

The influence of the tropical Indian Ocean warming on the Western Pacific teleconnection pattern

*Shiozaki Masahiro¹, Hiroki Tokinaga¹, Masato Mori¹

1. Research Institute for applied mechanics, Kyushu university

The tropical Indian Ocean has rapidly warmed over the past half-century with a significant impact on climate. Using the historical climate simulations in the Database for Policy Decision-Making for Future Climate Change (d4PDF), the present study examines the influence of the tropical Indian Ocean warming on the Western Pacific (WP) teleconnection pattern. The empirical orthogonal function (EOF) is applied to precipitation anomalies over the tropical Indian Ocean.

The first EOF mode shows a significant increasing trend superimposed on the decadal variability. This first EOF mode is positively correlated with sea surface temperature (SST) anomalies not only in the South Indian Ocean but also over global oceans, suggesting a possible influence of global warming. Further analysis indicates that the first EOF mode creates an East Asia-North Pacific dipole of 500 hPa geopotential height anomalies along the subtropical westerly jet, contributing to strengthening the southern center of action of the WP pattern. These anomalies are likely to be caused by vorticity advection from the tropical South Indian Ocean.

On the other hand, the second EOF mode exhibits a zonal dipole pattern over the tropical Indian Ocean. The regressed SST anomalies exhibit a pattern resembling a positive Indian Ocean Dipole mode and El Niño. This second EOF mode is significantly correlated with the WP teleconnection. When the positive IOD and El Niño concurrently occur, the local Hadley circulation over the maritime continent causes divergent wind anomalies that advect absolute vorticity northward. Given that the Indian Ocean continues to warm in the future, the tropical Pacific-Indian Ocean interaction may enhance the strength of the WP pattern.

Keywords: Teleconnection pattern, Indian Ocean, ENSO