

# Data Set for Empirical Validation of Double-Skin Façade Model

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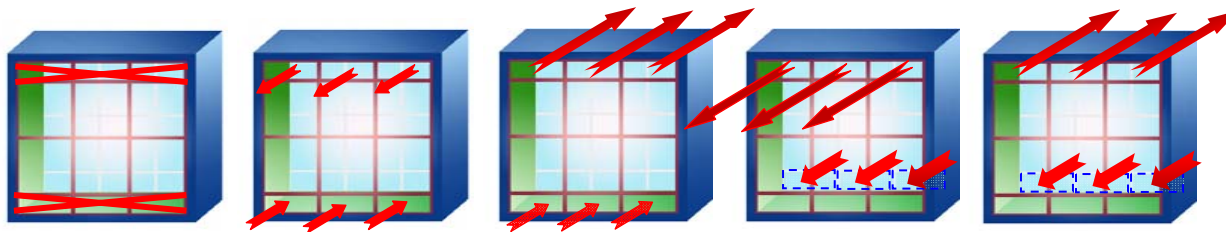
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# ... a few words about DSF

- Functioning modes of DSF

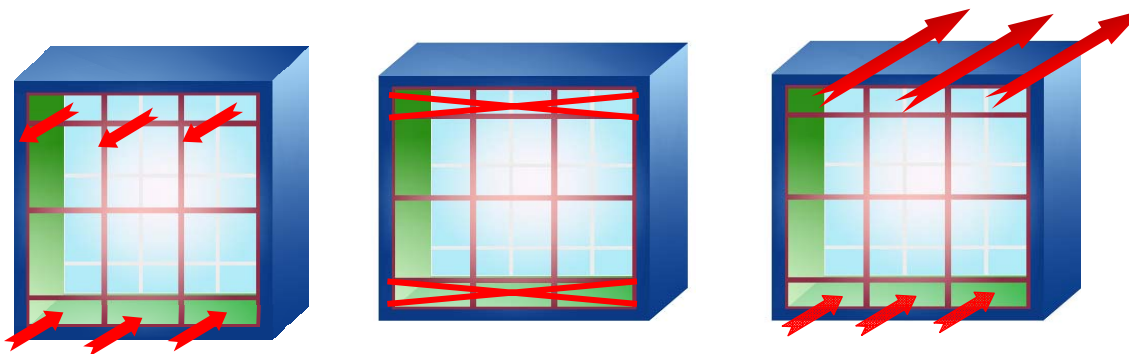


- Modeling of DSF
- Availability of the experimental data
- DSF solutions are being proposed in the building design and erected, resulting in poor indoor climate and unnecessary energy use. It is therefore critical to expand knowledge about dimensioning of DSF buildings, to obtain some tools, which can help to optimize the performance of DSF systems.

# Outdoor test facility 'The Cube'



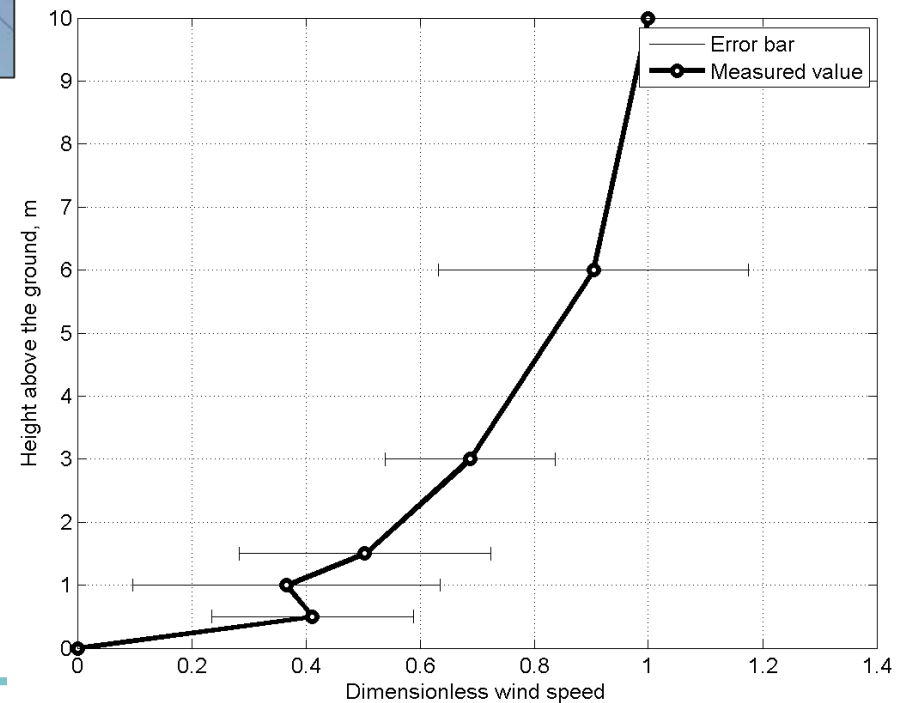
- Open flat country
- Windows facing South
- DSF internal dimensions:
  - height 5.5m
  - width 3.6m
  - depth 0.58m
- Tested ventilation modes:
  - External air curtain
  - Transparent insulation mode
  - Preheating mode



# I. Boundary conditions



- Outdoor air temperature
- Relative humidity
- Global solar radiation
- Diffuse solar radiation
- Wind speed
- Wind direction
- Wind profile



# Preliminary tests

- Air temperature measurement under the direct solar radiation
- Temperature variation in the adjacent room
- Air speed measurement under the direct solar radiation
- Measurement of the discharge coefficients
- Spectral properties of the glazing
- Ground reflectance
- Spectral properties of the internal surfaces
- Air tightness of 'The Cube'
- Calibration of the heat losses in 'The Cube'

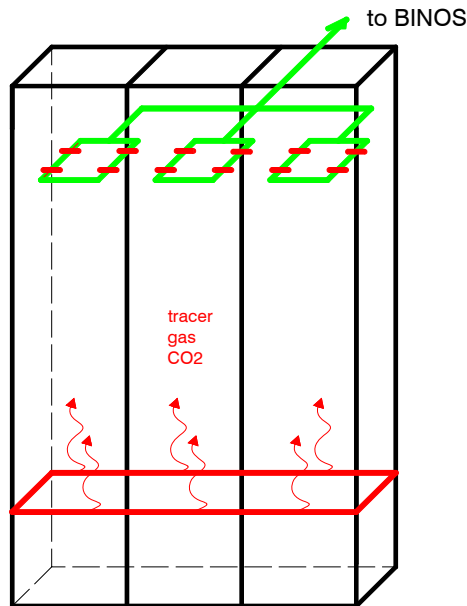




# Air flow



- Naturally driven flow
- Hot-spheres placed in 6 levels

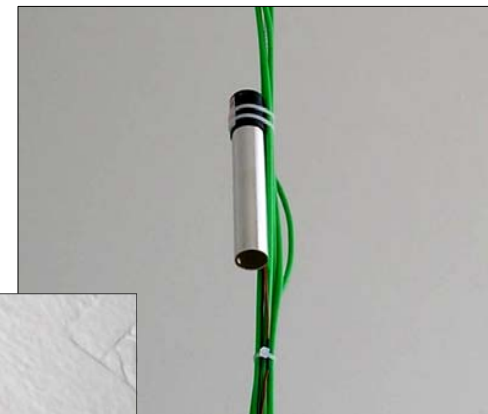


- 10Hz sampling frequency
- Constant injection of CO<sub>2</sub> tracer gas, apx. 5 l/min

# Temperature measurement

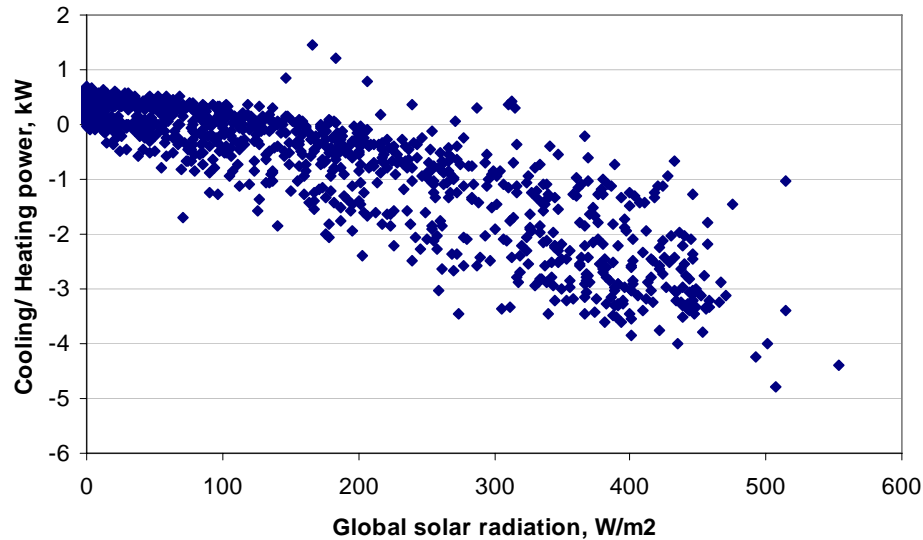
104 Thermocouples

- Wall surfaces
- Floor/Ceiling surfaces
- Vertical temperature gradients
- Window surfaces
- Under the foundation
- Outside temperature
- Air temperature in the outlet from DSF





# Cooling/Heating of adjacent room



- Temperature difference of the supply and return water in the cooling unit
- Water mass flow



# Summary

The experimental methods have sources of errors; the experimental results are limited in time and available only for certain boundary conditions. Nevertheless, the availability of these results is very important for further research and improvement within the DSF concept.

Long term monitoring of naturally driven mass flow rate is rather unique for the field of natural ventilation.

Possibility to test and compare DSF performance in the different ventilation modes, with and without shading devices allows to fill in the gap of lacking experimental studies

Thank you!