Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Analysis of Reynolds stress budgets in LES of Langmuir supercells under crosswind currents in a coastal ocean[1] ANDRES TEJADA-MARTINEZ, JIE ZHANG, University of South Florida — Langmuir supercells (LSCs) in coastal oceans consist of parallel counter rotating vortices engulfing the water column in unstratified conditions. These cells have been observed in continental shelf regions 15-30 meters deep during the passage of storms. LSCs are aligned roughly in the wind direction and are generated via interaction of the wind-driven shear current and Stokes drift velocity induced by surface gravity waves. LSCs have been determined to be an important contributor to the suspension of sediments and their overall transport across shelves. It has also been shown that tidal forcing distorts and weakens LSCs, inhibiting their potential for sediment suspension. Large-eddy simulations of LSCs in flows driven by a surface wind stress and a constant crosswind pressure gradient (representative of crosswind tidal forcing) have been performed. Although a crosswind tidal current stronger than the wind-driven current is able to break up the LSCs giving rise to smaller scale, weaker Langmuir cells (LCs), analysis of Reynolds shear stress budgets reveals that non-local transport remains significant relative to flow without LCs. This demonstrates the need for a non-local transport term in Reynolds shear stress and turbulent scalar flux closures for coastal flows with LCs.

[1]Support from the US National Science Foundation and the Gulf of Mexico Research Initiative is gratefully acknowledged

Jie Zhang
University of South Florida

Date submitted: 01 Aug 2016 Electronic form version 1.4