Title: Peeling Back the Oceanic Layers: The Invisible Oceanic Battle against Surface Temperature Rise

Presenter: Viviana Escalante, El Camino College
Mentor: Joseph Holliday

Ocean surfaces directly exposed to sun energy gain heat faster, where hot and cold water have density differences that create ocean layers with no vertical mixing unless externally influenced (Emelyanov) (Sprintal). Stratification is the creation of these oceanic layers, and the seasonal change in the depths they reach is integral to algae development as they are sunk for nutrients and raised for sunlight periodically. Without a mixing layer that reaches the ocean floor, surface algae are restricted from nutrients and die off (Katsura). The precedent has been set that climate change raising surface temperatures will cause heat density changes, and thus will change stratification layer depth above the ocean floor and nutrient blocking. Temperature rise affects not only surface temperatures but areas where deep water currents are formed, reducing the intensity of the heat difference between upper and lower layers, maintaining existing layer depths. As well, temperature peaks near mid-latitudes cause evaporation, leaving higher salinity water, where increased heat and salinity densities equalize (Somavilla). Oceanic influences such as winds' veering due to the Earth's rotation, cause surface currents that can converge and diverge to cause Ekman pumping and suction respectively. These contribute to a greater depth of the surface mixed layer as well. Ultimately, immediate perceptions of climate change's influence need to be studied in depth, rather than drawing conclusions based on dataless assumptions. As the climate transforms, it is increasingly imperative to accurately report real changes before they cause irreparable damage that could have been predicted and prevented.

Works Cited

Emelyanov, Emelyan M. The Barrier Zones in the Ocean. Kaliningrad, Springer, 2005, p.29.

Somavilla, R. et al. “The warmer the ocean surface, the shallower the mixed layer. How much of this is true?” Journal of Geophysical Research: Oceans, vol. 122, no. 9, 2017, p.7714. AGU, doi:10.1002/2017JC013125.

Sprintal, Janet and Matthias Tomczak “Evidence of the Barrier Layer in the Surface Layer of the Tropics.” Journal of Geophysical Research: Oceans, vol. 97, 1992, p.7315. AGU, doi:10.1029/92JC00407.

Katsura, Shota and Eitarou Oka. “Formation Mechanism of Barrier Layer in the Subtropical Pacific.” Journal of Physical Oceanography, vol. 45, 2015, p. 2799. AMS, doi:10.1175/JPO-D-15-0028.1.