Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Modulation instability and rogue waves for shear flows with a free surface QING PAN, The University of Hong Kong, ROGER GRIMSHAW, University College London, KWOK WING CHOW, The University of Hong Kong — The evolution of weakly nonlinear, narrow-band wave packets for free surface flows is governed by the nonlinear Schrödinger equation. Rogue waves, unexpectedly large displacements from equilibrium background can occur if the water depth is sufficiently large. In practice, shear currents nearly always occur in oceans, but modeling studies on wave dynamics are usually restricted to the case of linear current. The dynamics of rogue waves in the presence of a linear shear current has been studied in the literature. Generally rogue waves become narrower and with a short period of existence in terms of time if the background plane wave moves against the current. However, the modulation instability can be enhanced when background plane wave moves with the current. Here the investigation is extended to the case of a current with arbitrary vorticity gradient, by enhancing theoretical formulation established earlier by our group. The transient growth rate and the spatial extent of the rogue waves will be reported for two broad classes of velocity profiles, those convex to the right and those convex to the left. And thus knowledge on such focusing mechanisms of free surface waves will be of importance in both nonlinear science and physical oceanography.

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Date submitted: 26 Jul 2019 Electronic form version 1.4