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ENSO- and PDO-related SST reconstructions from the Anthropocene into the last millennium: planktonic foraminiferal Mg/Ca evidence at quasi-annual to multi-annual resolution from San Lázaro Basin (NE Pacific)

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On inter-annual time scales, the El Niño / Southern Oscillation (ENSO) climatic phenomenon is the largest driver of change in the ocean-atmosphere system. As such, it is a primary interest to understand how modern global warming has impacted ENSO, and whether the marine sedimentary archive can record this linkage. This would allow detailed comparison against other high-resolution archives, such as corals, and an improved ability to interpret past events as potential analogs for the future of ENSO and similar phenomena.

Here we present annual to inter-annual reconstructions of sea surface temperature (SST), derived from the Mg/Ca ratio of the shallow-dwelling planktonic foraminifera *Globigerinoides ruber*. The samples come from San Lázaro Basin in the southern Baja California continental margin (25˚N; 112˚W), situated beneath the dynamic boundary of the cool eastern Pacific boundary California Current (CC) of northern origin, and the warm subtropical water masses of southern origin. The bottom of this coastal basin (maximum depth of 540m) is bathed by oxygen-depleted waters that flow over a shallow sill at 370m. High levels of primary production and export of biogenic particles

to depth ensue from strong seasonal upwelling processes during spring to early summer. This combination of high sediment production and preservation in an area very sensitive to ENSO impact allows for a high-resolution reconstruction of inter-annual climatic phenomena in this eastern boundary current setting.

For our highest temporal detail, we examine 2 cores at quasi-annual resolution, with approximately 30 samples for the past $\sim$90 years, which we use to validate our proxy of choice against the instrumental record of 20^{th} century SST. The core locations in this southern CC region are known for the large amplitude SST responses to inter-annual sources of oceanographic variability, of which ENSO is the largest. This variability is effectively traced by the Mg/Ca signatures in the calcite shells of *G. ruber*, which has an affinity for warmer waters during late summer.

We extend upon this 20^{th} century validation work to previous centuries at slightly lower inter-annual resolution. By averaging over 3-7 years we enhance the inter-decadal to centennial variability, such as the Pacific Decadal Oscillation (PDO), and enable reconstruction of CC response to Northern Hemisphere multi-decadal to centennial cold spells, such as the Little Ice Age and the relatively warmer Medieval Warm Period.