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Developing of the Geologic Terminology for the Geologic Database of Serbia

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Abstract. Geologic terminology and vocabularies are being developed/constructed for use in the geologic information system of Serbia (GeolISS). The goal is to provide geologic data to geologist and non-geologist (publicity), using consistent descriptive terminology. These terms and definitions are used to classify observable or inferred geologic facts and to assign values for properties in descriptions.

Over the years of working on terminology, a substantial opus of inputs was introduced into GeolISS, which should facilitate the work of geologists when presenting the results of observations and its interpretations. However, the everyday geological practice will certainly require more terms, especially when it comes to describing the specific geological formations such as the ophiolitic mélange, a phenomena characteristic for the particular terrains etc. Therefore, it is necessary to continuously amplify the existing terminology with the new terms and concepts.

Key words: Terminology, Geologic Information System, vocabulary structure, hierarchy, communications.

Introduction

The Development of geological terminology and nomenclature for the geologic database of Serbia started with the physical implementation of the geological information system of Serbia (GeolISS). The main development objective is to provide a standard and logically consistent terminology for description, interpretation and classification of geologic materials, units, geologic structure, mineral deposits, hydrogeologic and geotechnical properties of rocks through GeolISS. The development of the terminology involved the experts from different geological disciplines, the geologic-map producers and the geologic-data users.

The approach to the development of geologic terminology

The initial ideas about the development and role of terminology in the geologic information system revolved around a variety of views; from the opinion that lists of geology terms for each domain should be made or favouring the idea of simply taking the terms from *Geologic Terminology and Nomenclature* edited by Petković (1975), through to the belief that taking the terms from *Glossary of Geology* (Bates & Jackson, eds., 1995) would be the best course of action. Finally, these ideas have resulted in a partial analysis of *Geologic Terminology and Nomenclature* edition (Petković, 1975), analysis of terms used in traditional geologic maps (field logs, accompanying pamphlets and map legends), and an analysis of the available terminology made for purposes of geological information systems (USGS, CGS, BGS, IUGS).

The results of these analyses showed that the Geologic Terminology and Nomenclature (Petković, 1975) is undoubtedly the most comprehensive local geologic-lexicographic edition, but rich in synonyms and different, often contradictory, meanings, homonyms with the same meaning, idioms, archaisms insufficiently known or unknown etymology, imprecise determinations of terms, etc. Terminology used in traditional geologic maps is very rich, but the descriptions of the observation locations are sometimes too 'baroque' or too short and cryptic, pamphlets contain very general outlook, without reference to specific data.

When it comes to the terminology developed for the geological information systems, the American Science-Language Standard for digital geologic-map database (*in* Soller, D.R., ed. 2004) is the most comprehensive and in many ways represents a terminolog-

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ical system (DE KAIZER *et al.*, 2000). It focuses not only on the classification of geologic materials, but also in a very precisely defined terms to describe the material properties, including its genesis.

The terminology of the Canadian Geological Survey, originally developed independently of the other (STRUIK & DAVENPORT, 2002), contains strict petrologic classification of rock materials.

Rocks Classification of British Geological Survey (GILLESPIE & STYLES, 1999; ROBERTSON, 1999; HALLSWORTH & KNOX, 1999; MCMILLAN & POWELL, 1999) is an excellent material from petrologic and practical aspects of the view, since it contains almost all the criteria for the rocks determination and multihierarchic classification (Genesis, composition, structure and texture).

IUGS publications related to the classification of Igneous rocks (LE MAITRE *et al.,* 2002), Stratigraphic Guide (SALVADOR, 1994), as well as Chrono-stratigraphic divisions (GRADSTEIN *et al.,* 2004), have been widely accepted by the national geological community and academic institutions. As such, they provide good resources of terms and guidelines for the development of geologic terminology.

The above-mentioned publications made it clear that:

- the terminology, in the geologic information system, cannot consist of a list of geologic terms only, but that every term or concept must be clearly and unequivocally determined, namely, defined and that only then it can have a communications role;
- analytical requirements of comparison, correlation, grouping and searching geologic similarities and differences, details and unique features of rock material, geological units and structures call for assigning the central role to terminology in the information system;
- older, inherited terminology must be included in the GeolISS vocabulary, because that is the only way for the original concepts from the historical geologic documents to be entered into the digital database, to track their evolution, i.e. possible changes of meaning over time;
- the progressive nature of the observation process (from reconnaissance to detailed) requires a hierarchical language structure—that is, language that begins at a generalized level and develops into progressively more specific categories that communicate more refined information about an geologic material (SOLLER, D.R., ED., 2004).

Vocabulary Structure

In order for the vocabulary to be able to meet all previously derived requirements and be functional within GeolISS, the UML model with a special structure was developed (Fig. 1).

The class *Rečnik (Vocabulary)* in the model is a lexicographic superclass whose instances are inherited. *Geološki Rečnik (Geologic Vocabulary)* has been implemented as an abstract class, since the class *Koncept (Concept)*, above all, allows entering general geologic concepts and terms common to all geologic disciplines and centralizes individual classifications (petrologic, mineralogic, stratigraphic, chronostratigraphic). The term "concept" itself (lat. conceptus – notion) naming the central class has been used in its original meaning to refer to an abstract or a general idea of an assumed or concrete instance (ANGELES, 1981).

The hierarchical structure of the vocabulary (Fig. 1) is made possible through involution i.e. recursive relation modelling the relation hypernym–hyponym in such a way that any (hyponymous) term in the vocabulary hierarchy can appear only once and have just one hypernym. Moreover, every term can have an equivalent in one or more foreign languages via the *MultijezičkiLeksan (MultilanguageLex)* class. The relations between different terms (e.g. derived from, having broader meaning than, lexical variant, etc.) can be recorded in the class *Relacije Termina (Term Relationship)*. Written source/s from which concepts or terms were taken, together with their meaning are entered into the class *Bibliografija (Bibliography)* and the author who added the new vocabulary entry is registered through the *Metapodatak (Metadata)* class.

Guidelines for further development of geological terminology

The geological terminology used in the information systems actually represents the terminology applied in the everyday practical and theoretical geological discourse. The only difference is that the terminology of information system is involved in the pre-defined semantic framework and that, apart from its descriptive and communicational role, there is an analytical function. In this sense, the 'development' of terminology for GeolISS has time necessity character, as well as the revisal character over the domestic geological lexicography in the context of the recent methodological and analytical techniques.

The fundamental principles which should be applied in further work on the new inputs are:

- Avoiding the repetition of the terms that already exist in the dictionary just because someone thinks that they have a different meaning within the context of a specific geological discipline;
- A fundamental difficulty could be the use of terms, even of some basic geological terms, in different meaning, the frequent use of particular feature to nominate the material and the lexical variations (i.e. slate, pelite, siltstones, cracks, crevices, etc.);

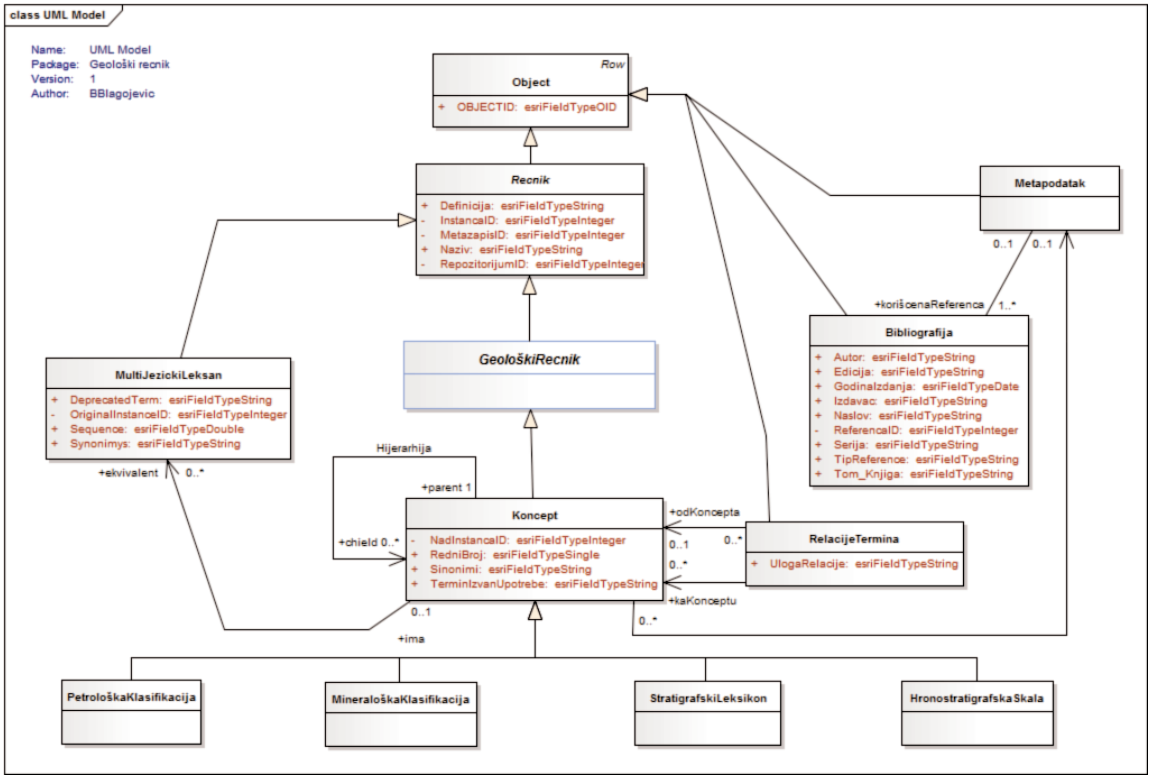

Fig. 1. UML model of the structure of the GeolISS vocabulary (ESRI profile).

– Avoiding designating / defining the concept by the other concept;
– Before making entry of the new inputs several domestic and foreign sources should be reviewed and the meaning of the term should be carefully analyzed, as well as the context of its communicational/scientific use;
– Legacy terminology should archive and organize verbatim, without attempting to translate such term(s) into modern science language;

Conclusion

The development and use of the standardized terminology in digital databases is in many respects a novel field that is bound to evolve over time, as more experience is gained in that area. The significant steps and progress that have been made in Serbia in the domain of geology, understandably, suffer from all the shortcomings that accompany such a project. The absence of unified, unequivocal and universally accepted classifications that can satisfy all the needs of geology as a science must certainly be emphasized. Thus, the expansion of the range of terms included in GeolISS will continue to be a fundamentally and operationally important task, aimed primarily at a clearer determination of the geologic content and improving the quality of geologic data. Immediate and end users of the information system can undoubtedly be instrumental in achieving that goal, above all, geologists, but also all other experts focusing on the geoscience-related research.

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