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Stochastic analysis of wing-tip vortex wandering in turbulent free streams.[1] SEAN BAILEY, University of Ottawa, STAVROS TAVOULARIS — Instantaneous measurements of the local velocity vector and streamwise vorticity were performed in the tip vortex of a finite wing with a NACA-0012 profile and a rectangular tip at Re $= 240000$ and angle of attack of 5°. Results are reported on six transverse planes downstream of the wing, in an unobstructed free stream with a turbulence intensity of 0.3%, as well in grid-generated turbulence with intensities of 2.5% and 5.0%. It was found that, although vortex formation and mean trajectory were unaffected by the turbulence, time-averaged velocity statistics in the vortex core were strongly influenced by random lateral motion of the vortex, which increased with increasing turbulence intensity. Analysis of velocity signals identified instances when the vortex axis was on the same horizontal or vertical plane as the probe tip, which provided an estimate of the probability density function of the vortex axis position, found to be approximately Gaussian. Joint PDF of the measured velocity components perpendicular to the vortex axis indicated that the instantaneous peak tangential velocity decayed with increasing streamwise distance.

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