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Orientation patterns of non-spherical particles in turbulence BERNHARD MEHLIG, University of Gothenburg, LIHAO ZHAO, NTNU, KRISTIAN GUSTAVSSON, University of Gothenburg, RUI NI, Penn State, STEFAN KRAMEL, GREG VOTH, Wesleyan, HELGE I. ANDERSSON, NTNU — Turbulent strains tend to align non-spherical particles advected by turbulence. When two such particles spend extended time near each other, they might reasonably be expected to converge toward the same orientation. We show here that this intuition fails in general. Orientations of nearby particles can be very different in turbulence because the distribution of relative orientations of nearby particles has power-law tails. We measure the moments of this distribution in experiments and numerical simulations, and explain their anomalous scaling as a function of centre-of-mass distance by analysing a statistical model. Our analysis builds on a description of the relative motion in a phase space that includes not only the usual spatial coordinates, but also the angular degrees of freedom. In this phase space the dynamics evolves to a fractal attractor. We explain how its geometry determines the anomalous scaling exponents. Our results provide a foundation for understanding collisions of non-spherical particles in turbulence, since relative orientations are critical in modeling collision rates and outcomes.. This talk is based on L. Zhao, K. Gustavsson, R. Ni, S. Kramel, G. A. Voth, H. I. Andersson, and B. Mehlig, arxiv:1707.06037

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