

The effect of rotation on internal solitary waves

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Abstract:

In the weakly nonlinear long wave regime, internal oceanic solitary waves are often modeled by the Korteweg-de Vries equation, which is well-known to support an exact solitary wave solution. However, when the effect of background rotation is taken into account, the resulting relevant nonlinear wave equation, the Ostrovsky equation, does not support an exact solitary wave solution. Instead an initial solitary-like disturbance decays into radiating oscillatory waves. In this talk, we will demonstrate through a combination of theoretical analyses, numerical simulations and laboratory experiments that the long-time outcome of this radiation is a nonlinear wave packet, whose carrier wavenumber is determined by an extremum in the group velocity. When variable bottom topography is also taken into account, although this process may still take place, some new features emerge such as the formation of secondary undular bores.