A 40 YEAR WAVE CLIMATOLOGY OF SOUTH EAST QUEENSLAND, USING MODELLED AND IN-SITU WAVE OBSERVATIONS

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INTRODUCTION

Climate change has the potential to impact weather patterns that drive the Queensland wave climate and increase the intensity of extreme events such as tropical cyclones and east coast lows, due to a widening of the tropics. This will likely result in a changing wave climate, an increase of erosion events and subsequent coastal morphological change throughout the subtropics. Thus, it is important to examine not only the modal wave climate, but also the extreme wave climate.

PREVIOUS WAVE CLIMATE ANALYSIS

While a number of hind-cast models have been used to assess global wave climates (Perez et al. 2017), there has been an identified lack of regional assessments. Wave climatology assessments for the SEQ region, have consisted of several point specific assessments undertaken predominantly using buoy data, hind-cast data, or visual daily observations. These studies generally agree that tropical cyclone and east coast lows are the dominant source of high energy sea states and beach erosion in SEQ.

WAVEWATCH III HINDCAST MODEL

A 40 year numerical wave hind-cast has been developed using the WaveWatch III (WW3) model version 4.08 (Durrant et al. 2013a, 2013b). The model was run at three different grid resolutions from 1979 - 2019. All model runs were forced with surface winds and sea ice utilizing information provided by the Climate Forecast System Reanalysis Version 2 (CFSRV2) (Durrant et al. 2013a).

WAVE BUOYS

There are nine wave monitoring sites in SEQ, six of which have datasets longer than five years that can be compared with the WW3 modelled data. Due to technological advancements, there is some discrepancies in the historical wave monitoring data caused by equipment upgrade. This has primarily resulted in changes to the recording schema from a 12 or 6 hour recording interval to the current 30 minute interval. It has been noted that recording intervals greater than 6 hours are likely to underestimate extreme wave events and miss maximum wave heights and periods. As such, the data recorded at intervals greater than 6 hours should be removed to obtain the most reliable measurements possible.

RESULTS

This project assesses the modal and extreme wave climate of SEQ over 40 years, produced using the WW3 hindcast and validated via comparison to in-situ wave observations, to determine the accuracy of wave models and determine their viability for long-term monitoring in the sub-tropical SEQ region. As an example Figure 1 demonstrates the wave climate at the Brisbane Buoy location, while Figure 2 displays a one month comparative timeseries of the WW3 and Brisbane Buoy data.

The WW3 hind-cast data compared well with the in-situ data displaying a strong correlation. The Wave climate is dominated by waves from the south to south east, with waves between 0.5 and 3.0 meters. Extreme waves over H_s 3.0 m were incident over a larger range of direction from south though to east, with a maximum wave height of 16.8.

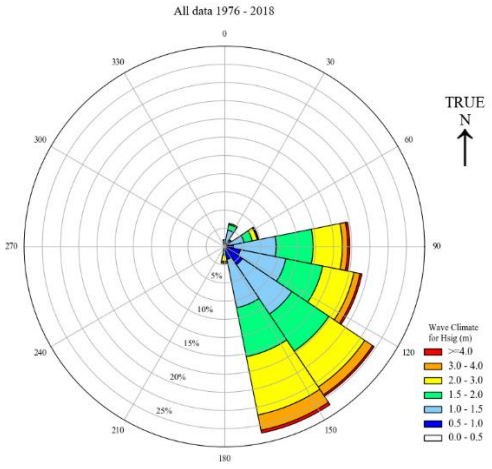

Figure 1 Directional wave rose for the Brisbane Site 1976 - 2018

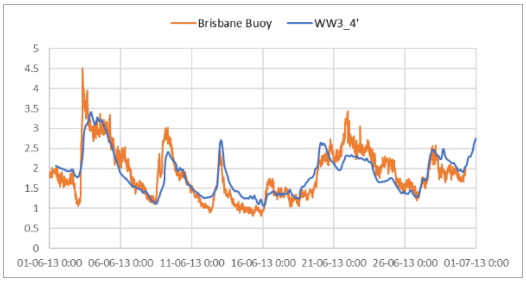

Figure 2 Comparison between WW3 and the Brisbane buoy

REFERENCES

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Perez, Jorge, Melisa Menendez, and Inigo J. Losada. 2017. "GOW2: A Global Wave Hindcast for Coastal Applications." *Coastal Engineering* 124(January): 1-11. http://dx.doi.org/10.1016/j.coastaleng.2017.03.005.