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Flow features from the wake of a rotating sphere ANDREW OOI, ERIC POON, The University of Melbourne, MATTEO GIACOBELLO, Defence Science Technology Organisation, RAYMOND COHEN, CSIRO — The flow features in the wake of a rotating sphere is investigated numerically. Simulations are carried out at Reynolds numbers up to $Re = 1000$, with non-dimensional rotational rates $\Omega = 0$ to 1. The axis of rotation is orientated from $\alpha = 0$ (streamwise rotation) to $\alpha = \pi/2$ (transverse rotation). At $Re=250$ and 300 , the flow field could be steady or unsteady, depending on the value of Ω and α . Phase diagrams of (CL_x, CL_y) and (CD, CL) are used to illustrate the dynamics of the unsteady forces acting on a rotating sphere. By employing the phase diagram (CL_x, CL_y) , the direction of the resultant lift force can be shown to be dependent on the non-dimensional rotation rate. The shape of the curves which appear on the phase diagrams (CL_x, CL_y) are highly correlated to the behaviour of the vortical structures in the wake. This study will give a more complete picture of the physics associated with the incompressible flow past a rotating sphere.

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