Summary of Age-Oxygen Current Results **Jordan Thomas**
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Aim:

Examine if the observed change in oxygen over the observational period is consistent with the ventilation changes documented by Waugh et al., 2013.

Use the GFDL ESM2Mc to establish the relationship between ideal age and oxygen in the Southern Ocean. Using the age changes found in Waugh et al., 2013, determine if the observed change in oxygen is consistent with the changes in circulation. Expectation that in SAMW where the age decreases, oxygen concentration will increase. In CDW where age increases, oxygen concentration will decrease.

Results - Model Age-Oxygen Relationship:

1. Quantified model relationship between ideal age and oxygen/AOU for SAMW region.

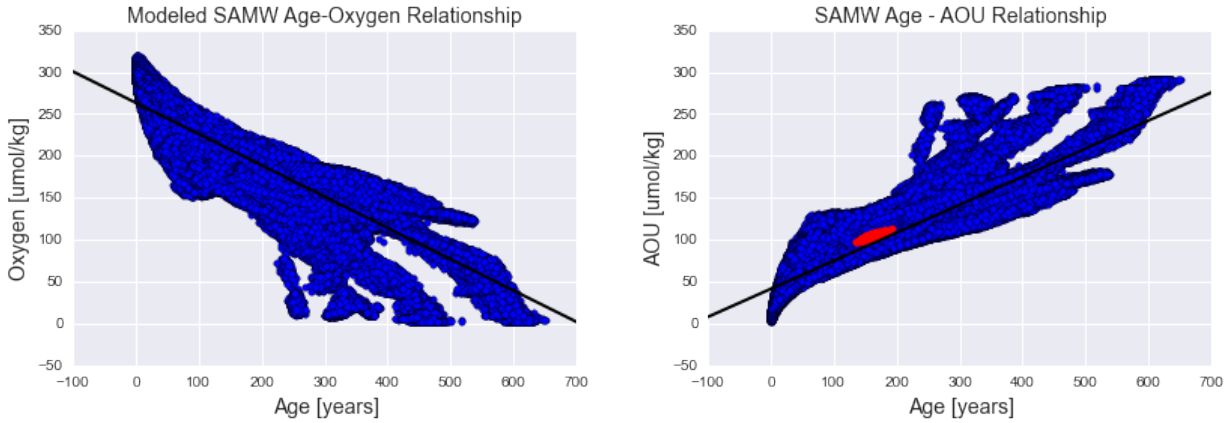

Figure 1: Relationship between ideal age and oxygen (left) and apparent oxygen utilization (right) for SAMW region in GFDL ESM2Mc control simulation.

2. Quantified the change in oxygen and AOU in SAMW region for each ship track.
   - Found negative trend in SAMW oxygen (3% per decade), except on track P16 which was slightly positive.
   - Found positive trend in SAMW AOU (10% per decade).
   - Very little change in CDW oxygen or AOU (not shown).

   This is the opposite response than suggested given the above relationship between age and oxygen and the documented changes in SAMW age.

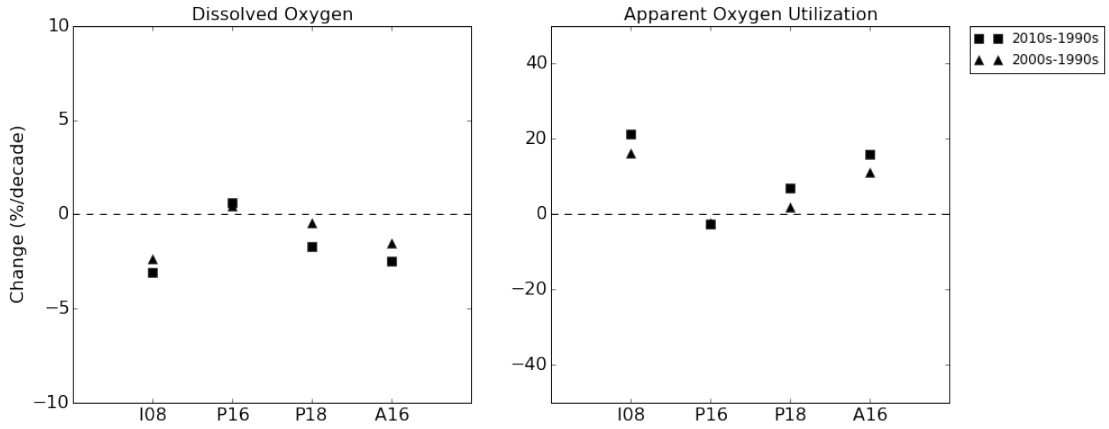

Figure 2: Percent change oxygen (left) and AOU (right) for entire time series (squares) and first decade (triangles).

3. Next aim to understand why we see a decrease in oxygen (increase in AOU) when the opposite is expected given the documented changes in ventilation. Look at oxygen utilization rates, other literature, ect.

Supplemental Figures:

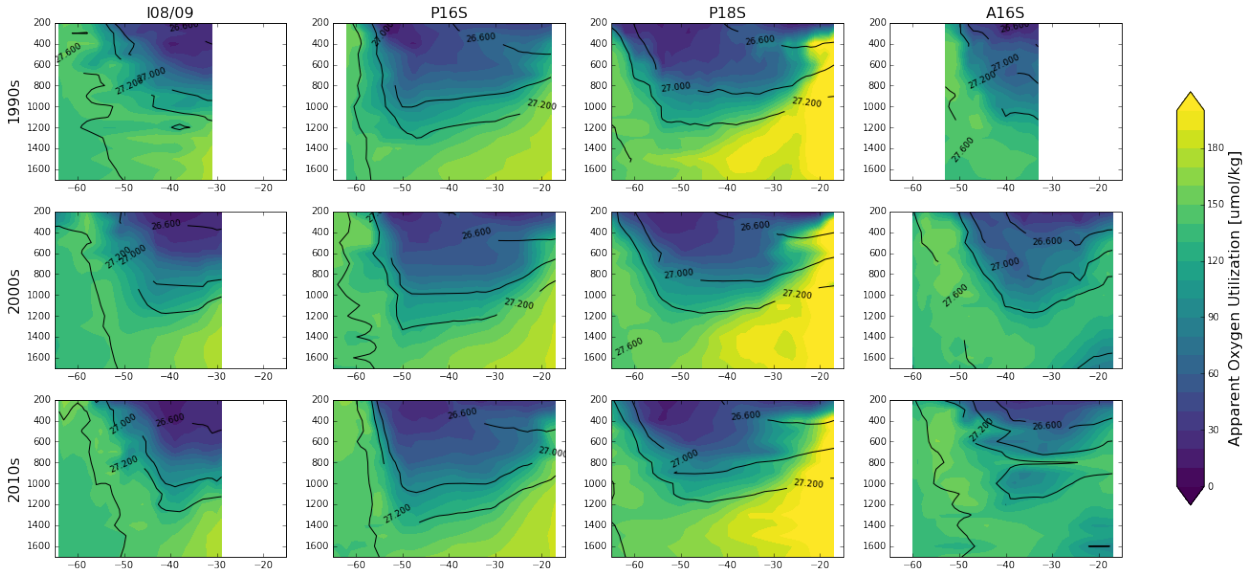

Figure 3: AOU spatial patterns for each transect and each sample year.

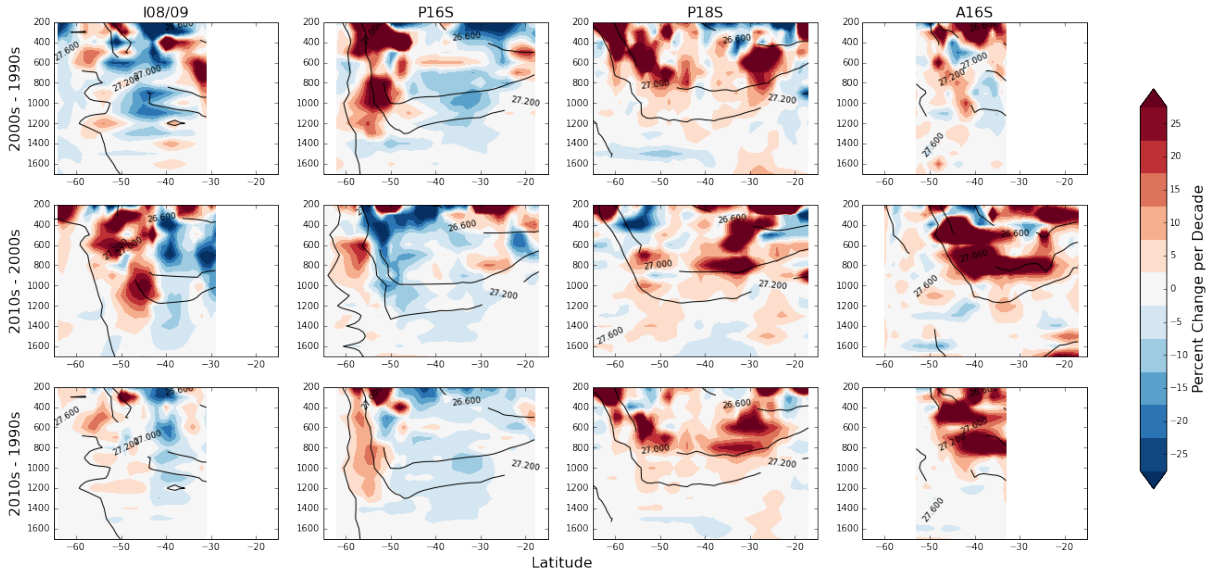

Figure 4: Percent change per decade for AOU.