

Exploring Sea Ice Composition Using Semantic Data Dictionaries and qb.js

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ABSTRACT

Sea Ice is a fundamental component of the Earth system that is undergoing rapid change. Yet sea ice data are described in myriad different, even unique, formats and representations. We show how the Sea Ice Grid (SIGRID) 3 data format and other representations of sea ice concentrations, age, and thickness based on the World Meteorological Organization (WMO) "egg code" can be easily mapped into multidimensional data. The data can then be readily projected onto commonly available geographic mapping tools in a multidimensional analysis environment. Our analysis environment, qb.js, uses Semantic Web standards and Semantic Data Dictionaries, a mixture of multiple ontologies, to provide a data exploration and visualization environment. Geographic and temporal extent are expressed as dimensions of sea ice, while concentrations, age, and thickness as measures of the ice. These dimensions and measures are rendered into a Resource Description Framework (RDF) graph that is described using a Semantic Data Dictionary. This tool will allow users to easily see and understand changes in sea ice extent over many years.

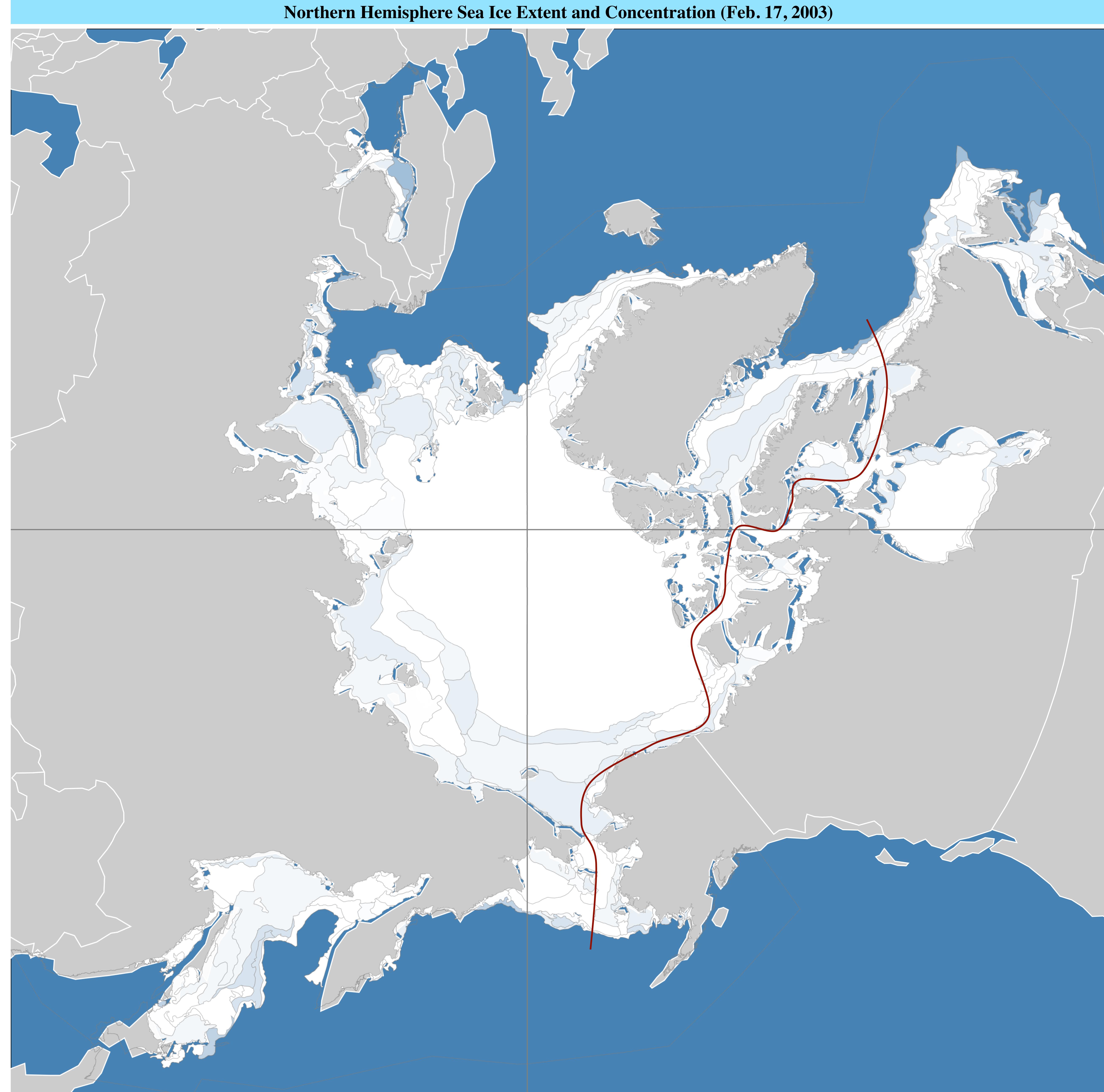
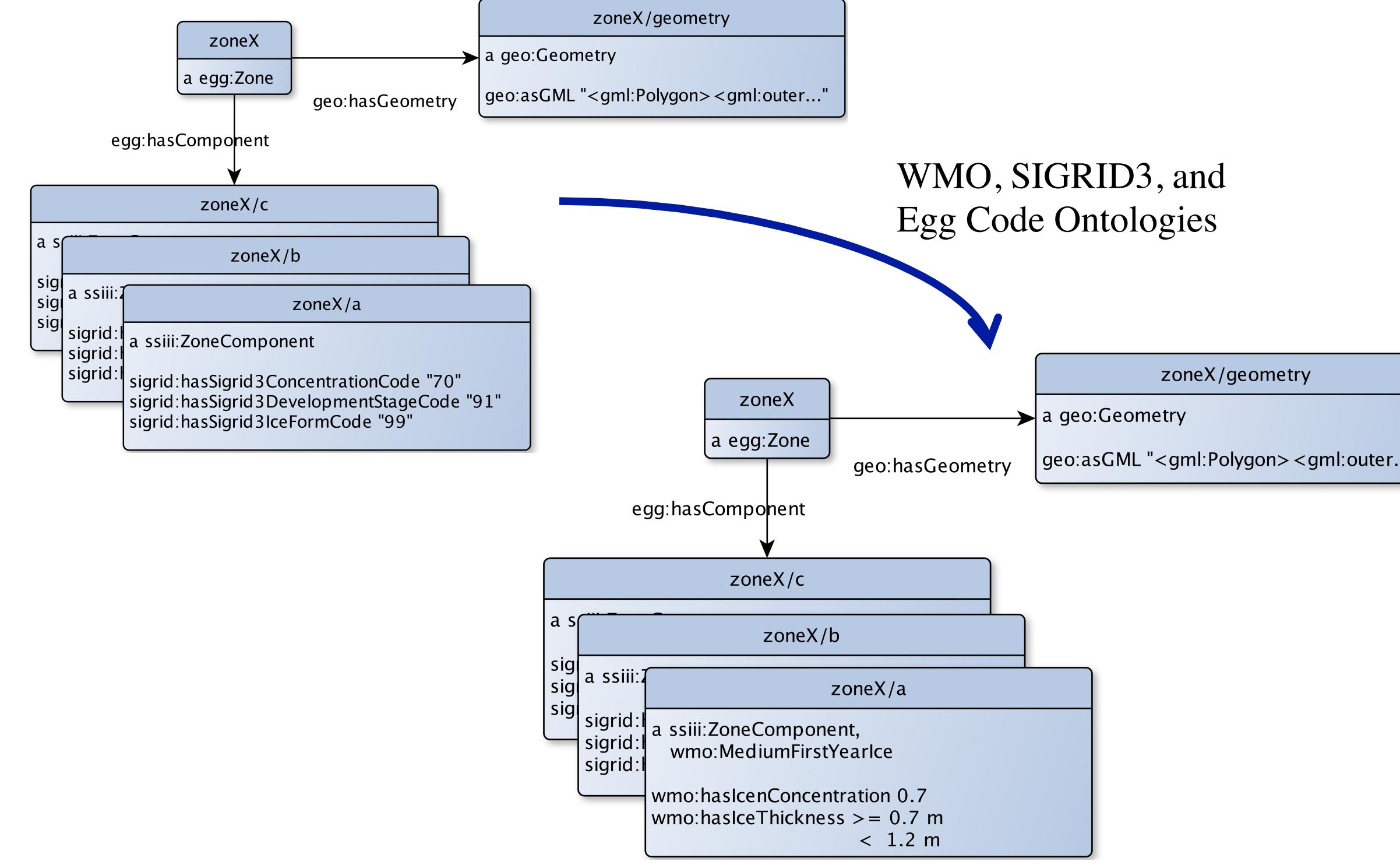
What if we could compute the best path through the Northwest Passage?

We would need to know:

- ❖ Ice concentration
- ❖ Ice thickness
- ❖ Ice form
- ❖ every step along the way.

Now we know it.

SIGRID3 to Egg Code and WMO Semantics



- ❖ Rendered using d3.js in Google Chrome
- ❖ Backed by simplified national borders/coasts
- ❖ Data retrieved from fuseki SPARQL endpoint
- ❖ Uses GML shapes embedded in GeoSPARQL Geometry objects
- ❖ Converted from SIGRID 3 SHP data files
- ❖ Available measures for display:
 - ❖ Sea Ice Concentration (shown)
 - ❖ Sea Ice Development (age)
 - ❖ Sea Ice Form
- ❖ Available display modalities:
 - ❖ Color/gradient fill and opacity
 - ❖ Multiple datasets can be joined for change over time

Sponsors:

National Science Foundation



Glossary:

RPI - Rensselaer Polytechnic Institute
 TWC - Tetherless World Constellation at Rensselaer Polytechnic Institute
 NSIDC - National Snow and Ice Data Center
 SSIII - Semantic Sea Ice Interoperability Initiative
 OWL - Web Ontology Language
 GeoSPARQL - Observation and Measurements

Acknowledgments:

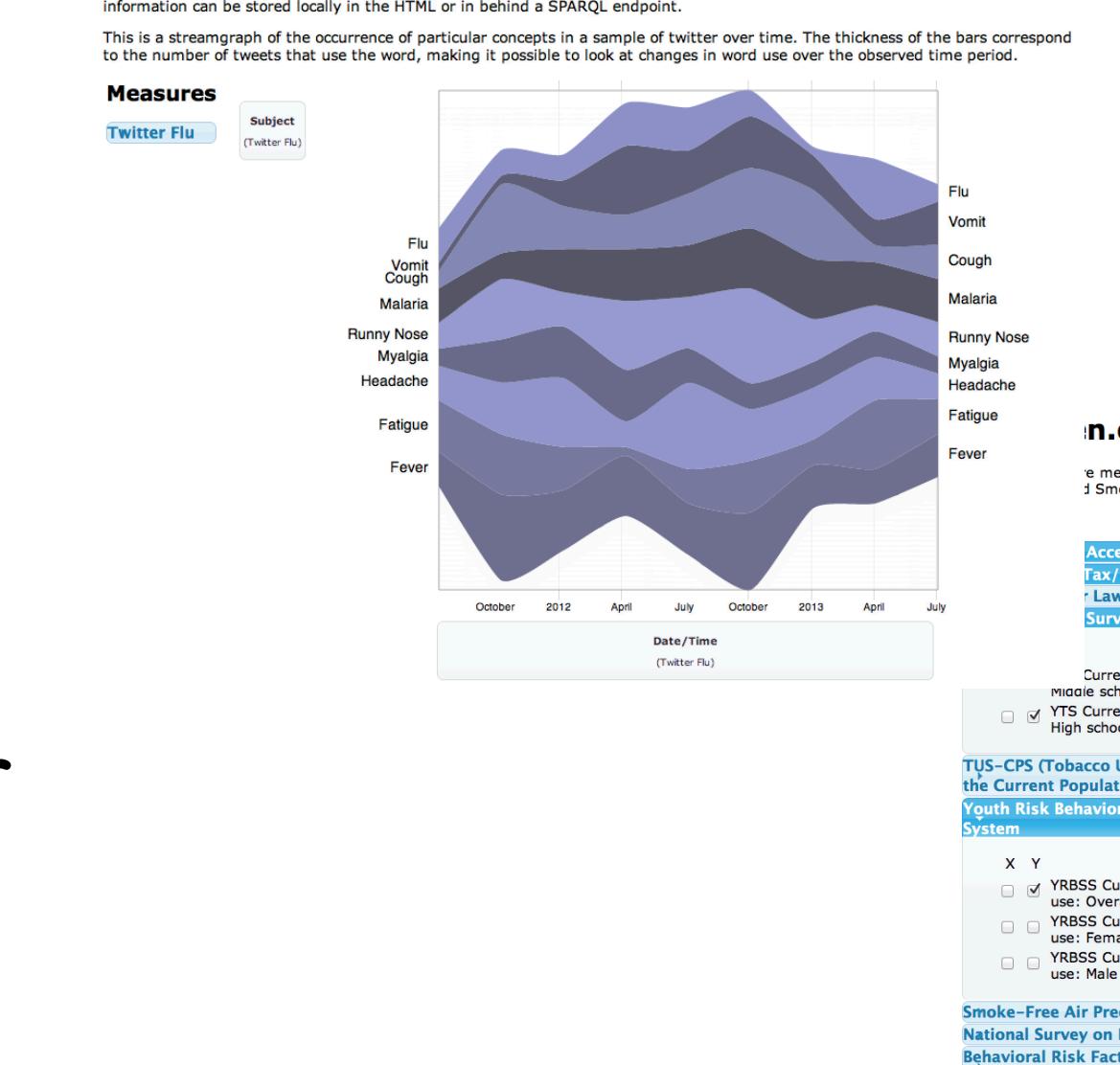
Simon Cox
 W3C Provenance Working Group

Incorporation into qb.js for:

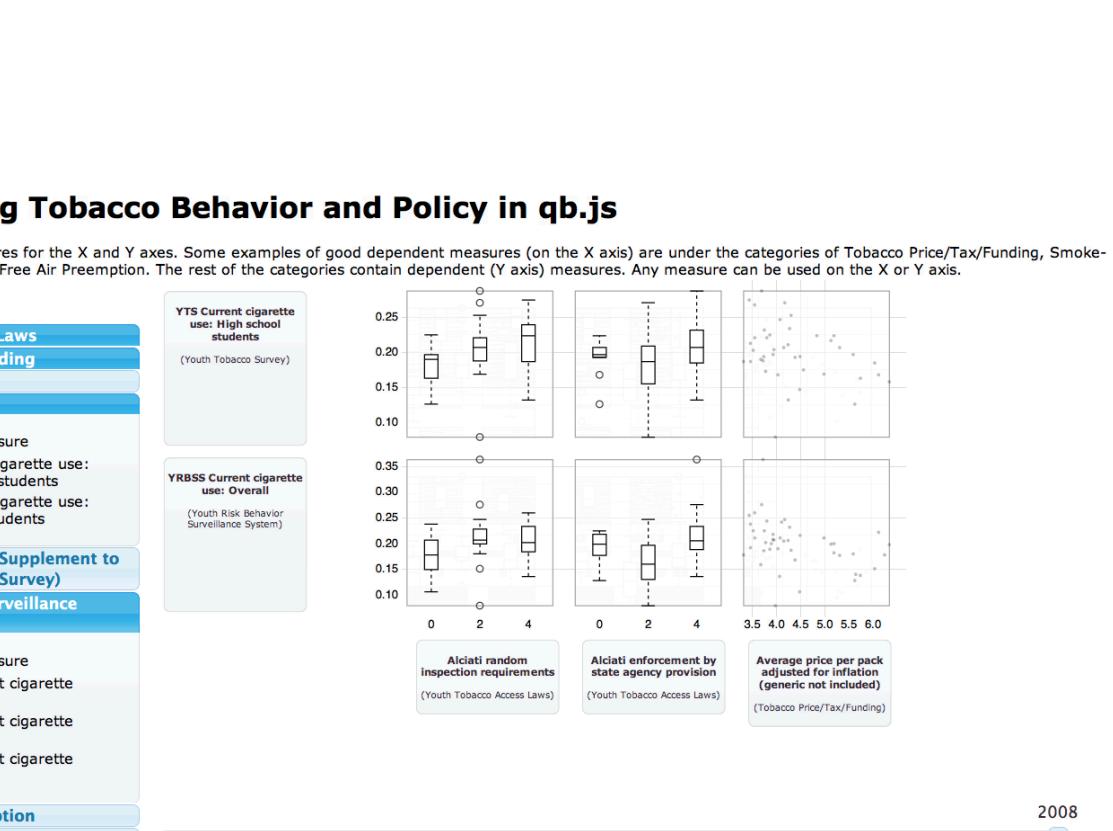
- ❖ Aggregation and display through time:
 - ❖ Day to day
 - ❖ This time each season
- ❖ Comparison between different data sources

Compute cross sections through regions for best shipping paths.

Next Steps



qb.js visualizations



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