Do Southern Ocean –Clines Change by Location and Season?

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INTRODUCTION

- The Southern Ocean is a major component of the global climate system and is potentially the region where the most rapid climate change on Earth is occurring (Trathan et al. 2007).
- There has been rapid warming of the ocean around Antarctica, and changes in ocean circulation, changes in sea ice, and mass-balance changes in the Antarctic ice sheet/peninsula (Mayewski et al. 2009).
- These changes could have an influence on water quality parameters such as dissolved oxygen, salinity, pH, etc.

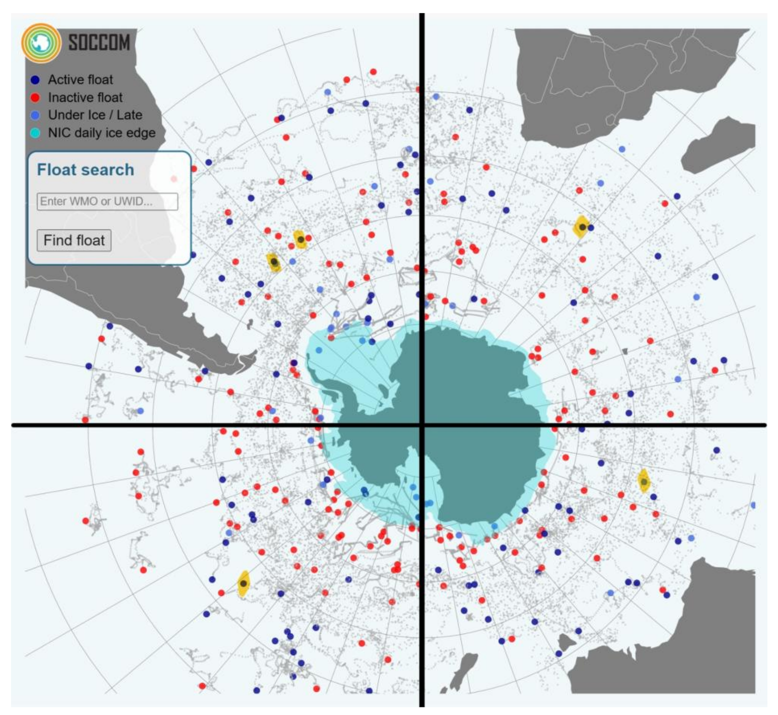

Figure 1. Map of SOCCOM Floats in the Southern Ocean. Highlighted floats are the ones that data was gathered from.

OBJECTIVES

The objectives of this study are to:

1. Determine if there is a difference in –clines between location.
2. Determine if there is a difference in –clines between season.

METHODS

- We used 1 SOCCOM float from each quadrant *(Figure 1)* to gather temperature, pH, salinity, and dissolved oxygen data that correspond with the –clines *(Table 1)*.
- Data was taken from January (Summer), April (Fall), July (Winter), and October (Spring) 2024 to compare data between location and season.

-cline	Data collected	Unit of measurement
Thermocline	Sea temperature	°C
Halocline	Practical salinity	psu
Oxycline	Dissolved oxygen	micromole/kg

Table 1. -Cline corresponding data and units of measurement.

RESULTS

-Cline graphs were made to show differences between temperature, pH, salinity, and dissolved oxygen. These clines show the seasonal variation between quadrants.

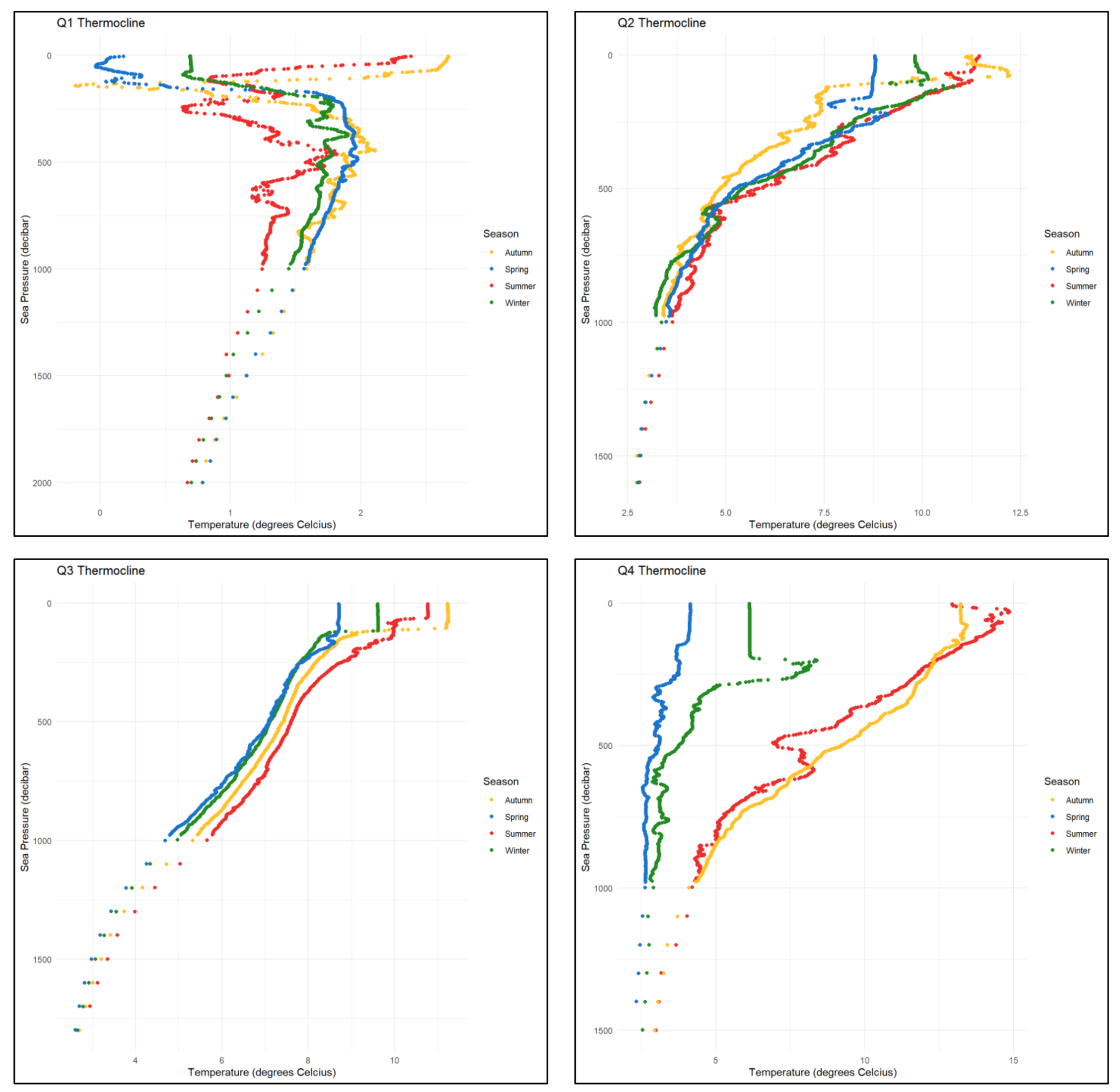

Figure 2. Thermoclines showing differences between location and season.

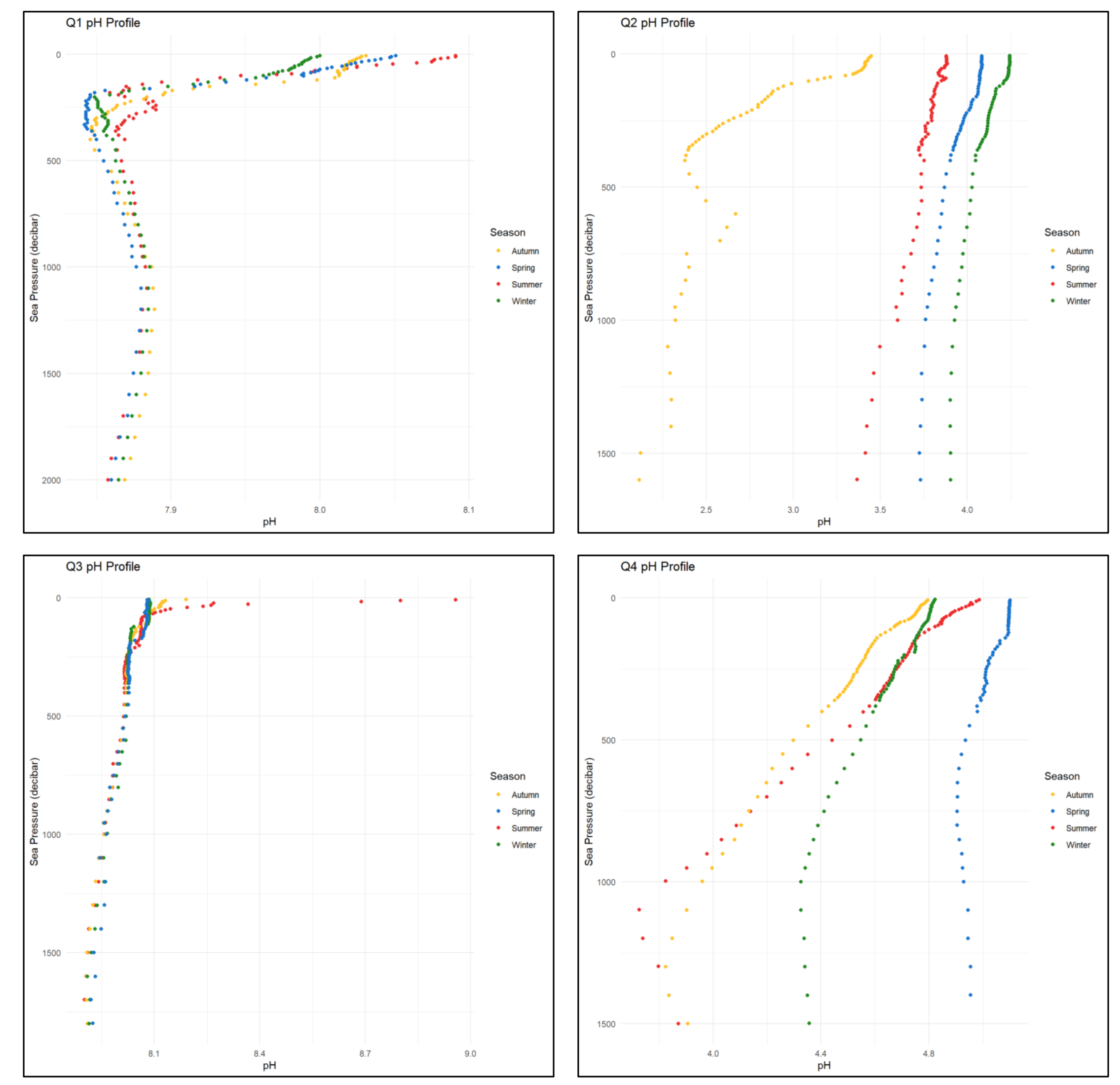

Figure 3. pH profiles showing differences between location and season.

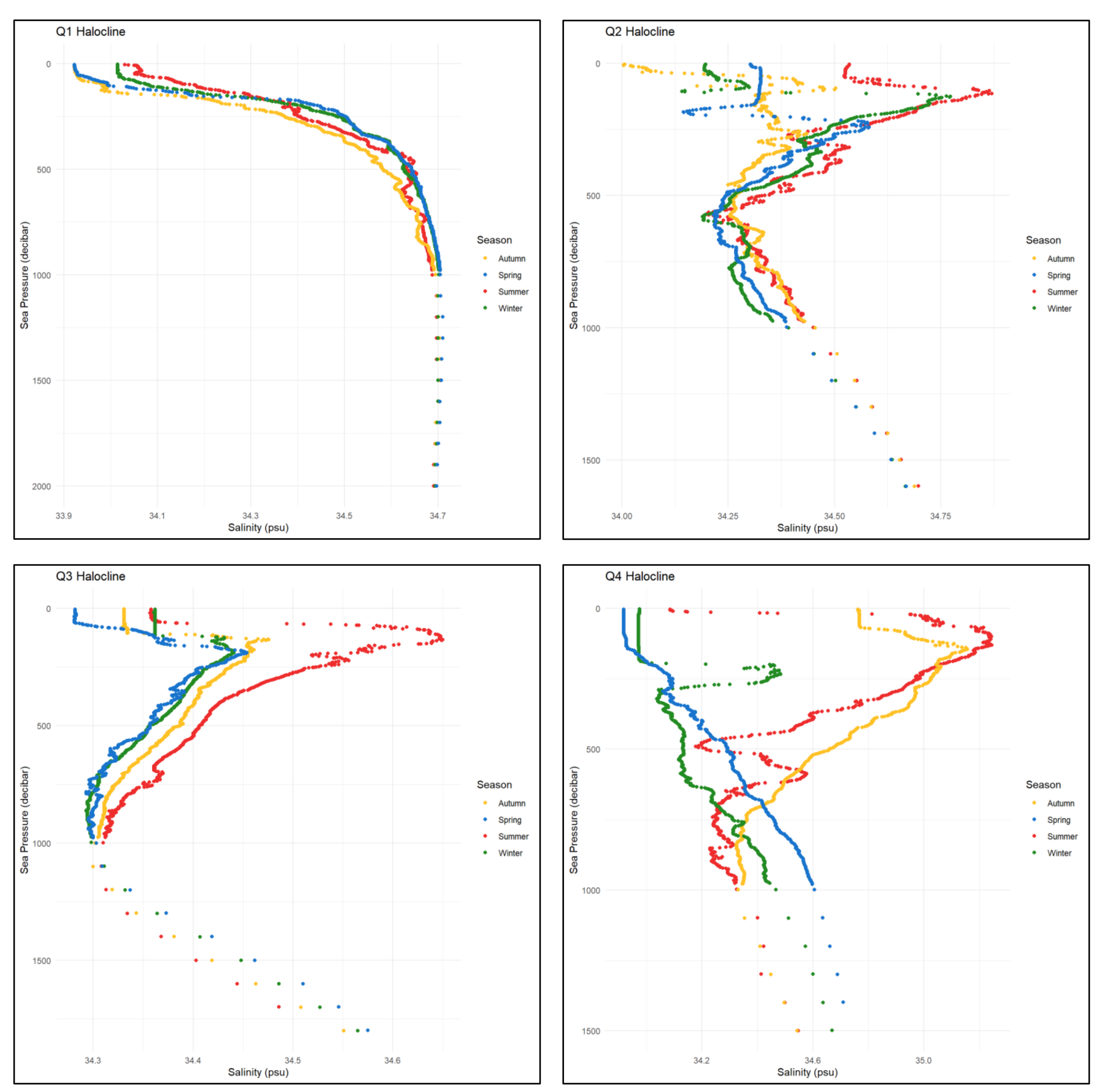

Figure 4. Haloclines showing differences between location and season.

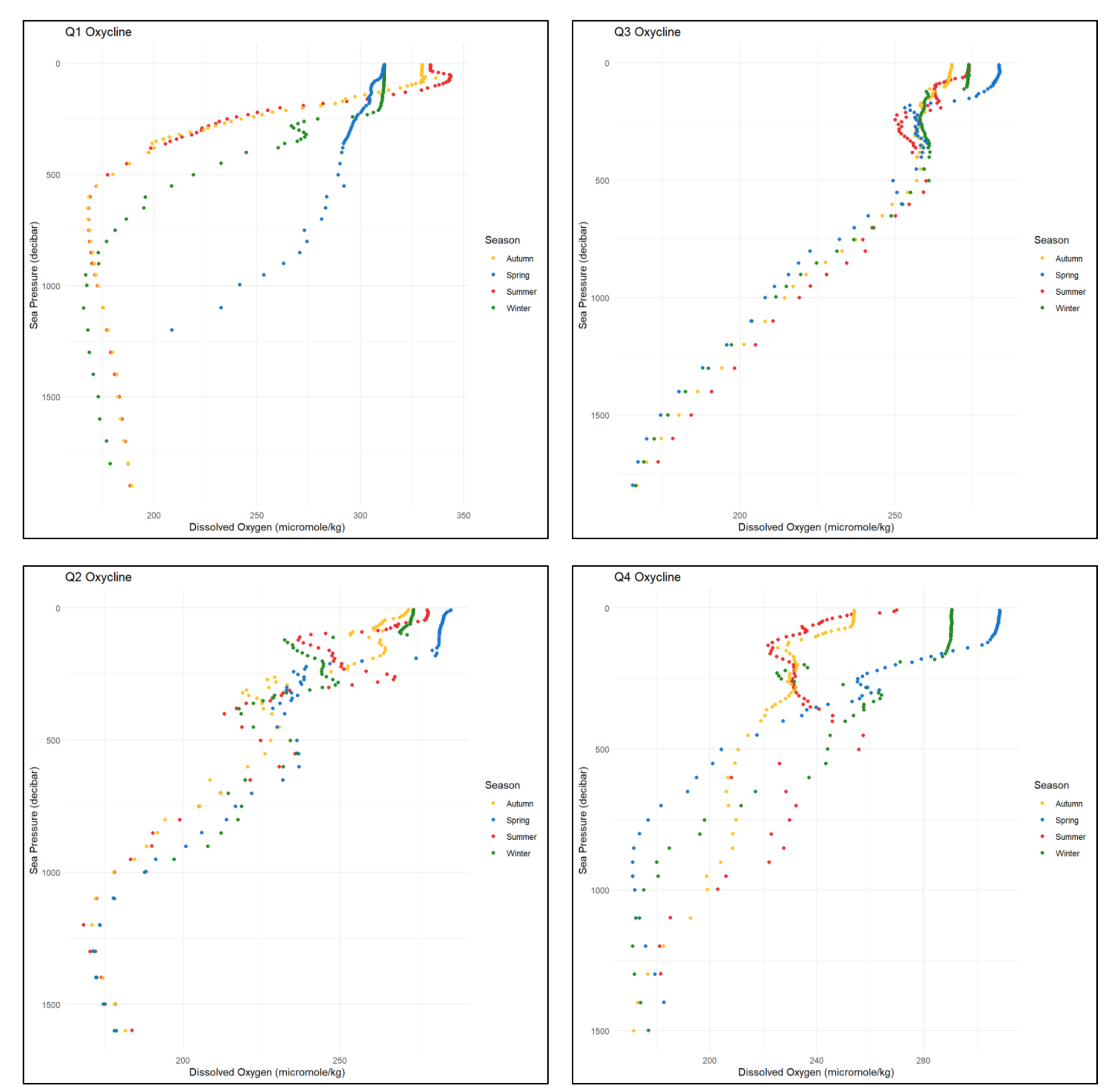

Figure 5. Oxyclines showing differences between location and season.

RESULTS (cont.)

Thermocline

- Q1 and Q4 have significant differences in temperature across seasons. Temperature decreases in Q2, Q3, and Q4 but increases in Q1 as depth increases. *(Figure 2).*

pH profiles

- Q2 and Q4 have significant differences in pH across seasons. Q1 and Q3 have the lowest pH values across seasons, while Q4 has the highest pH values in Winter and Spring *(Figure 3).*

Halocline

- From a depth of 0-1000 decibars of pressure, Q2, Q3, and Q4 differ in salinity across seasons. Past 1000 decibars of pressure, salinity increases between quadrant and season *(Figure 4).*

Oxycline

- Q1, Q2, Q4 have significant differences in dissolved oxygen across seasons *(Figure 5).*

CONCLUSIONS

Given our results, we conclude that:

1. Between location, there is visual variation based on the –cline graphs.
2. Between season, there is a visual variation based on the –cline graphs.

Future Work:

1. Two-sample Kolmogorov-Smirnov test for goodness of fit.

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