Metallogenic and Geochemical maps of Colombia: The MDRU-SGC Collaboration Agreement

A joint effort to produce high-quality country-scale maps

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I. Introduction

Colombia has had a long tradition of artisanal and small-scale mining since pre-Columbian times. This is reflected in significant historical production of gold, emeralds, platinum, coal, iron, and base metals. Despite numerous challenges in politics, social and environmental aspects, the mineral exploration industry recognizes Colombia as a highly-prospective country for the discovery of new world-class mineral deposits and the advancement of multiple undeveloped prospects.

The Colombian Geological Survey (Servicio Geológico Colombiano - SGC) has produced and compiled a plethora of basic geological information covering the entire country generated over the past 100 years. This information was not easily accessed, and the lack of publicly-available basic geology, geochemistry and geophysical information to support exploration programs has been a significant constraint faced by all companies conducting exploration activities in Colombia. However, new technological advances now permit public access and a wider distribution of this information, a major objective of the SGC and the Colombian Government.

MDRU has been conducting research in Colombia since 2011, primarily focused on mineral deposit exploration and regional metallogeny. For example, the Colombia Gold & Porphyry Project and other research projects were funded by major and junior exploration companies focused on exploration in Colombia. Exploration geochemistry with a focus on covered terranes is a key research component of MDRU through the Exploration Geochemistry Initiative.

III. The Metallogenic Map of Colombia, v. 2016

Objective: to represent the most significant mineral deposits and occurrences in Colombia in an adequate geo-tectonic context to depict ore forming processes and define metallogenic elements (domains, provinces/subprovinces, belts, and epochs).

Map on the 1:1,500,000 scale presenting the spatial distribution of mineral deposits and occurrences backed by a reclassification of the chrono-stratigraphic units and a selection of relevant structures from the SGC official Geological Map of Colombia (Gómez et al., 2015a), along with principal metallogenic elements.

Includes **366 deposits and >2800 occurrences** from the SGC mineral deposits and occurrences database.

Time component presents the relationship between magmatism and known ages of mineral deposits from the **geochronological information** from the SGC Radiometric Dating Catalog compilation (Gómez et al., 2015b).

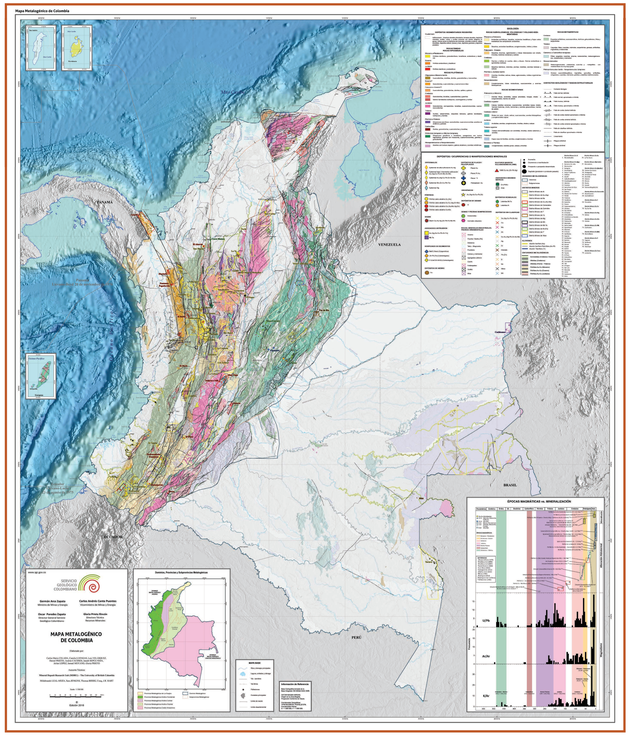
Uses and applications
- Planning and decision-making for sustainable development of mineral resources
- Providing a regional metallogenic framework for mineral exploration industry

MDRU provided critial expertise and support to SGC geoscientists for the conceptualization, construction and presentation of the Metallogenic Map of Colombia. This included the conceptual development and compilation of the SGC mineral deposits and occurrences database, mineral deposits classification, reclassification of chrono-stratigraphic units, definition of mining districts and metallogenic elements, in addition to editing and publication of the final map.

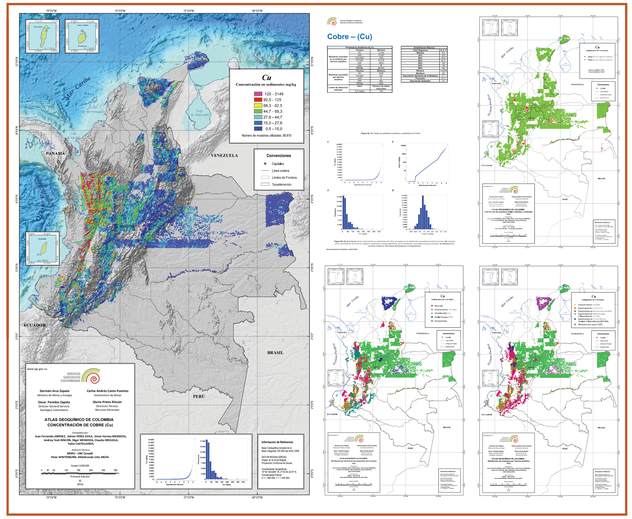
II. The MDRU-SGC collaboration Agreement

MDRU and the SGC signed an initial collaboration agreement (2015-2016) to prepare an updated version of the Metallogenic Map of Colombia (Barrero, 1976; Salinas et al. 1999a,b) and to produce regional geochemical maps to generate the first Geochemical Atlas of Colombia. On completion of the first agreement, and presentation of the 2016 versions of both products, a second agreement (2017-2018) was established to further develop both lines of research: metallogeny and exploration geochemistry.

MDRU and the SGC continue working together with the goal of making a significant contribution to the knowledge of Colombian geology; to support the mineral exploration industry; and high-level planning by government agencies involved in land management, and social and environmental development.



IV. The Geochemical Atlas of Colombia, v. 2016



Objective: to highlight regional geochemical trends and relationship to geology, mineral deposits and ocurrences, and/or antropogenic activity.

56 map sets were constructed from a subset of the SGC geochemical database, comprising >75,000 stream sediment anlyses from multiple SGC geochemical surveys conducted between 1960s and the present, covering approximately 35% of the Colombian territory.

Each set of maps includes: a main map showing the distribution of element concentration on a 1km^2 grid, accompanied by summary statistics; and supporting maps showing distribution of samples included or rejected, along with digestion, and analytical methods.

Uses and applications
- Planning and decision-making for sustainable development
- Identification of areas with high potential for hosting mineral deposits and occurrences
- Risk assesment of enrichment/depletion of trace elements potentially hazardous to health
- Geological and metallogenic mapping

MDRU provided direct support to the SGC geoscientists in all of the stages of the construction and preparation of the geochemical maps, including: training, data cleaning, validation, statistical analysis and leveling, in addition to editing and presentation of the final maps.

V. Present and Future Work

MDRU provides direct support in the continuous compilation of information for the Metallogenic Map of Colombia. Field visits to selected specific deposits and occurrences to characterize, classify and constrain the age of mineralization is a strategy to generate new information for the map. Integration of both is critical for the publication of an updated and improved version of the Metallogenic Map of Colombia in 2018.

MDRU continues to support the preparation of updated regional geochemical maps incorporating new data in addition to the preparation and organization of brief interpretative descriptions of trends and relationships of each element. MDRU will be also providing crucial expertise to support the SGC in the design of protocols for specific geochemical exploration surveys addressing different geologic and physiographic environments across the country.

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The Metallogenic Map of Colombia and the Geochemical Atlas of Colombia are available online at www.sgc.gov.co

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