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Uncertainty quantification of box model and CFD predictions for night-time ventilation in Stanford's Y2E2 building CATHERINE GORLE, Columbia University, Civil Engineering and Engineering Mechanics, GIANLUCA IACCARINO, Stanford University, Mechanical Engineering — Robust design of natural ventilation systems remains a challenging task, because the simplifications and assumptions introduced in models that predict natural ventilation performance can result in non negligible uncertainty in the results. The objective of this work is to investigate the predictive capability of two models with very different levels of fidelity: a box model and a CFD simulation. We consider night-flush ventilation in the Y2E2 building and compare the results with available temperature measurements. The box model solves for the average air and thermal mass temperatures, representing heat sources and sinks as integral values. The uncertainty in the input parameters is propagated using a non-intrusive polynomial chaos method. The mean result predicts a too fast cooling rate with a maximum air temperature difference of 0.6K, but the measurements are within the predicted 95% confidence interval. The CFD simulation represents a much higher level of detail in the building model, but it also predicts a too high cooling rate with a maximum air temperature difference of 0.9K. Further work will focus on quantifying the uncertainty in the CFD simulation and on using CFD results to determine inputs for the box model, such as discharge and heat transfer coefficients.

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