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Pliocene El Niño: Coral evidence of robust seasonal to interannual variabilities during warm period

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Global mean temperature and atmospheric CO2 concentration during the Pliocene warm period (PWP; 5-3 Ma) were substantially high as much as those predicted for the future climatic system of next or a few centuries future. However, the role of El Nino-Southern Oscillation (ENSO) in this greenhouse warming remains controversial mainly due to the lack of the information about seasonal to inter-annual variabilities of sea surface water in low latitude regions. Coral records are one of few candidates to be able to capture seasonal to interannual fractionations of past climates in tropical regions. We present 70 years oxygen isotope records from two fossil PWP corals (3.5-3.8Ma) with monthly resolution in order to decipher the seasonal to interannual characteristics of Pliocene ENSO. In the present day, the anomalies of sea surface temperature and precipitation occurred during El Niño events are significantly evident in sampling site of Philippine and both signals lead to shift 18O/16O ratios toward same direction and to be enhanced ENSO events in coral 8O/16O records. Several significant attenuations of seasonal amplitude were found in 18O/16O ratios of both two PWP coral records, which were also detected in the modern corals during El Nino events. Power spectrum density of normalized PWP coral records suggests that the characteristic of Pliocene ENSO was similar with that of recent. Our results contrast with the arguments that the past and future warm conditions in background climate system will lead the permanent El Niño state.