

## Ice-proximal record of the East Antarctic Ice Sheet glacial history

Sean P. S. Gulick<sup>1</sup>, Amelia E. Shevenell<sup>2</sup>, Aleksandr Montelli<sup>1†</sup>, Rodrigo Fernandez<sup>1</sup>, Catherine Smith<sup>2</sup>, Sophie Warny<sup>3</sup>, Steven M. Bohaty<sup>4</sup>, Charlotte Sjunneskog<sup>5</sup>, Amy Leventer<sup>6</sup>, Bruce Frederick<sup>1</sup>, Donald D. Blankenship<sup>1</sup>, Peter Bijl<sup>7</sup>, Francesca Sangiorgi<sup>7</sup>

<sup>1</sup>Institute for Geophysics, Jackson School of Geosciences, University of Texas at Austin, Austin, Texas 78758, USA; [sean@ig.utexas.edu](mailto:sean@ig.utexas.edu)

<sup>2</sup>College of Marine Science, University of South Florida, Saint Petersburg, Florida, 33701, USA; [ashevenell@usf.edu](mailto:ashevenell@usf.edu)

<sup>3</sup>Department of Geology and Geophysics, Louisiana State University, Baton Rouge, Louisiana, 70803, USA;

<sup>4</sup>School of Ocean and Earth Science, University of Southampton, Southampton S0143ZH, UK.

<sup>5</sup>Earth, Ocean, Atmospheric Sciences, Florida State University, Tallahassee FL 32306-4100 USA,

<sup>6</sup>Geology Department, Colgate University, Hamilton, New York, 13346, USA. <sup>7</sup>Department of Earth Sciences, Utrecht University, the Netherlands.

†Present Address: Scott Polar Research Institute, University of Cambridge, Cambridge, CB2 1ER, UK.

### **Abstract**

A lack of ice-proximal records limit our understanding of past East Antarctic Ice Sheet (EAIS) behavior and ability to evaluate its response to ongoing environmental change. The EAIS is marine-based within the glacially over-deepened Aurora Subglacial Basin (ASB) and drains ice from the Gamburtsev Mountains to the Sabrina Coast. Significant ice mass loss from the catchment's main outlet glacier, Totten Glacier indicate the potential for EAIS instability, which contains ~4.5 meters sea-level-equivalent ice. Ice-proximal high-resolution seismic reflection and marine sedimentary data from the Sabrina Coast continental shelf, seaward of the ASB provide evidence for glaciers at the Sabrina Coast before the establishment of continental-scale ice sheets in the earliest Oligocene. Glacial erosion surfaces from dynamic polythermal glaciers crossing the shelf at least 11 times before the late Miocene. By the late Miocene, ice in the ASB catchment transitioned to more stable polar conditions in conjunction with global atmospheric and oceanic cooling. These new data and results highlight the potential of the Sabrina Coast for a future IODP drilling expedition to examine an East Antarctic ice proximal record from the Paleocene to the Pleistocene.