

Role of Weddell Sea ice variability in southern African climate

*Yushi Morioka¹, Francois Engelbrecht², Swadhin Behera¹

1.Japan Agency for Marine-Earth Science and Technology, 2.Council for Scientific and Industrial Research

A potential role of interannual sea ice variability in the Weddell Sea in the southern African climate is investigated through data analysis and coupled general circulation model (CGCM) experiments. The Weddell Sea ice undergoes a distinct interannual variability during the austral summer when the southern African rainfall experiences most of its annual rainfall. The sea ice concentration in the Weddell Sea shows a significantly negative correlation with the southern African rainfall during the season. It is found that the low sea ice concentration anomalies in the Weddell Sea are associated with anticyclonic circulation anomalies to the northeast in the South Atlantic which facilitate more moisture advection from the southern Indian Ocean toward the southern Africa. The composite analysis reveals that the low sea ice concentration anomalies in the Weddell Sea may be attributed to the atmospheric forcing such as the increased solar radiation related to the decreased albedo and the northwesterly wind anomalies. This low sea ice concentration anomalies, in turn, act to cause the skin temperature warmer than normal and reduce the meridional temperature gradient to the north. This is a favoring condition for sustaining the anticyclonic circulation anomalies there by increasing the atmospheric stability. The observed association between the sea ice concentration and atmospheric circulation anomalies is simulated in the CGCM experiment, and the local sea-ice impact on the atmospheric circulation anomalies is also demonstrated in a sensitivity experiment where the interannual sea surface temperature variability in the tropical Pacific is suppressed by the model climatology. These model experiments suggest that besides the remote influence by the tropical Pacific climate variability such as El Niño-Southern Oscillation, the sea ice variability in the Weddell Sea may contribute to the atmospheric variability in the South Atlantic, which may be important for the southern African climate.

Keywords: Weddell Sea ice, Interannual variability, Atmosphere ocean sea-ice interaction