Australian Government
Geoscience Australia

# Information Models for the Australian Geoscience Community: GeoSciML, EarthResourceML and GroundWaterML

*Ollie Raymond [1] , Bruce Simons [2] , Eric Boisvert [3]*

Open Geospatial Consortium (OGC) web services offer a cost efficient and open source technology that permits transfer of standardised data from distributed sources, removing the need for data to be regularly uploaded to a centralised database. When combined with community defined exchange standards or schemas, OGC services offer the ability to access the latest data from source agencies in a consistent format.

The IUGS Commission for the Management and Application of Geoscience Information (CGI) has an on-going collaborative project to develop a data model and exchange language based on GML for geological map and borehole data, the GeoScience Markup Language (GeoSciML). The Australian Government Geoscience Information Committee (GGIC) has used the GeoSciML model as a basis to deliver mineral resources (EarthResourceML), and the Canadian Groundwater Information Network (GIN) has extended GeoSciML into the groundwater domain. The focus of these activities is to develop geoscience community schema that use globally accepted geospatial web service data exchange standards.

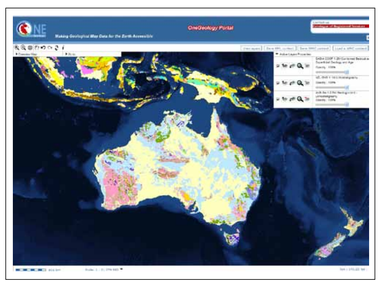

**Figure 1.** The OneGeology portal uses OGC standard web services to deliver geological data from all over the world.

## GeoSciML

In December 2008, the CGI's Interoperability Working Group (IWG) released GeoSciML version 2.0, and later version 2.1 (www.geosciml.org). GeoSciML 2 is the format used by the OneGeology portal to deliver global geology data (Fig. 1. http://portal.onegeology.org/) and by the AuScope portal to deliver geological map and borehole data (http://portal.auscope.org/gmap.html).

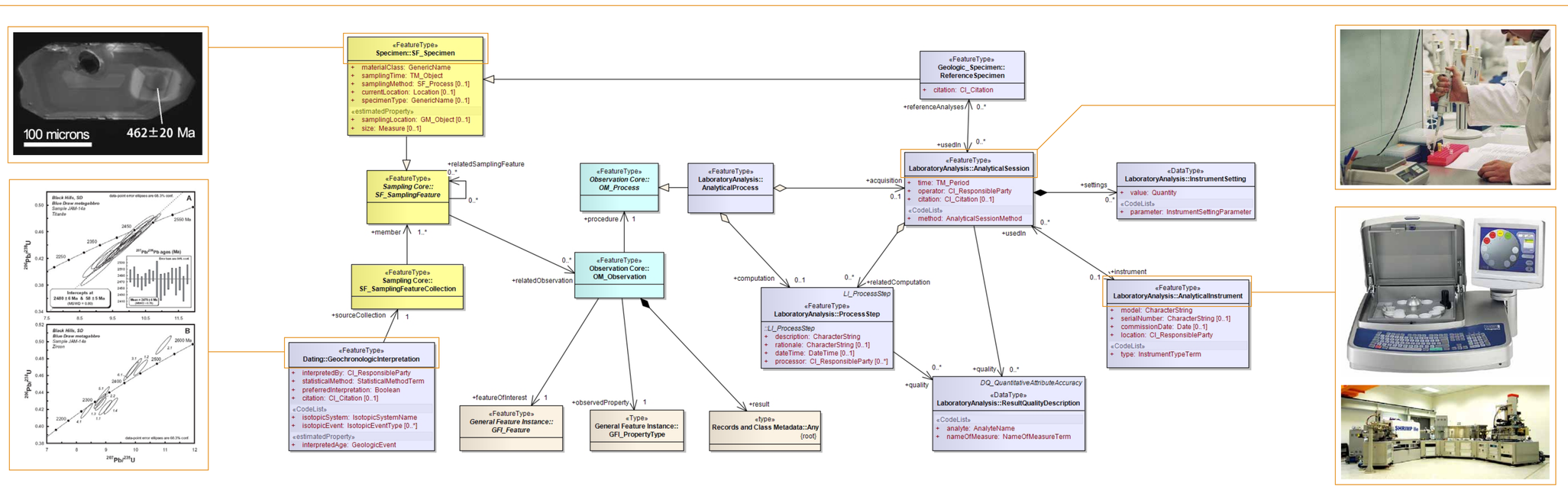


**Figure 2.** The proposed LaboratoryAnalysis package of GeoSciML v3 (purple classes) is an extension of the OGC Observations and Measurements model, and will permit delivery of analytical results as well as metadata such as instruments, procedures and result quality measures.

Forthcoming changes to the OGC Web Feature Service specifications have required some modification and updating of GeoSciML to version 3.0. These changes will make it easier for web clients to support complex web-based queries, as well as data providers to link to standard vocabulary and registry services. The core purpose of GeoSciML remains largely unchanged, covering the representation of geologic units, earth materials and geologic structures. Geologic structures include shear displacement structures (brittle faults and ductile shears), contacts, folds, foliations, lineations and structures with no preferred orientation (e.g. 'miarolitic cavities'). The Earth Material package allows for the description of compound materials, such as rocks or unconsolidated materials, as well as their individual components, such as minerals, and includes the relationships between the components. Provision is made for description of alteration, weathering, metamorphism, particle geometry, fabric, and petrophysical data. Mapped features describe the shape of the geological features using standard GML geometries, such as polygons, lines, points or 3D volumes. Geological events provide the age, process and environment of formation of geological features. Geological sampling, logs, and observations from boreholes and outcrops can also be delivered using the GeoSciML extension of the OGC standard for Observations and Measurements (O&M).

New features of GeoSciML version 3.0 will include the ability to better deliver analytical data and procedures (geochemistry, geochronology) by extension of the O&M standard (Fig. 2). GeoSciML version 3.0 will also include better provision for delivery of rock property data such as density, magnetic susceptibility, remanence, conductivity, and other geophysical properties. Testing of these changes is currently being undertaken with the aim to release GeoSciML 3.0 later in 2010.

## EarthResourceML

The EarthResourceML model, summarised in Figure 3, is an extension of the GeoSciML data exchange standard designed to facilitate mineral resource data transfer between government, industry and other organisations. Without a standard data transfer format like EarthResourceML, there is no easy way to share this data because each State and Territory Geological Survey has its own database with its own structure and vocabularies for storing information on mineral occurrences, mines, commodities, production, reserves and resources. EarthResourceML also provides a formal structure for reporting resources and reserves that can comply with national and internationally accepted reporting codes. EarthResourceML describes the earth resource (geological information) and associated human activities (mining information) independently.

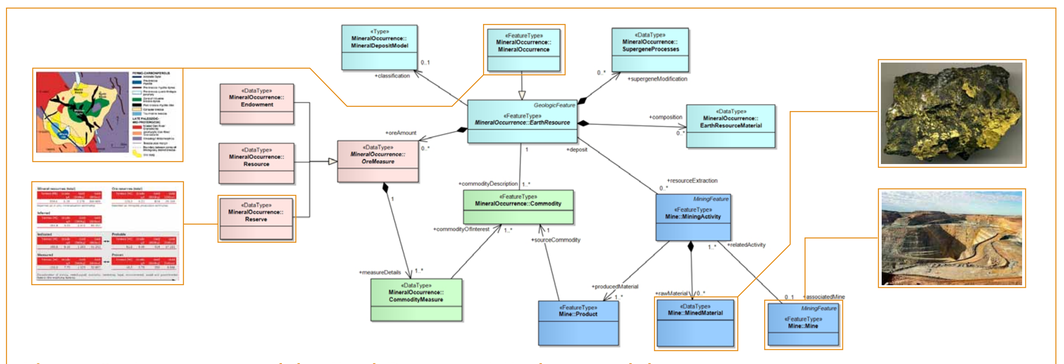


**Figure 3.** A summary of the EarthResourceML data model.

## GroundWaterML

The Geological Survey of Canada (GSC) has developed the Groundwater Markup Language (GWML) as a common format for exchanging groundwater data. It extends two advanced GML standards, GeoSciML and O&M, by adding entities such as hydrogeological units (e.g. aquifers), properties (e.g. storativity), water wells, and water budget entities. Due to its firm grounding in OGC standards, GWML can be used with OGC services, such as Web Feature Services, to enable exchange of a wide spectrum of groundwater data. GWML is currently used to support delivery of groundwater information through the Canadian Groundwater Information network. (http://ngwd-bdnes.cits.nrcan.gc.ca/service/api_ngwds:gin/en/wmc/aquifermap.html)

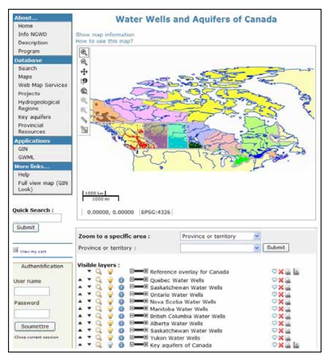


**Figure 4.** The Canadian Groundwater Information network delivers aquifer and water well information using the GWML data standard.

[1]*Geoscience Australia* [2]*Geoscience Victoria* [3]*Geological Survey of Canada*

**For further information contact: Ollie Raymond**
**Ph: 02 6249 9575 Email: oliver.raymond@ga.gov.au**
*www.ga.gov.au*



CA 10445

GEOSCIENCE AUSTRALIA