IODP Proposal Cover Sheet

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East Antarctic Ice Sheet Evolution

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Title	East Antarctic Ice Sheet evolution and paleoclimate of the Aurora Basin since the Late Cretaceous: A Mission-Specific Platform proposal to drill the Sabrina Coast shelf
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Area	Sabrina Coast

Proponent Information

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Abstract

We propose a 60-day Mission Specific Platform drilling program to recover Late Cretaceous to late Quaternary strata from the Sabrina Coast shelf, offshore of the Aurora Basin, East Antarctica. The Aurora Basin extends from the Gamburtsev Mountains to the coast, is one of East Antarctica's largest marine-based catchments, and contains 3-5 meters of sea-level equivalent ice. Models indicate that Antarctica's ice sheets may have nucleated in the Gamburtsev Mountains, reached the Sabrina Coast before continental-scale ice sheets formed, and has remained relatively sensitive to climate perturbations through the Cenozoic. The proposed drilling program will provide key constraints on the: 1) existence of warm high southern latitude climates during the late Mesozoic and early Cenozoic, and 2) evolution of the East Antarctic Ice Sheet in the Aurora Basin from the Paleogene to the last deglaciation. A broad range of datable open marine, glaciomarine, and subglacial sediments are accessible by shallow (150-300m) drilling, as imaged by high-resolution seismic data and confirmed by piston cores collected during site survey cruise NBP14-02. This accessible archive of past Antarctic climate and ice sheet history will provide data to improve ice sheet and climate model boundary conditions and outputs. This type of data-model integration is required to better understand the response of Antarctica's ice sheets to continued anthropogenic warming.

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Scientific Objectives

1. Characterize high-latitude Cretaceous to Paleogene climate and evolution of the Aurora Subglacial Basin, which extends from East Antarctica's Gambertsev Mountains to the Sabrina Coast.

2. Investigate how Antarctica's terrestrial and proximal marine environments contributed and/or responded to Paleogene hyperthermals.

3. Characterize the Paleogene greenhouse to Neogene icehouse transition in East Antarctica.

4. Understand the Cenozoic origin and evolution of the Aurora Subglacial Basin subglacial hydrologic system and its role in regional glacial dynamics.

5.Characterize the response of the East Antarctic Ice Sheet to Pliocene warmth in Aurora Subglacial Basin catchment.

Non-standard measurements technology needed to achieve the proposed scientific objectives

We anticipate needing X-ray radiographs, CT scanning, and shipboard sampling for carbonate macro and microfossils to reach our scientific objectives. Once a platform is determined, we will work with the operator to determine the timing of CT and X-ray scanning, and what shipboard sampling and measurements are possible. Based on our experience, we anticipate that the pre-Oligocene cores will need to be split, described, and sampled shipboard, as biogenic carbonate dissolves or is converted to gypsum within six months of collection.

Proposed Sites (Total proposed sites: 13; pri: 7; alt: 6; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
SC-01A (Primary)	-66.43790436 119.65405273	675	200	0	200	Plio-Pleistocene, angular unconformity, Paleocene and older shelf sediments
SC-02A (Alternate)	-66.40793610 119.77363586	679	200	0	200	Plio-Pleistocene, angular unconformity, Paleocene and older shelf sediments
SC-03A (Primary)	-66.31764221 120.13708496	529	200	0	200	Angular unconformity, Eocene shelf sediments, first occurrence of grounded ice
SC-04A (Primary)	-66.19862366 120.30204010	480	200	0	200	Plio-Pleistocene, angular unconformity, Oligocene glacial-interglacials
SC-05A (Alternate)	-66.15009308 120.36253357	498	200	0	200	Plio-Pleistocene, angular unconformity, Oligocene glacial-interglacials
SC-06A (Alternate)	-66.06323242 120.54962158	527	200	0	200	Angular unconformity, Oligocene-Miocene glacial-interglacials
SC-07A (Primary)	-65.99906921 120.69796753	503	200	0	200	Angular unconformity, Oligocene-Miocene glacial-interglacials
SC-08A (Alternate)	-65.96717834 120.77201080	450	200	0	200	Angular unconformity, Oligocene-Miocene glacial-interglacials
SC-09A (Primary)	-65.89762115 120.96318817	336	200	0	200	Plio-Pleistocene, angular unconformity, Miocene prograding sequence
SC-10A (Alternate)	-66.44574738 120.33951569	555	200	0	200	Angular unconformity, Eocene shelf sediments, first occurrence of grounded ice
SC-11A (Alternate)	-66.37213135 120.44529724	488	200	0	200	Angular unconformity, Eocene shelf sediments, clinoform
SC-12A (Primary)	-66.30219269 120.61511993	470	200	0	200	Angular unconformity, Eocene shelf sediments, clinoforms
SC-13A (Primary)	-66.23123932 120.77751160	368	200	0	200	Plio-Pleistocene, angular unconformity, Paleocene-Eocene shelf sediments, first occurrence of grounded ice, first tidewater glaciers