ONTOGEONOUS: an ontology for the geosciences and the geological mapping process

Alizia Mantovani (1), Vincenzo Lombardo (2), and Fabrizio Piana (3)

(1) Department of Earth Science, University of Turin, Turin, Italy (alizia.mantovani@unito.it), (2) Department of Informatics, University of Turin, Turin, Italy (vincenzo.lombardo@unito.it), (3) Institute of Geosciences and Georesources, Italian National Research Council, Turin, Italy (fabrizio.piana@cnr.it)

This contribution regards an ontology for the geosciences named "OntoGeonous" , which consists of a set of merged ontologies with the goal of representing the geologic knowledge, primarily focusing on the geological mapping process. Ontogeonous is developed by the University of Turin, Department of Computer Sciences, and the Institute of Geosciences and Earth Resources of the Italian National Research Council (CNR-IGG). It has been realized through the OWL encoding of the statements reported in some authoritative resources (GeoScienceML(1) and INSPIRE Data Specification on Geology(2)), to avoid ambiguities in the representation of data, i.e. concepts, features and relations.

OntoGeonous consists of a first part concerning the axiomatization (process of translation from natural language to machine readable language) of GeoSciML Geologic Units concepts and vocabularies, (already partially described in Lombardo et al., 2018) and by a second part (here illustrated for the first time) regarding the GeoSciML class "Geologic Structure". The ontology has been applied to the Geological Map of Piemonte region, NW Italy (Piana et al., 2017): some real geologic units of the map are described strictly following the requirements of the ontology (the sufficient and necessary conditions are listed), to comply the properties an object must have, in order to be classified as a "GeologicUnit" or a "GeologicStructure", or some of their relevant subclasses.

The taxonomy of the subclasses is inspired by the organization of knowledge represented in the UML schemata by GeoScienceML. The structure of the ontology and the process of translation from natural language to machine readable language (axiomatization process) are explained in a dedicated wiki-website(3).

OntoGeonous can be used for the implementation of geodatabase in geological mapping projects, as it now contains the encoded description of two among the three main geological features provided for by the IUGS-CGI/INSPIRE Data Model (the "Geomorphological Features" are still lacking). Based on OntoGeonous, a method to design an ontology-driven geodatabase has been developed, to apply the ontology concepts through the geological mapping task.

REFERENCES

Lombardo, V., Piana, F., Mimmo, D. (2018). Semantics–informed geological maps: Conceptual modeling and knowledge encoding. Computers & Geosciences. 116. 10.1016/j.cageo.2018.04.001.

Piana, F., Fioraso, G., Irace, A., Mosca, P., d'Atri, A., Barale, L., Falletti, P., Monegato, G., Morelli, M., Tallone, S., Vigna, G.B. (2017). Geology of piemonte region (nw Italy, alps–apennines interference zone). J. Maps 13 (2). https://doi.org/10.1080/17445647.2017.1316218.

(1)http://www.geosciml.org.

(2)http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_GE_v3.0.pdf

(3)https://www.di.unito.it/wikigeo/index.php?title=Pagina_principale