COMBINED EFFECTS OF ENSO AND MJO ON CLIMATIC EXTREME EVENTS

Marília Harumi Shimizu[1], Tércio Ambrizzi[1]

marilia.shimizu@iag.usp.br

[1] Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, São Paulo, Brazil

ABSTRACT

Extreme climatic events are a topic of concern due to the consequences on the environment, society, and economy, especially in vulnerable countries. Intergovernmental Panel on Climate Change (IPCC) future projections indicate an increase of the frequency of occurrence of extreme events. Thereby, studies about the phenomena that can influence the occurrence of these events are important, in order to forecast them more precisely. El Niño Southern Oscillation (ENSO) is one of the phenomena associated with events of extreme temperature and/or precipitation. However, some recent studies, focusing on the Northern Hemisphere, have indicated that the basic response of ENSO is dependent on the phase of the Madden-Julian Oscillation (MJO). Hence, this study aims to analyze the influence of the MJO on the frequency of occurrence and/or intensity of extreme events over South America in El Niño and La Niña years. Our goal is to explore the relative importance of the MJO to precipitation and temperature anomalies during ENSO events. Extreme events of temperature and precipitation over South America for the months of November to March (austral summer) were obtained through a composite analysis of the combinations of ENSO and MJO phases. MJO events were defined using a MJO index based on empirical orthogonal functions analysis of zonal wind and Outgoing Longwave Radiation (OLR). ENSO phases were defined according to the Oceanic Niño Index provided by the National Oceanic and Atmospheric Administration (NOAA). The results showed that the MJO convection can enhance or weaken the basic response of ENSO over temperature and precipitation extremes. Therefore, they suggest that the influence of ENSO over South America may be modulate by the MJO phase, i.e., it depends on the position of convection over the Tropical Indian/Pacific Oceans associated with each phase, which triggers eastward propagating wave trains as already described in the literature. This work contributes to a better understanding of the climate variability and will be helpful for the forecast of ENSO effects on extreme events of temperature and precipitation over South America.

Key words: Extreme events, ENSO, MJO.