# Numerical computation study on turbulence models for simulating the internal flow field of a subway passenger compartment

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## Abstract

This paper compares the performance of three different turbulence models for the internal flow field simulation within a subway middle car. The full-passenger working condition in summer and the unsteady Reynolds-averaged Navier–Stokes (URANS) method are adopted. The turbulence models—the standard k-ε turbulence model, the re-normalization group (RNG) k-ε turbulence model and the realizable k-ε turbulence model—are analyzed in terms of horizontal average velocity, horizontal average temperature and horizontal temperature difference within the subway passenger compartment. For algorithm validation, the turbulence models are evaluated by experimental data. The results show that the RNG k-ε turbulence model have the best agreement with the experimental data, and with a maximum numerical error about 3.98%. The simulation by the RNG k-ε turbulence model also cost less computational sources. Consequently, the RNG k-ε turbulence model provides an effectively choice for expensive internal flow field simulation problems as it balances computational cost and prediction accuracy.

**Keywords:** Numerical computation, Turbulence model, Internal flow field, Subway passenger compartment