

IODP Expedition 400: NW Greenland Glaciated Margin

Week 6 Report (17–23 September 2023)

Operations

This week we (1) cored one hole with the rotary core barrel (RCB) system, and (2) conducted a bit change.

Hole U1607A

Week 6 of the expedition began with the continued coring of Hole U1607A. Cores U1607A-8R to 60R advanced from 65.0 to 566.3 meters below seafloor (mbsf) and recovered 413.66 m (83%). On 20 September 2023 we began a bit change. The pipe was raised to 53.4 mbsf and a free-fall funnel (FFF) was deployed at 1542 h. The subsea camera system was then deployed at 1652 h to observe that the FFF had landed in position and ensure a clean exit from Hole U1607A. The bit cleared the seafloor at 1753 h and the subsea camera system was back on board by 1834 h. The drill string was then tripped up, with the bit at the surface at 2037 h. A RCB bottom-hole assembly (BHA) was made up with a new C-4 bit and the drill string was tripped back to the seafloor. The subsea camera system was deployed at 2245 h and Hole U1607A was reentered at 0042 h on 21 September. The subsea camera was back on board at 0130 h. The drill string was lowered to 516.7 mbsf, and we washed back to 566.3 mbsf. Cores U1607A-61R to 91R advanced from 566.3 to 867.0 mbsf and recovered 251.41 m (84%).

Science Results

Site U1607

Science activities during the week included the processing and measurement of core sections and shipboard samples for Site U1607. The science party also worked on finalizing reports for previous sites.

Lithostratigraphy

Cores U1607A-8R through 86R were split and described. The core consists primarily of dark brown to medium brown, thoroughly bioturbated sandy mud and muddy sand with subtle variations. Much of the core is lithified and iron-related diagenetic features are common, especially pyrite and glauconite. There are some thick intervals with abundant detrital glauconite grains and shell fragments are also observed.

Biostratigraphy

The Biostratigraphy team continued processing core catcher samples from Hole U1607A. Trace to common benthic foraminifera were observed including agglutinated and calcareous taxa. These observations are consistent with previously observed assemblages of ~Miocene age benthic assemblages from Ocean Drilling Program (ODP) Site 645 in Baffin Bay. Additionally, at least two species of planktonic foraminifera associated with the Miocene/Oligocene were observed in trace amounts. Lithified samples from increasing depths were consistently challenging to disaggregate. Although sporadic diatom occurrences preclude any precise biostratigraphic reconstructions, the overall assemblage character suggests ~Miocene age. Every other core catcher sample was processed and analyzed for palynology. Dinocysts were nearly absent from all samples which may be attributable to low concentrations of palynomorphs.

Paleomagnetism

Archive section halves of cores from Hole U1607A were measured on the superconducting rock magnetometer (SRM). Discrete cube samples were collected from Hole U1607A working section halves. Most discrete samples were measured on the SRM or the JR-6A spinner magnetometer. We measured the natural remanent magnetization, as well as magnetization after stepwise alternating field (AF) demagnetization up to peak fields of 50 mT.

Geochemistry

Whole-round core samples for interstitial water (IW) were processed and headspace (HS) void gas samples were measured for Site U1607. One IW and two HS samples were collected per core.

Methane concentrations in Hole U1607A were on average 30,000 ppm, with individual samples reaching concentrations of up to 113,700 ppm (758 mbsf). Ethane concentrations are between 3 and 725 ppm. Small amounts of higher order hydrocarbons are also present in some samples. Methane/ethane ratios (C1/C2) vary between 82 and 2580 ppm. Measurements of pH, alkalinity, and salinity were made on IW samples from Site U1607. Alkalinity ranges from 1.100 to 4.067 mM, with salinity between 34 and 27 mM. Additional analyses of IW for Site U1607 are in progress. Sampling for solid state carbon and carbonate analyses was carried out on an average of two samples per core. Samples from the surface to near 300 mbsf were analyzed and the CaCO₃ content is mostly below 1 wt%, while calcareous layers with up to 50 wt% are occasionally detected. The total carbon content varied between 0.16 and 7.1 wt% and the resulting organic carbon content is between 0.12 and 1.8 wt%.

Physical Properties

Whole-round sections of Hole U1607A were logged on the Natural Gamma Radiation Logger (NGRL) as soon as they arrived in the laboratory, followed by logging on the Whole-Round Multisensor Logger (WRMSL) after 4 h. Lithification of the sediments prevented core

temperature measurements but the time between core arrival at the laboratory and the WRMSL measurements was considered sufficient for the core to equilibrate to room temperature (~20°C). *P*-wave velocity (PWL), magnetic susceptibility (MS), and gamma ray attenuation (GRA) were logged at 2 cm resolution. Upon core splitting, X-ray images were obtained for all archive section halves of Site U1607. Thermal conductivity was measured on the working-half section with a contact puck. Discrete *P*-wave velocity measurements were made using the *P*-wave caliper on two working-half sections per core. Moisture and density (MAD) samples (2 per core) were collected from working-half sections to determine wet and dry bulk density, grain density, water content, and porosity. Due to the hardness of the sediments, a metallic syringe or a chisel was used for collecting MAD samples. In general, natural gamma radiation (NGR) values increase slightly downhole to 435 mbsf. *P*-wave velocities are fairly constant, with an average value of 2028 m/s. MS values are highly variable above ~350 mbsf and are extremely low below this depth.

Stratigraphic Correlation and Downhole Measurements

Further efforts to refine the stratigraphic correlation from Sites U1603 and U1604 were made, using downhole logging data to refine tie points.

Outreach

The following outreach activities took place during Week 6.

There was an increase in live ship-to-shore events this week, corresponding to schools returning to session. Scientists Yuka Yokoyama, Brian Romans, Lara Perez, and Libby Ives co-led ship-to-shore events for their institutions and the Outreach Officers scheduled a second Open House for 30 September. An article was posted on Reach the World (RTW) about core processing and the next live tour for RTW is scheduled for 3 October. In response to surveys of RTW classrooms, this tour will focus on laboratory spaces of the *JOIDES Resolution*. A video was posted to the *JOIDES Resolution* YouTube channel about the Protected Species Watch.

Social Media

Group	No. of posts	Analytics	Notes
Facebook	5	7 new followers Post reactions & likes: 180 Post Impressions: 8,800 Avg Post engagement: 5.85% Post shares: 22	Top post: Excitement Abounds (113 reactions and comments)
Instagram	22	6 new followers Post reactions & likes: 472	Top post: Signs of previous life (140 likes)

		Post Impressions: 9,000 Avg Post engagement: 9.84%	
X (formerly known as Twitter)	19	18 new followers Post reactions & likes: 424 Post impressions: 28,000 Avg Post engagement: 3.27% Reposts: 85	Top Post: Good morning twice (7.12%)

Ship-to-Shore Broadcasts

Group	No. of people	Notes
Virginia Tech	~19	Led by Brian Romans
Ball State University	~24	Past Climates and Oceanography/ Paleoceanography course
Phoebus High School	~60	Senior advanced placement course; focus on careers, micropaleontology and paleomagnetism
Northern Virginia Community College and Piedmont Valley Community College	~48	Oceanography and evidence for glaciers in ocean sediments course
Geological Survey of Denmark and Greenland	~30	Led by Laura Perez and Paul Knutz
Tokai University	Unknown	Co-led by Yuka Yokoyama
University of Connecticut	15	Glacial Processes & Materials course
Copenhagen International School	~20	Evidence of climate change and ocean acidification; Grade 8
Copenhagen International School	~36	Evidence of climate change, changes through time; Grades 7 and 8

Copenhagen International School	~20	Evidence of climate change and ocean acidification; Grade 7
Gruening Middle School	~300	Former Middle School of Michelle Pratt; Grade 8

Technical Support and HSE Activities

The following technical support activities took place during Week 6.

Laboratory Activities

- Technical staff were fully engaged in core processing, sampling, laboratory maintenance, and science support for Hole U1607A.
- The sample tray on the NGRL occasionally stopped moving when inserting a section into the instrument. The motor and bearings were changed and the issue was resolved.
- The Conductivity–Temperature–Depth (CTD) profiler and water sampling bottles were deployed on two subsea camera deployments.
- The latest version of a stand-alone X-ray image processing application was tested.

Application Support Activities

- Worked on improvements to iRIS, the new rig instrumentation software.
- Worked on GEODESC improvements.
- Assisted technicians and scientists with minor issues in LIMS and GEODESC.

IT Support Activities

- Completed monthly updates for the Linux and Windows servers.
- Researched the upgrade process for Adobe Creative Cloud applications.
- Worked on troubleshooting firewall application control issues with the vendor.
- Prepared to switch Adobe licensing model for upcoming dry dock.
- Labeled cables in network closets in preparation for upcoming dry dock network maintenance.

HSE Activities

- Emergency shower and eyewash stations were tested.
- An abandon ship drill was held on 17 September at 1300 h.