Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Cross-Shore Structure of Alongshore Flow over a Coral Reef Shelf GENO PAWLAK, ANDRE AMADOR, Mechanical and Aerospace Engineering, UCSD, ISABELLA ARZENO, SARAH GIDDINGS, MARK MERRIFIELD, Scripps Institution of Oceanography, UCSD — Tidally driven alongshore flow over a reef shelf on O'ahu, Hawai'i is examined using spatial velocity measurements from an autonomous underwater vehicle (AUV) along with time series observations of the alongshore pressure gradient. Depth-averaged velocities are reconstructed from AUV-based velocity observations as a function of cross-shore distance assuming tidal periodicity. Ensemble averages of the alongshore pressure gradient and velocities versus tidal phase from multiple AUV surveys reveal characteristics akin to an oscillatory boundary layer, with the nearshore flow leading the offshore flow and with a corresponding attenuation in velocity magnitude in shallower regions. Analysis of the depth-averaged alongshore momentum balance indicates that the cross-shore structure and evolution of the tidal boundary layer is well described by a balance between local acceleration, barotropic pressure gradient, and bottom drag. This primary balance allows estimation of the drag coefficient over depths spanning from 25 to 5 m. Estimates agree with analysis of time series data and compare favorably with drag coefficients estimated from AUV-based roughness mapping. Roughness data suggest that larger scales, at wavelengths comparable to the depth, play a more significant role than smaller meter-scale roughness.

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Date submitted: 01 Aug 2019 Electronic form version 1.4