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Forcing mechanisms of the half-precession cycle in western tropical Pacific temperature

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The western equatorial Pacific (WEP) plays an important role on global and regional climate. Its temperature reconstructions during the Quaternary display orbital-scale variations, containing major cycles of ~100, 40 and 20 kyr. In addition to these longer cycles, the half-precession cycle is also reported in a recent reconstruction, but the forcing mechanism deserves further study. Here we perform a systematic study on the half-precession cycle in the WEP temperature and related mechanisms. We first analyze existing temperature reconstructions to test whether there is robust half-precession cycle through time. We then use transient climate simulations to investigate its forcing mechanism. Our results show that the half-precession cycle is a robust feature in the long-term evolution of the WEP temperature, but its strength varies in time. Our model results further show that the half-precession cycle in the WEP temperature is mainly driven by maximum equatorial insolation, and its strength is modulated by eccentricity and the conditions of CO₂ and ice sheets. Our simulated half-precession cycles in the WEP temperature provide a possible explanation for the half-precession signal recorded in proxy records.