Abstract Submitted
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Aerodynamical sealing by air curtains DARIA FRANK, PAUL LINDEN, University of Cambridge — Air curtains are artificial high-velocity plane turbulent jets which are installed in a doorway in order to reduce the heat and the mass exchange between two environments. The performance of an air curtain is assessed in terms of the sealing effectiveness E, the fraction of the exchange flow prevented by the air curtain compared to the open-door situation. The main controlling parameter for air curtain dynamics is the deflection modulus D_m representing the ratio of the momentum flux of the air curtain and the transverse forces acting on it due to the stack effect. In this talk, we examine the influence of two factors on the performance of an air curtain: the presence of an additional ventilation pathway in the room, such as a small top opening, and the effects of an opposing buoyancy force which for example arises if a downwards blowing air curtain is heated. Small-scale experiments were conducted to investigate the $E(D_m)$-curve of an air curtain in both situations. We present both experimental results and theoretical explanations for our observations. We also briefly illustrate how simplified models developed for air curtains can be used for more complex phenomena such as the effects of wind blowing around a model building on the ventilation rates through the openings.

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