Geophysical Research Abstracts
Vol. 17, EGU2015-9302, 2015
EGU General Assembly 2015

Edge wave response on a barred beach with wind-sea and swell forcing

Stephanie Contardo (1), Graham Symonds (1), and Laura Segura (2)

(1) CSIRO Oceans and Atmosphere, Floreat, Western Australia, Australia , (2) The University of Western Australia, Crawley, Western Australia, Australia

The occurrence of short period wind-sea associated with a diurnal sea breeze, superimposed on longer period swell in South West Western Australia provides an opportunity to observe the response of infragravity (0.01-0.05 Hz) waves, in the nearshore, to both wind-sea and swell forcing. An alongshore array of pressure sensors and a cross-shore array of current velocity and pressure sensors are deployed at Secret Harbour, a barred beach near Perth.

The observations show a stronger infragravity response to longer period incident swell than to short period wind-sea. Infragravity waves at Secret Harbour are generated by two mechanisms: breakpoint forcing and bound wave release. Breakpoint forcing is observed with both swell and wind-sea forcing while bound wave release is only observed in the presence of swell. Two mechanisms generate free infragravity waves during swell periods while only one mechanism is in place during wind-sea periods, providing an explanation for the stronger response to swell than wind-sea.

Free infragravity waves propagating offshore after reflection at the shoreline are called leaky waves; those which are trapped to the shoreline by refraction are called edge waves. At Secret Harbour, both edge waves and leaky waves are detected. Leaky waves dominate with swell forcing while edge waves dominate with wind-sea forcing. Amongst edge waves, mode 0 waves are found to dominate in the absence of wind-sea, while higher mode edge waves dominate when wind-sea is present. We calculate the expected wavenumber-frequency distribution of edge wave and leaky wave energy, based on resonance conditions, using wave period, incidence angle and directional spreading, as proposed by Bowen and Guza (1978). Observations and predictions are in good agreement. However the model can be improved by quantifying the infragravity energy generated by both infragravity wave generation mechanisms.

Bowen, A. J., and R. T. Guza (1978), Edge waves and surf beat, Journal of Geophysical Research-Oceans and Atmospheres, 83(NC4), 1913-1920.