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On the Orientation of Vortical Structures in Homogeneous Turbulent Shear Flows FRANK JACOBITZ, ADAM MOREAU, JOYLENE AGUIRRE, University of San Diego — Direct numerical simulations were performed in order to study the orientation of vortical structures in homogeneous turbulent shear flows with density stratification or system rotation. Inclined structures are observed in the plane of shear and the three-dimensional two-point autocorrelation coefficient of vorticity magnitude is computed to quantify the orientation of the structures. Isosurfaces of the autocorrelation coefficient closely resemble an ellipsoid inclined in the direction of the structures. A least-squares fit of an ellipsoid to the isosurfaces was performed and the major axis was determined. From the major axis, the inclination angle of the structures was computed. For stratified and sheared homogeneous turbulence, the Richardson number Ri was varied. It was observed that both the growth rate of the turbulent kinetic energy and the inclination angle of the structures decrease as Ri is increased. For rotating and sheared homogeneous turbulence, the rotation to shear rate ratio f/S was varied. Again, the growth rate and the inclination angle show a similar dependence on f/S. Therefore, the structure of homogeneous turbulent shear flows appears to be directly related to the dynamics of the flows.

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