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Turbulent weak solutions of the Euler equations

Motivated by Kolmogorov's theory of hydrodynamic turbulence, we consider dissipative weak solutions to the 3D incompressible Euler equations. We show that there exist infinitely many weak solutions of the 3D Euler equations, which are continuous in time, lie in the Sobolev space Hs with respect to space, and they do not conserve the kinetic energy. Here the smoothness parameter s is any number less than $5/14$. In particular, this exponent lies above the Onsager critical value $1/3$ consistent with Kolmogorov's -4/5 law for the third order structure functions. We shall also discuss bounds for the second order structure functions, which deviate from the classical Kolmogorov 1941 theory.