

IODP Proposal Cover Sheet**567-Full4** New Revised Addendum

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	Please check if this is Mission proposal		
Title:	Paleogene South Pacific APC Transect: Heat Transport and Water Column Structure During an Extreme Warm Climate		
Proponent(s):	Deborah J. Thomas, Mitchell W. Lyle, David K. Rea, Theodore C. Moore, and Ingrid Hendy		
Keywords: (5 or less)	Paleogene, Paleoceanography, South Pacific, APC	Area:	South Pacific

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Permission to post abstract on IODP Web site: Yes No

Abstract: (400 words or less)

We propose to continue a Paleogene Pacific transect begun by ODP Leg 199 to study the very warm climate regime of the early Eocene. This proposal, under the aegis of the IODP Extreme Climates Initiative, is intended to study how the Eocene earth maintained high global temperatures and high heat transport to the polar regions despite receiving near modern levels of solar energy at the top of the atmosphere.

We have selected a series of new drill sites to capture records of the Paleocene-Eocene boundary event (sites set on anomaly 25n, at 56 Ma) and the sharp transition at the Eocene-Oligocene boundary (sites set on anomaly 18, at 40 Ma). We also propose to redrill DSDP Site 277, one of the classic Paleogene high latitude South Pacific spot-cored records, to provide a continuous record of the shallow subantarctic South Pacific from the Paleocene to late Oligocene. The proposed work is set in the South Pacific Ocean since high latitude records are unobtainable in the Northern Hemisphere of the Pacific.

Recovered sediments will be used to characterize water masses, deep and shallow ocean temperature, latitudinal temperature gradients, and the strength of upwelling. Further, we will be able to estimate the strength of the zonal winds to study both the atmospheric and oceanic climatic subsystems. We will be able to compare the results to those of Leg 199, which focused on Paleogene equatorial Pacific.

Sites in support of this proposal were surveyed in 2005. Results of surveying and coring in the Southwest Pacific Basin indicate that, in addition to the Eocene paleoclimate objectives, we will be able to approach three long-standing issues of Southern Ocean paleoenvironment. We will be able to determine the CCD history for the Southern Ocean; the presence of IRD in our cores indicates that a record of Antarctic ice cover may be obtainable, at least for the Paleogene; and finally, the backtracked position of the sites, directly west of the proto-Drake Passage, indicates that a good paleoceanographic record of the development of the Antarctic Circumpolar Current is achievable. This last objective is a theme of the Environmental Change portion of the IODP Initial Science Plan. We recovered Paleogene carbonates at pelagic depths and expect that much of the sediment recovered at present latitudes of 50°S will be carbonates, opening up the full range of paleoceanographic proxybased investigations.

Scientific Objectives: (250 words or less)

We propose a scientific ocean-drilling cruise to elucidate the subpolar Pacific climate, oceanographic structure, and biogeochemical cycling of the very warm Eocene through the transition to Icehouse conditions in the Oligocene. Most drillsites are positioned along anomaly 25n, 56 Ma, and spaced between paleolatitudes of 55° to 70°S. Two sites are located on anomaly 18, 40 Ma, to best capture the Eocene-Oligocene transition. Finally, we propose to redrill Site 277 to obtain a high-resolution, shallow sub-Antarctic time series. We anticipate being able to: 1) define the poleward extent of the low-productivity sub tropical gyre, 2) establish the position of the polar front, 3) determine sea-surface temperatures and latitudinal temperature gradient, 4) determine the width and intensity of the high-productivity zone associated with these oceanographic features, 5) characterize the water masses formed in the sub-polar region, 6) determine the nature of the zonal winds and how they relate to oceanic surface circulation, 7) determine the mass balance of carbonates within the southern ocean, 8) document the changes in these systems as climate evolves from the warm early Eocene to the cold Antarctic-influence system of the Oligocene, and 9) monitor mid to late Cenozoic Southern Ocean paleoceanography based on calcareous sediments, especially the development of the Antarctic Circumpolar Current. This proposal complements pre-proposal 625-Pre2 (Gersonde et al.), which focuses on the Neogene.

Please describe below any non-standard measurements technology needed to achieve the proposed scientific objectives.

Proposed Sites:

Site Name	Position	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
SP-1B	50°29.1'S, 163°16.7'W	4971	245	2	247	Southern Ocean
SP-2B	49°56.3'S, 156°50.6'W	5075	145	2	147	paleoceanography during the
SP-3B	49°23.2'S, 141°59.3'W	4703	83	2	85	warm Eocene,
SP-4B	46°30.4'S, 139°21.2'W	5186	58	2	60	paleoproductivity, sea-surface
SP-5B	42°45.3'S, 137°09.3'W	5210	30	2	32	temperature, water-column
SP-13A	50°46.6'S, 151°58.0'W	4772	162	2	164	structure, strength of zonal
SP-14A	47°06.0'S, 133°59.9'W	4658	179	2	181	winds, rapid transition at the
SP-15A	40°00.6'S, 154°02.5'W	4778	89	2	91	Eocene-Oligocene boundary,
DSDP 277	52°13.4'S, 166°11.5'W	1214	480	0	480	development of the Antarctic Circumpolar current and the Drake gateway (all sites)