UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences Seminar Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Impacts of Tropical North Atlantic and Equatorial Atlantic SST Anomalies on ENSO

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Date: **Wednesday, September 30, 2020**
Time: **3:30pm**
Zoom Meeting: **https://hawaii.zoom.us/j/97454168193**
Meeting ID: 974 5416 8193
Passcode: 207183

Abstract:

El Niño-Southern Oscillation (ENSO) is the most dominant mode on the interannual timescale over the globe. Classic ENSO dynamic frameworks emphasized local precursory signals in the Pacific (such as equatorial Warm Water Volume, WWV) according to the recharge oscillator. However, recent studies demonstrated that the ENSO prediction could be improved with the information from other ocean basins. In this seminar, I will mainly focus on discussing the impacts of the tropical Atlantic Sea Surface Temperature Anomaly (SSTA) modes on ENSO evolution from different perspectives.

First, the impact of the basin-wide SSTA modes in the tropical Atlantic on ENSO is examined. An Empirical Orthogonal Function (EOF) analysis of the SSTA in tropical Atlantic during the boreal spring and summer shows two dominant modes with a basin-warming and a meridional dipole pattern, respectively. Observational and coupled model experiments indicate that the former induces a La Niña in the tropical Pacific in the succeeding winter whereas the latter cannot. The mechanism through which the basin-wide Atlantic warming induces a La Niña is through a Kelvin wave response and associated wind-evaporation-SST-convection (WESC) feedback over the northern Indian Ocean (NIO) and Maritime Continent (MC). Anomalous easterlies associated with the Kelvin wave response interact with the monsoon westerly, leading to a warm SSTA and a northwest-southeast oriented heating anomaly in NIO/MC, which further induces easterly and cold SST anomalies over the equatorial Pacific. In contrast, the Kelvin wave in response to the Atlantic dipole heating is much weaker due to the cancellation of the positive and negative heating effects in the Atlantic. As a result, the SST and heating anomalies over the NIO/MC are weak, which are not sufficient to induce significant easterly over the equatorial western Pacific and the subsequent La Niña event.

Further observational and modeling studies with respect to the Tropical North Atlantic (TNA) and Equatorial Atlantic (EA) SSTA modes indicate that the TNA (EA) forcing induces a CP- (EP-) type ENSO. In both cases, the Kelvin wave-monsoon interaction and WESC feedback over NIO/MC holds a key in conveying the Atlantic impact. The difference lies in distinctive Rossby wave responses - A marked westerly anomaly appears in the equatorial eastern Pacific (EEP) in response to the TNA forcing while no significant wind response is observed in EEP in response to the EA forcing. The westerly anomaly prevents a cooling tendency in EEP through anomalous meridional and vertical advection according to a mixed-layer heat budget analysis.