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**Shiyi Chen\*** (syc@jhu.edu), 3400 N. Charles Street, Baltimore, MD 21218, and **Robert Ecke, Gregory Eyink, Michael Rivera, Minping Wang** and **Zuoli Xiao**. *Numerical Studies of Physical Mechanism of the Two-Dimensional Inverse Energy Cascade.*

We study the physical mechanisms of the two-dimensional inverse energy cascade using direct numerical simulations. Kraichnan's prediction of a  $-5/3$  spectrum with constant, negative energy flux is verified in our simulations of 2D Navier-Stokes equations. We show that inverse cascade results mainly from turbulent stress proportional to small-scale strain rotated by 45 degrees. This "skew-Newtonian" stress is explained by the elongation and thinning of small-scale vortices by large-scale strain which weakens their velocity and transfers their energy upscale. (Received August 12, 2007)