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Projections and drivers of future changes in biological pump as inferred from apparent oxygen utilizations

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The biological carbon pump (BCP) stores a large quantity of carbon in the deep ocean and is a major contributor to the surface to depth gradient in dissolved inorganic carbon. Without the BCP, the atmospheric CO2 concentration would be higher by about 200 ppm. Thus, the BCP is a key component of the global carbon cycle, and yet its future evolution is highly uncertain. In model simulations, changes in the BCP are often estimated using the Apparent Oxygen Utilisation (AOU) that measures the difference between the in-situ oxygen content and the saturated oxygen content. With a changing climate, AOU can vary because of changes in ocean circulation or changes in remineralization. Here, we combine AOU with water mass ideal age to take apart changes in the BCP due to circulation change and to remineralization change. We will apply our analysis to a set of Earth System Models under different global warming scenarios. We will determine the sensitivity of these drivers to different level of climate change and investigate the spatio-temporal variability and magnitude of the projected BCP changes. This analysis may help to trace models uncertainty in future BCP change back to ocean physic and marine biogeochemistry.