

MULTI-TEMPORAL VARIATION OF THE ROSS SEA POLYNYA IN RESPONSE TO CLIMATE

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ABSTRACT... The multi-temporal scales of the two physical characteristics (areas and occurrence time) of the Ross Sea Polynya (RSP) in Antarctica were analyzed based on sea ice concentration dataset (1988-2014) derived from the Special Sensor Microwave Imager (SSM/I) and the Special Sensor Microwave Imager Sounder (SSMIS). The dataset was applied to the Ensemble Empirical Mode Decomposition (EEMD), decomposing a signal into the finite number of intrinsic mode functions and residual mode (long time trend). The approach allows us to understand the long-term variability of the RSP in response to the atmospheric forcing through tele-connections between low and high latitudes by comparing the Nino3.4 and SAM indices. While the non-linear trend of the RSP areas has an upwarding trend shift around the late 1990s, the polynya occurrence time consistently increases, but the acceleration decreased. Furthermore, the trend of the polynya area has a significant correlation (+0.92) with the ratio of the trend of meridional to zonal wind components, suggesting that the meridional wind stress dominates the changes of polynyas areas. The non-linear trend of the RSP area agrees well with the residual mode of the Nino3.4 index in general (correlation -0.71). In addition, the decadal relationship between the SAM and polynya occurrence time shows a strong negative correlation, but the non-linear trends are completely consistent between the occurrence time and SAM.

KEY WORDS: Ross Sea Polynya, Non-linear trend, Climate change