Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A Reynolds-averaged simulation of coastal Langmuir cells and comparison to large eddy simulation[1] ANDRES TEJADA-MARTINEZ, JUAN PENALOZA GUTIERREZ, ANTHONY PEREZ, Univ of South Florida, MICHEL BOUFADEL, New Jersey Institute of Technology — Langmuir turbulence in the coastal ocean is driven by winds and waves and is characterized by Langmuir cells (LCs) that can span the full depth of the water column. A solution strategy based on Reynolds averaging is introduced, relying on the coherency and persistence of full-depth LCs. Here these cells are treated as a secondary component to the wind and/or pressure gradient-driven primary flow. The strategy is used to investigate LCs engulfing unstratified shallow water regions representative of a shallow shelf zone and a surf-shelf transition zone. The resolved LCs and associated statistics will be compared with their counterparts in large-eddy simulation (LES). The comparison shows that the Reynolds-averaged approach can successfully reproduce cell meandering and merging (i.e. the so-called Y-junctions), a requisite for capturing the proper crosswind width of the LCs. The merging occurs less frequently over time as the cells grow after being spun from rest. Additional studies via the Reynolds-averaged approach will be presented investigating the impact of variable depth and wave direction on the width of the LCs and their intensity.

[1]This research was made possible through a grant from the Gulf of Mexico Research Initiative.

Andres Tejada-Martinez
Univ of South Florida

Date submitted: 10 Aug 2020

Electronic form version 1.4