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Simulating the changes in the teleconnection between the SPCZ and ENSO in different climate contexts

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Studying the interannual variability within different climate contexts gives the opportunity to identify the mechanisms linking it to the mean state, allowing to anticipate the changes due to the current global warming. In the tropical Pacific, the interannual variability is mainly driven by the El Niño/Southern Oscillation (ENSO). Considering the strong economical and health consequences of this phenomenon, understanding and anticipating its future modifications is a very important issue. Using past simulations of the Mid Holocene (6 kyr BP and 4 kyr BP) and the Last Glacial Maximum (21 kyr BP), as well as climate future projections with carbon dioxide multiplied by four, we show that ENSO is significantly modified depending on the climate context. The high temporal resolution paleodata such as corals used for reconstructing past ENSO are located in the southwestern tropical Pacific, and reflects the strength of the ENSO teleconnection. The SPCZ (South Pacific Convergence Zone) is the main feature of the hydrological cycle in our region of interest i.e. the southwestern tropical Pacific. In this study, we focus on the position of the SPCZ because the local rainfall conditions in this area are very sensitive to little changes in the SPCZ location, so that it is determining for the teleconnection characteristics and for the signal recorded by the paleodata. The SPCZ location is statistically related to ENSO as it moves during ENSO events, but it still has its own variability. We show that the link existing between the SPCZ location variability and ENSO is different in the different climate states. This concerns the SPCZ sensibility to ENSO events and the amplitude of the SPCZ response, as well as the spatial patterns shifts of the teleconnection. The results demonstrate that the teleconnection mechanisms inferred from the modern climate cannot be directly extrapolated to other climates.