Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Numerical Simulations of an Asymptotically Reduced Model of Anisotropic Langmuir Turbulence[1] ZHEXUAN ZHANG, GREG CHINI, KEITH JULIEN, EDGAR KNOBLOCH — "Langmuir turbulence" is a wind and surface-wave driven flow that is thought to dominate vertical transport and mixing in the ocean surface boundary layer. The characteristic occurrence of quasi-coherent counter-rotating vortical structures elongated in the wind direction renders Langmuir turbulence strongly anisotropic. Recently, an asymptotically exact reduced model of this flow was derived using multiscale analysis (Chini, Julien & Knobloch, GAFD 2009). The reduced PDEs go beyond strictly 2D (downwind invariant) formulations of the governing Craik–Leibovich (CL) equations by consistently incorporating the dominant 3D physical processes while continuing to average or filter certain fast, fine downwind-scale flow features. Here, pseudospectral numerical simulations of the reduced PDEs are performed to explore the dynamics and bifurcation structure of the reduced model.

[1]Funding from NSF CAREER Award 0348981 is gratefully acknowledged.

Zhexuan Zhang

Date submitted: 06 Aug 2010 Electronic form version 1.4