Meeting: 1000, Albuquerque, New Mexico, SS 9A, Special Session on Mathematical Methods in Turbulence

1000-76-216 **Robert E Ecke*** (ecke@lanl.gov), Center for Nonlinear Studies, MS-B258, Los Alamos, NM 87545. *The physical mechanisms of two-dimensional turbulence: Inverse and direct cascade processes.*

Two dimensional turbulence is investigated using two experimental systems and direct numerical simulation. The physical mechanisms of the direct enstrophy cascade where mean-square vorticity is transferred to small scales and of the inverse energy cascade where energy moves preferentially to large scales are elucidated using a combination of experimental and numerical measurements of energy and enstrophy flux between spatial scales. The direct cascade is demonstrated to result from the stretching of vortex patches into fine filaments by the straining motion of the turbulence field. The inverse energy cascade is shown to occur not by the widely believed mechanism of vortex merger but by the correlated interaction between large scale strain and vortex gradient stretching. This research has only been possible through a combination of experiment, numerical simulation and theoretical/mathematical analysis. (Received August 24, 2004)