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Uncertainty quantification in CFD simulations of natural ventilation to support designing experiments for model validation[1] CHEN CHEN, CATHERINE GORLE, Stanford University — Natural ventilation can significantly reduce building energy consumption, but the variability in the boundary and operating conditions makes robust design a challenging task. In previous studies, a computational framework using an integral model and a computational fluid dynamics (CFD) model with uncertainty quantification (UQ) was used to predict the volume-averaged indoor air temperature during night-time ventilation in Stanfords Y2E2 building. Comparison to point-wise building sensor measurements indicated that spatial variability in the temperature field is non-negligible. Hence, the sensor measurements might not be representative of the volume-averaged temperature. The objective of the present study is to use CFD simulations with UQ to design an experiment that optimizes temperature sensor placement to (1) obtain measurements that are representative of the volume-averaged temperature, and (2) support further analysis of the spatial variability in the temperature field for validation of CFD results. The presentation will discuss the methodology used to account for the variability in the boundary and initial conditions, the design of experiments based on the results, and the use of the measurements for validation of the model results.

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