Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Effect of background rotation on the evolution of 3D internal gravity wave beams[1] BOYU FAN, T. R. AKYLAS, MIT — The effect of background rotation on the 3D propagation of internal gravity wave beams (IGWB) is studied, assuming that variations in the along-beam and transverse directions are of long length scale relative to the beam width. The present study generalizes the asymptotic model of KA (Kataoka Akylas 2015) who considered the analogous problem in the absence of rotation. It is shown that the role of mean vertical vorticity in the earlier analysis is now taken by the flow mean potential vorticity (MPV). Specifically, 3D variations enable resonant transfer of energy to the flow MPV, resulting in strong nonlinear coupling between a 3D IGWB and its induced mean flow. This coupling mechanism is governed by a system of two nonlinear equations of the same form as those derived in KA. Accordingly, the induced mean flow features a purely inviscid modulational component, as well as a viscous one akin to acoustic streaming; the latter grows linearly with time for a quasi-steady IGWB. On the other hand, owing to background rotation, the induced mean flow in the vicinity of the IGWB is no longer purely horizontal and develops an asymmetric behavior.

[1]Supported by NSF

T. R. Akylas
MIT

Date submitted: 27 Jul 2016 Electronic form version 1.4