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Rotational motion of elongated particles in isotropic turbulent flow: statistical perspective[1] LIHAO ZHAO, HELGE ANDERSSON, Norwegian University of Science and Technolog, EVAN VARIANO, University of California, Berkeley — We consider the rotational motion of non-spherical particles in turbulent flow, comparing the statistics of particles' angular velocity to the corresponding quantities computed in the fluid phase. We use numerical (DNS) and laboratory measurements for particles that are both larger and smaller than the Kolmogorov lengthscale. The particles are spheroids or rods, with aspect ratios between 1 and 10. We will discuss the subtleties of defining a meaningful Stokes number for these particles, focusing on the effect of asphericity and the fact that our interest is in rotation and not translation. Comparing the probability density function of angular velocity between fluid and particle phase indicates that the angular velocity of particles has a narrower distribution than that of the fluid phase, and that. particles do respond to extreme events in the fluid phase. The first four moments of the PDFs are analyzed, and these show that the "filtering" effect is very similar between DNS and lab experiments, despite differences in particle sizes and mass. We propose a nondimensional curve for predicting the magnitude of the filtering effect, and discuss the implications of this curve for the definition of Stokes number, as discussed earlier.

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