



## Semantics-informed cartography: the case of Piemonte Geological Map

Fabrizio Piana (1), Vincenzo Lombardo (2), Dario Mimmo (2), Marco Giardino (3), and Giandomenico Fubelli (3)

(1) CNR IGG TO, Istituto Geoscienze e Georisorse, Torino, Italy (f.piana@csg.to.cnr.it), (2) Dipartimento di Informatica, Università di Torino, Italy (vincenzo.lombardo@unito.it), (3) Dipartimento di IScienze della Terra, Università di Torino, Italy (marco.giardino@unito.it)

In modern digital geological maps, namely those supported by a large geo-database and devoted to dynamical, interactive representation on WMS-WebGIS services, there is the need to provide, in an explicit form, the geological assumptions used for the design and compilation of the database of the Map, and to get a definition and/or adoption of semantic representation and taxonomies, in order to achieve a formal and interoperable representation of the geologic knowledge. These approaches are fundamental for the integration and harmonisation of geological information and services across cultural (e.g. different scientific disciplines) and/or physical barriers (e.g. administrative boundaries).

Initiatives such as GeoScience Markup Language (last version is GeoSciML 4.0, 2015, <http://www.geosci.ml.org>) and the INSPIRE “Data Specification on Geology” [http://inspire.jrc.ec.europa.eu/documents/Data\\_Specifications/INSPIRE\\_DataSpecification\\_GE\\_v3.0rc3.pdf](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_GE_v3.0rc3.pdf) (an operative simplification of GeoSciML, last version is 3.0 rc3, 2013), as well as the recent terminological shepherding of the Geoscience Terminology Working Group (GTWG) have been promoting information exchange of the geologic knowledge. Grounded on these standard vocabularies, schemas and data models, we provide a shared semantic classification of geological data referring to the study case of the synthetic digital geological map of the Piemonte region (NW Italy), named “GEOPIemonteMap”, developed by the CNR Institute of Geosciences and Earth Resources, Torino (CNR IGG TO) and hosted as a dynamical interactive map on the geoportal of ARPA Piemonte Environmental Agency.

The Piemonte Geological Map is grounded on a regional-scale geo-database consisting of some hundreds of GeologicUnits whose thousands instances (Mapped Features, polygons geometry) widely occur in Piemonte region, and each one is bounded by GeologicStructures (Mapped Features, line geometry). GeologicUnits and GeologicStructures have been spatially correlated through the whole region and described using the GeoSciML vocabularies. A hierarchical schema is provided for the Piemonte Geological Map that gives the parental relations between several orders of GeologicUnits referring to mostly recurring geological objects and main GeologicEvents, in a logical framework compliant with GeoSciML and INSPIRE data models.

The classification criteria and the Hierarchy Schema used to define the GEOPIemonteMap Legend, as well as the intended meanings of the geological concepts used to achieve the overall classification schema, are explicitly described in several WikiGeo pages (implemented by “MediaWiki” open source software, <https://www.mediawiki.org/wiki/MediaWiki>). Moreover, a further step toward a formal classification of the contents (both data and interpretation) of the GEOPIemonteMap was triggered, by setting up an ontological framework, named “OntoGeonous”, in order to achieve a thorough semantic characterization of the Map.