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Holocene history of ENSO variance and asymmetry in the eastern tropical Pacific

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Understanding how El Niño-Southern Oscillation (ENSO) is affected by natural and anthropogenic climate forcings requires studying its behavior under contrasted climate conditions. We present a reconstruction of ENSO characteristics in the eastern tropical Pacific during the Holocene based on the statistics of sea surface temperature (SST) variability derived from oxygen isotopes in fossil mollusk shells from Peru. ENSO variance was close to modern level in the early Holocene, and at its lowest level ∼4-5 thousand years ago (ka). A shift in ENSO asymmetry indicates a persistent predominance of the central Pacific mode 6.7-7.5 ka. The modern ENSO regime was established ∼3 ka. From climate models sensitivity experiments, we attribute the large variability of ENSO in the early Holocene to the wasting of continental ice sheets. These results demonstrate that both variance and spatial structure of ENSO are sensitive to external forcings but that insolation was not the prevailing forcing in the Holocene.