Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Langmuir circulation in sheared shallow waters[1] WILLIAM PHILLIPS, Swinburne University of Technology — The instability of shallow water waves on a moderate shear to Langmuir circulation is considered. In such instances, specifically at the shallow end of the inner coastal region, the shear can significantly affect the drift giving rise to profiles markedly different from the simple Stokes drift. Since drift and shear are instrumental in the instability to Langmuir circulation, of key interest is how that variation in turn affects onset to Langmuir circulation. Also of interest is the effect to onset of various boundary conditions, viz Neumann and Cauchy. Two typical flow fields are considered, namely shear driven and current driven flow. Relative to the reference case, shear driven flow is found to be destabilizing and current driven stabilizing to Langmuir circulation. In current driven flow it is further found that multiple layers, as opposed to a single layer, of Langmuir circulation can form. Moreover the layers can extend into a region of flow beyond that in which the instability applies. Finally, while Neumann-Neumann are known to ensure the least stable spanwise wavenumber is zero and Cauchy-Neumann boundary conditions non zero, we find the latter further act to realize the long observed but unexplained large aspect-ratio shallow water Langmuir circulation.

[1]NSF OCE-0116921; ARC DP-1093517

William Phillips
Swinburne University of Technology

Date submitted: 31 Jul 2012 Electronic form version 1.4