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**On the small-scale structure of turbulence and its impact on the pressure field** DIMITAR VLAYKOV, MICHAEL WILCZEK, Max Planck Institute for Dynamics and Self-Organization — Understanding the non-locality of the pressure field in incompressible flows is one of the fundamental challenges in turbulence. The pressure field is encoded in the non-linear structure of turbulence by a Poisson equation. We present a quantitative investigation of the link between intense small-scale vortical and strain structures and the non-locality of the pressure field. Specifically, we show that the pressure in the neighborhood of intense vorticity regions is determined primarily by the local structures and with little influence from far-field contributions. Moreover, the degree of locality increases with the intensity of the reference regions. This is explained by the generation of a shielding shear region around a given vortex through the Biot-Savart law on the one hand, and the rapid decorrelation of the velocity gradient field on the other. Strong shear regions display similar but less pronounced insulating features. This behavior depends on the Reynolds number in two ways. Firstly, due to the intermittent nature of the velocity gradient, the intensity and frequency of occurrence of extreme events grow quickly with increasing Reynolds number. Secondly, the degree of locality of regions of given intensity tends to change slowly but monotonically with Reynolds number.

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