Distribution of *Trichodesmium* in the Brazil Current (BC) and their association with iron-rich particles

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1. Overview and motivation

- N-fixer Trichodesmium contribute significantly to carbon and nitrogen cycles in low-nutrient tropical and subtropical ocean basins.
- High biomass and abundance are often associated with specific physical conditions that may favor surface accumulation such as low wind speed, shallow mixed layer, stratification and mesoscale convergence zones.
- Only a few reports address their distribution in the South Atlantic Ocean, and the contribution to biogeochemical cycle is often limited to studies conducted in the North Pacific and North Atlantic Oceans.
- This study aimed to collect high spatial resolution data of *Trichodesmium* along the Brazilian Current to fill up the gap; elucidate the key environmental parameters associated with aggregations; and provide new data for

3. *Trichodesmium* x BC dynamics

High densities were related to high temperature, increased PO_4^{2-} (>0.08 µM) and NO_3^{2-} (~2.4 µM), low wind speeds (<11 m s⁻¹) and weak water column stability. We suggest that shelf break dynamics, which drive and modulate the intensity of upwellings, as well as wind divergence associated with mesoscale processes (~600 km²) may favor *Trichodesmium* growth and accumulation.





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2. Spatial and vertical distribution of *Trichodesmium*

Density distribution of trichomes. Gray circles represent <800 trichomes L⁻¹, red circles represent 800< and <8×10³ trichomes L⁻¹. Black "X" symbols indicate aggregations $(>8\times10^3$ trichomes L⁻¹). The inset map shows the average sea surface temperature distribution over the three cruises and the 36 salinity isoline, indicating the **Tropical Water limit**



Vertical distribution of *Trichodesmium* at four northernmost stations, showing (a) total trichomes L⁻¹,

Daily maps of absolute geostrophic velocities (m s⁻¹⁾ (black vectors) and SSH (m) anomaly (colorbar) for the respective days during observed *Trichodesmium* aggregations (black dots)

4. Unique biogeochemistry inside the colonies





(b) single trichomes L⁻¹, (c) puff-shaped colonies L⁻¹, and (d) tuft-shaped colonies L⁻¹



Vertical distribution of *Trichodesmium* at four southernmost stations



EDS x-ray analysis of particle composition: averaged contribution of elements, as percentage, from samples of different stations



Images taken by inverted microscopy (Zeiss Axiovert A1) coupled with a camera (AxioCam MRc) and SEM images of *Trichodesmium* with associated particles and heterotrophic bacteria

5. Concluding remarks

- Trichodesmium trichomes were found in all stations along the BC, with abundance decreasing southwards and with depth. They were associated with higher temperatures >22°C and mesoscale processes such as wind divergence and shelf break upwellings.
- Colonies had particles attached to their surface and interior that were composed by a wide range of elements. Associations between the colonies and heterotroph bacteria may convert these particles into bioavailable nutrients.
- Estimates on biological role in biogeochemical cycles must take into consideration the high *Trichodesmium* abundance and unique behavior along the BC.



Projeto TALUDE

