# A new scheme for torque coupling

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A novel scheme for the complete coupling between Lagrangian point-particles and a continuous fluid phase has been developed. A full mechanical coupling can only be achieved if torque-coupling is employed along with the more conventional force-coupling. The torque vector acting from the particles on the fluid is expressed in terms of a new *particle stress tensor* which adds to the Newtonian stress tensor. A fully-coupled simulation of spherical particles in a turbulent channel flow demonstrated that the resulting particle spin became strikingly different from that observed in the one-way coupled simulation by Mortensen et al. (2007). Sample results for ellipsoidal particles will also be presented at the Colloquium.
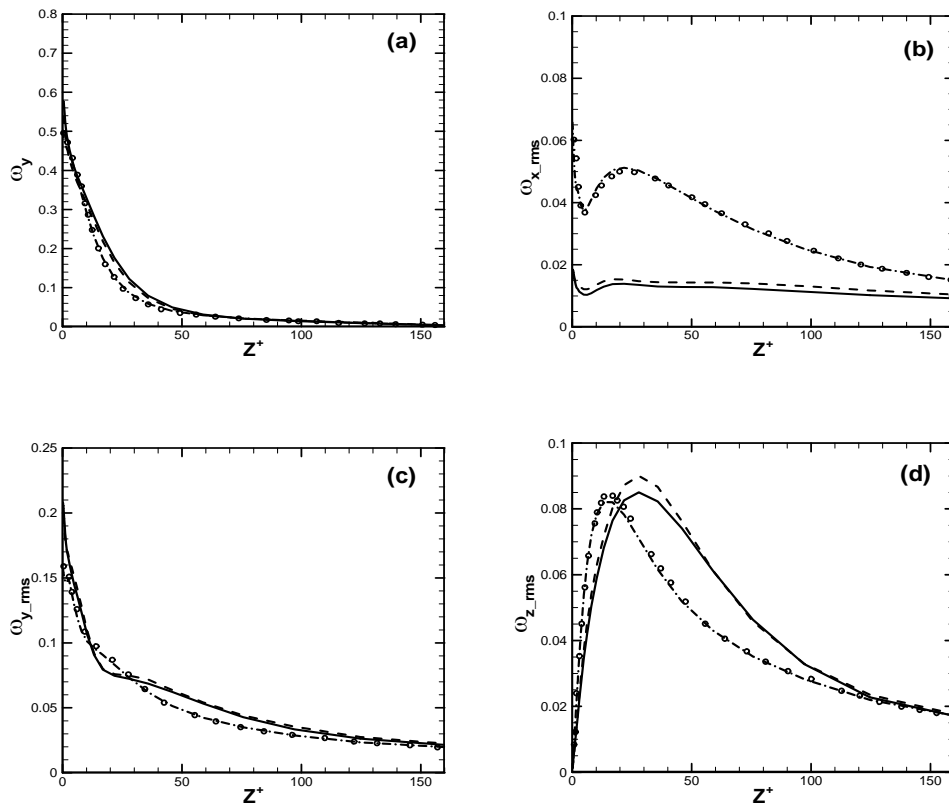
Mean spanwise particle spins and rms values of particle spins in streamwise, spanwise and wall-normal direction. One-way coupling by Mortensen *et al.* (2007) (open circle); force- and torque-coupling (solid line); force-coupling (dashed line); torque-coupling (dash-dot line).

Mortensen, P.H., Andersson, H.I., Gillissen, J.J.J. & Boersma, B.J. 2007 Particle spin in a turbulent shear flow. *Phys. Fluids* **19**, 078109.