

Article

Brazil Wave Climate from a High-Resolution Wave Hindcast

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Citation: de Sá Cotrim, C.; Semedo, Á.; Lemos, G. Brazil Wave Climate from a High-Resolution Wave Hindcast. *Climate* **2022**, *10*, 53. <https://doi.org/10.3390/cli10040053>

Academic Editor(s):

Received: date

Accepted: date

Published: date

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Abstract: A detailed climatology of ocean wind waves in the South Atlantic Ocean, based on the ERA-5 reanalysis and in a higher resolution wave hindcast (ERA-5H), both developed by the European Centre for Medium-Range Weather Forecasts, is presented. The higher resolution of the wave fields in the ERA-5H (22 km), allowed a better description of the wind sea and swell features, compared to previous global and regional studies along the Brazilian coast. Overall, it is shown that swell waves are more prevalent and carry more energy in the offshore area of the study area, while wind sea waves dominate the nearshore regions, especially along the northern coast of Brazil. The influence of different climate indices on the significant wave heights patterns is also presented, with two behavioral groups showing opposite correlations to the North Atlantic Oscillation and Southern Annular Mode than to the Southern Oscillation Index. The analysis of the decadal trends of wind sea and swell heights during the ERA-5H period (1979–2020) shows that the long-term trends of the total significant wave height in the South Atlantic Ocean are mostly due to swell events and to the wave propagation effect from Southern Ocean storms.

Keywords: wave analysis; ERA5; South Atlantic Ocean

Supplementary Material

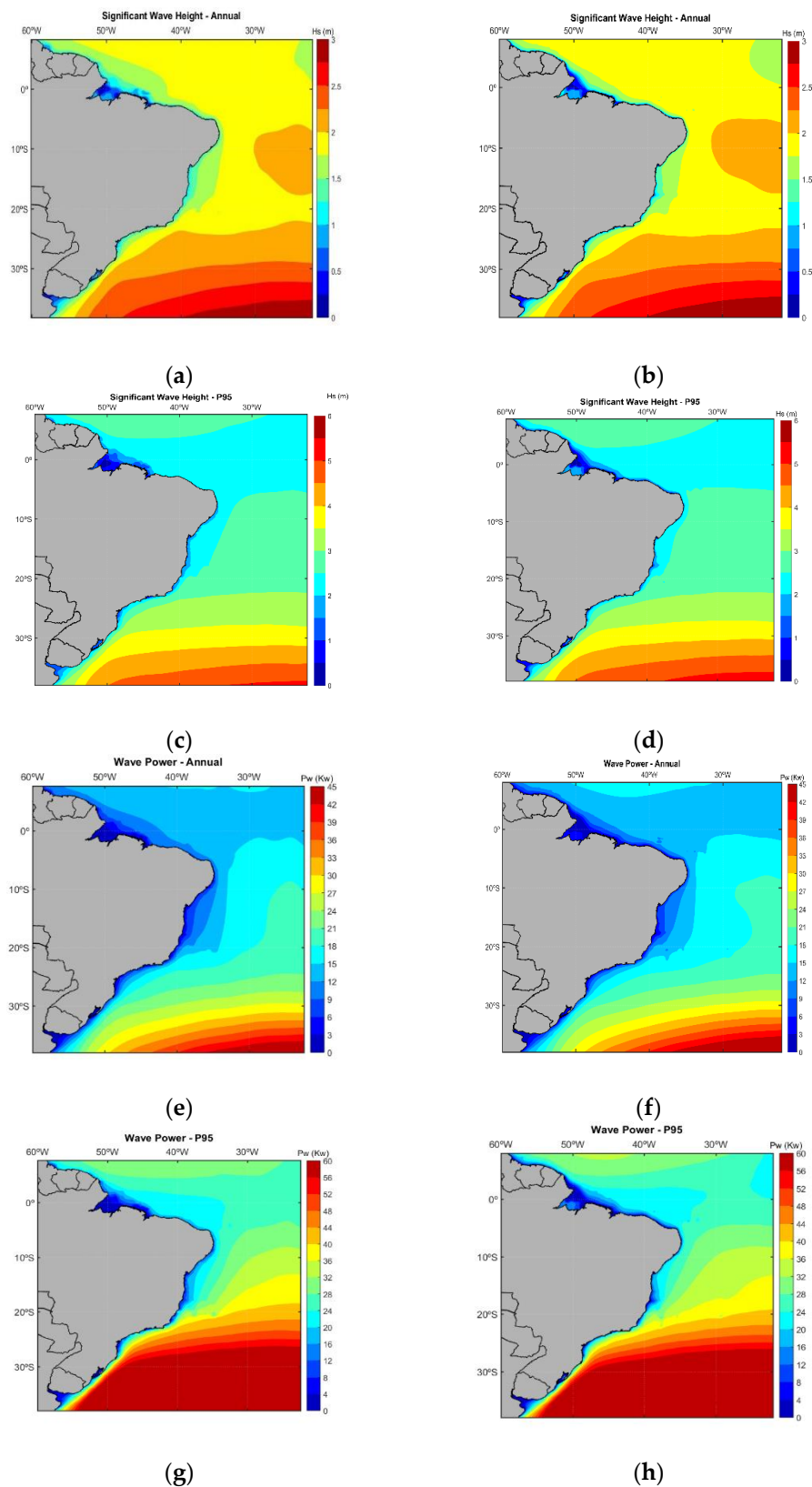


Figure S1. Spatial distribution of annual averages of H_s (m) (a), P95 (m) (c), P_w (Kw) (e) and P95 of P_w (Kw) (g) based on ERA5, for Brazil. Spatial distribution of annual averages of H_s (m) (b), P95 (m) (d), P_w (Kw) (f) and P95 of P_w (Kw) (h) based on ERA-5H, for Brazil.

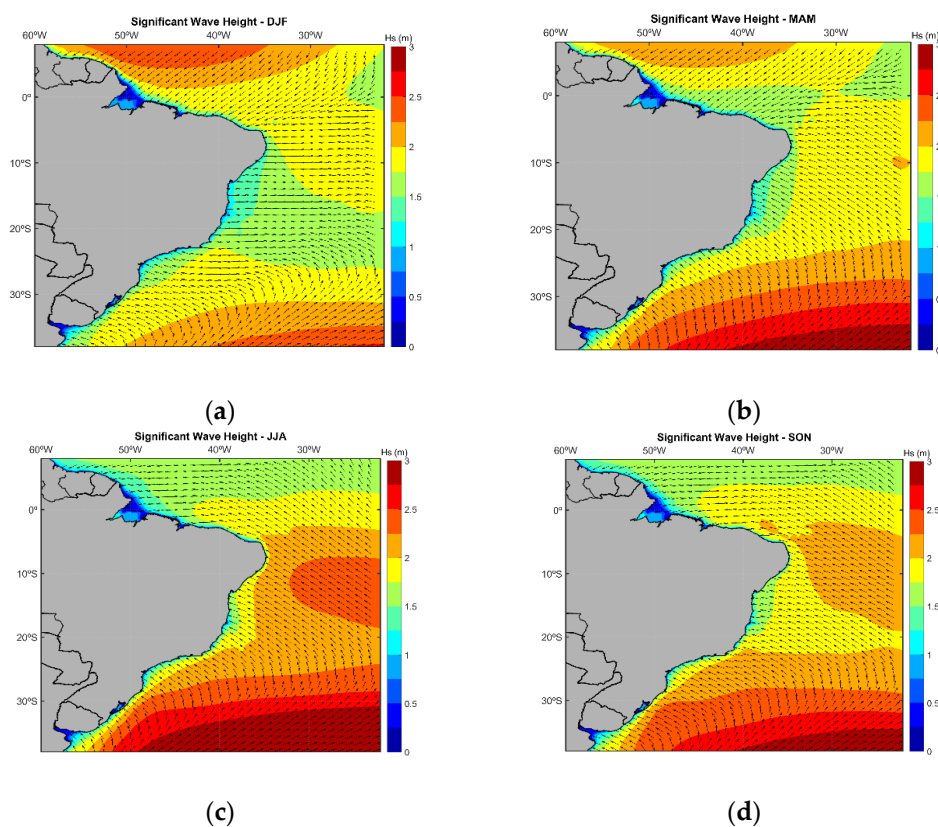


Figure S2. Spatial distribution of seasonal averages of H_s (m) and θ_m ($^\circ$) for (a) DJF, (b) MAM, (c) JJA, and (d) SON, for Brazil.

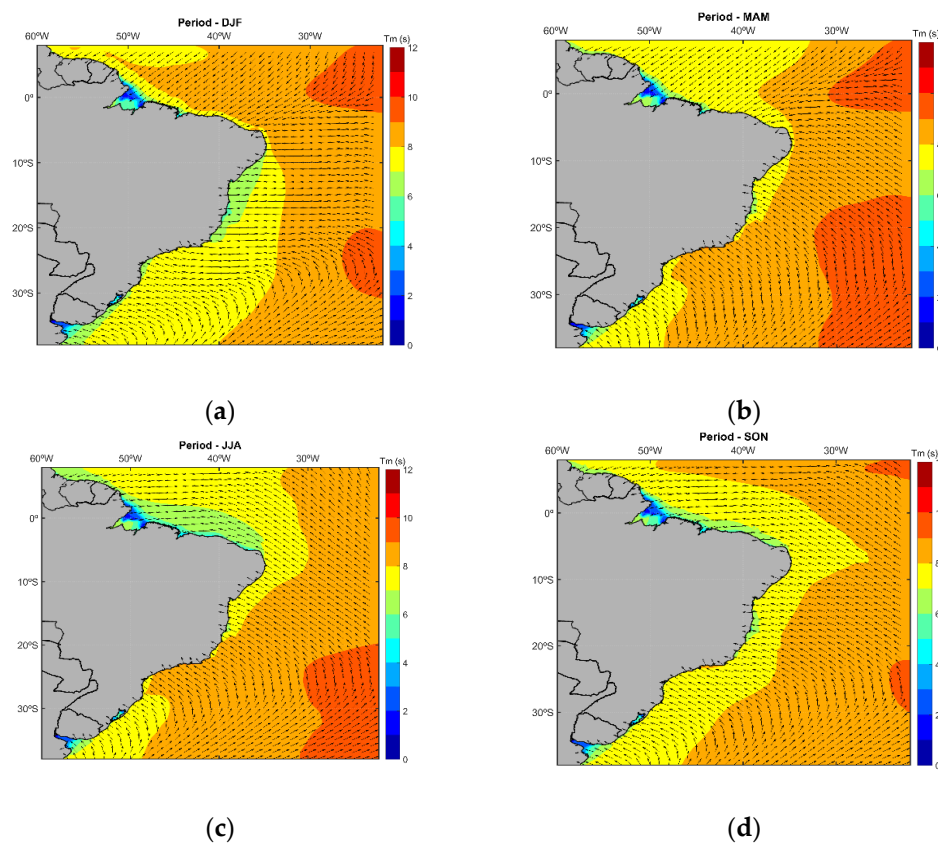


Figure S3. Spatial distribution of seasonal averages of T_m (s) and θ_m ($^\circ$) for (a) DJF, (b) MAM, (c) JJA, and (d) SON, for Brazil.

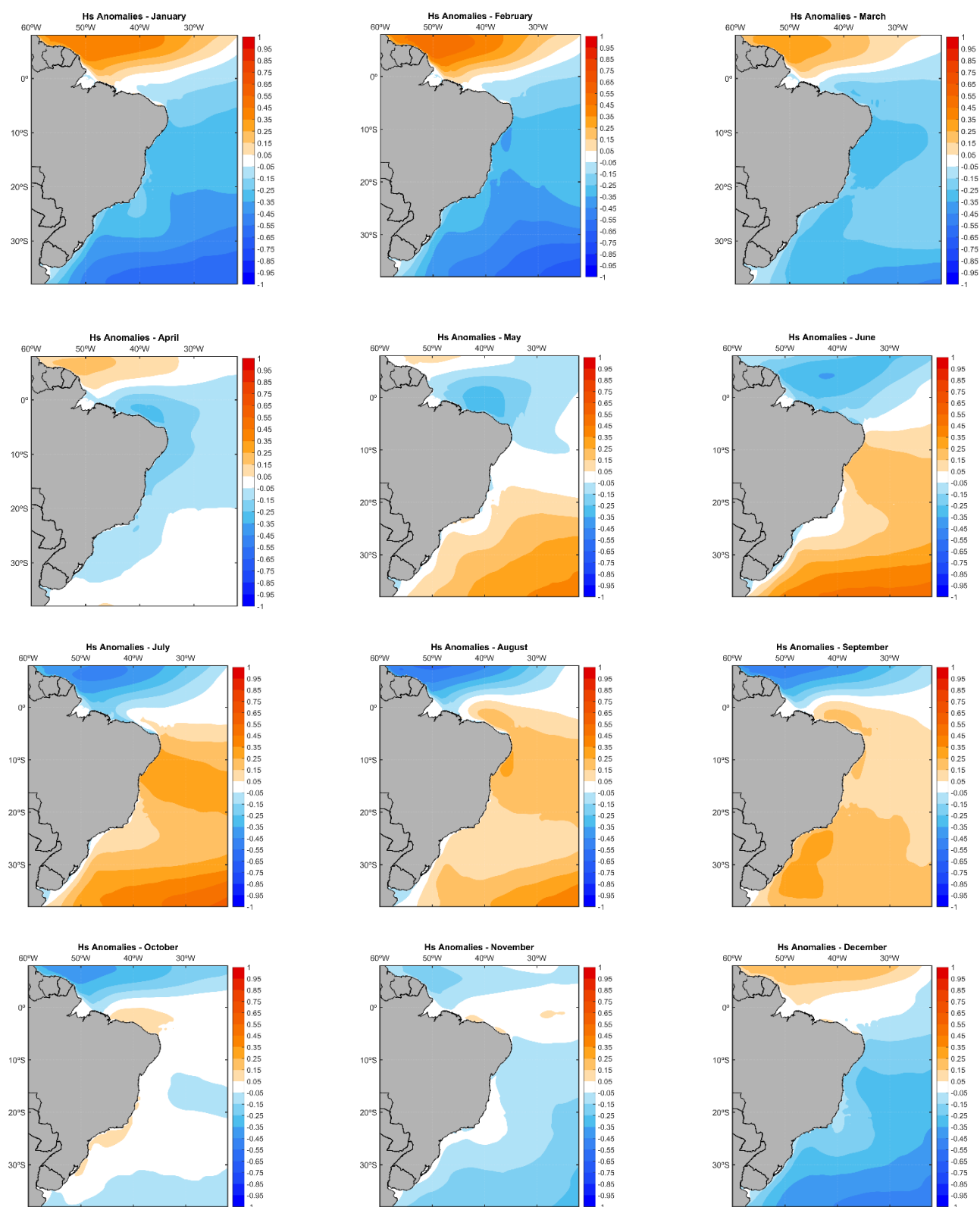


Figure S4. Spatial distribution of H_s anomalies (m) per month, for Brazil.