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The structure of the extreme Lyapunov exponents in the inertial scales of turbulence[1] ALBERTO VELA-MARTIN, JAVIER JIMENEZ, Universidad Politecnica de Madrid — A fully reversible homogeneous isotropic turbulent system is constructed using inviscid LES to model energy fluxes in the far inertial range. Reversibility is exploited to efficiently calculate the highest/most unstable and lowest/most stable short-time Lyapunov exponents (STLE) of the system. When restricted to inertial modes, both extreme STLE have similar absolute value and inverse sign, suggesting the Hamiltonian nature of inertial dynamics. Their associated short-time Lyapunov vectors (STLV), which are complete flow fields that provide information on the perturbations to which the system is most/least sensitive, are found to be concentrated in small regions in physical space. The analysis of the structure of the STLV reveals that these small regions, where intense expansive and contractive events take place, are strongly dominated by the strain field of the flow. These regions are also characterized by a preferential alignment of the field of the STLV with the different eigenvectors of the strain tensor. However, no strong correlation of the STLV with the vorticity field is found. These results emphasize the active role of the strain in turbulence dynamics.

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