



A Linked Data Driven Visual Interface for the Multi-Perspective Exploration of Data Across Repositories



Gengchen Mai, Yingjie Hu, Krzysztof Janowicz, Grant McKenzie

STKO Lab, Department of Geography, University of California Santa Barbara, Santa Barbara, California, USA

ABSTRACT

As more data from heterogeneous sources become available, interfaces that support the federated exploration of these data are gaining importance to uncover relations between entities across multiple sources. Instead of explicit queries, visual interfaces enable a follow-your-nose style of exploration by which a user can seamlessly navigate between entities from different data sources. This requires an alignment of the ontologies used by said sources as well as the coreference resolution of entities across them. Together with Semantic Web technologies, the Linked Data paradigm provides the technological foundations to address these challenges. In this work, we present a multi-perspective visual interface that enables the seamless exploration of major geo-data sources that contain millions of RDF triples.

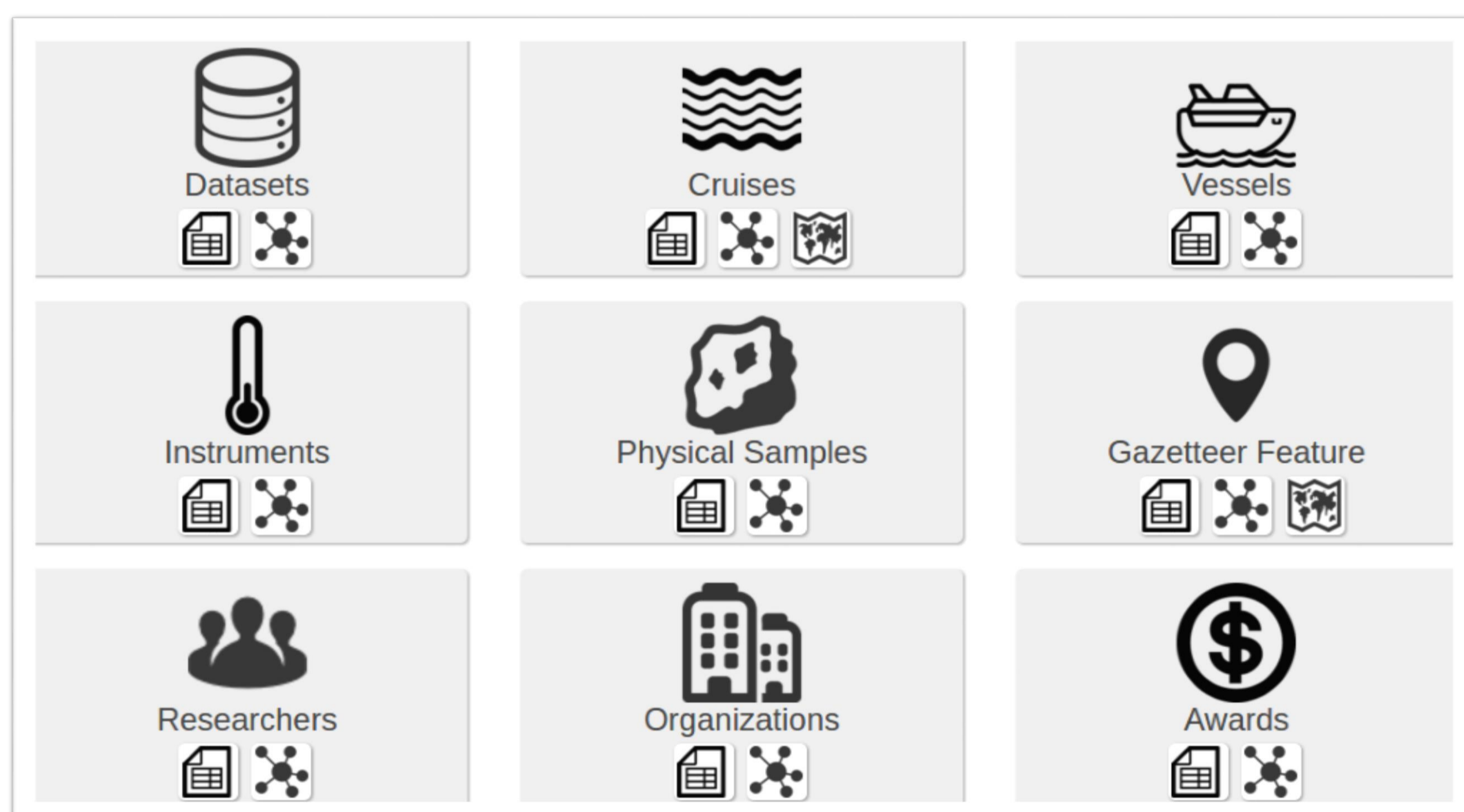
INTRODUCTION AND MOTIVATION

Linked Data as a paradigm describes how to break up data silos and support the publication, retrieval, and interlinkage of data on the Web. However, making use of the largely machine-oriented global graph of Linked Data also requires human-centric interfaces to query data or to explore it by following links across entities and even repositories.

In this work, we present an interface that supports knowledge exploration across several federated geo-data sources by means of a modular collection of ontology design patterns and multiple perspectives including a tabular view (lens), a graph view, and a map view on the data. The used data sources include BCO-DMO, DataONE, IEDA, IODP, LTER, MBLWHOI Library, R2R, and a dataset of AGU abstracts and NSF award. Nonetheless, this interface is independent to underline datasets and ontologies.

NINE CORE ENTITIES AND THREE VISUALIZATION OPTIONS

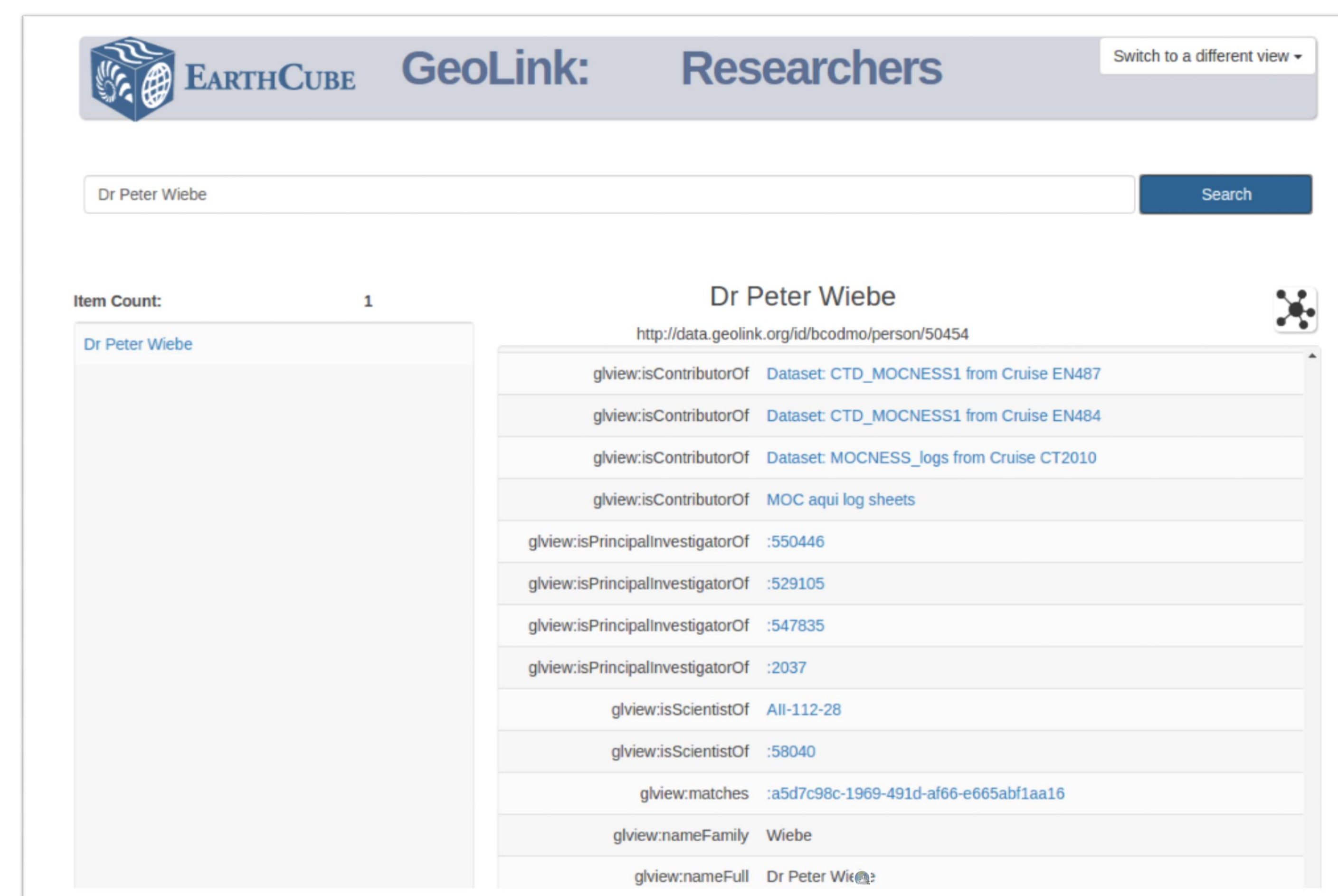
These are nine core entities with several visualization options for users to begin with. The changing of the underline datasets and ontologies will not affect the operation of our interface.



FOLLOW-YOUR-NOSE TABULAR EXPLORATION

Tabular View supports the classic *follow-your-nose* exploration:

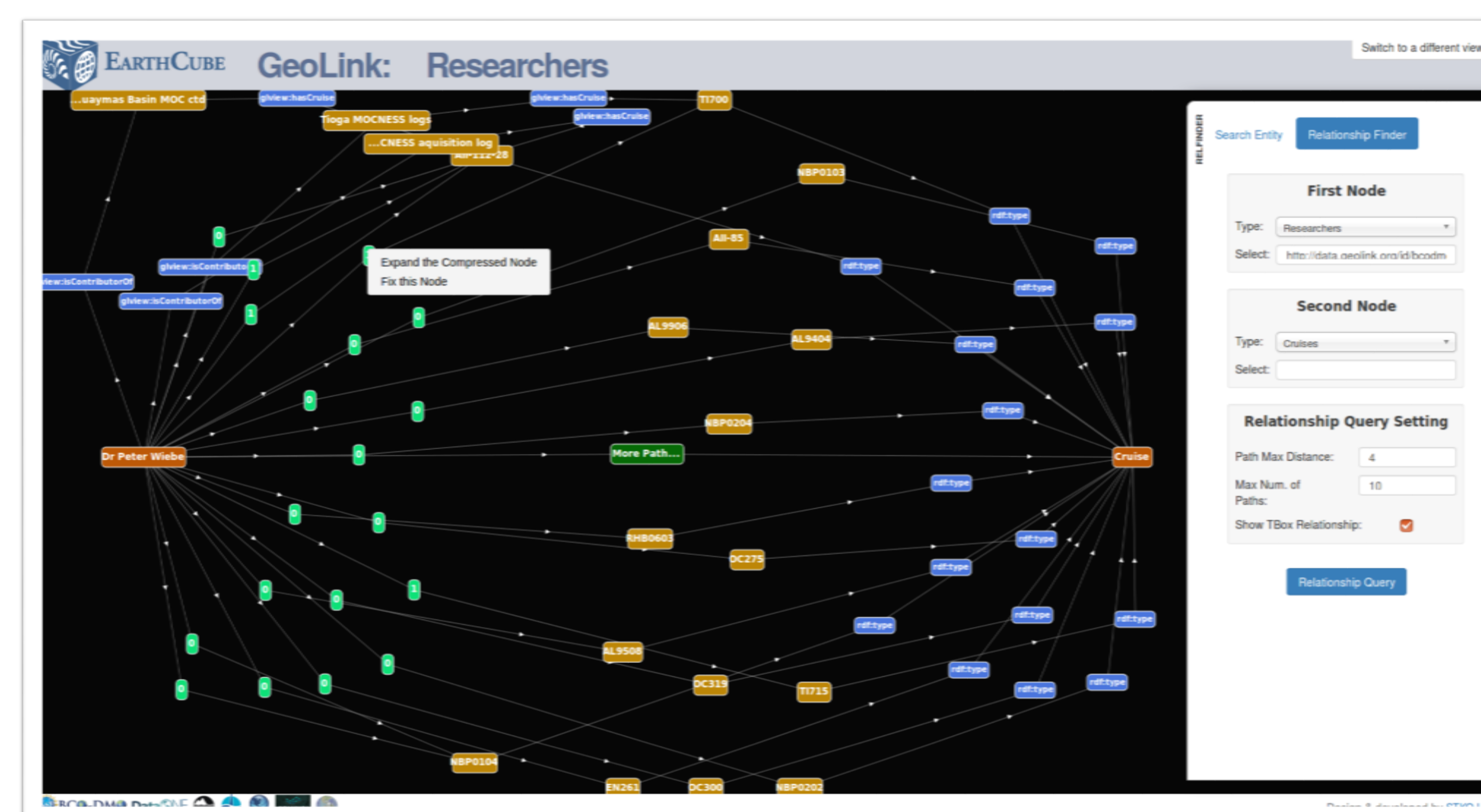
- Using search-while-you-type to select a particular entity of said type.
- Exploring the information across repositories step by step.



RELFINER EXPLORATION INCLUDING ENTITY-TO-TYPE QUERIES

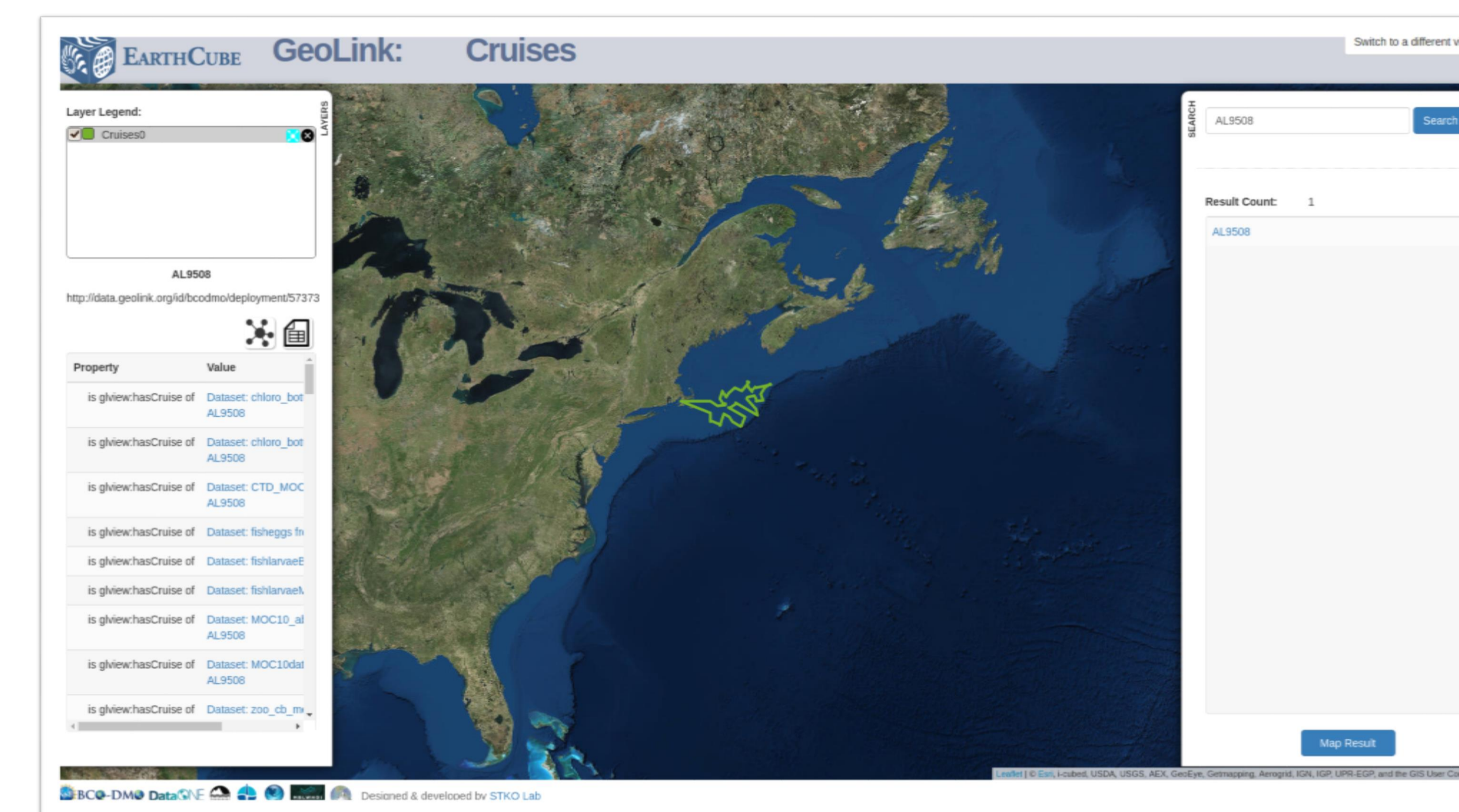
Graph View extends the RelFinder system in several features:

- Mixed entity-to-type path queries: performing n-degree path queries to uncover all subjects, predicates, and objects that are along the path from source to target which can be entities or entity types.
- Compress and expand the path.
- Range queries around nodes.
- Enabling “Go to Tabular View” for each node.
- Enabling “Go to Map View” for each geographic entity.



MULTI-LAYER MAP EXPLORATION

Map View enables a multi-layer map visualization for entities which have a GeoSPARQL-conform WKT geometry.



CONCLUSION

In this work, we introduced a Linked Data driven, multi-perspective interface that allows users to discover data across different repositories from three seamless perspectives, a tabular view, a graph view, and a map view. These perspectives enable users to discover detail information about an entity, relationships between entities and between entity types, as well as the spatial distribution of entities. Our work thereby contributes to research on knowledge exploration across federated data sources. In the future, we plan to add additional data sources and interaction possibilities to further strengthen the interface. A key issue that will determine the success of exploratory interfaces is the quality and extent of the coreference resolution which is currently ongoing. Finally, we also plan to test the interface by means of a user study.

RELATED PUBLICATIONS

- Mai, G., Hu, Y., Janowicz, K., McKenzie, G. A Linked Data Driven Visual Interface for the Multi-Perspective Exploration of Data Across Repositories. In Proceedings of the 9th International Conference on Geographic Information Science. Sep. 27 - 30, 2016, Montreal, Canada., Under review.
- Krisnadhi, A., Hu, Y., Janowicz, K., Hitzler, P., Arko, R., Carbotte, S., Chandler, C., Cheatham, M., Fils, D., Finin, T., Ji, P., Jones, M., Karima, N., Lehnert, K., Mickle, A., Narock, T., O'Brien, M., Raymond, L., Shepherd, A., Schildhauer, M., & Wiebe, P. (2015): The GeoLink modular oceanography ontology, In: Proceedings of the 14th International Semantic Web Conference, Oct. 11-15, 2015, Bethlehem, Pennsylvania, USA.

ACKNOWLEDGEMENTS

The presented work is partially funded by the NSF award 1440202 EarthCube Building Blocks: Collaborative Proposal: GeoLink.