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Comparison of turbulence modelling approaches in the low-velocity application including a higher velocity region

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Four different turbulence modelling approaches are compared in the case of low-velocity case similar with indoor air case including a higher velocity jet shaped region similar with ventilation air inlets and the results are validated against measured results obtained using particle image velocimetry method (PIV). Four approaches are

1. without turbulence model (implicit large eddy simulation, ILES),
2. SST (shear stress transport) k-ω,
3. SST k-ω SAS (scale adaptive simulation) and
4. WALE (wall-adapting local eddy-viscosity).

All simulations are performed as unsteady simulations. The grid resolution test is conducted using four different grids consisting from 2.8 million to 32 million cells. Results show that the both turbulent viscosity based methods (SST k-ω and SST k-ω SAS) are too dissipative and the results of both LES methods (ILES and WALE) give results very close to measured ones.