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Particle rotation in shear flows JOHANNA BLUEMINK, LEEN VAN WIJNGAARDEN, University of Twente, ANDREA PROSPERETTI, Johns Hopkins University, DETLEF LOHSE, University of Twente — For a *linear shear flow* it is known that a particle rotates *slower* than the surrounding flow when inertial effects are included. Experiments performed for a sphere fixed (but free to rotate) in a flow in *solid body rotation* indicate that the rotation rate of a sphere can be *faster* than the rotation rate of the flow. Numerical simulations at moderate Re confirm this observation. To gain understanding of the phenomenon the effects of stream-wise and cross-stream shear on the rotation rate of a fixed sphere in a flow are numerically investigated. Moreover, the change of the flow due to the sphere is recorded. The results indicate that for moderate Re the two types of shear have completely different effects on the particle rotation rate. Moreover, the cross-stream effects appear to be dominant to the stream-wise effects. When the two types of shears are combined to create a strain field, the particle starts to rotate, although the undisturbed flow is non-rotational.

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