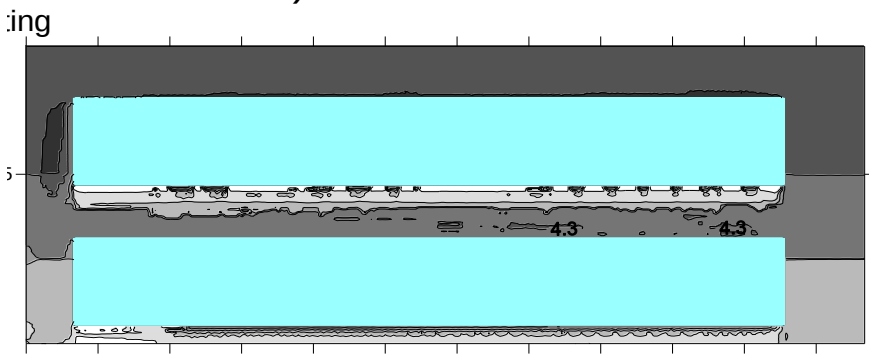
meteorological data -> climate

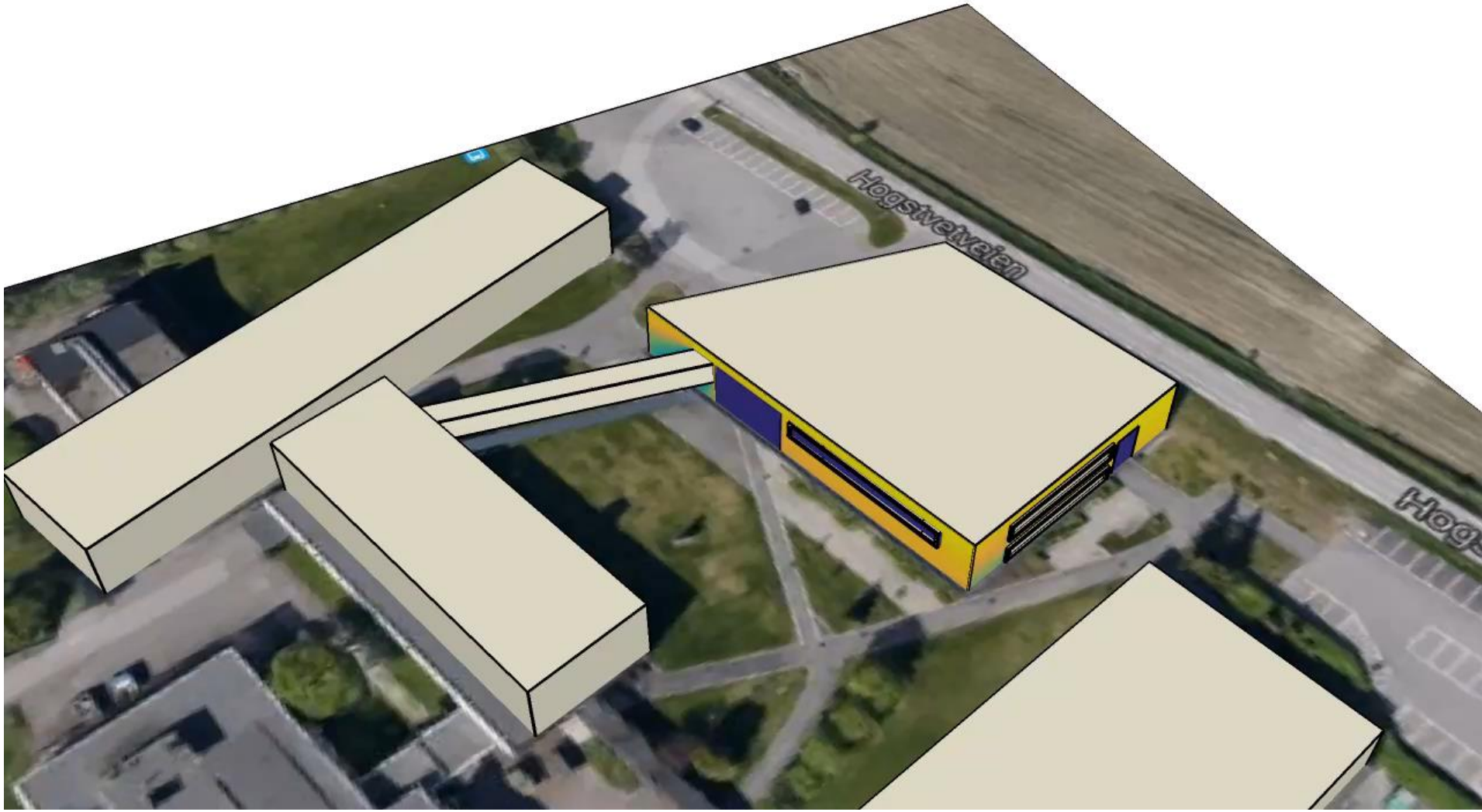
- Radiation



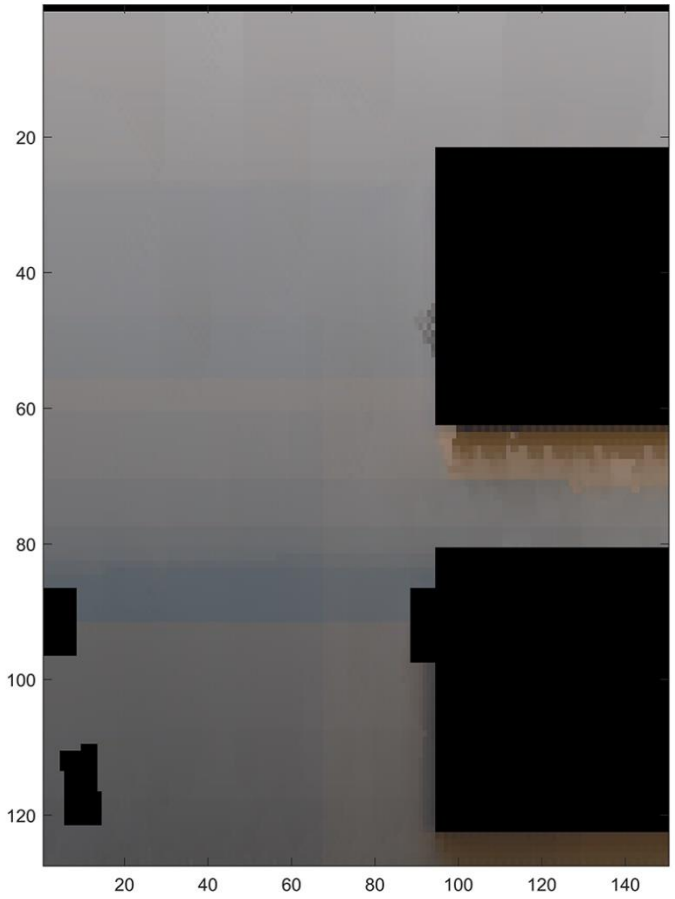
- Mould rating (Thelanderson&Isaksson)

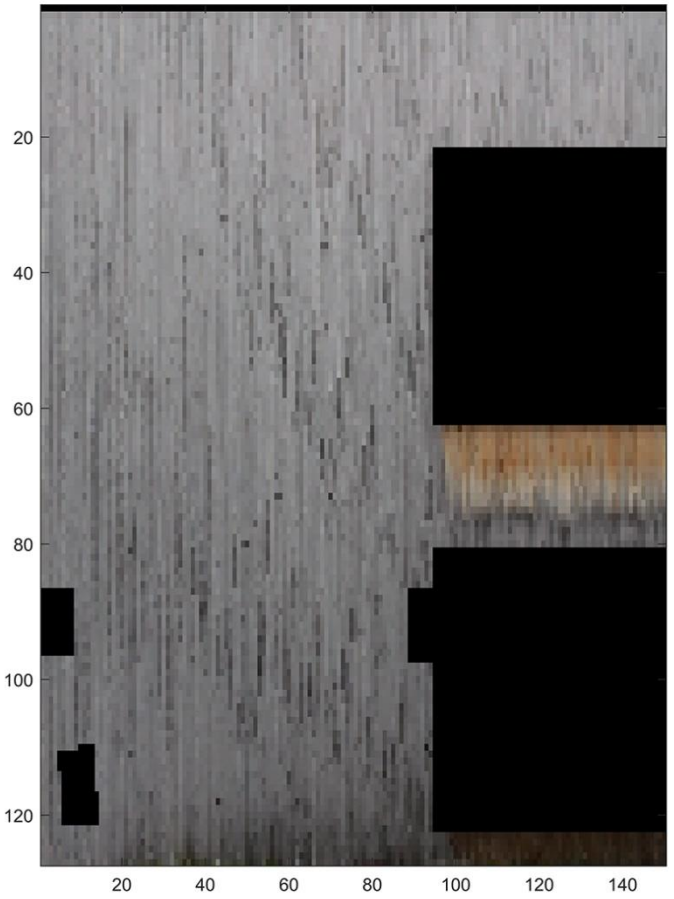
(temperature and moisture)




Hogsiveivatan

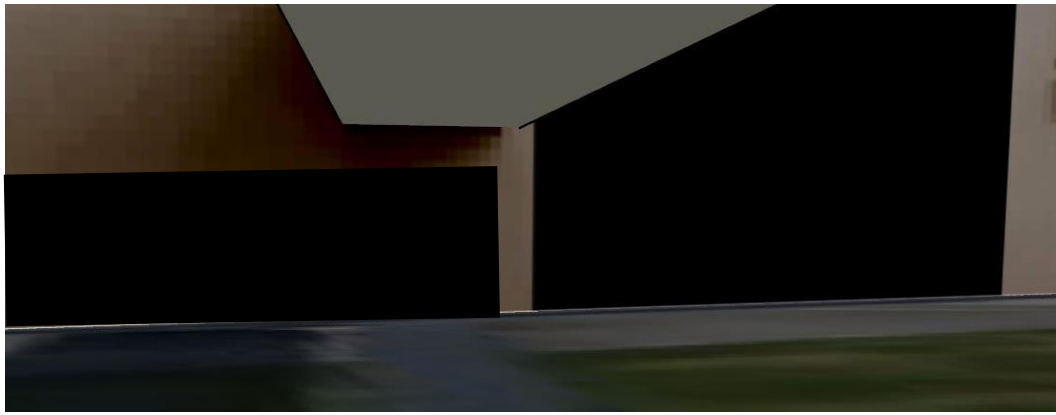
Results


20
40
60
80
100
120
20
40
60
80
100
120
140

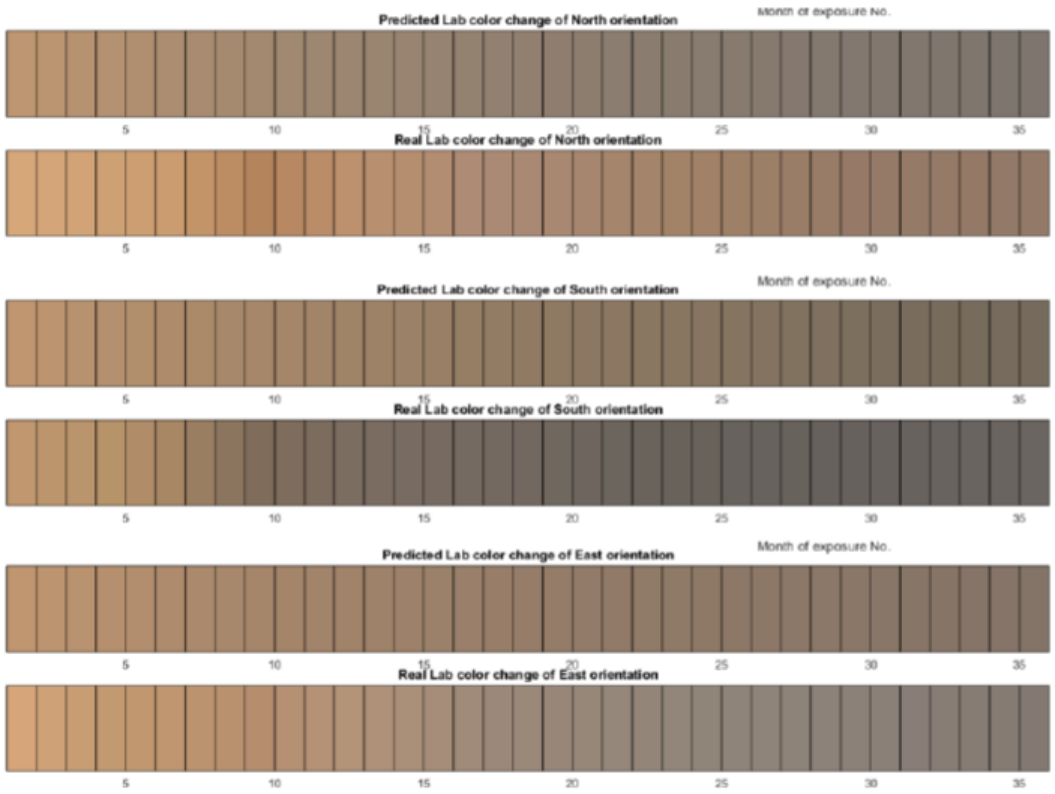

20
40
60
80
100
120
20
40
60
80
100
120
140

Results

Results



Development of colour model
(in cooperation with Uni. Ljublijana)



predicted colour

real colour

NORTH

predicted colour

real colour

SOUTH

predicted colour

real colour

EAST

Future use of the surface climate models

- Improved color change model using data from RoundRobin campaign
- Thermo mechanical degradation (cracking)
- Paint degradation
- Maintenance planning

Last slide!