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EarthResourceML/INSPIRE Mineral Resources data models and ERML Lite: Data Standards to Deliver Mineral Resources Data EU and Globally

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Abstract

EarthResourceML (http://www.earthresourceml.org) is the international data model and standard for mineral resources data. EarthResourceML (ERML) was initially developed for the Australian Chief Government Geologists Committee (CGGC) but is now under the governance of the Commission for Geoscience Information (CGI), a commission of the International Union of Geological Sciences (IUGS). ERML/INSPIRE MR data models are the preferred standard for mineral resources data sharing initiatives and projects, such as the European Union's INSPIRE directive, and EU-projects (Minerals4EU, ProSUM) and the Australian AuScope, and Geoscience Portal projects. The current version of ERML v2.0 was released in August 2014 and ERML v3.0 will be published 2018. Current ERML v.2.0 and INSPIRE Mineral Resource data models are practically identical. The main elements of the ERML/INSPIRE models cover mineral occurrences, mines, and mining activity. The standard describes the geological characteristics and settings of mineral occurrences, their contained commodities, and their mineral reserve, resource and endowment. It is also able to describe mineral exploration, mines and mining activities, processing/transformation activities, with the production of concentrates and refined products, and waste material characterization. ERML/INSPIRE utilises the GeoSciML v4.1 Mapped Feature model to describe spatial representations of mineral occurrences and mines, and the GeoSciML Earth Material model to describe host- and associated materials. ERML Lite v. 1.0 version was accepted and released in August 2016. The new version 2.0 of ERML Lite was published June 2018. ERML Lite 2.0 delivers a user-friendly designed and simplified flat view of key elements of the full ERML/INSPIRE data models. The CGI Geoscience Terminology Working Group (http://resource.geosciml.org/def/voc/) and INSPIRE code list register (http://inspire.ec.europa.eu/codelist/) provides a range of standard vocabularies that can be used to populate ERML/INSPIRE data services. ERML Lite test service will be demonstrated at the AGU meeting at Onegeology portal and data providers are from Oceania (AUSGIN and New Zealand), Europe (Minerals4EU, FODD, and Finland) and Arctic (60°- 90°) data (Nordic Countries, Russia, Alaska, and Canada). The ERML and ERML Lite data models enable comparison of mineral resource information from different jurisdictions. With increasing participation from geological surveys these data model will assist global resources estimates and exploration targeting.

EarthResourceML/INSPIRE Mineral Resources data models and ERML Lite: Data Standards to Deliver Mineral Resources Data EU and Globally

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General

The interoperability Working Group (IWG) of the international Union of Geological Sciences' Commission for the Management and Application of Geoscience information (IUGS—CGI - www.cgi-iugs.org/) was formed in 2004 to develop international data transfer standards for geoscience information. Originally tasked with delivering a standard for data that is typically found on a geological map, the IWG developed GeoSciML, a UML data model and GML—based markup language based on the spatial data standards of the Open Geospatiai Consortium (OGC).

EarthResourceML and Lite

EarthResourceML (http://www.earthresourceml.org) is the international data model and standard for mineral resources data. EarthResourceML (ERML) was born from a model developed by the Australian Government Geoscience Information Committee (GGIC) from 2004 – 2008. The CGI took over governance of the Australian model in 2008, and, after modifications by CGI Interoperability Working Group, EarthResourceML version 1.1 was published in 2009. ERML/INSPIRE MR data models are the preferred standard for mineral resources data sharing initiatives and projects, such as the European Union's INSPIRE directive, and EU-projects (Minerals4EU, ProSUM) and the Australian AuScope, and Geoscience Portal projects.

The current version of ERML v2.0 was released in August 2014 and ERML v3.0 will be published 2018. Current ERML v.2.0 and EU-INSPIRE Mineral Resource data models are practically identical. The main elements of the ERML/INSPIRE models cover mineral occurrences, mines, and mining activity. The ERML application schema contains two principal components: one centered on the **EarthResource** - the geological characteristics and settings of mineral occurrences, their contained commodities, and their mineral reserve, resource and endowment. The other centered on **a mining feature** - mineral exploration, mines and mining activities, processing/transformation activities, with the production of concentrates and refined products, and waste material characterization. ERML/INSPIRE utilises the GeoSciML v4.1 Mapped Feature model to describe spatial representations of mineral occurrences and mines, and the GeoSciML Earth Material model to describe host- and associated materials.

ERML Lite v. 1.0 version was accepted and released in August 2016. The new version 2.0 of ERML Lite was published June 2018. ERML-Lite 2.0 is a model and schema for simple map services (eg, WMS and WFS Simple Features). It is an abridged version of the full EarthResourceML model and can be used to deliver simplified views on mineral occurrences and their commodities, mines, mining activities and mine waste products.

ERML Lite test service will be demonstrated at the AGU meeting at Onegeology test portal and data providers are from Oceania (AUSGIN and New Zealand), Europe (Minerals4EU, FODD, and Finland) and Arctic (60°- 90°) data (Nordic Countries, Russia, Alaska, and Canada).

Vocabularies for ERML and GeoSciML

The IUGS-CGI IWG has developed vocabularies for classification of many geoscience concepts to support data provided by the GeoSciML and EarthResourceML standards. The IWG have established a vocabulary service at http://resource.geosciml.org/def/voc/ for these vocabularies that can be accessed by web services. Further vocabulary development is undertaken by the new IUGS—CGI Geoscience Terminology Working Group. The GeoSciML v4.1 and EarthResourceML v2 schemas do not include vocabularies. However, the data models recommend a standard pattern to reference controlled vocabularies using HTTP-URI links.

Global use of ERML

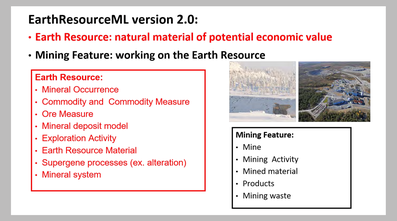
ERML is used or endorsed as the mineral resources data transfer standard by data-sharing initiatives across the world. Some examples include:

- the European INSPIRE Directive (https://inspire.ec.europa.eu/) uses ERML as its data standard for exchange of mineral resource information between countries of the European Union. The implementation project are Minerals4EU (http://www.minerals4eu.eu/) and EGDI (http://www.europe-geology.eu/).
- The Australian AuScope (http://auscope.org.au/site/) and AUSGIN (http://www.geoscience.gov.au/) projects use ERML Lite to deliver mineral resource data from state and territory agencies.
- The African-European Georesources Observation System (http://www.aegos-project.org/index.php) is promoting ERML as the standard for mineral resource data exchange across Africa.
- The OneGeology project (http://www.onegeology.org/) is currently starting to use ERML Lite web feature services in its portal of worldwide geological map and mineral resource data.

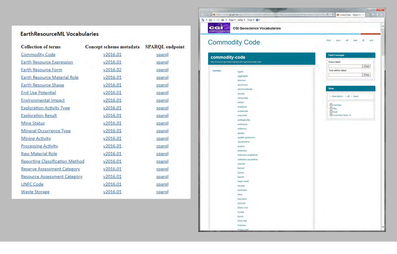
ERML links – Downloads and other resources

- EarthResourceML working Group - http://www.cgi-iugs.org/tech_collaboration/earthResourceML.html
- Documentation - www.earthresourceml.org — documentation, UML models, examples, and XML schemas for ERML and ERML Lite
- Vocbulary service - http://resource.geosciml.org/def/voc/ - the vocabulary repository contains useful vocabularie to support delivery of interoperable geological data for mineral occurrences and mines to support delivery of interoperable geological data for mineral occurrences and mines

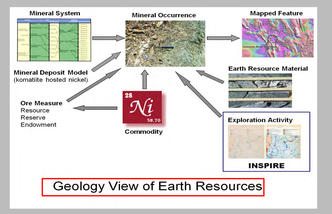
ERML

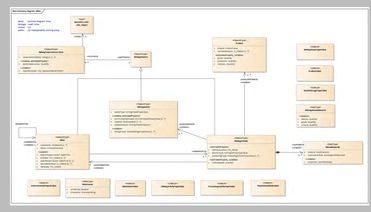


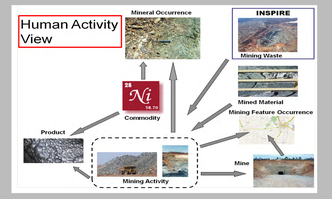
Vocabulary service - ERML

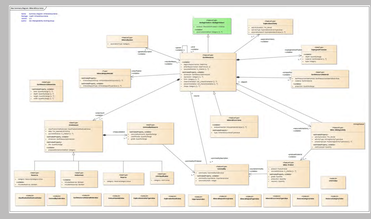


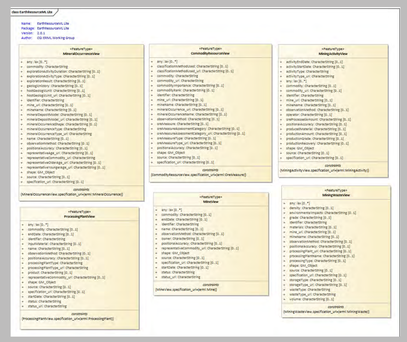
ERML Lite



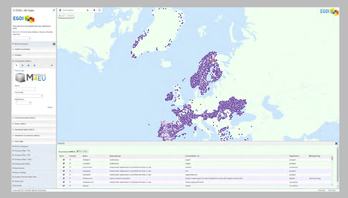




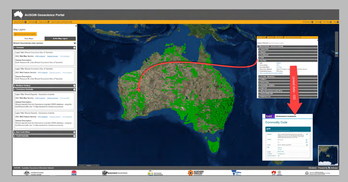




Global Implementations



European Geological Data Infrastructure (http://www.europe-geology.eu/mineral-resources/ or http://minerals4eu.brgm-rec.fr/minerals4EU/) – EU countries data sets based on ERML 2.0/ INSPIRE Mineral Resource data model (snapshot 29.11.2018)

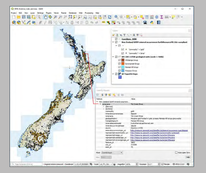


AusGin Data (http://portal.geoscience.gov.au/gmap.html) – Australian states data sets based on ERML Lite 1.0 and 2.0 Mineral Resource data model (snapshot 29.11.2018)

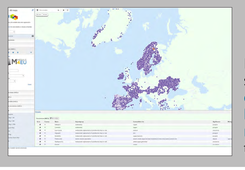
OneGeology services

Circum Arctic Data set – original service (http://geo.ngu.no/kart/circumarctic/) – mapped to ERML Lite 2.0 (GTK)

Fennoscandian Data set – original service (http://gtk-data.gtk.fi/fmd/) – mapped to ERML Lite 2.0 (GTK)



New Zealand Data set – (service not yet ready) – mapped to ERML Lite 2.0 (GNS Science)



European Geological Data Infrastructure (http://www.europe-geology.eu/mineral-resources/ or http://minerals4eu.brgm-rec.fr/minerals4EU/) – not yet mapped to ERML Lite 2.0

AusGin Data set – original service (http://portal.geoscience.gov.au/gmap.html) – mapped to ERML Lite 2.0 (GeoScience Australia)