Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Interaction between an inclined gravity current and a pycnocline in a two-layer stratification[1] YUKINOBU TANIMOTO, NICHOLAS OUELLETTE, JEFFREY KOSEFF, Department of Civil and Environmental Engineering, Stanford University — A series of laboratory experiments were conducted to investigate the characteristics of a dense gravity current flowing down an inclined slope into a quiescent two-layer stratification. The presence of the pycnocline causes the gravity current to split and intrude into the ambient at two distinct levels of neutral buoyancy, as opposed to the classical description of gravity currents in stratified media as being either a pure underflow or interflow. The splitting behavior is observed to be dependent on the Richardson number (Ri) of the gravity current, formulated as the ratio of the excess density and the ambient stratification. For low Ri, underflow is more dominant, while at higher Ri interflow is more dominant. As Ri increases, however, we find that the splitting behavior eventually becomes independent of Ri. Additionally, we have also identified two different types of waves that form on the pycnocline in response to the intrusion of the gravity current. An underflow-dominated regime causes a pycnocline displacement where the speed of the wave crest is locked to the gravity current, whereas an interflow- dominated regime launches an internal wave that moves much faster than the gravity current head or interfacial intrusion.

[1]NSF

Yukinobu Tanimoto
Stanford University

Date submitted: 29 Jul 2019 Electronic form version 1.4