Skillful multi-year predictions of tropical Atlantic-Pacific interaction

*Yoshimitsu Chikamoto[1], Axel Timmermann[2], Takashi Mochizuki[3], Masahide Kimoto[4], Masahiro Watanabe[4], Masayoshi Ishii[5]

1. Utah State University, 2. Pusan National University, 3. Japan Agency for Marine-Earth Science and Technology, 4. University of Tokyo, 5. Japan Meteorological Agency

Tropical sea surface temperature (SST) anomalies have large impacts on global climate variability through atmospheric teleconnections. Although reliable predictions of tropical SST variability are useful to assess the future climate variability, the predictability of tropical climate conditions is typically limited to the El Niño Southern Oscillation (ENSO) predictive skills for several seasons. Here we present observational and modelling evidence for multi-year predictability of coherent trans-basin climate variations that are characterized by a zonal seesaw in tropical sea surface temperature and sea-level pressure between the Atlantic and Pacific basins. State-of-the-art climate model forecasts initialized from a realistic ocean state show that the low-frequency trans-basin climate variability, which explains part of the ENSO flavors, can be predicted up to 3 years ahead, far beyond the predictable limit of ENSO. This low-frequency variability emerges from the synchronization of ocean anomalies in the Atlantic and Pacific basins via global reorganizations of the atmospheric Walker Circulation. Through this trans-basin connection, the Atlantic SST impacts on the atmospheric circulation can be detected in the decadal sea level pressure trends in the entire Pacific and western North American drought conditions.

Keywords: Climate variability, Climate prediction, ENSO, Atlantic, Trans-basin variability

