Differences Between the Subtropical Surface Salinity Patterns

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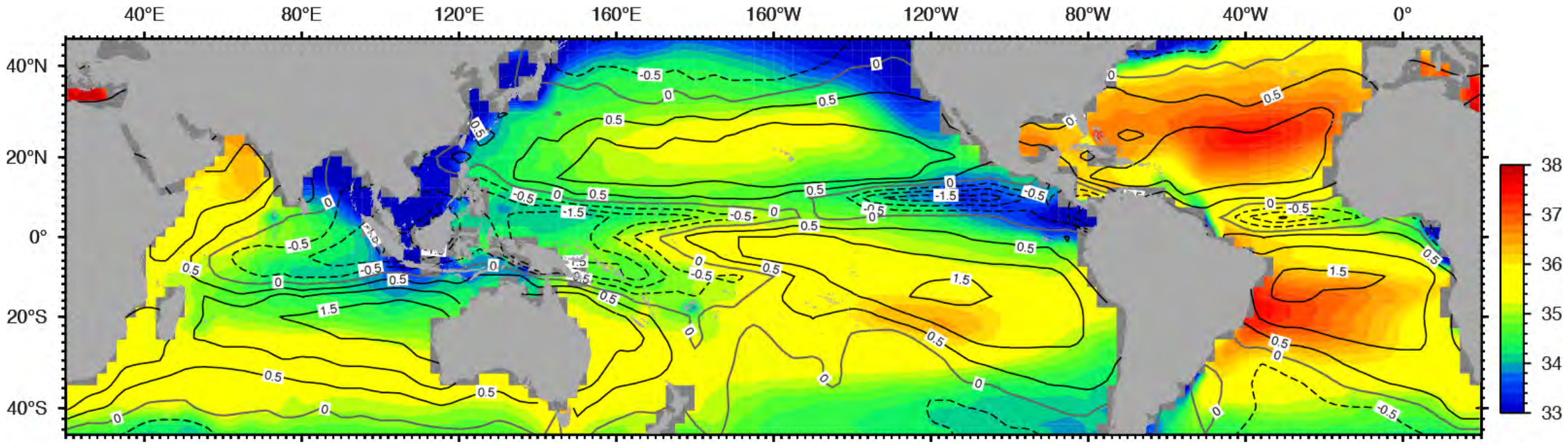
Introduction



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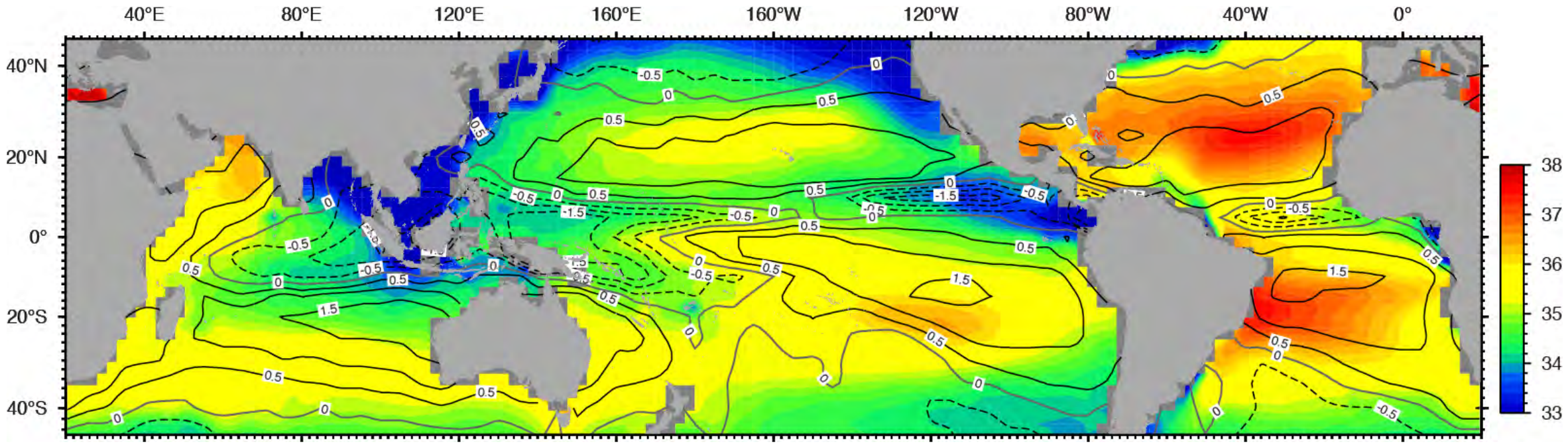

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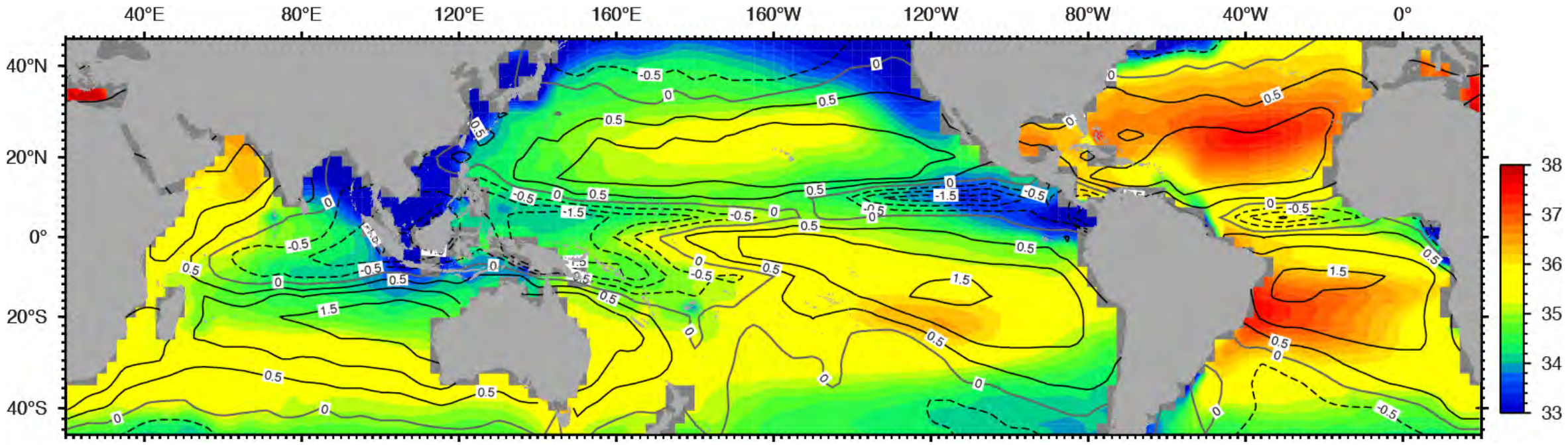

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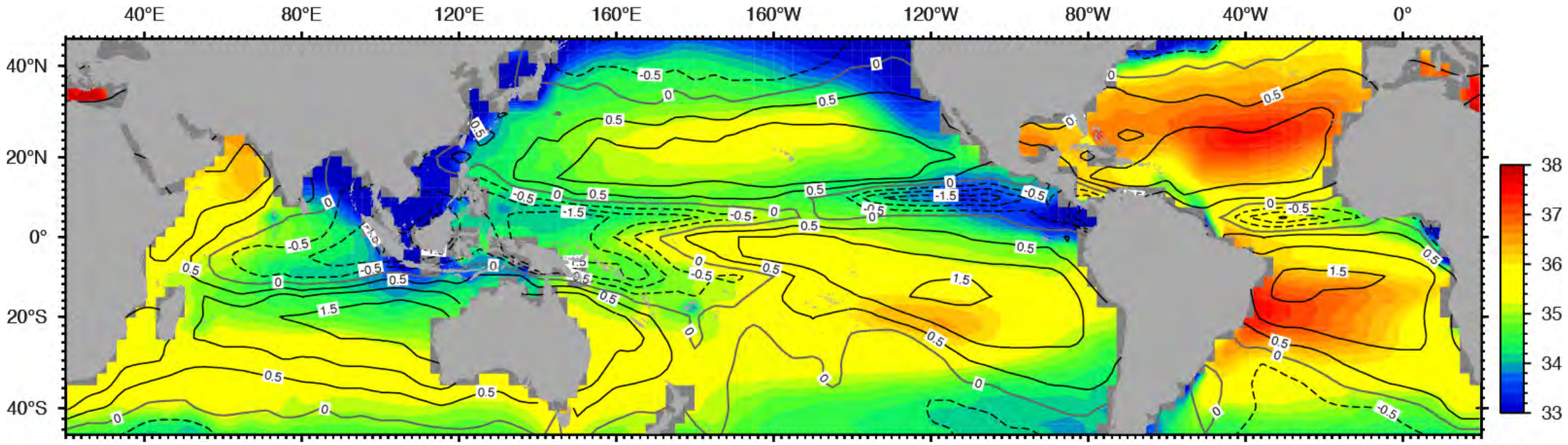

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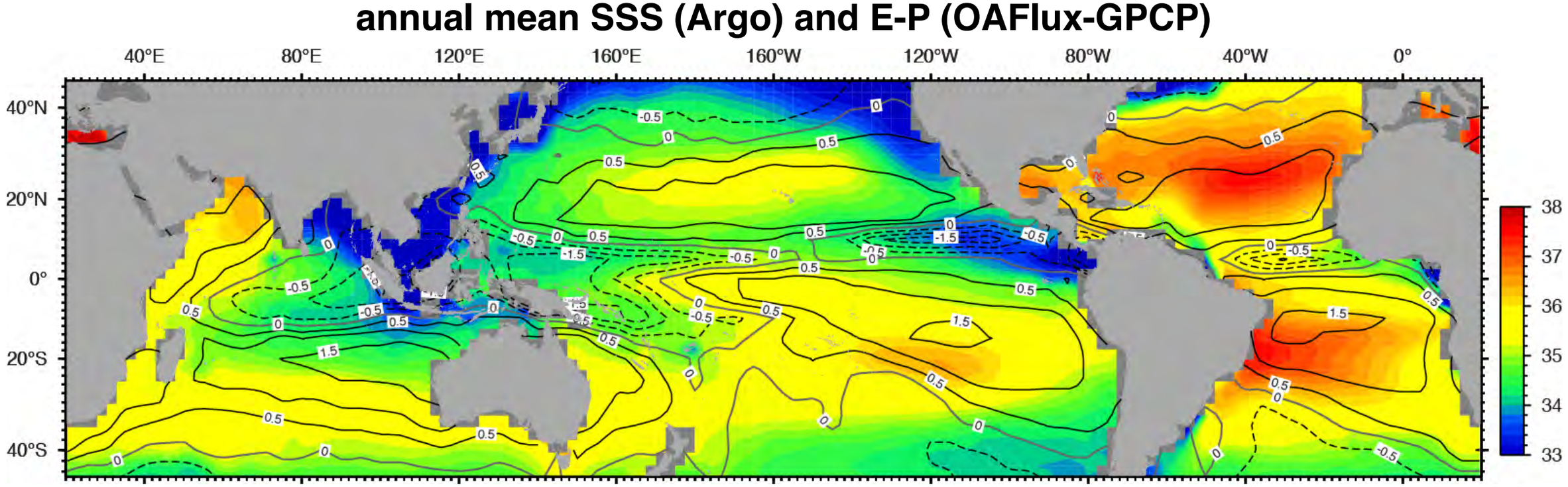

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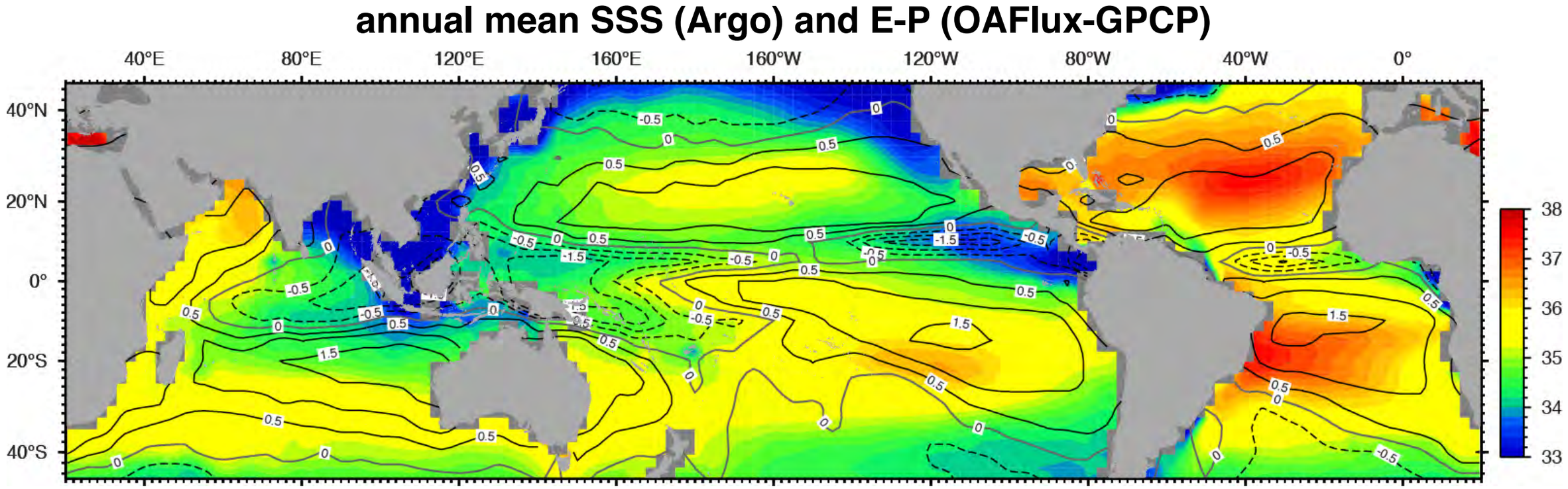
- Can we readily apply findings to other basins ?



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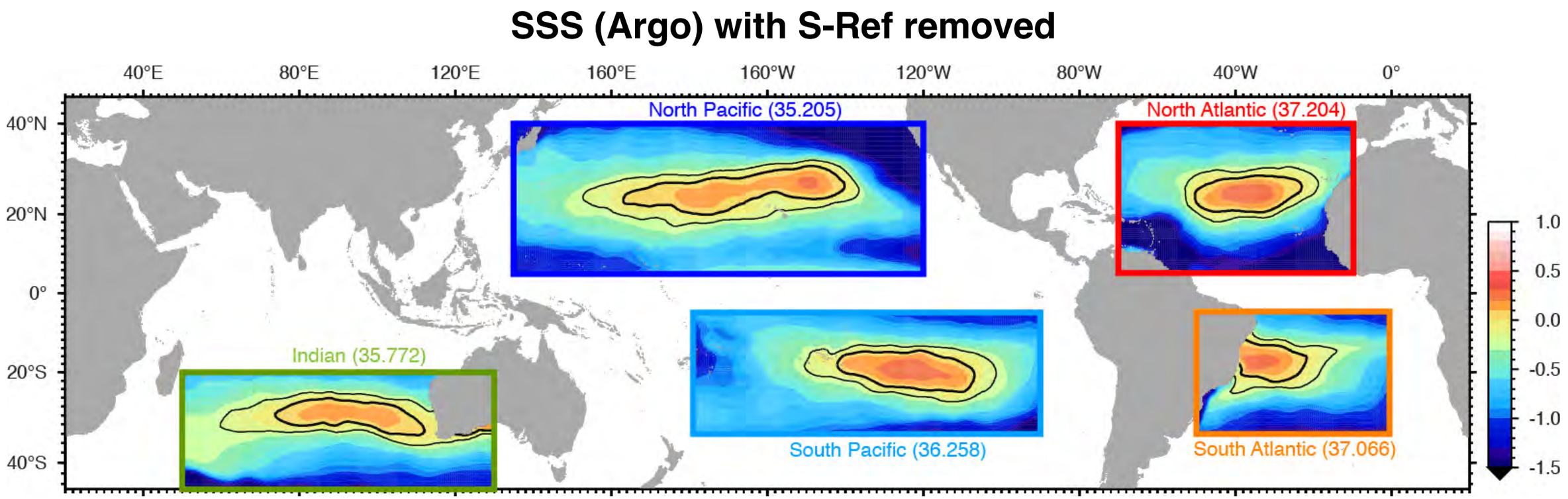
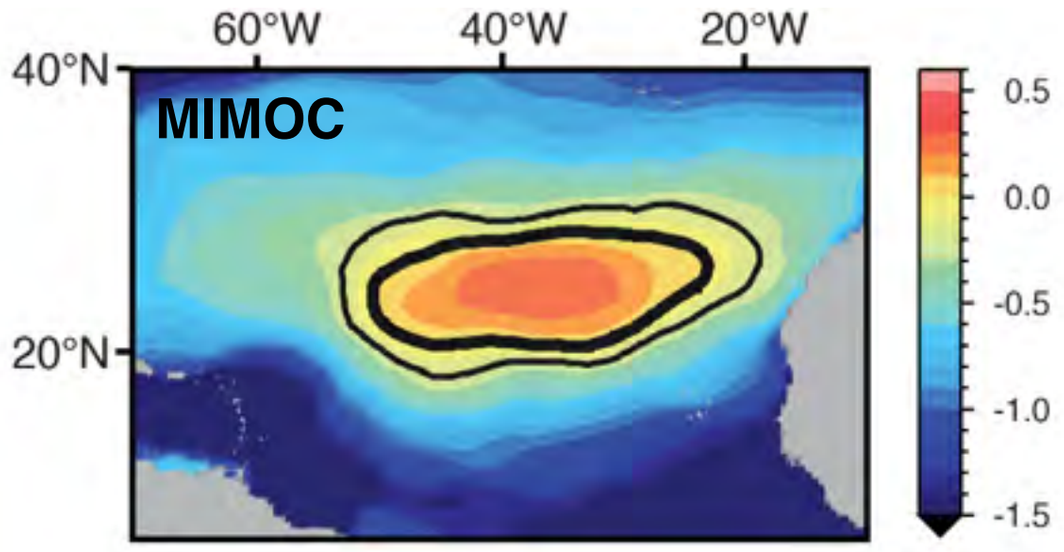


North Atlantic

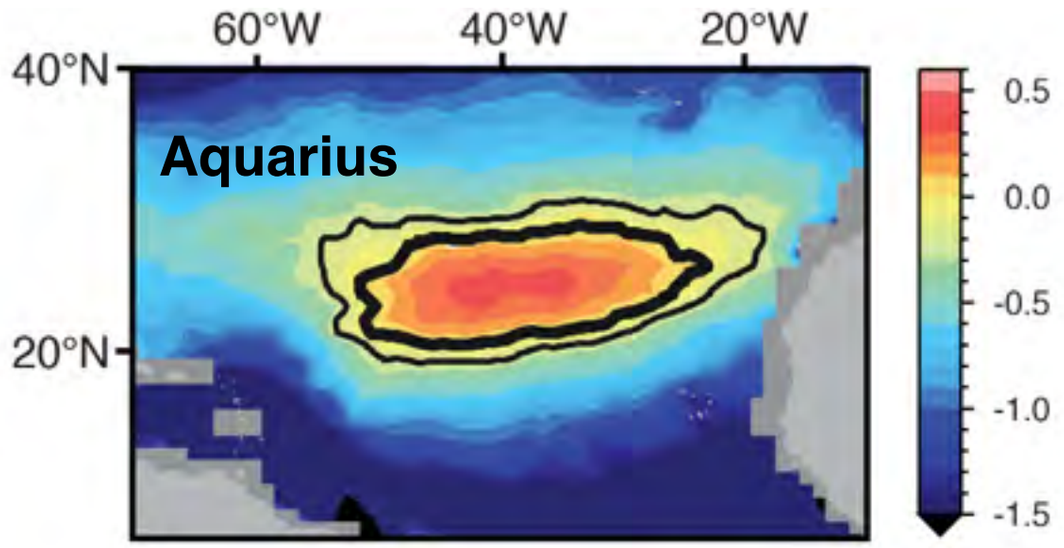
Saltiest of the 5 subtropical regions

- High E-P
- water vapor flux across Central America
- AMOC



- The subtropical eastern boundary current (Canary Current) is saltier than in the other basins
- Does not advect low salinity subpolar water towards the equator as the North/South Pacific and South Atlantic.
- Rather, the subpolar region feeds into the lower limb of the AMOC.

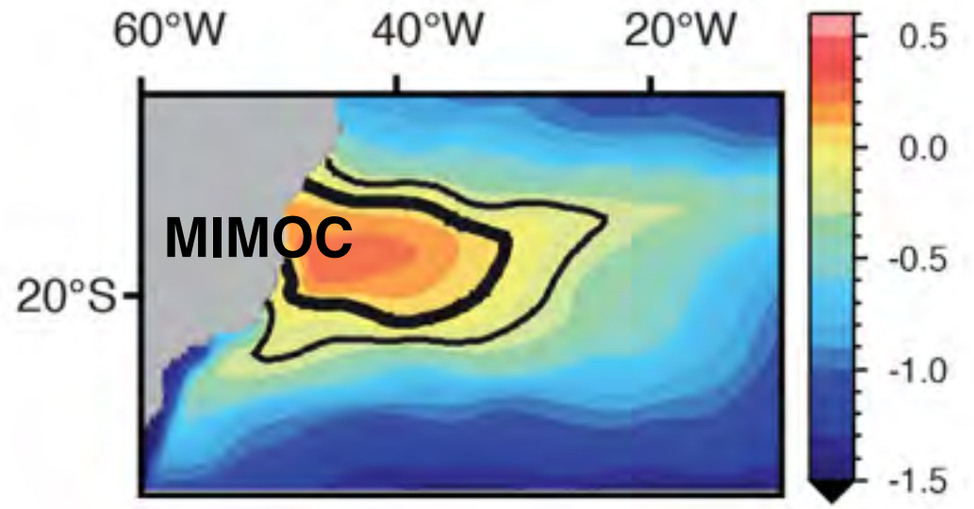
Mean SSS with S-Ref removed



South Atlantic

SSS-max at the western boundary

- Likely a consequence of the AMOC.
    - Lower salinity water (Agulhas leakage and subpolar water) curl into the Benguela Current (Beal et al., 2011).
    - The South Equatorial Current (SEC) 'washes' away the SSS-max within the central and eastern subtropical sectors of the South Atlantic.
    - The SEC feeds into the cross equatorial transport, rather than turning southward into the South Atlantic subtropical western boundary (Brazil current), leading to a build up in salty waters along the coast.



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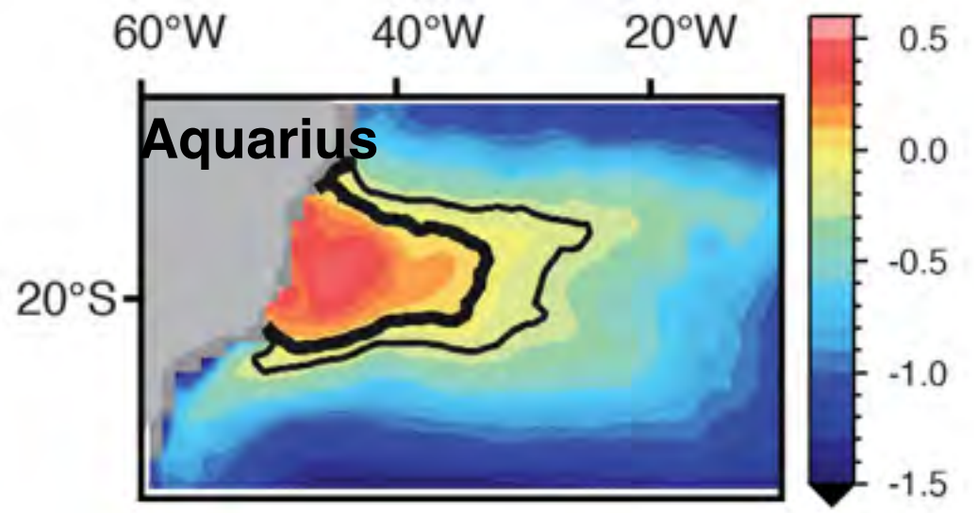
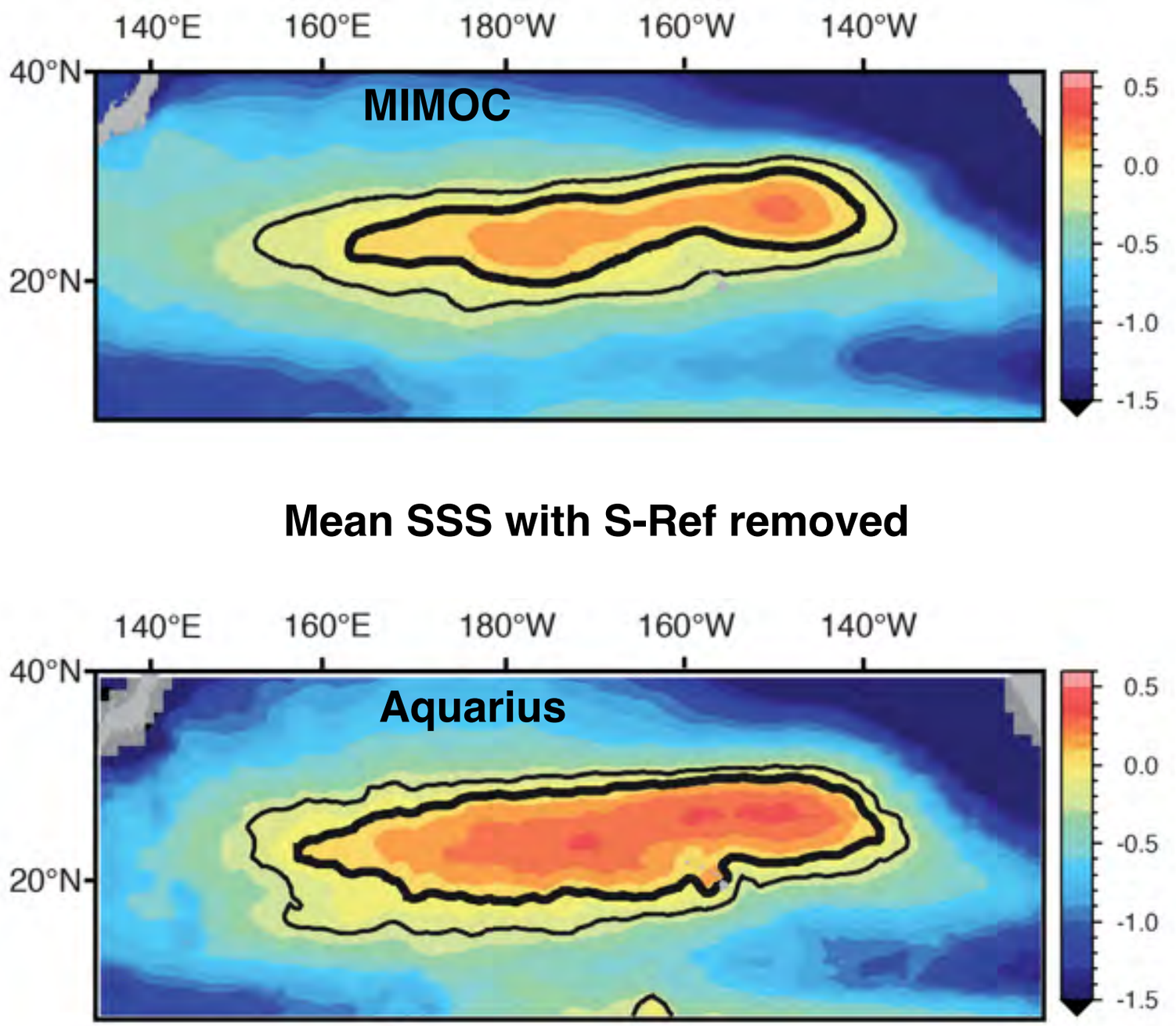


North Pacific

Freshest of the 5 subtropical regions

- Basin has negative E-P due to input of water vapor from the across Central America, and southern hemisphere water vapor into the ITCZ.

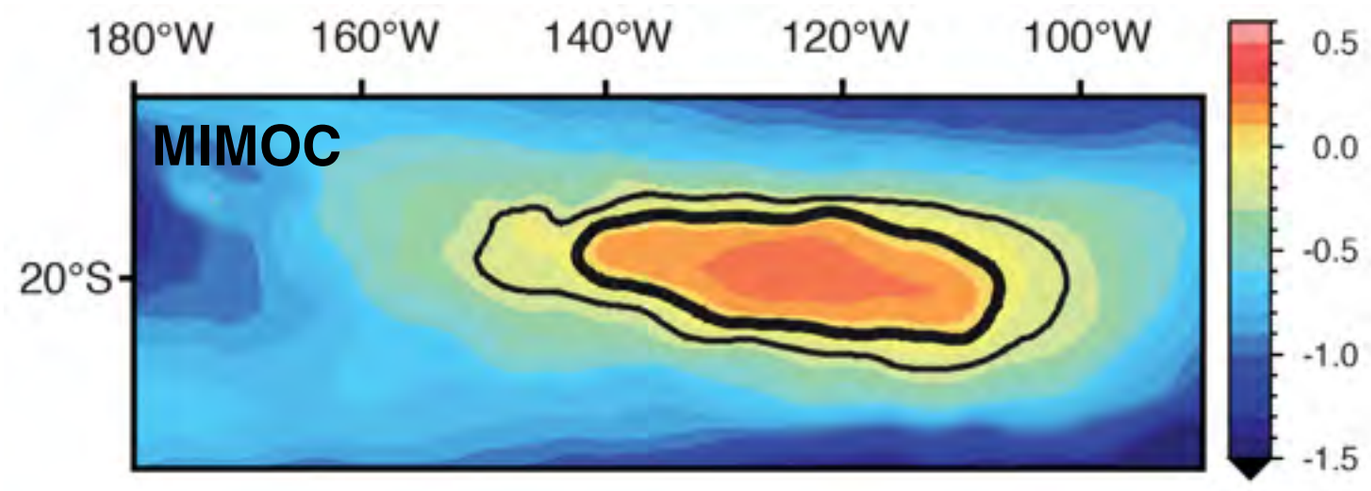
- Low SSS subpolar water is mainly injected into subtropical latitudes in the eastern boundary California Current, as export into the Arctic is small



South Pacific

Primary and a secondary SSS-max

- Southern ITCZ
    - The South Pacific displays a large SSS anomaly and a broad seasonal cycle compared to the other 4 SSS-max regions
- Within the western tropical South Pacific maximum SSS occurs in August/September, whereas more variable timing of the SSS-max occurs in the eastern South Pacific. (Bingham et al., 2010)
- This is likely a result of the details of the seasonal variability of the precipitation.



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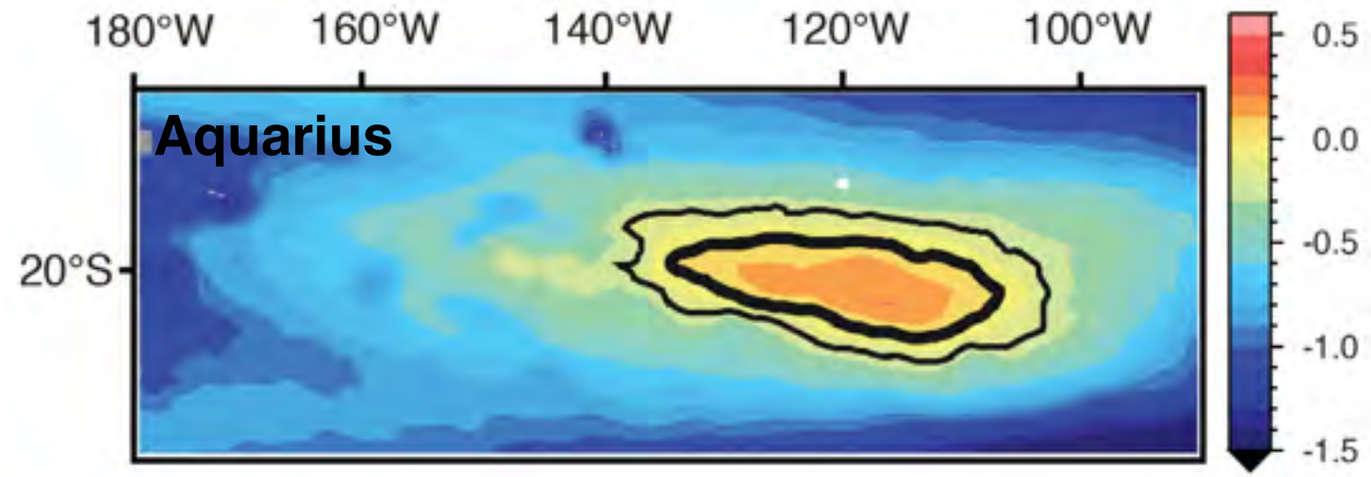


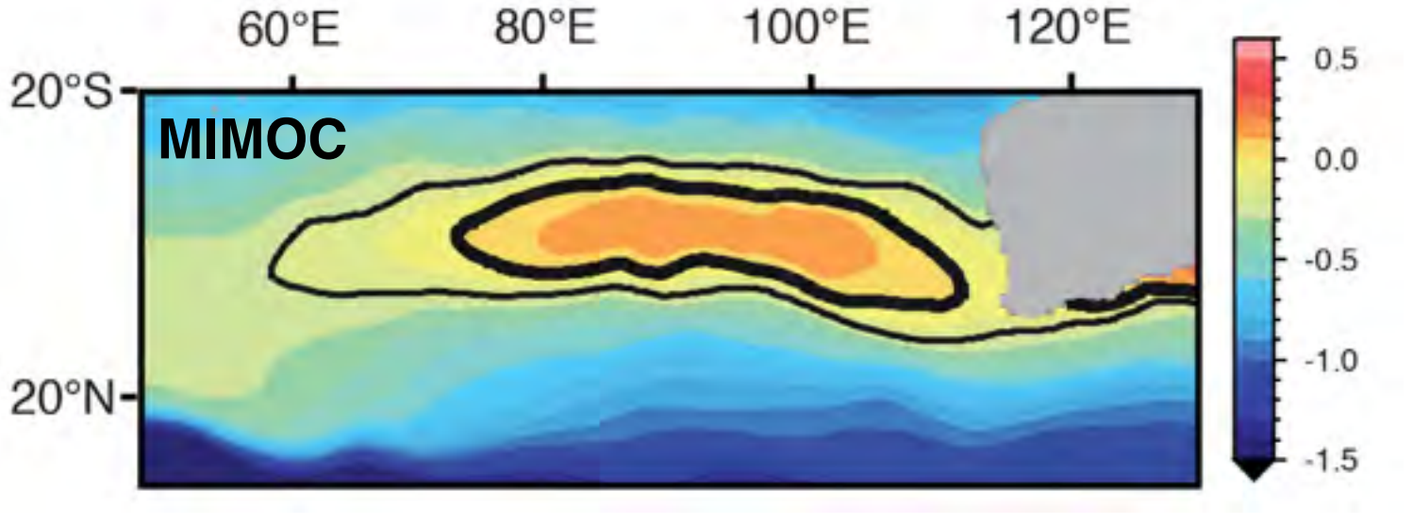
Indian Ocean

Broad zonal band / furthest from the Equator.

- Monsoon shifts ITCZ into the southern hemisphere during the boreal winter season.

- Low SSS are injected into the eastern Indian Ocean with the Indonesian throughflow and from the Bay of Bengal. Forcing the subtropical SSS-max water to reside well to the south of the high E-P band slightly north of 20°S.

- The eastern boundary is relatively salty as low SSS subpolar water blocked by the southward flowing Leeuwin Current off the coast of Australia. Instead Tasman leakage allows salty subtropical water from the Great Australian Bight to spread into the Indian Ocean



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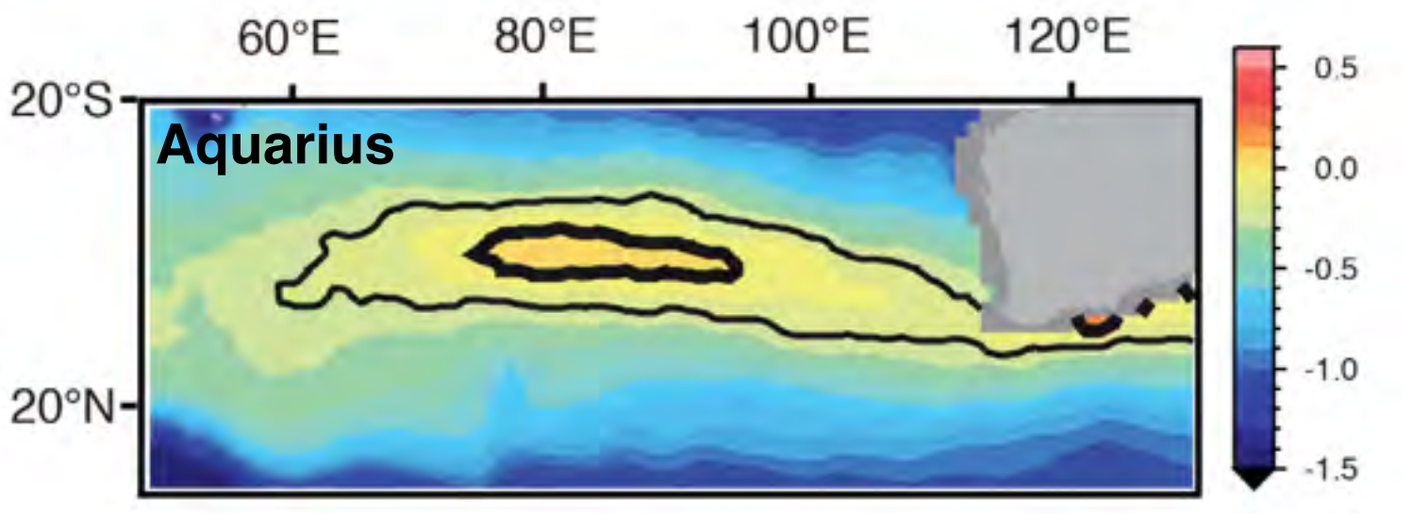
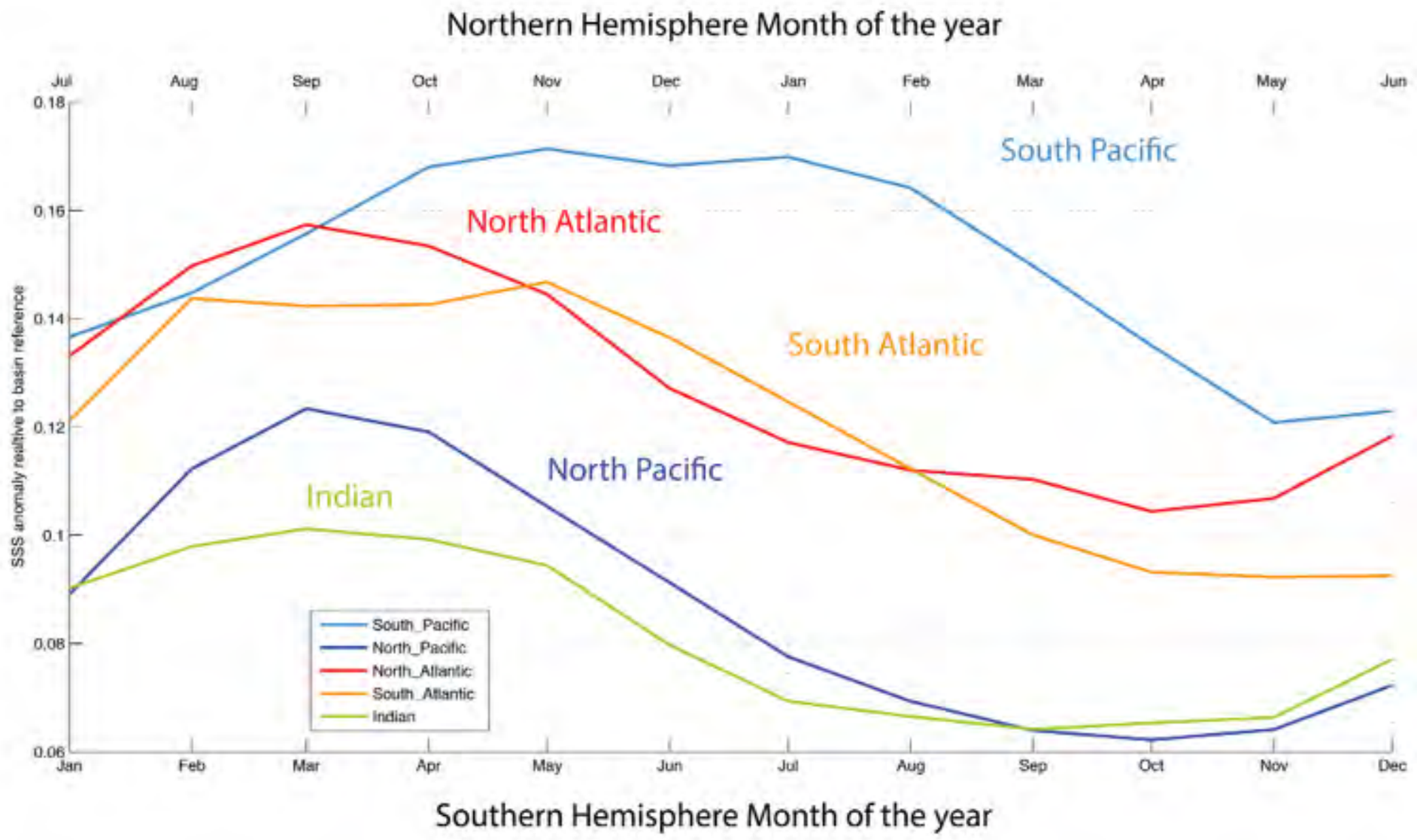


Seasonal Cycle

- Climatology shows seasonal cycle in all SSS-max with varying strength
- Higher values indicate higher salinity contrast within the SSS-max



Argo-MIMOC salinity anomaly averaged within S=S-ref

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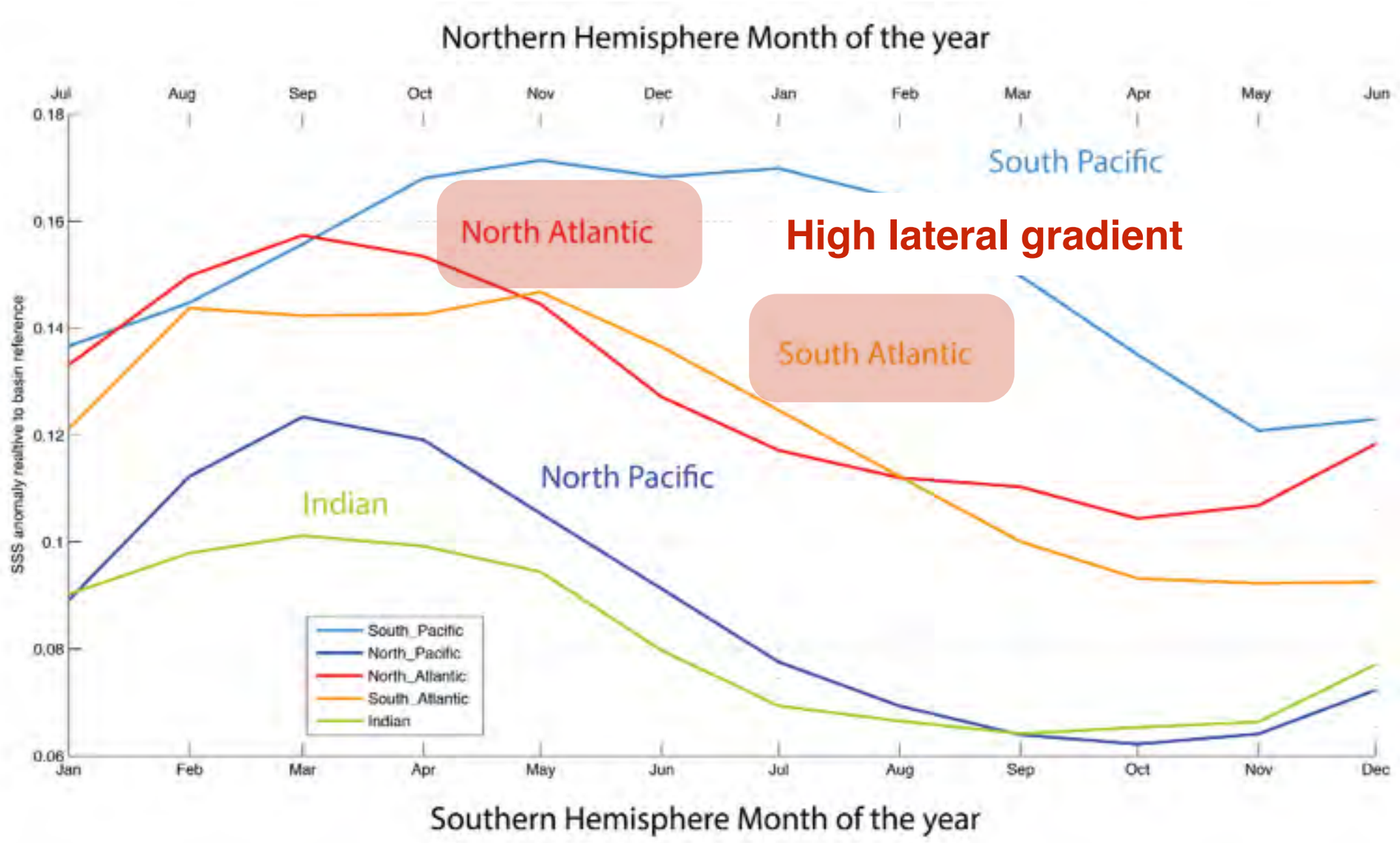

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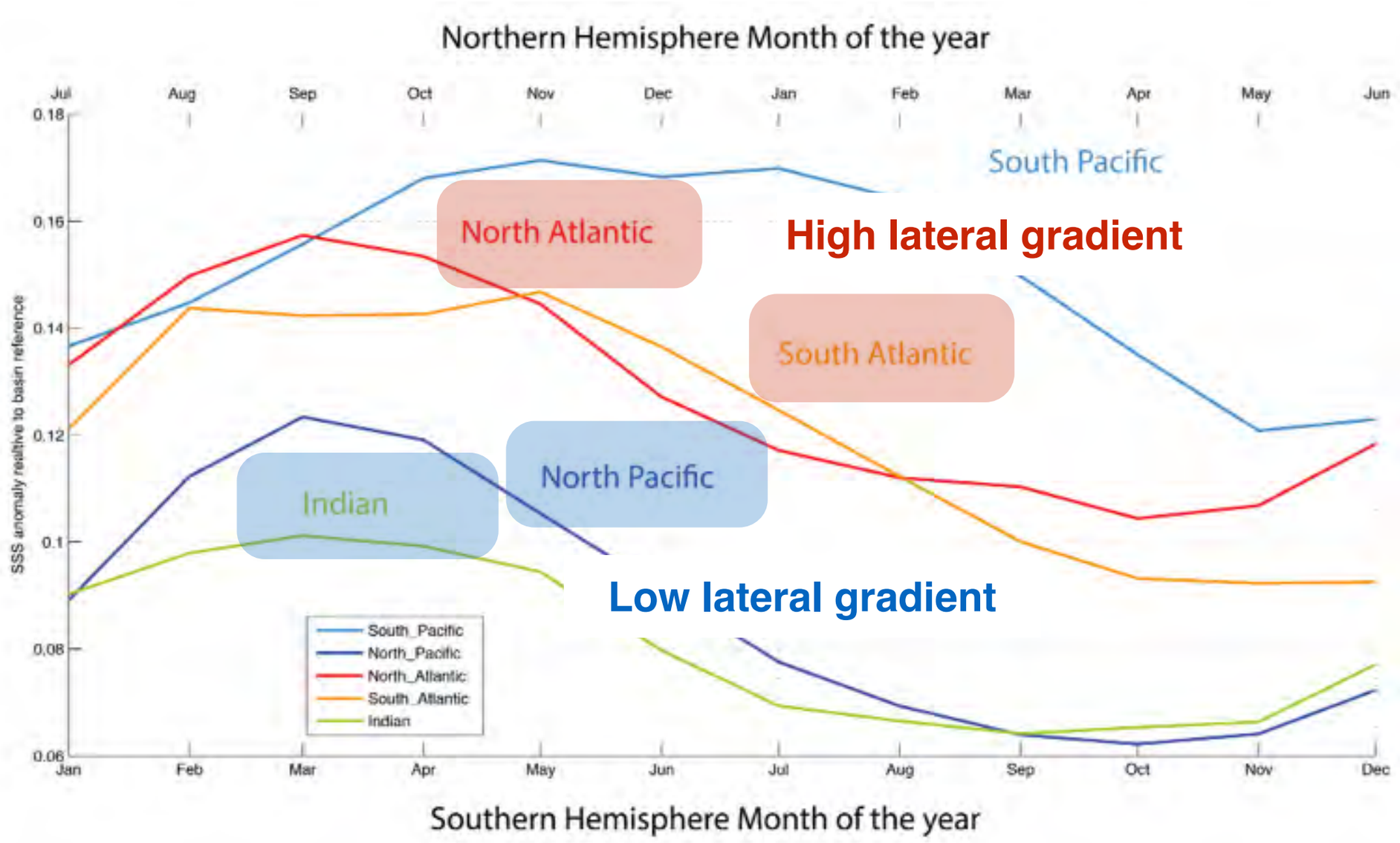

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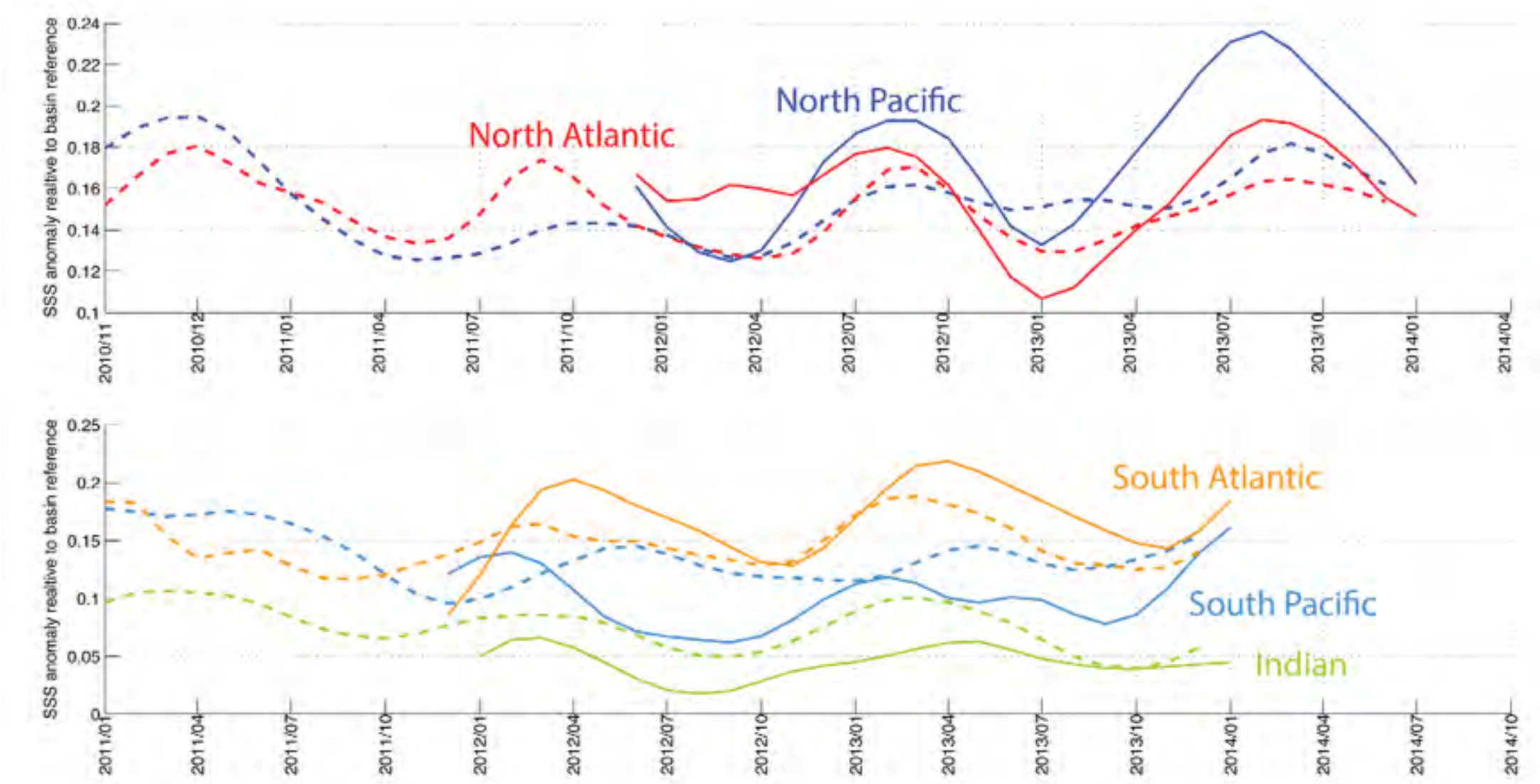
Interannual Time Series

- Aquarius captures the phasing of the seasonal cycle
- The amplitude seems higher in the Aquarius record
- Future work is needed to evaluate regional differences (e.g. South Pacific)



Conclusions

- Reference salinity provides simple method to compare SSS-max properties within isohalines
    - Removal of reference value reveals differences in mean SSS-max position likely due to regional set up
        - Satellite observations show marked interannual variability and more intense seasonal cycle
        - Transfer of conclusions might not be straight forward due to the possible difference in mixing dynamics/forcing
- A more detailed comparison between SSS-max areas is in preparation