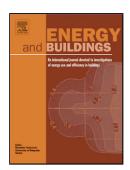
### Accepted Manuscript

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## ACCEPTED MANUSCRIPT

Energy and Buildings. Special Issue "Advances in Adaptive comfort Modelling and Passive/Hybrid Cooling of buildings"

#### Naturally ventilated Double-Skin Façade in Modeling and Experiments

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#### Highlights

- An experimental validation of a model, developed for integration of DSF in Building Simulation tools, is given.
- The validation was based on heat removed by natural ventilation, which is the main parameter in passive cooling systems.
- Selecting hourly data associated to low wind fluctuations a good degree of correlation was found between the predicted total driving pressure and the flow measurements.
- 2D CFD analysis was performed for selected thermal and wind conditions, offering a detailed insight in flow reversal and recirculation phenomena.

#### Abstract

The modelling activity presented in this work aims at the assessment of a simplified model, named BS model, which was specifically developed for integration of DSF in Building Simulation. The BS model is based on a pressure loop and on an integral approach to the heat transfer along the vertical channel. It considers buoyancy as a function of the average temperature in the channel. The wind action is taken into account by means of wind pressure coefficients (Cp) on the façade openings. The focus of this study is the experimental validation of the modelling "core": the natural ventilation through

the DSF. The validation is based on the dataset of the experimental campaign conducted on a DSF test

facility, the "Cube", in Denmark, under IEA ECBCS ANNEX 43/SHC Task 34. Hourly simulations were

performed with the BS model for the 15 days of the experimental campaign.

A CFD modelling activity was also carried out on a selection of four cases, extracted from the experimental benchmark and representative of different temperature and pressure boundary conditions.

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