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Polarized Turbulence on the 3-sphere OWEN DIX, RENA ZIEVE, University of California, Davis — We have simulated He II superfluid turbulence on a 3-sphere, using the Hopf vector field $(-y, x, -w, z)$ as the driving velocity. This vector field lies along parallel great circles of the 3-sphere. It has a uniform magnitude, is divergence-free, and is analogous to a uniform driving velocity in periodic boundaries (a flat 3-torus), with the important exception that it has a non-zero curl tangent to the field itself. The resultant system is an interesting modification of rotating counterflow turbulence, which produces a state of polarized turbulence for driving velocities above a critical velocity V_{DG}. The average polarization of the vortex tangent field on the 3-sphere is 0.8-0.95, significantly higher than rotating counterflow. We also found a vortex reconnection rate proportional to $L^{1.6}$, in contrast to homogeneous turbulence, which yields exponents of 5/2 or 2, depending on the importance of the local velocity term and on the turbulence state. A reduced exponent is consistent with predictions and previous simulations of polarized turbulence, but the degree of reduction is remarkable. Development of this polarized turbulence state is still under investigation.

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