

Plan Overview

A Data Management Plan created using DMPTool

Title: “Collaborative Research: Magmatic and Tectonic Drivers of Geological, Hydrothermal and Biogeochemical Processes on the Mid-Cayman Rise”

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Template: NSF-EAR: Earth Sciences

Project abstract:

Multidisciplinary study of volcanic, tectonic, hydrothermal, and ecological processes on the Mid-Cayman Spreading Center, using deep submergence tools (i.e., the human occupied submersible (HOV) ALVIN and autonomous underwater vehicle (AUV) Sentry). The project will generate subsea video and still imagery data, physical samples collected by HOV Alvin, along-track sensor data and navigation from HOV Alvin and AUV Sentry, CTD and other sensor data Sentry and a CTD rosette. Data will undergo QA/QC by the science party and, in some cases, processed by the vehicle and vessel operators. Some data products will also be generated by shore-based modelling and IB analyses. Metadata will be generated for all.

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“Collaborative Research: Magmatic and Tectonic Drivers of Geological, Hydrothermal and Biogeochemical Processes on the Mid-Cayman Rise”

Product 1: Oceanographic Data - Alvin navigation and vehicle attitude and along-track sensor data Creation Plan: HOV ALVIN data will be constructed by combining multiple sensor streams into a single file interpolated by time. Raw data will also be submitted. Anticipated Volume: 200 MB, Format(s): ASCII

Product 2: Oceanographic Data - Subsea video and still imagery. Creation Plan: HOV ALVIN and AUV SENTRY Video and still imagery data will be recorded digitally. Anticipated Volume: 25 TB. Format(s): Video will be stored in H.264 format and still imagery as JPG

Product 3: Oceanographic Data - Seabed bathymetry, backscatter. Creation Plan: AUV SENTRY sonar data will be recorded digitally. Anticipated Volume: 15 TB. Format(s): Bathymetry data will be stored in raw and grid file format. Backscatter data will be stored raw and as geotiff.

Product 4: Oceanographic Specimen (volcanic and metamorphic rock, grab specimens from HOV ALVIN). Anticipated Quantity: 250 hand specimens, processed photographed, described, and split at sea, weight 2000 lbs. Metadata for all samples compiled and registered with IGSN via SESAR.

Product 5: Oceanographic Specimen and derived compositional data (Seafloor vent fluid water samples from HOV ALVIN). Anticipated volume: 50 L. Metadata: samples will be given a unique ID based on dive and sample number. Georeferenced temperature and derived geochemical data associated with each water sample (including in situ methane sensor values) will be tabulated and made available through publications and deposition in EarthChem and SESAR. File types: .xlsx

Product 6: Oceanographic Specimen (Macrofauna and Microbiological samples from HOV ALVIN). Anticipated quantity: hundreds of specimens, processed photographed, described, and in some cases preserved at sea (Biological specimens will either be frozen or preserved chemically, e.g., ethanol, RNA later).

Product 7: Oceanographic Sensor Data (in situ redox, CTD and methane data from HOV ALVIN and AUV Sentry). Data will be acquired digitally by sensors during deployments, downloaded and processed on ship. Data will be stored in xlsx format. Anticipated volume: 100 GB. Metadata and data registered through BCO-DMO

Product 8: Geological Mapping data (Merged geospatial integration and interpretation of geological features, and sampling sites). Data collected during dives and subsequent dive review will be compiled in ARGIS or Q-GIS, exported as GeoTIFF format, and made available as a derived data product through MGDS. Appropriate geospatial metadata will be tagged in the GeoTIFF and available as a txt file.

Product 9: Processed Geological Specimens Data (rock thin sections). Thin sections will be made of selected samples after the expedition and will be described petrographically and photographed. Metadata will be tied to parent sample IGSN as children. Anticipated Volume 250 thin sections; 100 GB of jpeg and xlsx documentation.

Product 10: Geochemical Data (derived compositional data, major element, trace element and volatile abundances, from glasses, rocks and minerals, collected on shore by electron microprobe, XRF, SEM, FTIR, LA-ICP-MS and solution ICP-MS, plus associated sample photomicrograph analysis maps when appropriate). Creation Plan: non-destructive or destructive compositional analysis of selected samples using grain mounts, powders, or dissolved splits of specimens. Anticipated volume of data: 100 MB. Data will be collected, reduced, processed, and compiled in .xlsx for preservation at EarthChem, with specimen data tied to sample IGSN metadata.

Product 11: Genetic sequence data. Creation Plan: DNA will be extracted from the sediments and rocks collected during the expedition and submitted for high-throughput sequencing. Sequence data, tied to specimen IGSN metadata, will be processed through field-standard quality control algorithms. Anticipated Volume: 500 GB, Format(s): Fastq text files

Product 12: Physical Oceanographic Data (Water Column Plume models). Creation Plan: Numerical model-based interpretation of AUV and CTD sensor data of flow fields, particle contents, and other physiochemical properties of the water column. Validation of model to be coupled with Product 7 data. Anticipated Volume: 500 GB, Format(s): Software products written in Python 3.x and Julia; model products as .csv, JSON, and HTML.

Product 1 Soule (URI), contingency: Rubin (URI) - Intended Repository: MGDS; Duration of Availability: in perpetuity; License: CC_BY-NC-SA_2.0; Release Timeline: ASAP

Product 2: Soule (URI), contingency: Rubin (URI) - Intended Repository: WHOI Data Library and Archive; Duration of Availability: in perpetuity; License: WHOI Copyright, free to use for non-commercial activities; Release Timeline: 1 year after expedition.

Product 3: Soule (URI), contingency: Rubin (URI) - Intended Repository: MGDS; Duration of Availability: in perpetuity; License: CC_BY-NC-SA_2.0; Release Timeline:

ASAP

Product 4: Kelley (URI); Warren (U. Del), contingency: Rubin (URI) - Preservation Plan: HOV Grab samples will be described at sea; all specimens will be registered with IGSNs. Physical Specimen Repository: Samples will be archived at URI-MGSL (Rock and Core lab). Specimen Release Timeline: 2 years from acquisition. Duration of Availability: Perpetual, Metadata Repository: SESAR and IMLGS. Metadata Release immediate upon archival at the repository.

Product 5: McDermott (Lehigh), contingency: Michel (WHOI); Preservation Plan: Fluids remaining after analysis will be archived in McDermott's lab at Lehigh. All specimens will be registered with IGSNs. Metadata Repository: SESAR Specimen and Data Release Timeline: 2 years from acquisition. Duration of Metadata Availability: in perpetuity

Product 6: Marlow (Boston) and Shank (WHOI), contingency: Michel (WHOI); Preservation Plan: Specimens are consumed during analysis. all specimens will be registered with IGSNs. Metadata Repository: SESAR; Specimen and Data Release Timeline: 2 years from acquisition. Duration of Metadata Availability: in perpetuity

Product 7: Prestin (Olin), contingency: Michel (WHOI) - Preservation Plan: NSF Repository. Intended Repository: BCO-DMO; License: CC_BY-4.0. Data Release Timeline: 1 year from acquisition. Duration of Metadata Availability: in perpetuity.

Product 8: Soule (URI) and Rubin (URI) Geological Mapping data - Preservation Plan: Derived maps will be published and made available as GeoTIFFs through MGDS with attached relevant metadata (deployment number and observations used to compile these interpretations)

Product 9: Kelley (URI); Warren (U. Del), contingency: Rubin (URI) - Preservation Plan: Thin sections will be archived in the Kelley and Warren labs. Data will be archived in EarthChem. All specimen sections will be tied to sample IGSNs. Metadata Repository: SESAR Specimen. Data Release Timeline: 2 years from acquisition. Duration of Metadata Availability: in perpetuity

Product 10: Kelley (URI); Warren (U. Del), contingency: Rubin (URI) - Preservation Plan: Data Release Timeline: 2 years from acquisition. All specimen results will be tied to sample IGSNs. Duration of Availability: Perpetual, Data Repository: EarthChem (PetDB).

Product 11: Marlow (Boston) and Shank (WHOI). Preservation Plan: Samples are consumed during analysis. Sequence data will be preserved by submission to the appropriate repositories at the National Center for Biotechnology Information (NCBI), where they will be assigned accession numbers and made publicly accessible within one year of generation. Duration of Availability: in perpetuity. Intended Repository: NCBI. License: Public domain Release Timeline: Within a year of sequence data generation.

Product 12. Preston (Olin), Contingency, Michel (WHOI). Preservation Plan: NSF Repository. Intended Repository: BCO-DMO (coupled with Product 7) and GitHub Public Repository with Zenodo DOI; License: CC_BY-4.0. Data Release Timeline: 2 years from acquisition. Duration of Metadata Availability: in perpetuity.

Repositories are listed in the prior section.

not applicable

Planned Research Outputs

Physical object - "Rock, Water, Bio specimens"

Physical samples collected with HOV ALVIN. Repositories listed with products. Metadata by IGSN.

Dataset - "AUV Sonar Products"

Bathy and Backscatter data.

Image - "HOV/AUV Photos and Video"

Images collected by vehicles

Dataset - "rock, Water, Bio analytical data"

Compositional or genetic analysis of specimens. Multiple repositories listed in products.

Model representation - "Water Column Plume models"

Data available through BCO-DMO and GitHub Public Repository with Zenodo

Planned research output details

Title	Type	Anticipated release date	Initial access level	Intended repository(ies)	Anticipated file size	License	Metadata standard(s)	May contain sensitive data?	May contain PII?
Rock, Water, Bio specimens	Physical object	2026-06-30	Open	None specified	100 MB	Creative Commons Attribution 4.0 International	None specified	No	No
AUV Sonar Products	Dataset	2025-06-30	Open	Marine Geoscience Data System	15 TB	Creative Commons Attribution 4.0 International	DataCite Metadata Schema	No	No
HOV/AUV Photos and Video	Image	2026-06-30	Restricted	Marine Geoscience Data System	25 TB	Creative Commons Attribution Non Commercial Share Alike 4.0 International	None specified	No	No
rock, Water, Bio analytical data	Dataset	2027-06-30	Open	None specified	1 GB	None specified	DataCite Metadata Schema	No	No
Water Column Plume models	Model representation	2027-06-30	Open	github Biological and Chemical Oceanography Data Management Office	200 MB	Creative Commons Attribution 4.0 International	None specified	No	No