IODP Proposal Cover Sheet

East Fram Strait Paleo Archive

Title	EASTERN FRAM STRAIT PALEO ARCHIVE
Proponents	Renata Giulia Lucchi, Michele Rebesco, Riccardo Geletti, Caterina Morigi, Jan Sverre Laberg, Juliane Müller, Katrine Husum, Jacques Giraudeau, Jennifer Pike, Anne De Vernal, Thomas Cronin, Claude Hillaire-Marcel , Leonardo Sagnotti, Jochen Knies, Stefan Büenz, Wolfram Geissler, Rüdiger Stein, Florence Colleoni
Keywords	Arctic, Fram Strait, Paleoclimate, Paleoceanography
Area	East Fram Strait

Proponent Information

Proponent	Renata Giulia Lucchi
Affiliation	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), and CAGE-UiT
Country	Italy

☑ Permission is granted to post the coversheet/site table on www.iodp.org

Abstract

EFRAM-ARC aims to recover a high-resolution (sub-centennial) Early Pleistocene stratigraphic sequence containing the paleoceanographic archive after the onset of shelf-edge glaciation on the western Barents Sea (c. 1.3 Ma), the Mid-Brunhes Period (0.5–0.4 Ma) and switch from 41-ka to 100-ka glacial cycles periodicity (c. 1 Ma). The target is a sedimentary depocenter (Bellsund or Isfjorden plastered sediment drifts) on the western margin of Svalbard formed under the effect of the Norwegian Sea Deep Current (deep branch of the North Atlantic Current) flowing on the eastern Fram Strait.

The primary target is the triple-hole recovery of a 340 m-thick, normally consolidated depositional sequence in 1650 m water depth, using the Advanced Piston Corer (APC) plus a full wireline logging . Extended Core Barrel (XCB) may be necessary in the lowermost part of the sequence. The expected time of operations is 6 days.

EFRAM-ARC is coherent with the IODP Science Plan 2013–2023: Climate and Ocean Change: Reading the Past, Informing the Future, and it is complementary and synergic with the active IODP proposals addressing the Arctic: 708-Full, Central Arctic Paleoceanography (ACEX2); 934-Full, Arctic Atlantic Gateway Climate (AAG-DRILL); 915-Pre, Fjord sediment archives - assessing the recent (post LGM) millennial to sub-decadal scale variability of marine and continental climates in the northeastern North Atlantic (FANA); 935-Pre, Pleistocene evolution of Arctic gas hydrates and fluid flow systems (PATH).

EFRAM-ARC Site is motivated by the need to obtain a robust high-resolution Quaternary cronostratigraphic reference section for a better understanding of the boundary conditions and forcing mechanisms in the Barents Sea ice sheet evolution, and will provide an important foothold to link stratigraphic units from the Central Arctic to standard isotope/ magnetic stratigraphic record.

Svalbard can be considered as a "sentinel of climate change". The paleo Barents Sea ice sheet is considered the best available analogue to the West Antarctic ice sheet, whose loss of stability is the major uncertainty in projecting future global sea level. Projecting models struggle in simulating the deglaciation of the Barents Sea complex (the Svalbard-Barents Sea Ice Sheet) because little is known on the mechanisms that triggered the retreat, and the overall complexity of ice sheet dynamics operating on multiple timescales in the Earth system and ice sheet response to major climate transitions, such as the Pleistocene glacial terminations, are still poorly known.

EFRAM-ARC will provide a unique marine paleo-climatic archive complementary to the Ice Memory archives and the terrestrial paleo-climatic archives.

Scientific Objectives

Beside of the general objective of retrieving a continuous, high-resolution paleoclimatic archive since the onset of shelf-edge glaciation on the eastern side of the Fram Strait, specific objectives are:

- Definition of a high-resolution, chronostratigraphic reference sequence for seismic and drill site correlation along the eastern side of the Fram Strait and western Barents Sea margin.
- Detailed reconstruction of paleoceanographic characteristics and paleoclimatic fluctuations since the onset of shelf-edge glaciation in the areas east of the Fram Strait.
- Identification of intervals with open sea-ice in the Arctic Ocean vs the barotropic (and temperature) properties of the West Spitzberg Current for model experiments (e.g., Agarwal and Worster, 2018; Maslowski et al., 2001)
- Identification of prominent depositional events associated with abrupt environmental changes (e.g. meltwater pulses), their recurrence during past glacial terminations, and their impact on local/regional/global oceanographic circulation as a forcing mechanism on climate change.
- Using multiple proxies, definition of the differences between sedimentation associated with 41-ka and 100-ka glacial cycles, with particular focus on glacial-interglacial climatic transitions in order to depict the possible forcing factors concurrent with the mid-Pleistocene Transition.

The dataset collected with EFRAM-ARC will be used to model the role of oceanic conditions in the marine ice sheet instability of the Barents sea complex during past terminations as an analogue of Antarctic ice sheet response to past and on-going ocean warming.

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

No non-standard measurement technologies are required to fulfill EFRAM-ARC scientific objectives.

Proposed Sites (Total proposed sites: 3; pri: 1; alt: 2; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
BELD-01A (Primary)	76.521597 12.738673	1647	340	0	340	Continuous, high-resolution paleoclimatic archive since the onset of shelf-edge glaciation eastern side of the Fram Strait (seismic reflector R4A)
ISFD-01A (Alternate)	77.590375 10.085585	1322	200	0	200	Continuous, high-resolution paleoclimatic archive since the onset of shelf-edge glaciation eastern side of the Fram Strait (seismic reflector R4A)
ISFD-02A (Alternate)	77.526389 9.821667	1585	360	0	360	Continuous, high-resolution paleoclimatic archive since the onset of shelf-edge glaciation eastern side of the Fram Strait (seismic reflector R4A)