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Decadal to Multi-centennial SST Reconstructions From the Anthropocene Into the Last 2 Millennia: Planktonic Foraminiferal Mg/Ca Evidence From San Lazaro 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. Significant impacts also arise from longer-term phenomena at decadal to centennial timescales, such as the Pacific Decadal Oscillation (PDO). It is a primary interest to understand how modern global warming has impacted such drivers of significant climatic impacts, and how the marine sedimentary archive records this linkage in the southern California Current (CC). 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 PDO. Furthermore, such reconstructions in recent millennia are crucial, since they record pre-anthropogenic climates under interglacial (warm) boundary conditions that allow us to characterize the nature of modern influence on this system.

Here we present sub-decadal 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 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 and PDO impacts allows for a high-resolution reconstruction of inter-annual climatic phenomena in this unique eastern boundary current setting.

For our highest temporal detail, we examine 2 cores at interannual resolution for the past ∼90 years, which we use to validate our proxy against instrumental SSTs. This variability is effectively traced by Mg/Ca in *G. ruber*, which has an affinity for warmer waters during summer. We then sampled down-core continuously at a temporal resolution between 4-6 years, tracking inter-decadal to centennial variability and capturing well PDO-driven variability, which further enables reconstruction of southern CC response to Northern Hemisphere multi-decadal to centennial anomalies, such as the Little Ice Age and the relatively warmer Medieval Warm Period. Our record shows no significant 20th-century departure relative to earlier centuries, thus resembling a “hockey stick without a blade”. We will present the complete 1200-year composite reconstruction, and explore causes for 20th-century and earlier discrepancies, as well as decadal to multi-centennial modes of cyclicity and variability. We will also compare our record in detail to available and appropriate ENSO and PDO reconstructions from the region.