

Relocating the Antarctic Core Collection: The Story of a Large-Scale Data Rescue Initiative for an Historic Collection of Geologic Samples

Valerie Stanley¹, Anthony Koppers¹, Joseph Stoner¹, Maziet Cheseby¹, Cara Fritz¹, and Rupert Minnett²

¹Oregon State University

²Cogense, Inc.

November 22, 2022

Abstract

The story the Antarctic Core Collection's (ACC) transition from Florida State University (FSU) to Oregon State University (OSU) is one of the largest-scale data rescue efforts in recent history. The ACC is the world's largest collection of seafloor sediment samples from the Southern Ocean. The collection was officially established in 1963 as the US Antarctic Program took shape. For the next fifty years, the collection grew to represent the scientific discoveries of over one-hundred and twenty research cruises and expeditions around Antarctica. FSU hosted the irreplaceable collection at its Antarctic Research Facility, an iconic lab in the center of campus. In 2016, the university chose not to renew its contract for supporting the facility. Recognizing the value and potential of the collection, the National Science Foundation began a search for another university to host these important samples and enable future research. In 2017, OSU's Marine and Geology Repository (OSU-MGR) initiated a plan to relocate this historic collection of over eighteen kilometers of core samples from Tallahassee, FL to Corvallis, OR. The project began by planning and constructing a state-of-the-art facility with temperature-controlled space to house the next fifty years of coring expeditions to the Southern Oceans and beyond. In the summer of 2018, the ACC was carefully packaged, digitally inventoried, and shipped to OSU. In this process, the OSU-MGR staff have worked to improve metadata records to build an effective modern inventory of the ACC using new digital collection management techniques, including QR coded labels and scanners. These metadata are managed on tablets with the OSU-MGR App and indexed in an Elasticsearch cluster to streamline the repository's workflows and to display summary statistics. Current and future curation projects will comply with FAIR data principles, with the goal of making all OSU-MGR collections and associated datasets more easily discoverable online.

Relocating the Antarctic Core Collection: The Story of a Large-Scale Data Rescue Initiative for an Historic Collection of Geologic Samples



Valerie L. Stanley, Anthony A.P. Koppers, Joseph Stoner, Maziet Cheseby, Cara Fritz, Rupert Minnett

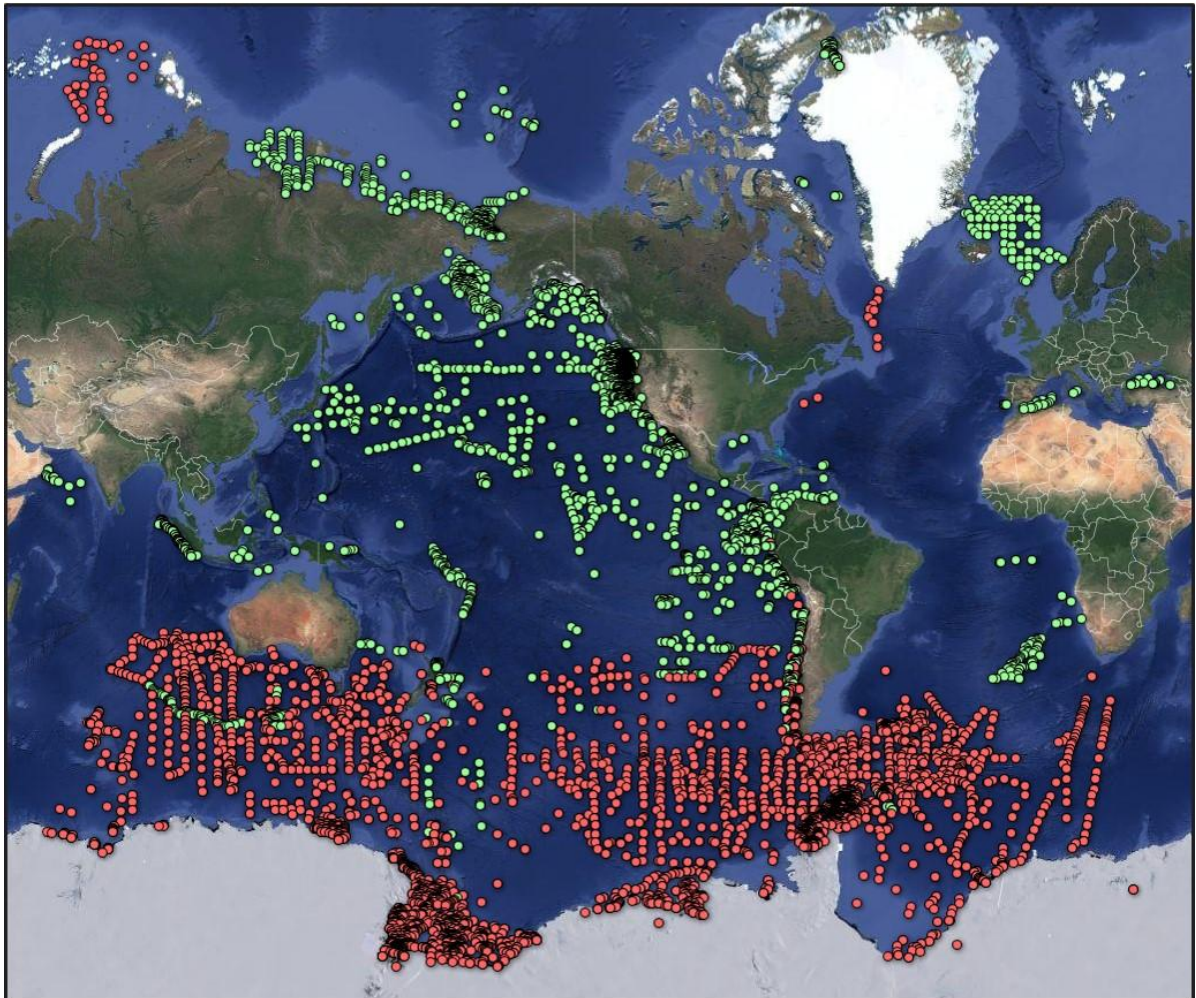
Oregon State University, College of Earth, Ocean, and Atmospheric Sciences, Marine and Geology Repository, 4700 SW Research Way, Corvallis OR 97333
www.osu-mgr.org



PRESENTED AT:



AN IRREPLACEABLE SCIENTIFIC RESOURCE



(<https://arcg.is/0n8qCi>)

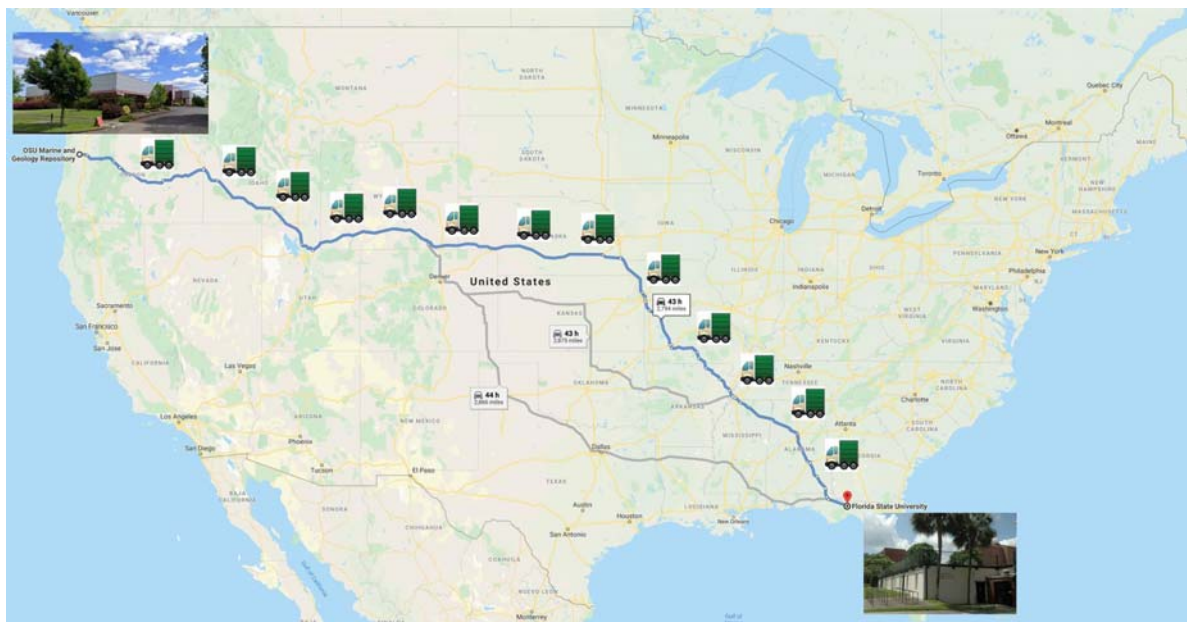
The National Collection of Geological Rock and Sediment Cores from Antarctica and the Southern Ocean is one of the world's premier geological collections. Consisting of irreplaceable sediment cores collected from the 1960's onward, these materials have greatly advanced our understanding of Earth system history and will remain critical to future studies of Earth and climate. While recent findings have documented new mechanisms for ice sheet retreat (e.g. DeConto and Pollard, 2016; Clark et al. 2016) and paint a picture of increased future instability of the Antarctic ice sheets, their past response to times warmer than the present are only captured in the sediment record surrounding Antarctica. The wealth of geological information and climate data contained within the present (red circles on map) and future collection remain a critical asset to the scientific community and are important for gauging Earth's future.



Samples are research artifacts

“Geoscience data and collections are national resources, and are a part of our nation’s heritage. Preservation of geoscience data and collections is a comparatively small investment in our past, our present, and our future, with both immediate and long-term benefits.” (National Research Council 2002)

TRANSCONTINENTAL RELOCATION PROJECT



Relocating the Antarctic Core Collection (July 2018):

- 4.5 weeks, 10+ hour days
- 9 full time employees from Tallahassee
- 12 refrigerated 53-ft semi-trucks
- 1 frozen 53-ft semi-truck
- 11,840 d-tubes
- 4,456 drill core boxes
- 1 moving truck for library and instruments
- 251 pallets



OSU MGR staff with Tallahassee-based crew, surrounded by shipping supplies in the old lab.



Loading d-tubes into boxes. Each box was assigned a unique ID and the contents were digitally inventoried.



Boxes were stapled shut, pallets were inventoried and weighed, and then forklifted into a refrigerated trailer for transport to Oregon State University.

[VIDEO] [https://www.youtube.com/embed/n3pfov1T7NQ?](https://www.youtube.com/embed/n3pfov1T7NQ?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0)

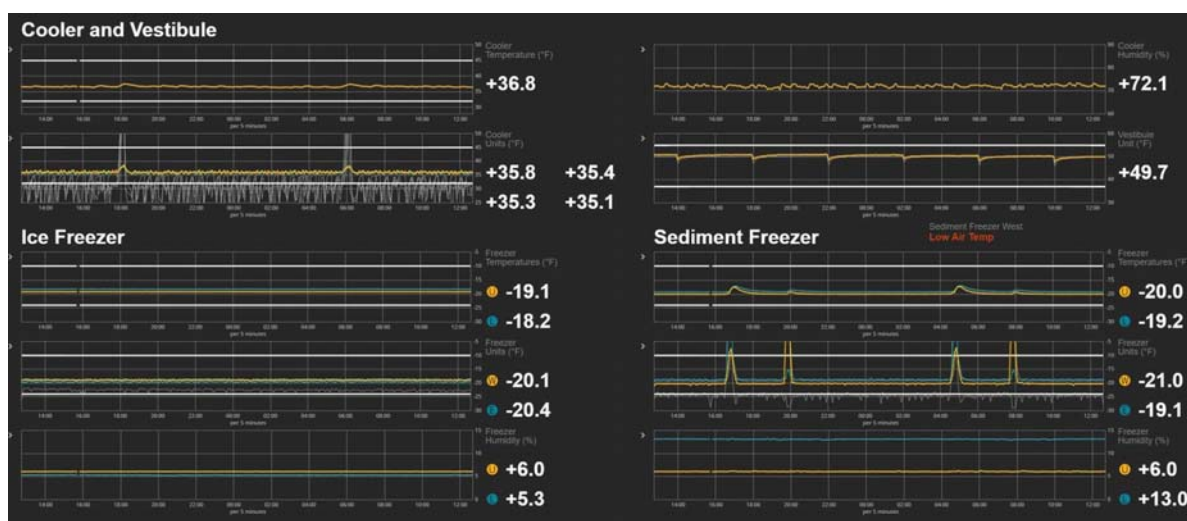
[feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0](https://www.youtube.com/embed/n3pfov1T7NQ?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0)

The OSU-MGR App was initially developed to capture data for tracking all assets throughout the relocation project. This effort generated the very first digital inventory of all cores in the Antarctic Core Collection.

THE NEW REPOSITORY



By combining both the Antarctic Core Collection and the Marine Geology & Geophysics Collection, the new repository is responsible for the curation of *over twenty-two miles of core*.



(<http://osu-mgr.org/nypro-refrigeration-5-minute>)

All temperature-controlled spaces in the repository can be monitored from a custom webpage online and on displays throughout the facility.

The relocation project began by planning and constructing a state-of-the-art facility at OSU to house both the current marine geology research collections and the ACC, including temperature-controlled space large enough to house the next fifty years of coring expeditions.



In addition to long-term storage and archiving services, the new facility includes a core lab equipped to run major sampling parties, research programs, and educational endeavors; laboratory space with instrumentation including five track systems for physical properties and elemental analyses; a wet lab with a fume hood and grain-size analyzers; and a thirty-person classroom. The global distribution and diversity of the combined collections in combination with a complete suite of modern analytical facilities offers a unique opportunity to collaborate with a wider community in research, curation, and education.

Associated Laboratories

- **OSU Argon Geochronology Lab** (<http://geochronology.coas.oregonstate.edu>)
- **Paleomagnetic & Environmental Magnetic Research Lab**
(<http://paleomag.coas.oregonstate.edu/>)
- **College of Veterinary Medicine CT Scanning Facility**
(<https://vetmed.oregonstate.edu/imaging-facilities-and-equipment>)

DIGITAL COLLECTION MANAGEMENT

[VIDEO] [https://www.youtube.com/embed/ssdwXgGtaaE?](https://www.youtube.com/embed/ssdwXgGtaaE?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0)

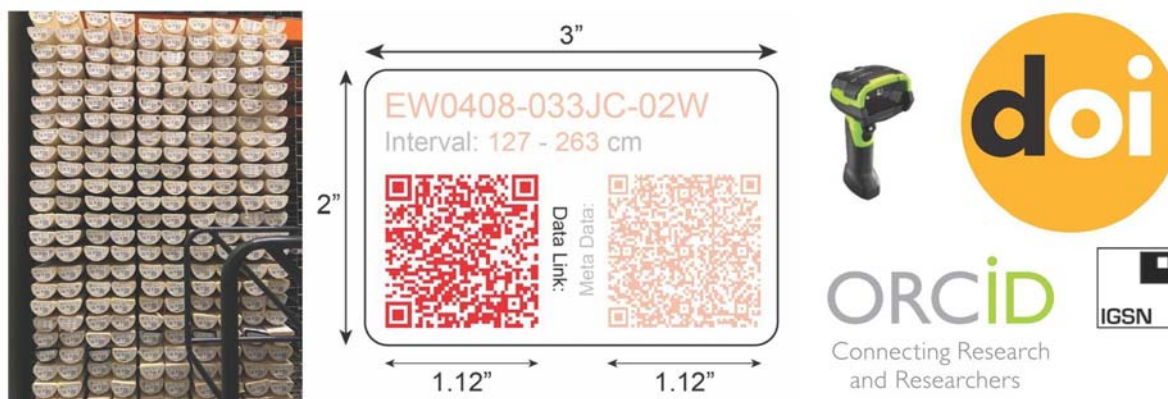
[feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0](https://www.youtube.com/embed/ssdwXgGtaaE?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0)

Modern curation implies digital collection management. Developing our own digital collection management system allows for greater efficiency in repository workflows, and improves accuracy in recordkeeping from initial metadata capture to serving related datasets on [the repository website](http://osu-mgr.org/) (<http://osu-mgr.org/>).

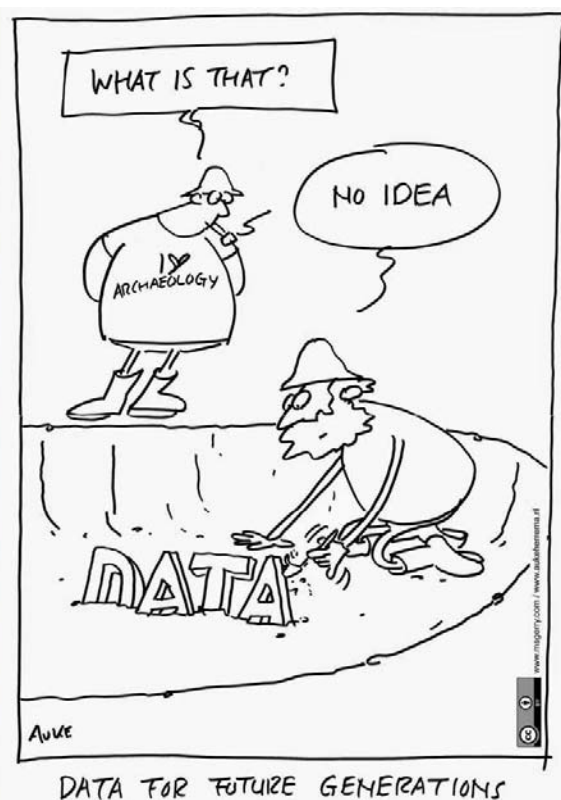
The OSU MGR App is a tablet-based application for displaying data indexed in Elasticsearch. The application includes a user interface developed to manage collection inventories, add new data and samples, look up storage locations, and print QR-coded labels.

FAIR DATA INITIATIVES

Rescuing a fifty-year-old collection is an ongoing effort. Future work will focus on integrating the repository's website with the OSU MGR App, including sample requests and updated map layers. The improved web services will include more digital content for the Antarctic Core Collection, as well as automatic generation and updating of IGSNs (International Geoscience Sample Number) via the SESAR API.



OSU MGR embraces the major challenge of data storage and online distribution, as a key part of expanding and modernizing our facility to meet future needs of the scientific community. IGSNs and QR-encoded core labels are now considered fundamental in the state-of-the-art geological repositories, and are tangible representations of digital progress. These facility and online data access improvements will significantly enhance discoverability and usage of all OSU MGR collections. Digital data generated on instrumentation at the facility should be automatically collected, linked, and digitally archived for cores, and be made available in addition to core descriptions. Along with proper physical curation of a core, digital curation for all assets incorporating **FAIR data principles** (<https://www.force11.org/group/fairgroup/fairprinciples>) will increase the scientific value of the collections.



On preserving links for data and samples

“In some subdomains of geology, physical specimens are key to research. Scientists gather data from these items, analyze these data and produce scientific outcomes. These physical objects become data once they have been used in research, along with their associated metadata and descriptions. This metadata and documentation is also used to enable discovery and access for reuse as well as to capture geological information. There is a transition from a rock being just a rock, to it now representing scientific knowledge with this connection to the documentation. If this connection is lost, the value as data becomes lost and the physical item just becomes a rock again.” (Ramdeen 2015)

ABSTRACT

The story of the Antarctic Core Collection's (ACC) transition from Florida State University (FSU) to Oregon State University (OSU) is one of the largest-scale data rescue efforts in recent history. The ACC is the world's largest collection of seafloor sediment samples from the Southern Ocean. The collection was officially established in 1963 as the US Antarctic Program took shape. For the next fifty years, the collection grew to represent the scientific discoveries of over one-hundred and twenty research cruises and expeditions around Antarctica. FSU hosted the irreplaceable collection at its Antarctic Research Facility, an iconic lab in the center of campus. In 2016, the university chose not to renew its contract for supporting the facility. Recognizing the value and potential of the collection, the National Science Foundation began a search for another university to host these important samples and enable future research. In 2017, OSU's Marine and Geology Repository (OSU-MGR) initiated a plan to relocate this historic collection of over eighteen kilometers of core samples from Tallahassee, FL to Corvallis, OR. The project began by planning and constructing a state-of-the-art facility with temperature-controlled space to house the next fifty years of coring expeditions to the Southern Oceans and beyond. In the summer of 2018, the ACC was carefully packaged, digitally inventoried, and shipped to OSU. In this process, the OSU-MGR staff have worked to improve metadata records to build an effective modern inventory of the ACC using new digital collection management techniques, including QR coded labels and scanners. These metadata are managed on tablets with the OSU-MGR App and indexed in an Elasticsearch cluster to streamline the repository's workflows and to display summary statistics. Current and future curation projects will comply with FAIR data principles, with the goal of making all OSU-MGR collections and associated datasets more easily discoverable online.

REFERENCES

Clark, P.U., Shakun, J.D., Marcott, S.A., Mix, A.C., Eby, M., Kulp, S., Levermann, A., Milne, G.A., Pfister, P., Santer, B.D., Schrag, D.P., Solomon, S., Stocker, T.F., Strauss, B.H., Weaver, A.J., Winkelmann, R., Archer, D., Bard, E., Goldner, A., Lambeck, K., Pierrehumbert, R.T., and Plattner, G.-K. (2016). Consequences of twenty-first-century policy for multi-millennial climate and sea-level change. *Nature climate change*, 6(4), 360-369.

DeConto, R. M., & Pollard, D. (2016). Contribution of Antarctica to past and future sea-level rise. *Nature*, 531(7596), 591.

National Research Council. (2002). *Geoscience data and collections: National resources in peril*. National Academies Press.

Ramdeen, S. (2015). Preservation challenges for geological data at state geological surveys. *GeoResJ*, 6, 213-220.

