IODP Proposal Cover Sheet

ISOLAT Southern Ocean Paleoclimate

863 - MDP

Title	Integrated Southern Ocean Latitudinal Transects (ISOLAT) to Investigate Southern Ocean Paleoclimate and Past Antarctic Circumpolar Current Variability
Proponents	L. Peterson, I. Hall, F. Lamy, X. Crosta, D. Hodell, M. Kienast, R. Zahn, S. Barker, C. Charles, L. Armand, B. Anderson, R. Dunbar, G. Cortese, R. Ganeshram, S. Goldstein, R. Graham, K. Hendry, M. Ikehara, T. Ito, S. Jaccard, A. Martinez-Garcia, N. McCave, E. McClymont, E. Michel, U. Ninnemann, K. Pahnke, V. Peck, J. Pike, M. Sicre, L. Skinner, J. Stoner, C. Waelbroeck,
Keywords	Southern Ocean, Paleoclimate, Long Coring
Area	Multiple circum-Antarctic

Contact Information

Contact Person:	Larry C Peterson		
Department:	Marine Geosciences		
Organization:	RSMAS - University of Miami		
Address:	4600 Rickenbacker Causeway	Miami	33176
Tel.:	1-305-421-4692	Fax:	1-305-421-4632
E-mail:	lpeterson@rsmas.miami.edu		

Abstract

A fundamental goal of paleoclimate science is to deliver an improved quantitative understanding of key processes in the Ocean-Climate system in order to provide a basis for improved prediction of future changes in climate, ocean circulation, biogeochemistry and ecology, and understanding of climate sensitivity at large. In this context the Southern Ocean plays a leading role in that it is involved, through its influence on global ocean circulation and the carbon cycle, with the development and maintenance of the Earth's climate system.

Here we outline the scientific basis for a multiphase drilling project - Integrated Southern Ocean Latitudinal Transects (ISOLAT) - aimed at acquiring a coordinated suite of long (40-60 m) sediment cores from a total of eight focus areas, seven of which form latitudinal transects crossing the key oceanographic frontal systems of the Southern Ocean and the Antarctic Circumpolar Current (ACC). The primary goal of ISOLAT is to resolve and reconstruct past atmosphere-ocean variability across the ACC on orbital to suborbital timescales and investigate its involvement with rapid global ocean variability and climate instability. The fact that eight distinct regions are recommended for long coring is testimony both to the importance of the Southern Ocean within the global climate and biogeochemical systems and to its relatively undersampled nature. It also reflects the fact that interbasin differences exist within the Southern Ocean domain in the latitudinal positions of surface ocean fronts, the extent of sea-ice, sites of intermediate and bottom water formation, intrabasin bottom water circulation, and the sources of dust that reach the surface ocean. Our targeted areas for long coring can contribute to a better understanding of the distribution of key climatic and oceanographic changes in the circum-Antarctic region. Because of the large numbers of sites and the wide geographic separation of focus areas, ISOLAT is envisioned as a multi-expedition program that would require mission-specific coring platforms.

This proposal is an outgrowth of discussions and planning at the recent ISOLAT MagellanPlus Workshop held in Cambridge, UK, in September 2013.

generated: Mon Apr 7 21:40:19 2014
by if340_pdf
(user 0.2566)

863 - MDP

Scientific Objectives

We propose the recovery of multiple transects of long piston cores spanning the circum-Antarctic that are designed to allow the study of Antarctic Circumpolar Current variability across a range of latitudes and timescales in conjunction with past meridional shifts of the major surface ocean-fronts. The further targeting of sites distributed with water depth will ensure the opportunity to reconstruct the vertical water mass architecture of the ACC. The primary scientific objectives of an integrated long coring program in the Southern Ocean will be to reconstruct on orbital to submillennial timescales:(1) Fluctuations of the ACC and ensuing inter-ocean surface and deep water transports during periods of rapid climate change; (2) Variability of latitudinal sea-ice extents, westerly wind strength and dust deposition, and the biological pump and their implications for air-sea gas exchange and atmospheric chemistry (CO2); (3) Variability of surface ocean fronts and their relation to ACC activity and changes in westerly winds;(4) Contribution of ACC variability and Southern Ocean THC to rapid global ocean circulation changes and global climate variability; (5) Biogeochemical inventories of CDW and their relation to biological fluxes; and (6)Import of Northern Hemisphere waters to the CDW at a location proximal to the primary entrance of North Atlantic Deep Water to the Southern Ocean.

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

None required.

generated: Mon Apr 7 21:40:19 2014
by if340_pdf
(user 0.2566)