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Passive Scalar in 2D Turbulence RORY CERBUS, WALTER GOLDBURG, University of Pittsburgh, Department of Physics and Astronomy — We examined the behavior of a passive scalar in a 2D turbulent flow and confirm the so-called Batchelor scaling. For large r, the second order structure function $S_2(r) = < (\theta(x+r) - \theta(x))^2 > \sim \log(r)$. For small r, $S_2(r) \sim r^2$. The logarithmic dependence of $S_2(r)$ is consistent with a power spectrum that goes as the inverse power of k, the wavenumber. These experiments are performed using a falling soap film as the 2D turbulent system and various colored dyes for the passive scalar, which is injected at a point. The decaying turbulence is generated using a comb oriented perpendicular to the film. It does not appear to matter whether the dye is injected above or below the comb. The measurements were made in the Eulerian frame at a single point. Time is then replaced by distance using the Taylor frozen turbulence hypothesis. The structure function is determined from the correlation function, which is calculated using a photon correlation scheme. The passive scalar measurements are compared with the behavior of thickness fluctuations in the soap film, which is another random variable.

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