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Alignment of Disks with Lagrangian Stretching in Turbulence CONOR HUNT, LYDIA TIERNEY, STEFAN KRAMEL, GREG VOTH, Wesleyan University — We study Lagrangian stretching in isotropic turbulence in order to understand both the rotations of disks and the preferential alignment of vorticity with the intermediate strain rate eigenvector. Using velocity gradient tensors from a numerical simulation of homogeneous isotropic turbulence at $R_\lambda = 180$, we calculate the Cauchy-Green strain tensors whose eigenvectors provide a natural basis for studying stretching phenomenon. Previous work has shown that rods preferentially align with the vorticity as a result of both quantities independently aligning with the extensional Cauchy-Green eigenvector. In contrast, disks orient with their symmetry axis perpendicular to vorticity and preferentially align with the compressional Cauchy-Green eigenvector. We also find that the intermediate strain rate eigenvector is aligned with the extensional Cauchy-Green eigenvector. A natural consequence is that the intermediate strain rate eigenvector is aligned with the vorticity vector since conservation of angular momentum aligns vorticity with the direction it has been stretched.

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