ENSO Frequency Asymmetry and the Pacific Decadal Oscillation in Observations and 19 CMIP5 Models

Fei Zheng, Renping Lin, and Xiao Dong
Institute of Atmospheric Physics, Chinese Academy of Sciences, International Center for Climate and Environment Science (ICCES), Beijing, China (zhengfei@mail.iap.ac.cn)

Using observational data and the pre-industrial simulations of 19 models from the Coupled Model Intercomparison Project Phase 5 (CMIP5), the El Niño (EN) and La Niña (LN) events in positive and negative Pacific Decadal Oscillation (PDO) phases are examined. In the observational data, with EN (LN) events the positive (negative) SST anomaly in the equatorial eastern Pacific is much stronger in positive (negative) PDO phases than in negative (positive) phases. Meanwhile, the models cannot reasonably reproduce this difference. Besides, the modulation of ENSO frequency asymmetry by the PDO is explored. Results show that, in the observational data, EN is 300% more (58% less) frequent than LN in positive (negative) PDO phases, which is significant at the 99% confidence level using the Monte Carlo test. Most of the CMIP5 models exhibit results that are consistent with the observational data.