Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Effects of Rotation on Internal Solitary Waves KARL HELFRICH, Woods Hole Oceanographic Institution, ROGER GRIMSHAW, Loughborough University, TED JOHNSON, University College London — An internal solitary waves in a rotating system decays by radiation into longer Poincare waves. The radiation extinguishes the initial solitary wave in a finite time. Recent numerical and theoretical studies show that the radiated waves develop into a localized nonlinear internal wave packet, or envelop soliton, that persists for long times. The 13-meter LEGI-Coriolis platform in Grenoble, France was used to perform laboratory experiments designed to test these theoretical results. The experiments confirm theoretical predictions of the packet formation and characteristics including the phase speed of the carrier waves and packet group speed. In particular, the wave number of the carrier wave is found to be close to the linear wave with the maximum group velocity. The localized packet formation is, however, a consequence of nonlinearity. As the rotation rate is increased, the initial disturbance (produced from a dam-break) develops into the packet structure without first forming a distinct solitary wave. These nonlinear inertia-gravity wave packets are a natural outcome in a rotating system and do not require initiation by radiation decay of an internal solitary wave.

Karl Helfrich
Woods Hole Oceanographic Institution

Date submitted: 06 Aug 2010 Electronic form version 1.4