



Topographically Trapped Waves Around South America : Oceanic Teleconnections between Equatorial Pacific and Tropical Atlantic

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Introduction : Topographically Trapped waves

Previous work : (Poli et al., JGR, 2020)

Locally forced trapped-waves contribute to the nutrient supply to the Patagonian platform (one of the largest fisheries of the world ocean)



Topographically Trapped waves

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Are there remotely forced trapped waves along the Patagonian Slope ?

Trapped waves propagation characteristics depend upon the slope, the stratification and the mean flow.



Contrasted characteristics between eastern and western South America



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Topographically Trapped Waves Propagate with the coast to their left in the southern hemisphere.





• To which extent does Altimetry capture their signal ?

- How do the TWs propagate around South America ?
 How do they evolve during their propagation ?
- What are the forcing mechanisms ?

Bathymetry

Observations

Models

Daily Gridded Satellite Altimetry ¼° resolution



Tide gauges

Mercator Ocean Reanalysis GLORYS12 :

1993-2019,1/12°, Daily outputs Assimilation: Along track SLA SST *in-situ* data (Argo, ctd, xbt, etc)



Theoretical :

Trapped linear waves (Brink et al., 1989)

Comparison between Satellite SLA/ model outputs and Tide gauge records



Spectral content of SLA around South America :



Spectral content of SLA around South America :



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Trapped Waves Around South America : Surface Signature

27 years lagged correlations (1993-2019) between 40-130 days band-pass filtered SLA at 47°S and SLA field:



-0.6

Coherent Propagative SLA patterns and their phase speeds :



Phase speeds depend upon shelf width and Burger number.

Burger number Bu=(a N / f)²



Bu >1 *Baroclinic (slower propagation)*

Forcing and modulation of the waves : Link with Madden Julian Oscillation and ENSO



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Forcing : Madden Julian Oscillation (MJO)

Lagged correlation between Madden-Julian Oscillation index and SLA along the track.



- The waves are triggered by the Zonal wind anomalies over the Equatorial Pacific associated with the MJO.

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- Satellite Altimetry detect coherent Sea Level Anomalies propagating along the slope from the Equatorial Pacific to the Tropical Atlantic (22°S) with velocities ranging between 1m/s to 7 m/s.
- They correspond to 40-130 days period trapped waves.
- The vertical structure of the waves evolves during their propagation and they modulate the mean flow.
- The Madden-Julian Oscillation (MJO), through oceanic and atmospheric teleconnections, plays a key role in forcing the trapped waves.
- Trapped waves activity is modulated by ENSO
- Furthermore, local winds trigger waves in specific locations, such as the south-east Pacific and the Brazil-Malvinas Confluence

Thank you !

Any questions ?

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Theoretical vertical modes :



Vertical structure:



Bu <1 Barotropic



Local wind forcing



Local wind forcing









