

# MOZAMBIQUE SEA-LEVEL RECORD IN A GLOBAL CONTEXT

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## KEY POINTS

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- Local relative sea level (RSL) differs from eustatic (global mean) sea level due to a set of processes known as glacial isostatic adjustment (GIA).
- We will correct for these effects using numerical models of GIA, allowing new estimates of eustatic sea level surrounding the last glacial maximum (LGM).

## SIGNIFICANCE

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The sea-level record of the Mozambique cores reveals the local RSL history of the northern Mozambique margin. Relating this local record to global sea level and climate changes requires accounting for GIA, the processes that deform the solid Earth and gravitational fields and drive spatial variations in sea level during ice-age cycles. Robust modeling of the effects of GIA will allow:

- **Comparison to other datasets:** GIA modeling will quantify the expected differences between Mozambique and datasets from other regions, and how spatial variability depends on ice history and solid Earth rheology.
- **Refining estimates of eustatic sea level:** The addition of a well-constrained record in an unstudied region will improve estimates of eustatic sea level during rapid changes leading into and out of the LGM.

The ongoing work presented here links the local dataset generated by the Mozambique project to global sea-level and climate trends. Future research will refine the local sea-level history and integrate these new records with existing geologic data to produce new constraints on sea-level and ice-sheet history.

## METHODS AND RESULTS

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### *GIA Modeling*

GIA modeling requires inputs of ice history and a model of Earth rheology. The model then solves for the resulting changes in sea level in space and time in a gravitationally self-consistent framework (Mitrovica and Milne, 2003; Kendall et al., 2005). Ice histories can be constrained by geologic indicators of ice extent and sea-level constraints on ice volume (Peltier et al., 2015); Earth rheology is constrained by observations of GIA and other geophysical processes (Mitrovica and Forte, 2004). However, both inputs feature substantial uncertainty.

### *Eustatic sea-level reconstructions*

An RSL history at a single location can be fit by a range of ice and Earth models, meaning that a single record cannot uniquely constrain eustatic sea-level history. Existing datasets spanning the LGM are sparse, hindering efforts to invert GIA models for the eustatic sea-level history and global ice volumes. As a result,

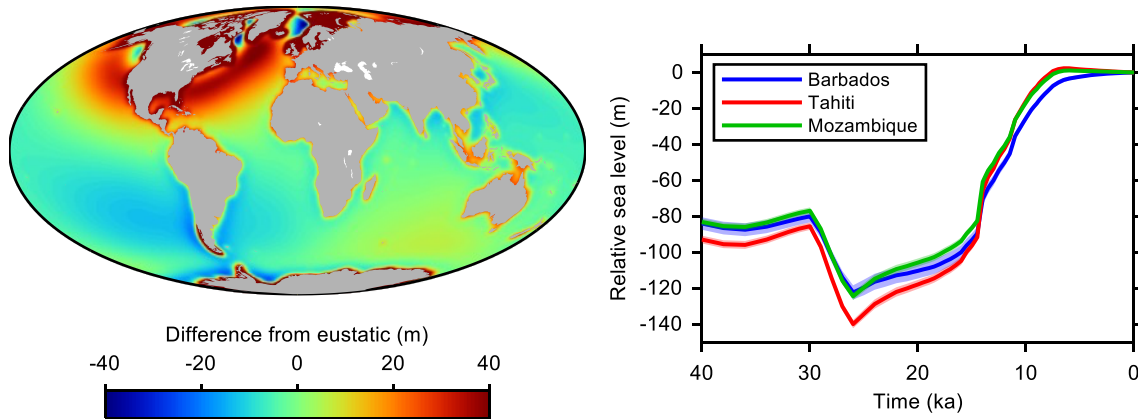


Figure 1: GIA model predictions from 144 simulations using the ICE-6G ice history (Peltier et al., 2015) and 144 Earth models spanning a plausible range of values. (left) Map of mean predicted sea level across 144 models at LGM (26 ka), relative to the eustatic value of  $-131$  m. (right) Predicted RSL histories at three locations. Thick lines show the mean of 144 models; shaded regions show  $\pm 1$  SD.

published reconstructions of eustatic sea level surrounding the LGM differ by up to 30 m (Clark et al., 2009; Lambeck et al., 2014; Peltier et al., 2015). While Holocene records are widely distributed, data surrounding the LGM are much sparser due to the increased difficulty and expense of obtaining geologic samples. Robust estimates of eustatic sea level therefore depend on globally distributed RSL data.

#### *Mozambique record in a global context*

Our preliminary analysis suggests that eustatic sea level at LGM may have been 10–15 m lower than suggested by some reconstructions, indicating a strong sensitivity of ice-sheet growth to climate change. Future work will improve depth constraints on our dated samples to refine the local RSL curve, which we will then combine with existing datasets to invert for eustatic sea-level history.

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