## Ocean Forecasting and Analysis Systems as a Tool to Investigate Coastal Trapped Waves Along the Brazilian Continental Margin

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## Abstract

Coastal Trapped Waves (CTW) are low-frequency oscillations in sea level and currents that propagate phase with the coast in its left (right) in the Southern (Northern) Hemisphere. These waves can play a significant role in the hydrodynamic variability along continental margins worldwide. Along the Brazilian continental margin, studies have shown that CTW are primarily generated by synoptic atmospheric systems, with a notable decay in the wave signal in Sea Surface Height (SSH) near the Tubarão Embayment and the Abrolhos Bank (near the latitude of 21° S).

This study compares 7 different Ocean Forecasting and Analysis Systems (OFAS) and 11 *in situ* SSH measurements to evaluate the reanalysis ability to represent the coastal phase propagation of CTW. The assessment uses the Taylor Skill Score, which combines the correlation and the standard deviations to provide a score able to objectively compare these data series. The associated statistical parameters, such as the Root Mean Squared Error, the correlation, and the standard deviation were also collectively evaluated. The evaluated OFAS are then employed to investigate CTW propagation along the Brazilian coast, their seasonality and their contribution to the current variability.

Results show that all OFAS successfully captured CTW in the region of interest, with an average skill of approximately  $0.6 \pm 0.3$ , higher skill scores (averaging  $0.7 \pm 0.1$ ) were observed in the south/southeast regions. The same behavior, with similar values, was also observed in the correlation. CTW in the northeast region exhibit significant coherence with signals in the southern/southeastern regions, particularly in the 10-15 day frequency band, but with lower energy levels. In the south/southeast regions, the waves display a seasonal pattern, with peak energy during winter, whereas a semiannual pattern emerges in the northeastern region. The along shelf current component of the OFAS reveal that the CTW accounts for over 70% of the current's energy in the south/southeast region, decreasing to around 40% in the north/northeast region.