

## Interannual Variation of Surface Wind Field over the Southern Ocean and DPOI

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The Southern Ocean (SO) is a single oceanic domain encircling the globe, and covered by the strong eastward flowing Antarctic Circumpolar Current (ACC). Especially, westerly winds principally drive the ACC, and the easterlies are critical for the westward flow along the Antarctic continental margin. Previous studies pointed out that there are some dominant atmospheric variabilities over the SO such as the Southern Annular Mode (SAM), the Antarctic Oscillation (AAO) and the Pacific South America (PSA), and they are related to the strength of westerly winds and affect large change of ecological environment in the Antarctic/Southern Ocean during recent decades (Boyd and Roberts, 1993). Naganobu et al.(1999, 2008) found significant correlations between the krill recruitment and DPOI (Drake Passage Oscillation Index) which is a climate index defined by the sea-level pressure differences between Rio Gallegos at the southern edge of the South America and Esperanza at the northern edge of the Antarctic Peninsula. DPOI can be taken as an index of the climate-ocean-environmental ecosystem variability in the Antarctic Peninsula.

In this study, we examine dominant variations in the atmospheric field over the SO by comparing with dominant modes revealed by previous studies. To clarify spatial features for interannual variation in the surface wind field over the SO, we investigate relationships among DPOI, AAOI and dominant modes in surface wind field.

In order to investigate the spatial structures of zonal wind variations, we perform empirical orthogonal function (EOF) analysis. The spatial feature of the 1st EOF mode for the zonal wind, having contribution ratio of 27.6%, is similar to that of the AAOI pattern derived from the 1st mode of the 700-hPa height in the NCEP reanalysis. The score of this mode has a high correlation with the AAOI (0.74). Thus, the leading EOF mode of the zonal wind is related to the Atmospheric SAM pattern. The spatial distribution of the 2nd EOF mode, having contribution ratio of 15.4% reveals a dominant pattern in the Atlantic and Indian sectors with maxima, poleward of that for the 1st EOF mode. The score of this mode has high correlation with DPOI (0.62). These suggest that the DPOI-related variations are characterized by spatial features in the 2nd EOF mode of the zonal wind, and their mechanisms will be examined in further studies.

Keywords: Westerly Wind, DPOI, AAOI, Interannual Variation, Air-Sea interaction