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1. Describe and compare the venΘlaΘon pathways of carbon and heat in AntarcΘc boΣom water. Touch on the significance of venΘlaΘon for the ecosystem of the AntarcΘc region. 5When it comes to the venΘlaΘon of carbon and heat; they both involve two main steps. The first would be the flow through the oceans surface and the second would be the transferring from the surface layer to deeper depths of the ocean which isolate these tracers (heat & carbon) from the atmosphere. This can happen through the process of mixing or even the formaΘon of dense boΣom waters. This exchange is occurring in the mixed layer which channels this process. This is a dynamical process and is highly correlated with the surface's buoyancy fluxes and winds within the mixing layer. This process could also be reversed as if a large polynya occurs, heat stored in the ocean could potenΘally be released by deep convecΘons and will bring the warm water back up to the atmosphere. This venΘlaΘon process is vital and effects the climate as the oceans water store both excess heat and carbon which plays a role in climate change. Without this process there would be major changes in the climate which would affect the ecosystem tremendously.
2. Describe the ocean layers XLD and MLD and their similariΘes/ Differences. The mixed layer depth or MLD has verΘcal uniform temperate and density values. These values help calculate how the mixing occurs and provides venΘlaΘon at certain

profiles. There are also horizontal buoyancy gradients which is a key factor in controlling the

dynamics of venΘlaΘon. The mixing layer depth or XLD is focused more on the surface of the water where as the MLD would be located underneath. They both are involved in the processes of venΘlaΘon and movement of tracers as they accumulate. One major difference between these two would be the Θmescales of when the mixing occurs. The XLD is acΘvely mixing by the turbulence of the wind or waves and happens over a shorter period. Even as this mixing period is fast and is affected by turbulence it doesn't instantly affect the MLD unless a chance even like a large storm comes into factor. The MLD is more of a longer process that involves the accumulaΘon of these tracers as it is mixed and provides a pathway for venΘlaΘon.

3. Define polynya and discuss the ecological implicaΘon. What marine organisms might benefit from more polynyas? Which ones might suffer?

A polynya is an area where a hole opens in sea ice. So, it there would be a body of water surrounded by this sea ice. It has high ecological implicaΘons as it creates ways for local mixing and currents which allow venΘlaΘon for deep sea waters. It also creates an increase in marine life as it is a main source for many organisms to find food/prey.

4. Pick a figure from the arΘcle and explain what it is showing. CriΘque the figure. I picked figure 5 on page 13 that deals with both the Southern Ocean and the AntarcΘc BoΣom Water. These graphs depict temperature anomalies which show how the

heat is ether retained or redistributed. Figure 5a shows the SAMW and how at the surface waters the uptake of heat directly correlates with the ocean temperature and salinity changes. Where as figure 5b shows the AABW and how deep overturning circulaϴon affects the ϴmescale of ocean warming. One improvement to make on these graphs could be to add some color or only go as far label the x-axis for beΣer understanding.