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3D instability of internal gravity wave beams[1] T. R. AKYLAS, MIT, TAKESHI KATAOKA, Kobe University, Japan, BOYU FAN, MIT — The stability of isolated and interacting internal gravity wave beams (IGWB) to 3D perturbations is studied, based on the beam–mean-flow equations derived in Kataoka Akylas (2015). Depending on the beam profile and amplitude, a single uniform IGWB as well as two interacting IGWB which propagate in the same or opposite directions, can be subject to 3D modulational instability brought about by a purely inviscid nonlinear mechanism. Moreover, for moderate viscous dissipation, the mean flow induced by a mechanism analogous to acoustic streaming can cause significant distortion, leading to breakdown, of forced IGWB with small lateral amplitude variations. These findings suggest that modulational and streaming instabilities are central to 3D IGWB dynamics, in contrast to the widely-studied PSI of sinusoidal wavetrains, which is most relevant to beams with nearly monochromatic profile only.

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