



Seasonal and interannual variations of tropical Pacific induced by insolation changes in the early and middle Holocene

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The El Niño - Southern Oscillation (ENSO) dominates interannual variations in the tropical Pacific climate system. It was present throughout the Holocene but underwent a steady increase from the mid-Holocene to the present. Using the IPSL-CM4 coupled ocean-atmosphere model we analyze in a first step the response of the seasonal and interannual variations to the changes of insolation during the early and middle, for which only the variations of Earth's orbital configuration are considered. Comparison of the early and mid-Holocene with 0ka BP show that both the seasonal cycle and the characteristics of the interannual variability are altered by the changes in insolation. In particular, there is a decrease of the amplitude of the Niño3 SST seasonal variation. Simulations also show that ENSO strengthens across the Holocene, as suggested by coral data or lake sediments. In addition, we also consider simulations that contain a fresh water flux, ice sheet or only the obliquity signal in the insolation forcing. For all these experiments we analyse in detail the changes in seasonality and in interannual variability by comparing El-Niño and La-Niña composites. The comparison of the different results will help us better understand the relationship between the mean state, the seasonal cycle and the development of El-Niño events. The relative impact of the different forcing on the changes in precipitation, temperature and mixed layer depth in different places of the Pacific Ocean will be discussed.