Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Novel Kinetic Trapped-Particle Mechanism for Modulational Instability in Nonlinear Plasma Waves[1] D.H.E. DUBIN, Dept. of Physics, U. C. S. D. — Modulational instabilities, in which a longer-wavelength wave grows on a shorter-wavelength nonlinear wave-train, are endemic in plasmas. This poster discusses a new instability mechanism caused by a small fraction f of particles trapped in the potential wells of the wave-train. This mechanism describes a recently-observed modulational/parametric decay instability in Trivelpiece-Gould waves[2], and could also be active in a broad range of nearly-collisionless nonlinear plasma waves. In the instability, adjacent peaks of the wave-train approach one-another (and therefore recede from the next peaks). This adiabatically heats particles trapped between the approaching peaks, and cools trapped particles between receding peaks. This heating and cooling would normally produce a pressure restoring force that stabilizes the motion of the peaks. However, some trapped particles are heated enough to become untrapped, and these particles are then retrapped and cooled between receding peaks. The net effect of this detrapping and retrapping is to change the sign of the pressure force, producing a trapped particle pressure that amplifies the modulations with a growth rate scaling as $\sqrt{f}$. Expressions for the instability growth rate will be presented and compared with experiments and simulations. [2]See adjacent poster

[1]Supported by the NSF/DOE Partnership and DOE Grant DE-SC0008693

D.H.E. Dubin
Dept. of Physics, U. C. S. D.

Date submitted: 06 Jul 2017 Electronic form version 1.4