

Validation of a coupled CFD-HAM model with a climate chamber experiment on a small wall sample

9th Nordic Symposium on Building Physics – NSB 2011
29 May – 2 June 2011

Marnix Van Belleghem, Marijke Steeman,
Arnold Janssens, Michel De Paepe

Introduction

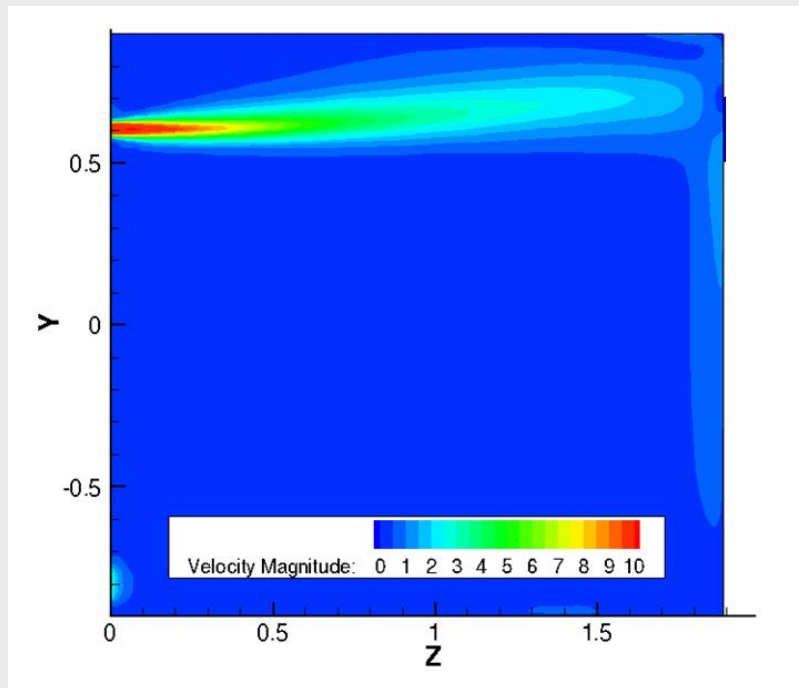
Validation of a coupled CFD-HAM model
with a climate chamber experiment
on a small wall sample

Introduction

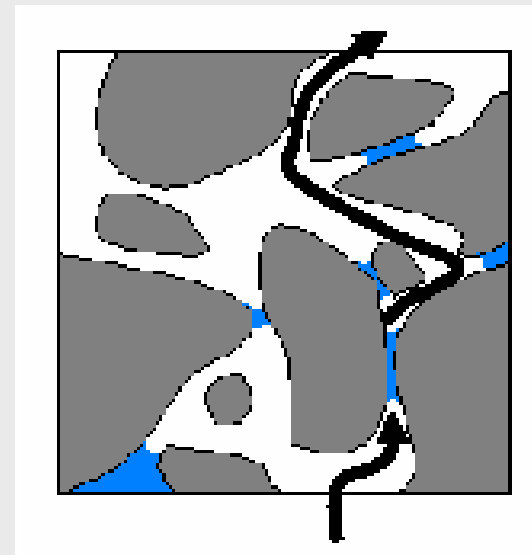
Validation of a **coupled CFD-HAM** model
with a **climate chamber** experiment
on a **small wall sample**

Coupled CFD-HAM model

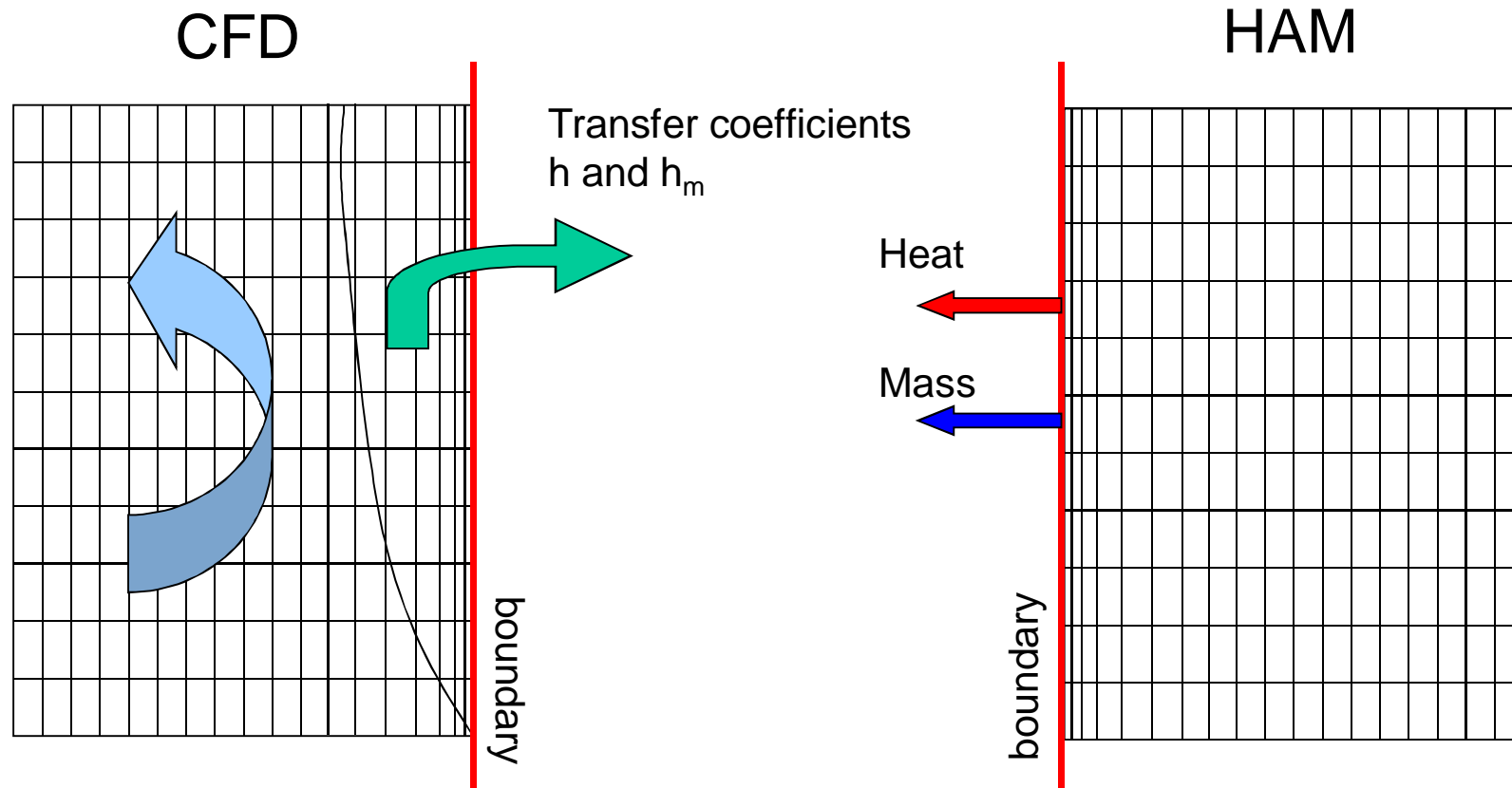
- CFD
 - Computational Fluid Dynamics



- HAM
 - Heat, Air and Moisture transport modelling

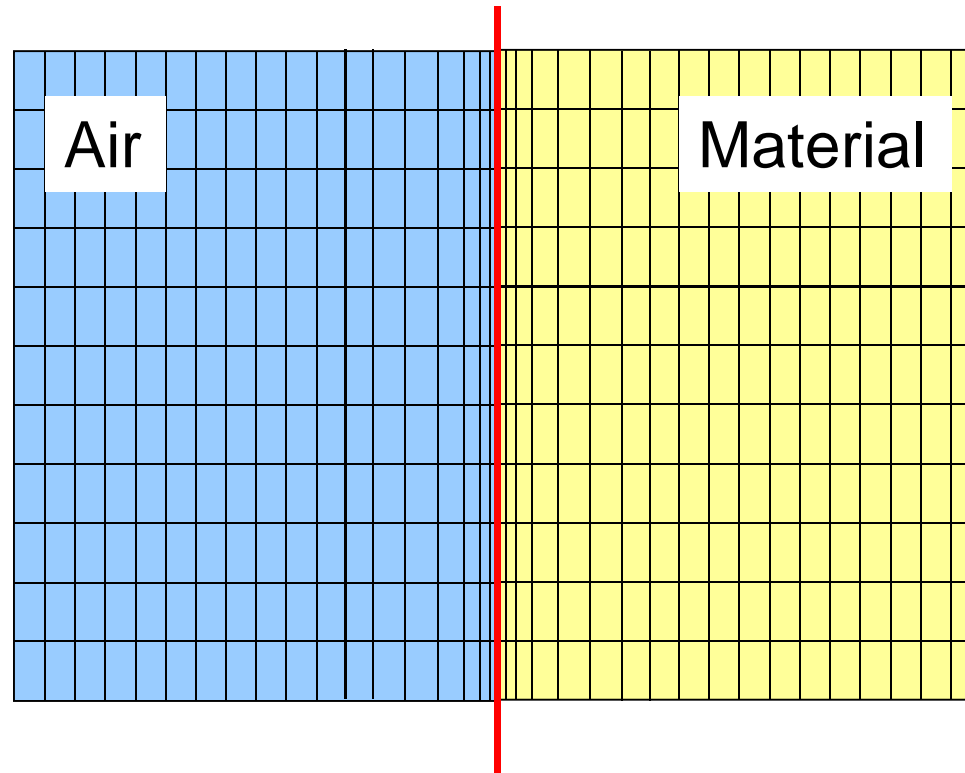


Indirect coupling approach

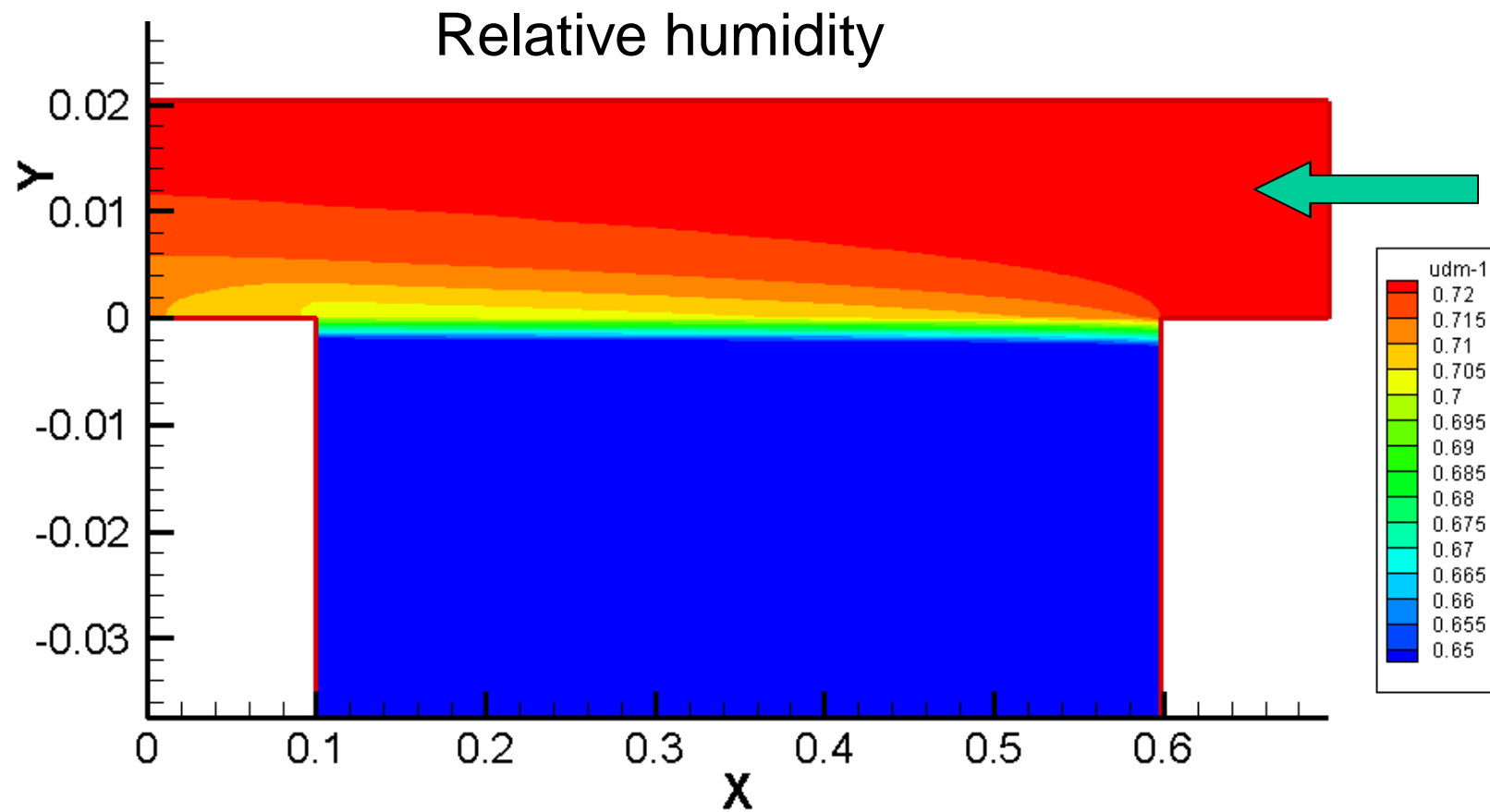


Direct coupling approach

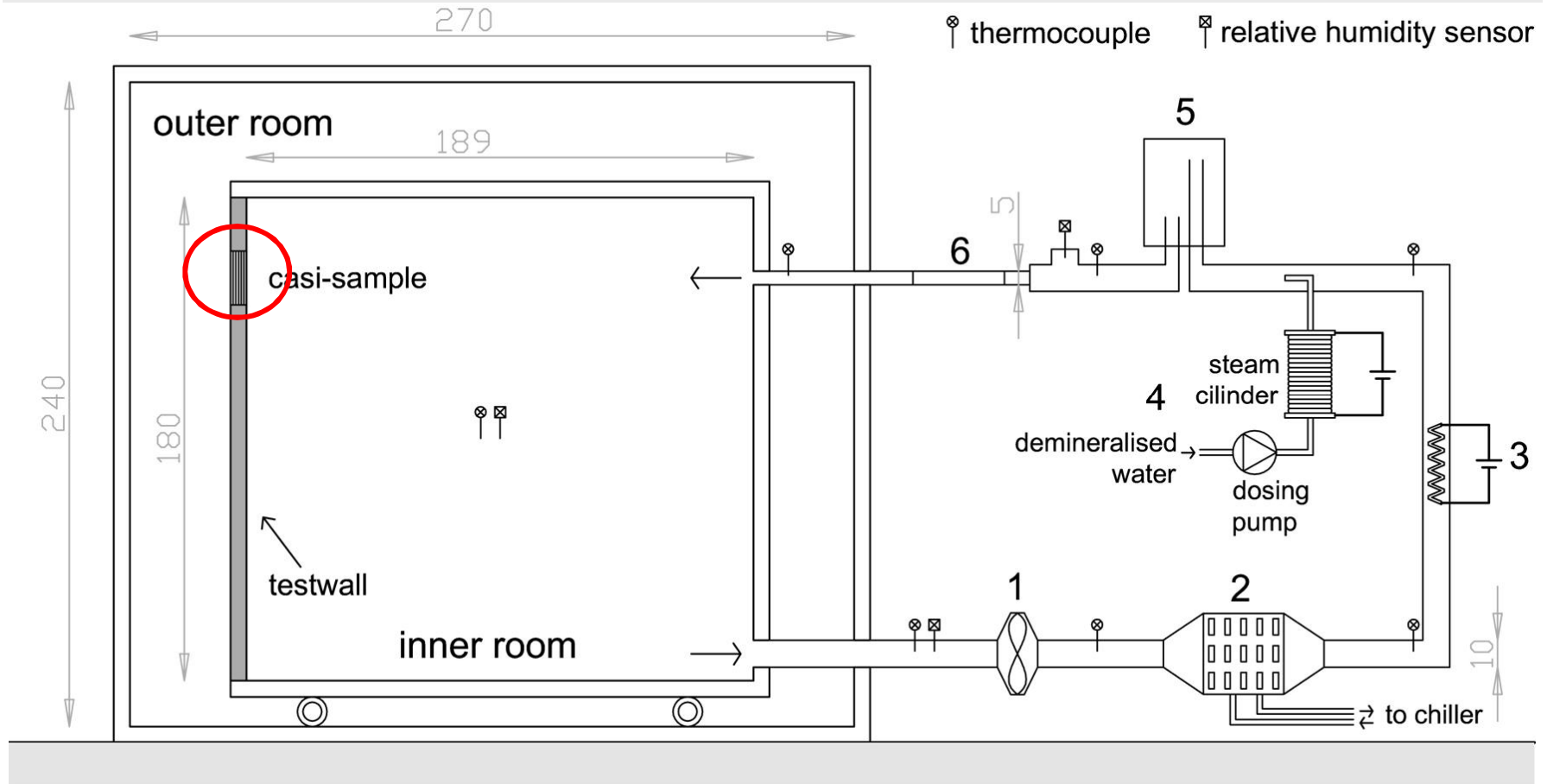
Coupled CFD-HAM
Only one solver needed



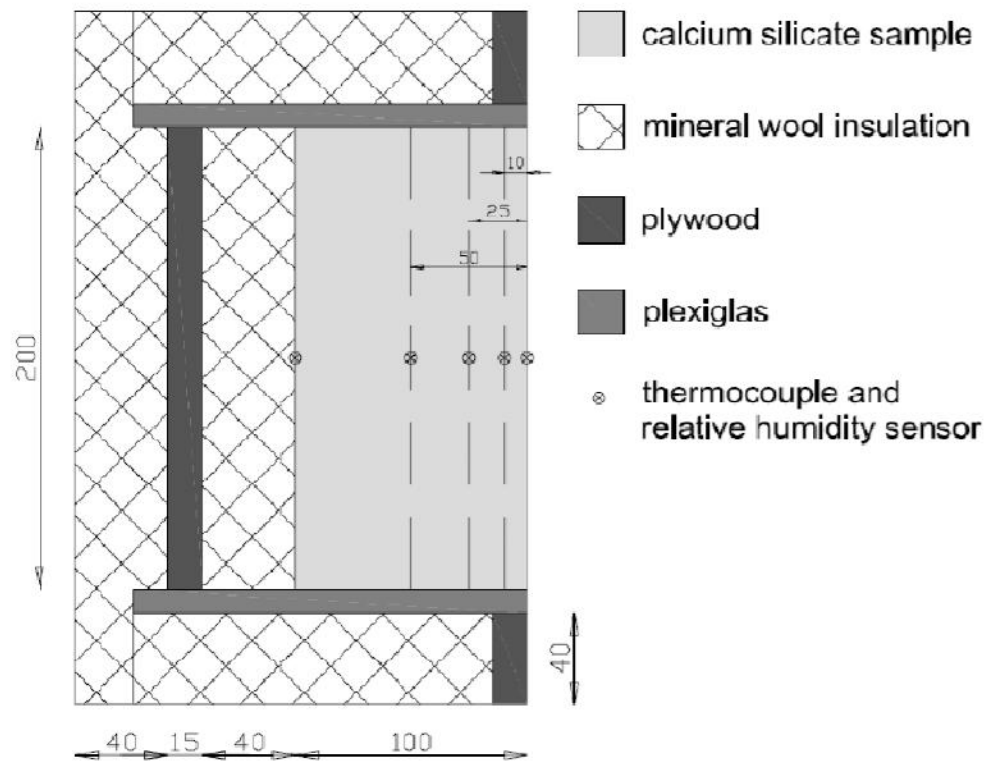
Coupled CFD-HAM results



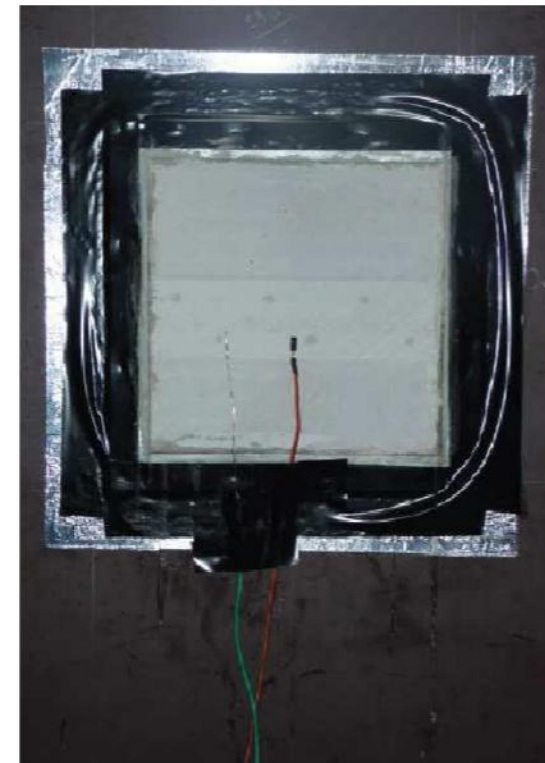
Climate chamber design



Test sample



(a)

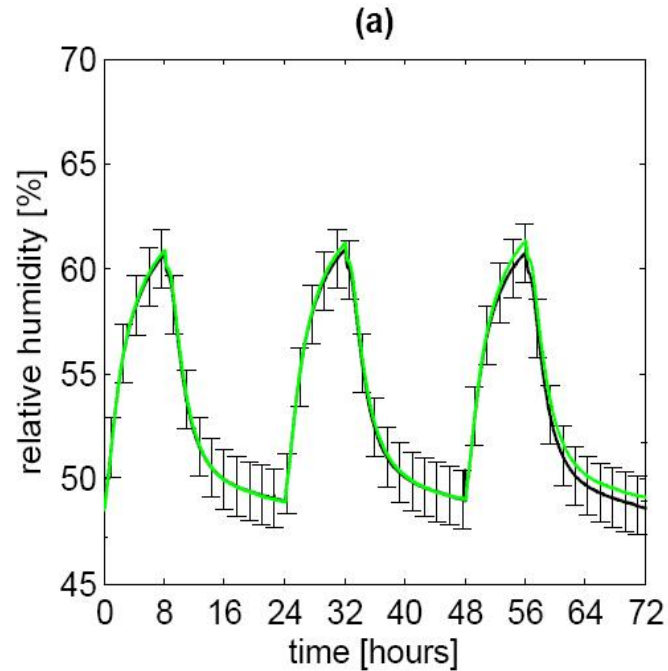


(b)

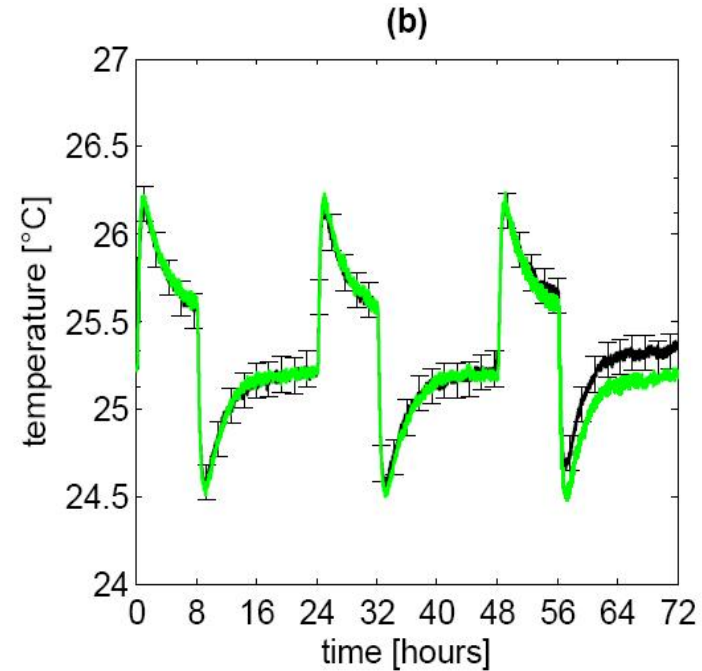
Experimental results

Influence of cutting

Relative Humidity @ 25mm

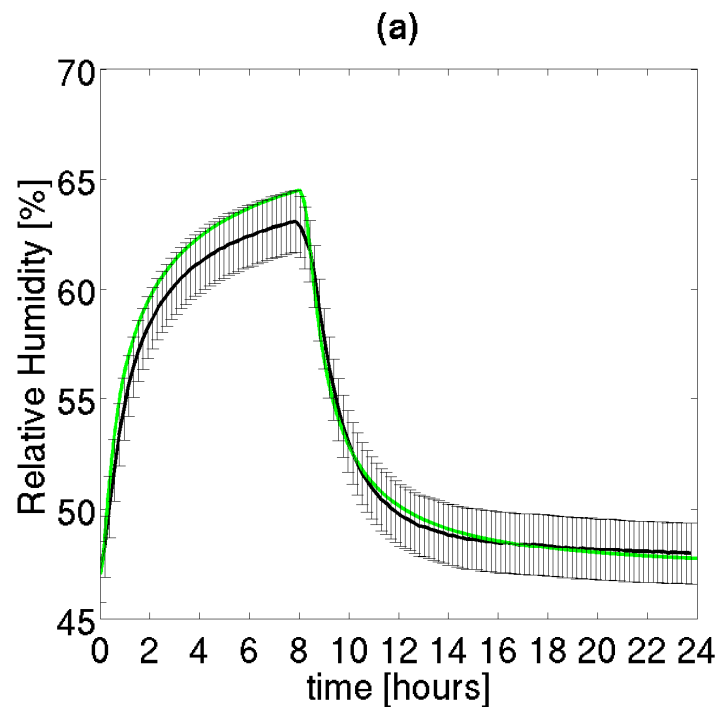


Temperature @ 25mm

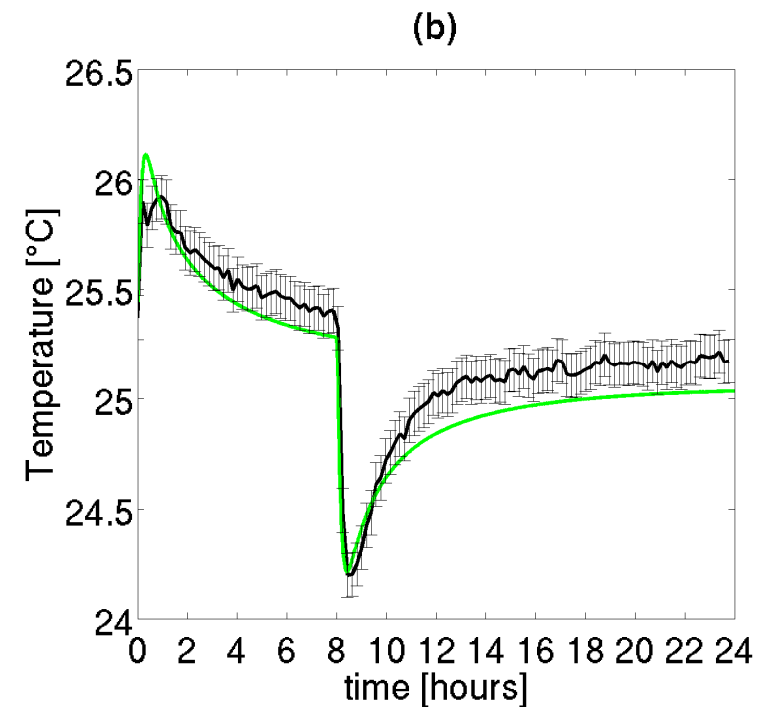


CFD-HAM validation

Relative Humidity @ 10mm



Temperature @ 10mm



Conclusions

- Test chamber designed and built for CFD-HAM validation
- Coupled CFD-HAM model successfully validated
- Deviations between model en experiments
 - Due to uncertainty on
 - » boundary conditions
 - » material properties

Conclusions

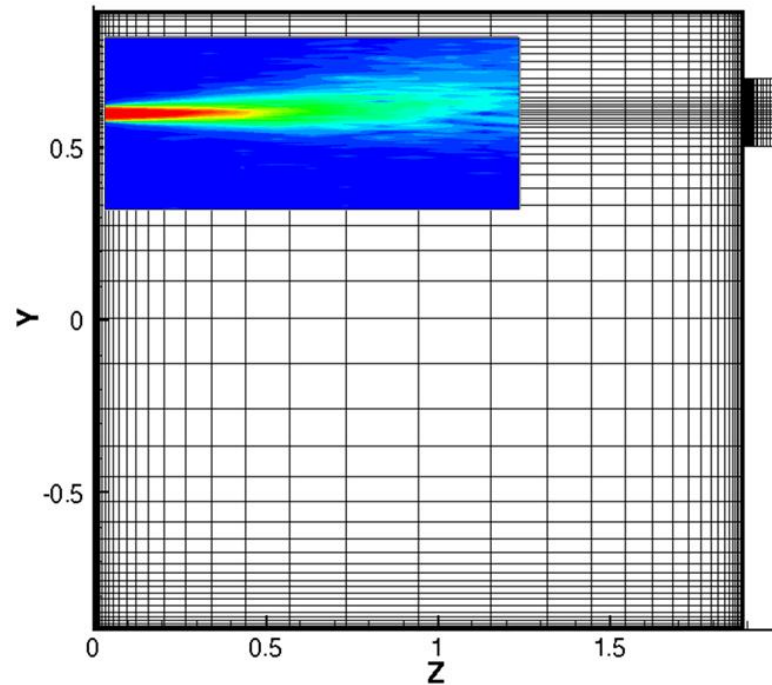
- Test chamber designed and built for CFD-HAM validation
- Coupled CFD-HAM model successfully validated
- Deviations between model en experiments
 - Due to uncertainty on
 - » boundary conditions
 - » material properties

Thank You

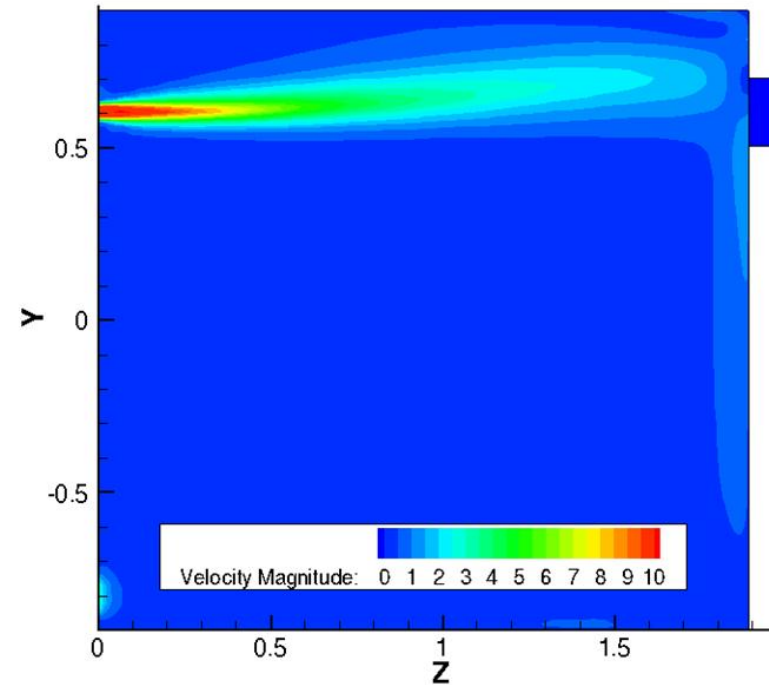


Validation of CFD

(a)



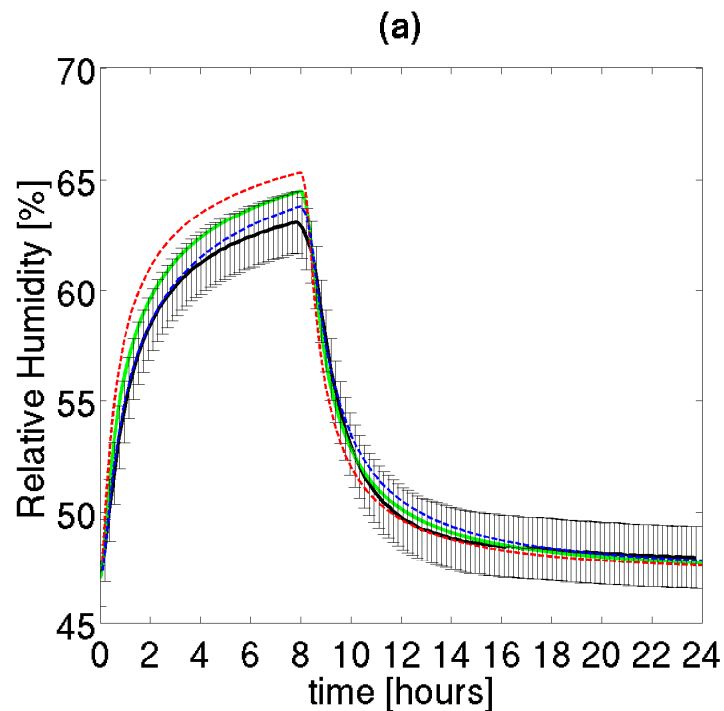
(b)



Effect of boundary conditions / material properties

Effect sensor depth

Relative Humidity @ 10mm



Temperature @ 10mm

