

Chikyu Shallow Core Program (SCORE)

Proposal Cover Sheet

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Basic Information

Title:	Variations in sea-ice and intermediate water in the Okhotsk Sea during the late Quaternary warming periods
Keywords: (5 or less)	Okhotsk Sea; sea ice; intermediate water; warm interglacials; millennial and orbital timescales
Area:	Southwestern Okhotsk Sea

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Scientific Objectives (250 words or less)

The Okhotsk Sea is characterized by two pronounced features - the southernmost boundary of seasonal sea ice coverage in the North Hemisphere and the formation of Okhotsk Sea Intermediate Water (OSIW) as a precursor of the North Pacific Intermediate Water (NPIW). Over the last few decades, fast shrinking sea-ice has weakened OSIW formation and resulted in warming and deoxygenation of NPIW. This greatly impacts the physical-chemical-biological processes in the North Pacific. To understand the ongoing and future environmental changes in the Okhotsk Sea, we can learn from the past warming periods. During the last glacial termination 15-13 ka, oxygen-depleted intermediate water occupied the North Pacific, which changed the regional marine ecosystem and impacted global biogeochemical cycles. Similar intermediate water expansion events in the North Pacific must have occurred during the previous interglacials (some of which were warmer than the

present). However, the long-term history of OSIW remains elusive due to the lack of high-resolution sediment core extending back to these past interglacials.

Here we propose to drill in the southwestern Okhotsk Sea off Hokkaido to recover continuous 100 m-long sediment cores by double APC to reconstruct the variability of OSIW and sea-ice over the past 300-400 kyrs including past warm and/or warmer than present interglacials/glacial terminations. Interdisciplinary methods combining sedimentary, micropaleontological, palynological and geochemical proxies will be conducted on this high sedimentation rate sediment core.

Proposed Sites

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)	Primary or alternate
OK-1A	45°05.9'N, 144°10.1'E	461	100	Primary

[Note: Only shallow-penetration coring (about <100 m below seafloor) is available.]

Non-standard Measurements

If possible, we would like to perform porewater sampling onboard for chlorinity and oxygen isotopes measurements.

[Note: Please describe above any non-standard measurements needed to achieve the proposed scientific objectives. Standard measurements are X-ray CT, Multi-sensor core logger, and split surface image.]

List previous drilling in area

No scientific drilling site in the Okhotsk Sea throughout DSDP, ODP and IODP.

A giant piston core MD01-2412 (44°31.65'N, 145°00.25'E, water depth 1225 m, core length 58.1 m) was recovered (Harada et al., 2006; Sakamoto et al., 2006)

List potential hazards and preferred weather window

June to September is the weather window to avoid sea-ice cover and rough weather.

Proponent List

First Name	Last Name	Affiliation	Country	Expertise
Yusuke	Okazaki	Kyushu University	Japan	Micropaleontology, Paleoceanography
Takuya	Itaki	Geological Survey of Japan	Japan	Marine geology, Micropaleontology
Osamu	Seki	Hokkaido University	Japan	Organic geochemistry
Li	Lo*	National Taiwan University	Taiwan	Geochemistry
Yu-Min	Chou*	Southern University of Science and Technology	China	Paleomagnetism
Liang-Chi	Wang*	National Chung Cheng University	Taiwan	Pollen and diatom
Jianjun	Zou*	First Institute of Oceanography	China	Sedimentary geochemistry
Chandranath	Basak*	University of Delaware	USA	Inorganic geochemistry
Lester	Lembke-Jene*	Alfred Wegener Institute	Germany	Isotope geochemistry
Heather	Ford*	Queen Mary University of London	UK	Inorganic geochemistry

[Note: For proponents who do not have J-DESC memberships, please put an asterisk (*) AFTER his/her last name.]

Proposal Format Requirements

- Font Size: 12 point
- Line Spacing: 1.5
- Margin: 2.5 cm all around
- Main Text: Up to 1,600 words
- Figures and Tables: Up to 5
- Figures: Cannot be larger than a single-page A4
- File Sizes of Main Text PDF including Figures: Maximum 15 MB