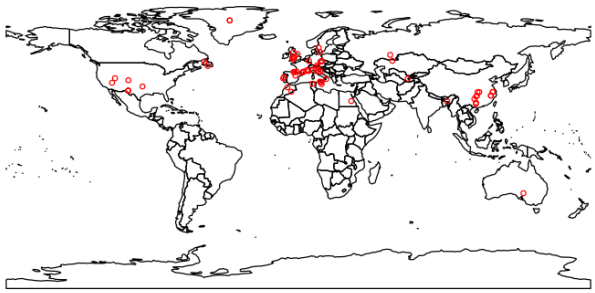
# A deep-time knowledge base and service

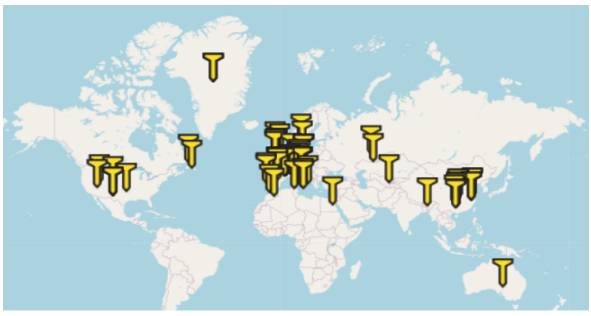
Xiaogang Ma (max@uidaho.edu)
Department of Computer Science, University of Idaho, Moscow, ID 83844, USA

Deep time is a common reference in geoscience and many researchers are using deep time as a framework to synthesize datasets. Through an NSF supported research, we are building a deep-time knowledge base (DTKB) with semantic technologies. The knowledge graphs we built are based on community-level standards, and we have included a list of global, regional and local geologic time scales in a common framework. A SPARQL endpoint has been set up, and a number of use cases have been built to demonstrate how to use the service from workflow platforms, such as Jupyter. All the outputs are made open source and are accessible through a GitHub repo.

**https://github.com/xgmachina/DeepTimeKB**



Draw a static map of Golden Spikes (Global Boundary Stratotype Section and Point) from the DTKB with records in the 2018 International Chronostratigraphic Chart



Draw an interactive map of Golden Spikes with the same records from the DTKB

**Core ontologies and schemas used in the DTKB (courtesy of Dr. Simon Cox and Dr. Steve Richard)**

| Prefix | Namespace | Role in the deep time knowledge graph |
|---|---|---|
| **dc** | <http://purl.org/dc/elements/1.1/> | Specify metadata of vocabulary schemes and concepts |
| **dcterms** | <http://purl.org/dc/terms/> | Specify metadata of vocabulary schemes and concepts |
| **geo** | <http://www.opengis.net/ont/geosparql#> | Specify the location of golden spikes |
| **gts** | <http://resource.geosciml.org/ontology/timescale/gts#> | Based on THORS and ISO 19156; Specify the structure of core classes and relationships in the geological time scale |
| **isc** | <http://resource.geosciml.org/classifier/ics/ischart/> | Specify the deep time concepts in the ISC charts |
| **sf** | <http://www.opengis.net/ont/sf#> | Specify spatial feature types |
| **skos** | <http://www.w3.org/2004/02/skos/core#> | Specify hierarchical structure and multilingual labels of deep time concepts |
| **thors** | <http://resource.geosciml.org/ontology/timescale/thors#> | Based on ISO 19108; Specify the temporal hierarchical ordinal reference system of deep time concepts |
| **tm** | <http://def.seegrid.csiro.au/isotc211/iso19108/2002/temporal#> | Based on ISO 19108; Specify temporal objects and the reference system |
| **time** | <http://www.w3.org/2006/time#> | Specify the reference system and topological relationships of deep time concepts |
| **ts** | <http://resource.geosciml.org/vocabulary/timescale/> | Specify the different versions of vocabulary schemes for the ISC charts |

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