IODP Proposal Cover Sheet

APL 777

777 - Apl 3

Title	Ancillary Project Letter: Quaternary evolution of the western boundary current in the North Pacific subtropical gyre and its linkage to equatorial Pacific temperature
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Keywords	Kuroshio Current	Area	Okinawa Trough

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Abstract:

During the transit from the leg for Proposal 605, we propose to drill one site in the Okinawa Trough region to investigate how the western boundary current of the North Pacific subtropical gyre has evolved and how it is linked to the evolution of the equatorial Pacific temperature gradient during the Quaternary. The evolution of the zonal temperature gradient in the equatorial Pacific shows stepwise increases during the Plio-Pleistocene. The evolution of the meridional temperature gradient along the eastern margin of the Pacific also shows increases during this period. Reconstruction of the evolution of the north-south temperature gradient in the western Pacific should help us to reconstruct the evolution/variability of the western boundary current of the North Pacific subtropical gyre and ocean heat transport. So far, there is no long-term record of north-south temperature gradients from the western side of the Pacific to compare to the equatorial and eastern Pacific records. Comparisons with these records will help us understand the evolution of the subtropical gyre in the North Pacific and its linkage to equatorial Pacific temperature change. We believe that proposed site is an ideal site to monitor the Kuroshio. Previous analysis shows that there is little difference in glacial sea surface temperature and salinity between the Okinawa Trough and Ryukyu forearc, indicating that the Kuroshio water flowed into the glacial Okinawa Trough. Also the surface salinity decrease during the last glacial was less than 1 ppt at the central Okinawa Trough, suggesting that the effects of a large river discharge input should have been minimal near the proposed site during the last glacial.

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Scientific Objectives

We propose to drill Site OT-1A (original site) or OT-1B (alternate site) in the Okinawa Trough region to reconstruct changes in sea surface temperature, water column structure and thermocline depth during the Quaternary. Especially the long-term temperature records from this drilling will be compared to those from the western and eastern equatorial Pacific, and mid- and high-latitude Pacific, to reconstruct latitudinal and longitudinal temperature gradients for the North Pacific. From these, we expect to reconstruct the evolution and variability of the Kuroshio Current and its role in ocean heat transport. Also we anticipate being able to test a linkage between ENSO-like sea surface temperature variability in the equatorial Pacific and the intensity and variability of the Kuroshio on orbital to tectonic timescales. This will help us to understand how zonal and meridional surface temperature gradients have evolved to drive cyclones and other aspects of mid-latitude climate during the time period (see Challenge 3 of the Climate and Ocean Change theme of the new Science Plan).

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

Proposed Sites

Site Name	Position (Lon, Lat)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
OT-1B	127.192167, 28.119	1070	700	0	700	Ancillary Project Letter: Quaternary evolution of the western boundary current in the North Pacific subtropical gyre and its linkage to equatorial Pacific temperature
OT-1A	126.804833, 27.693833	1450	600	0	600	To reconstruct changes in sea surface temperature, water column structure, thermocline depth, and ocean circulation. To reconstruct N-S and E-W temperature gradients of the North Pacific.

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