WAVE TRANSFORMATION OVER PALM BEACH REEF

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BACKGROUND

Ocean wave parameters are influenced by shallowing water depth and varying bottom topography. Modelling and in-situ studies have found that as waves propagate over a reef, interaction in the form of friction with the shallower reef can alter wave height, wave period, wavelength, and wave direction. Submerged structures such as coral and rock-based reefs provide an uncertain amount of shoreline protection. Quantifying wave transformation over submerged structures will inform and aid in the design of future coastal protections.

PALM BEACH REEF

The natural reef at Palm Beach on the Gold Coast, Queensland is a rock-based reef covered with abundant marine life. The reef extends seaward, surrounded by sand bottom, from 500 m off the beach for 850 m and it is 600 m wide at the widest point. The seaward reef edge is 10 to 16 m deep while the shore edge is 5 to 9 meters deep, hence the reef shallows towards the shore. The reef is generally exposed to a dominant south easterly swell but Point Danger to the south offers some protection.

Figure 1 Wave buoy locations at Palm Beach Reef.

WAVE MONITORING

Four DWR-G4 Waverider buoys were deployed at strategic locations at Palm Beach, Queensland Australia. Wave data from four sites around the Palm Beach Reef from three separate deployments are used to determine how the reef influences wave characteristics as waves travel over the reef. The sites are: a deep-water site (PBO4) in 23.8 meters and: three shallower sites in 11 – 12 meters. Of the shallow sites two were located in-shore of the reef (PBO2 and PBO3) while the other was south of the reef.

Figure 2 DWR wave monitoring buoy deployed off Palm Beach, Queensland.

WAVE TRANSFORMATION OVER THE REEF

Wave attenuation and transformation occurs, with the presence of Palm Beach Reef having an observable influence on wave height and wave direction. Leeward of the reef to inside of the reef significant wave height (mean) was reduced by 7 per cent, wave direction (mean) changed by 5 to 10 degrees depending on how the measurement station was aligned with propagation over the reef, peak wave period was not changed significantly.

Table 1 Significant wave height (m), peak period (s) and wave direction (degrees true)

Site	Significant wave height (m)	Peak wave period (s)	Wave direction (°T)
PBO4	0.87	10.21	83.2
PBO3	0.81	10.85	78.6
PBO2	0.84	10.90	75.2
PB01	0.76	10.86	85.2

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