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Coastal ocean boundary mixing and internal boluses

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Waves propagating along ocean density interfaces, called internal waves, may deform and break when they encounter shoaling bottoms, in a manner analogous to waves on beaches. The repeated breaking at ocean boundaries of internal waves may produce sufficient turbulence to mix coastal seas. As an internal wave shoals, a series of pulse-like swashing features, called internal boluses, can be produced. The physics of internal boluses have been studied experimentally and numerically for the idealized situations of uniform slopes and normally incident internal waves. However, the more general case of boluses produced by obliquely- incident internal waves on natural slopes has received little attention although this situation is common in the coastal ocean. Here we report on unaliased field measurements of turbulence within internal boluses that have presumably arisen from both normally- and obliquely- incident internal waves. We found that boluses may have amplitude comparable to the total water depth, are asymmetrical and are characterized with near-bottom turbulent dissipation up to 0.001 W/kg. We also found that most boluses produced by obliquely-incident internal waves propagated normally to the isobaths. This research provides a clearer understanding of the structure and behavior of naturally-occurring internal boluses.