

Year-to-year variability of vertical displacement of seasonal pycnocline responding to sea surface wind stress curl near the Drake Passage

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The Drake passage oscillation index (DPOI) is defined by the sea-level pressure difference between the Drake Passage. We firstly show that the DPOI variability is essentially the same as the Antarctic oscillation, except for the local variability in the vicinity of the Drake Passage. Because a significant correlation between DPOI and krill recruitment has been reported by previous studies, we examined relationships between oceanic vertical density structures around a krill fishing ground near the Drake Passage and the sea surface wind field including DPOI.

As a result, we found that the difference in the depth of the seasonal pycnocline is associated with the magnitude of DPOI. That is, when DPOI is high, the seasonal pycnocline becomes deep, then, when DPOI is low, the seasonal pycnocline becomes shallow. We furthermore analyzed year-to-year variabilities of the pycnocline using wind fields of JOFURO3. The result suggests that the vertical displacement of the seasonal pycnocline is caused by the change of the Ekman divergence/convergence in the surface layer associated with the rotational field of the wind stress.

Keywords: Drake Passage, Drake Passage Oscillation Index, sea surface wind, seasonal pycnocline, Ekman divergence/convergence