

Abstract Submitted  
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**An air curtain in the doorway of a ventilated space** DARIA FRANK, PAUL LINDEN, University of Cambridge — Air curtains are used to reduce the heat and the mass exchange between the indoor environment and the ambient. Their sealing ability is assessed in terms of the effectiveness  $E$ , the fraction of the exchange flow prevented by the air curtain compared to the open-door situation. Previous work studied the air curtain effectiveness when the doorway is the only means of ventilating a space. In this talk we examine effects of an additional displacement ventilation pathway on the effectiveness. The main controlling parameter is the deflection modulus  $D_m$  which is the ratio between the momentum flux of the air curtain and the transverse forces due to the displacement ventilation. For small values of  $D_m$  the air curtain is drawn inside the space by the ventilation flow. For high values of  $D_m$  the flow is controlled by the air curtain. A smooth transition occurs between these two regimes and we estimate the  $D_m$  value for the onset of this transition. Our model makes a quantitative prediction of  $E(D_m)$  in the ventilation-driven regime, and explains qualitatively the shape of the curve in the other two regimes. Laboratory experiments were conducted to test the proposed model. The experimental data were compared to theoretical predictions and good agreement was found.

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