

# Large-Scale Climate and Atmospheric Drivers of Local Headland Bypassing

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## Supplementary Material

### Supplementary Tables

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**Supplementary Table 1: Geographic domains tested for the weather type analysis and the results of the multivariate linear regression between the PCs and the daily wave parameters (significant wave height Hs, peak period Tp and peak direction Dirp). Results are presented for calibration/validation periods.**

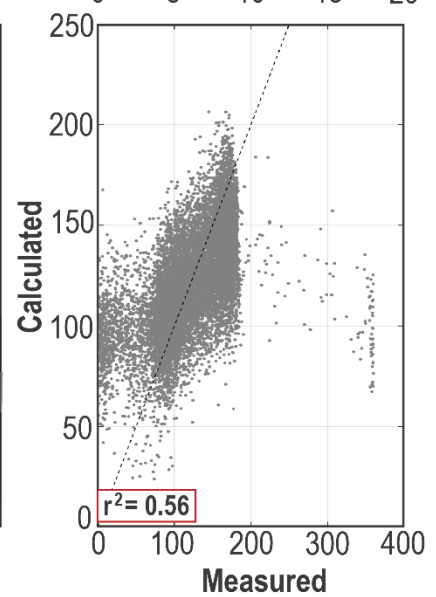
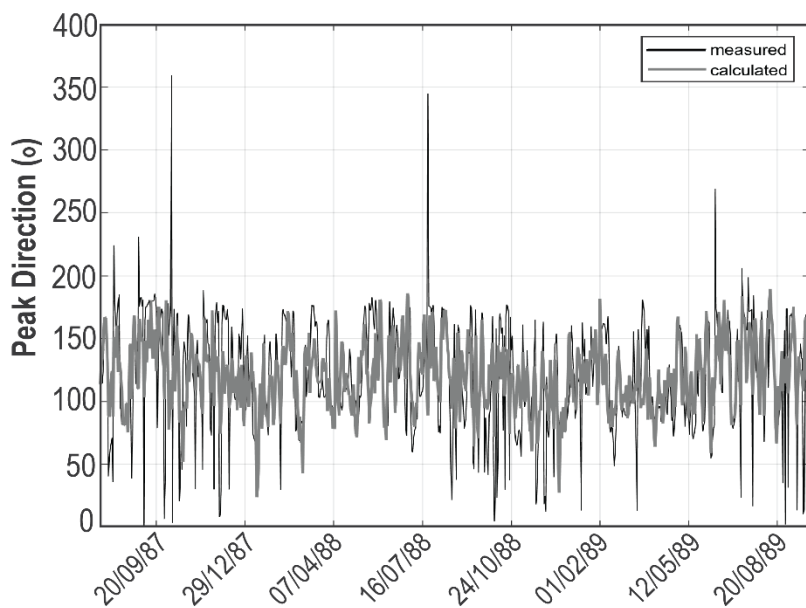
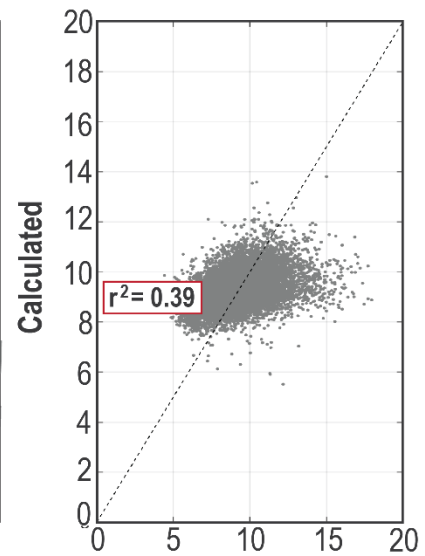
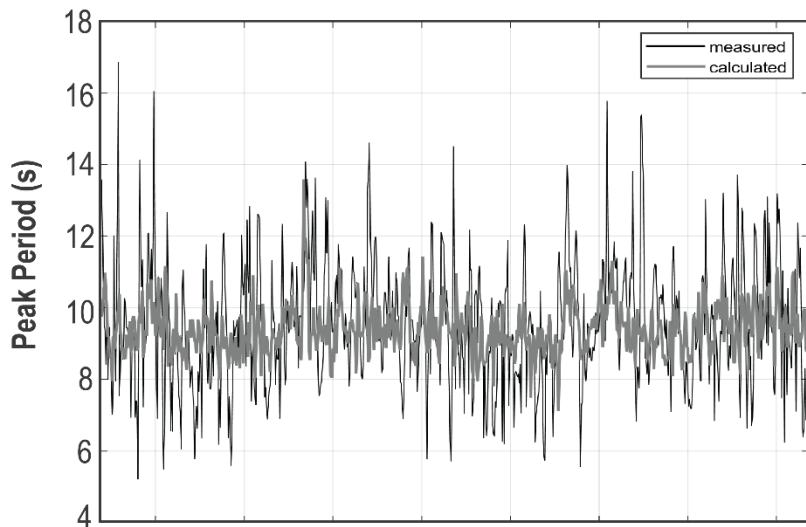
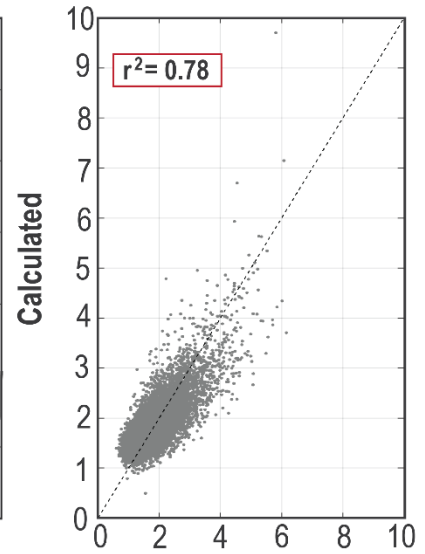
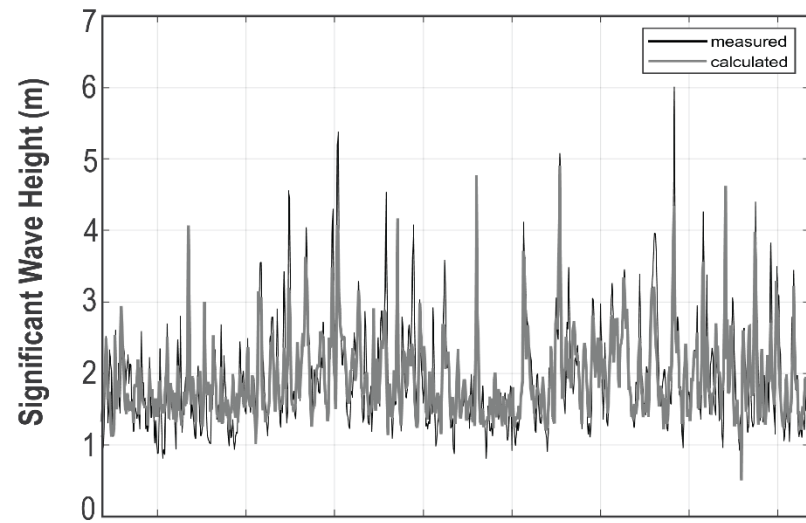
Latitude	Longitude	Hs	Tp	Dirp
70N to 70S	130 to 300	0.08 / 0.03	0.13 / 0.19	0.17 / 0.16
25N to 60S	140 to 300	0.07 / 0.03	0.11 / 0.17	0.16 / 0.13
10N to 60S	130 to 210	0.17 / 0.13	0.23 / 0.11	0.25 / 0.19
0 to 60S	140 to 200	0.78 / 0.78	0.39 / 0.32	0.55 / 0.54
<b>0 to 60S</b>	<b>140 to 190</b>	<b>0.78 / 0.78</b>	<b>0.39 / 0.33</b>	<b>0.56 / 0.56</b>
0 to 50S	140 to 180	0.77 / 0.77	0.39 / 0.32	0.55 / 0.55
10S to 45S	150 to 180	0.78 / 0.78	0.36 / 0.32	0.55 / 0.54
15S to 35S	150 to 165	0.77 / 0.79	0.29 / 0.32	0.52 / 0.49

### Supplementary Figures

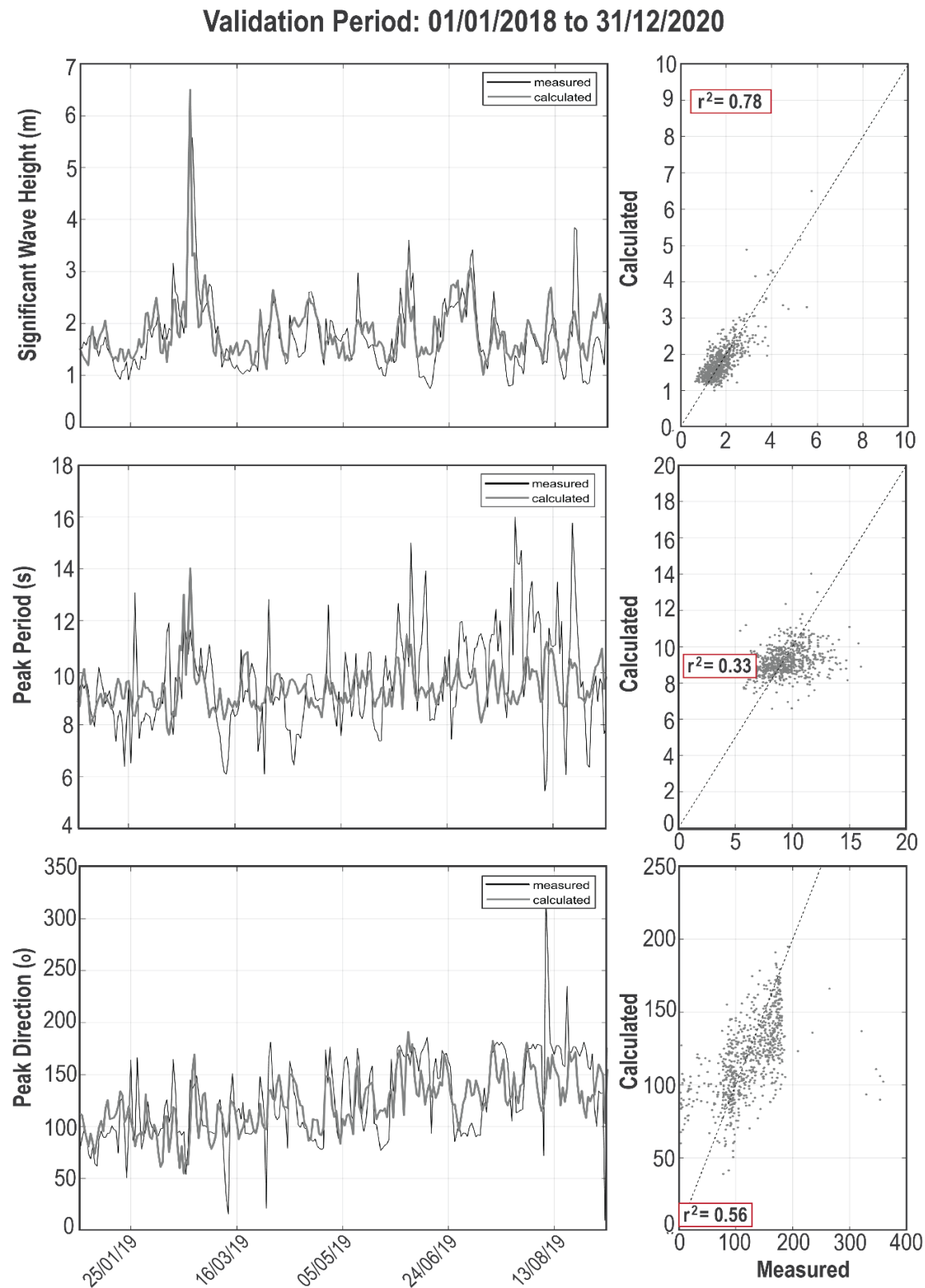
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**Supplementary Figure 1: Time series illustrating the results for the calibration period. Total calibration period was from 01 January 1987 to 01 January 2018. Figure represents the first 2 years of the calibration. R<sup>2</sup> are calculated for the complete period.**

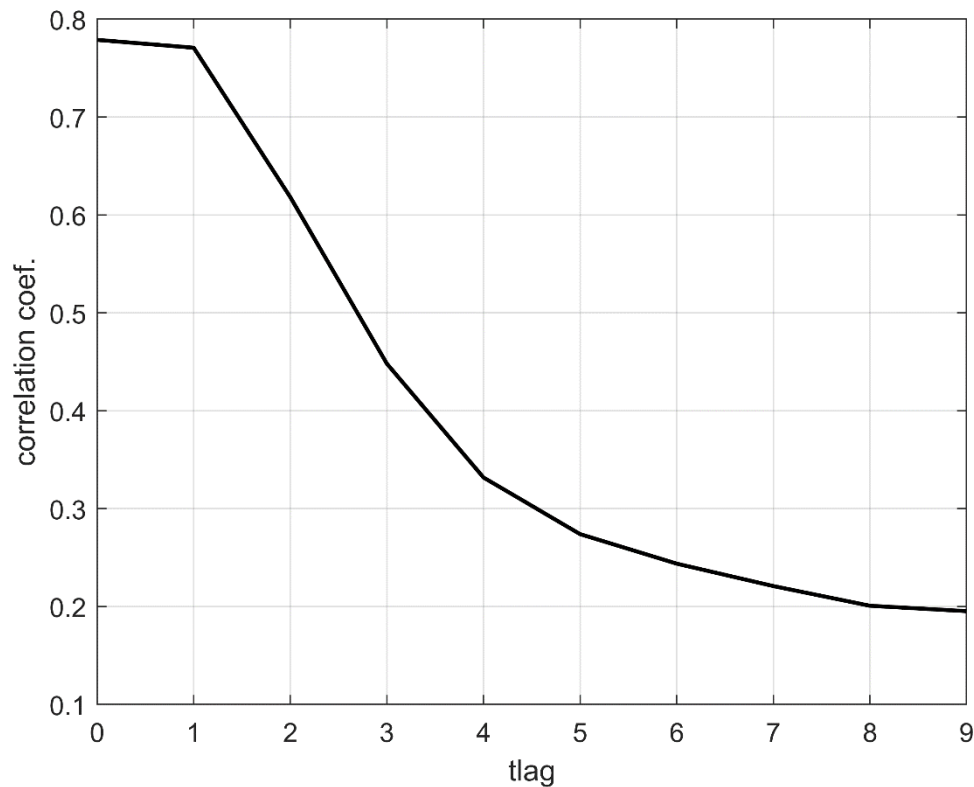
## Calibration Period: 01/01/1987 to 01/01/2018



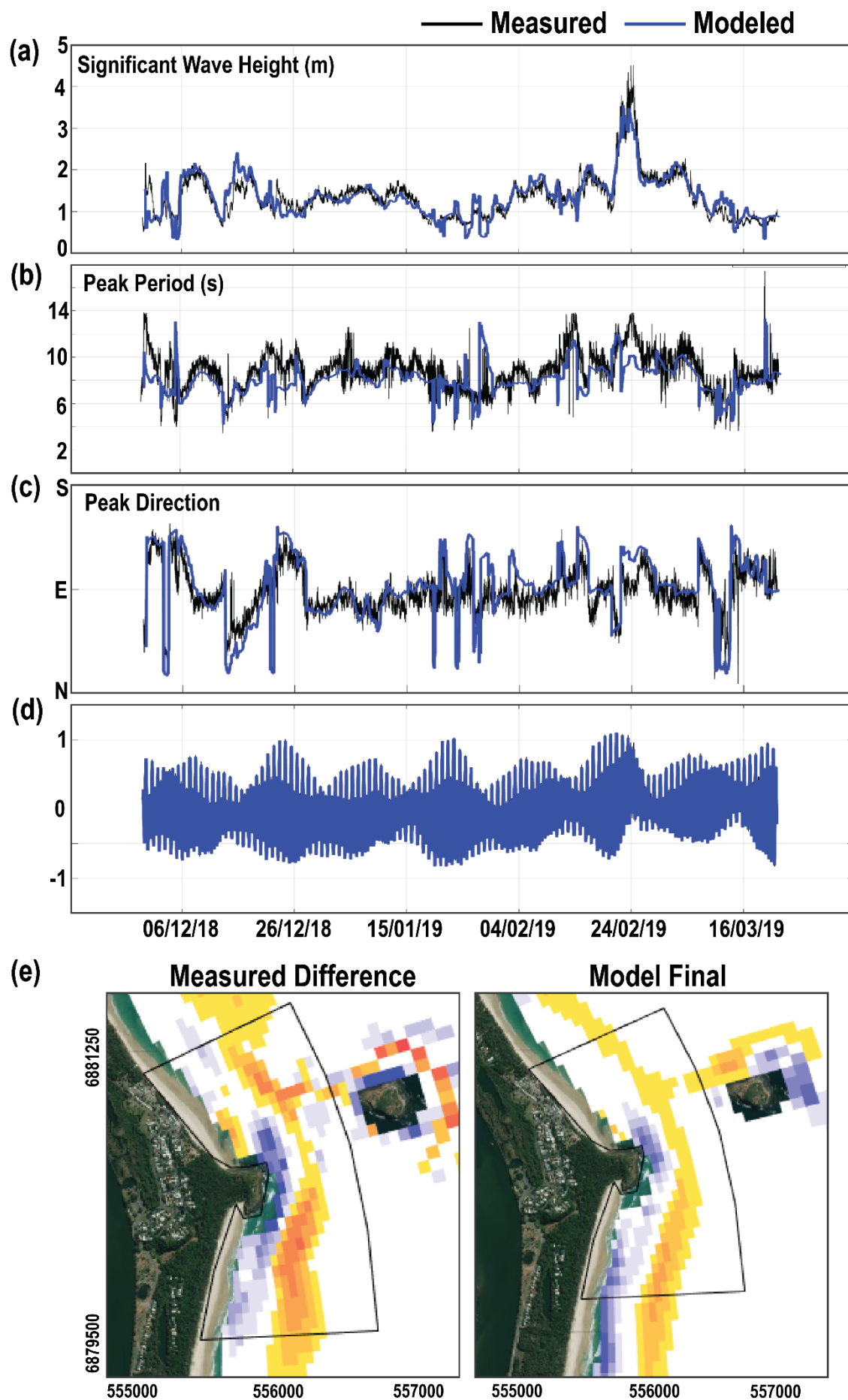
**Supplementary Figure 2: Time series illustrating the results for the validation period. Total validation period was from 01 January 2018 to 31 December 2020. Figure presents the results for the year of 2019.  $R^2$  are calculated for the complete period.**



**Supplementary Figure 3: Results of correlation coefficients (Y-axis) by the time lag (X-axis) used on the multivariate linear regression between significant wave height and PCs.**



**Supplementary Figure 4: Comparison of measured and modelled results for hydrodynamic parameters at the Tweed Buoy location including (a) significant wave height, (b) peak period, (c) peak direction and (d) water level. Morphological changes around Fingal Head are also compared (e) showing the results for difference between measured initial and final bathymetries and the model final result for cumulative sediment accumulation and erosion on 22 March 2019.**



**Supplementary Figure 5: Waves (m), currents (m/s), sediment transport ( $10^{-3}$  m<sup>3</sup>/s/m) and cumulative accretion and erosion (m) model results for each of the secondary storm events: (a) February 2018 and (b) March 2017.**

