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Margaret Beck, Osman Chaudhary and C. Eugene Wayne* (cew@math.bu.edu). *Analysis of enhanced diffusion in Taylor dispersion*. Preliminary report.

We consider a simple model of the evolution of the concentration of a tracer, subject to a background shear flow by a fluid with viscosity $\nu \ll 1$ in an infinite channel. Taylor observed in the 1950's that, in such a setting, the tracer diffuses at a rate proportional to $1/\nu$, rather than the expected rate proportional to ν . We provide a mathematical explanation for this enhanced diffusion using a combination of Fourier analysis and center manifold theory. More precisely, we show that, while the high modes of the concentration decay exponentially, the low modes decay algebraically, but at an enhanced rate. Moreover, the behavior of the low modes is governed by finite-dimensional dynamics on an appropriate center manifold, which corresponds exactly to diffusion by a fluid with viscosity proportional to $1/\nu$. (Received January 09, 2015)