

Abstract Submitted  
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**Multiple stages of decay in two-dimensional turbulence**<sup>1</sup> LEI FANG, NICHOLAS OUELLETTE, Stanford University, OUELLETTE LAB TEAM — We report measurements of the free decay of turbulence in a quasi-two-dimensional laboratory flow. We observe three clearly distinguished stages of decay, each characterized by an exponential decrease of the kinetic energy with time, but with different decay constants. Using filtering techniques, we identify the physics that controls each stage of decay. The first, most rapid stage is not due to the merger of like-sign vortices as has often been suggested but rather to the rapid relaxation of downscale spectral energy leakage. The second stage is a manifestation of dynamical inverse energy cascade processes, and lasts until the separation of scales becomes small. The final stage of decay appears to be dominated by the vertical stratification in our experiment. Our results clarify the dynamical processes at work in decaying two-dimensional turbulence.

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