

Minutes of the Geological Mapping and Regional Geology Workshop organized by the Expert Groups of ASGMI and EGS.

2023 November 15th – 16th

The Expert Group on Geological Mapping and Regional Geology of the Ibero-American Geological and Mining Services Association (ASGMI) and the Expert Group Geological Mapping and Modelling of EuroGeoSurveys have organized a Workshop on Geological Mapping and 3D Modeling on November 15th and 16th.

The workshop has taken place virtually, and its activities have included: i) Two scientific-technical sessions comprising eight presentations in the first session and three presentations in the second session. ii) An open discussion panel on the first day and another discussion panel on the second day with event conclusions and next steps to be taken.

DISTRIBUTION OF PRESENTATIONS:

November 15th

Welcome Note

Marina Cabidoche (EGS Secretariat) y Gracia Olivenza (ASGMI Secretariat)

History and current objectives of ASGMI, EuroGeoSurveys, and respective Expert Groups

Marina Cabidoche (EGS Secretariat) y Gracia Olivenza (ASGMI Secretariat)

Overview of national mapping programmes and maps in Europe

Hans Georg Krenmayr

Overview of national mapping programmes in South America, Central America and the Caribbean

Felipe Espinoza (Servicio Nacional de Geología y Minería de Chile, SERNAGEOMIN) y Ana Sofia Huapaya (Dirección General de Minas de Costa Rica)

Status of the Geological Cartography in Argentina

Alicia Folguera (Servicio Geológico y Minero Argentino, SEGEMAR)

The National Geologic Mapping Program of Chile

Felipe Espinoza (SERNAGEOMIN)

National Geologic Mapping Program in Costa Rica

Luis David Jara (DGM)

Geological Mapping in Cuba, 140 years of history and current events

Ramón Omar Pérez (Instituto de Geología y Paleontología de Cuba, IGP)

Evolution of the Geological Cartography in Ecuador

Andrea Albán (Instituto de Investigación Geológica y Energética de Ecuador, II GE)

Open discusión

Moderator: Felipe Espinoza (SERNAGEOMIN)

November 16th

Welcome Note

Marina Cabidoche (EGS Secretariat) y Gracia Olivenza (ASGMI Secretariat)

The IQAME 2500 Projekt of Europe (Int. Quaternary Map of Europe 1:2.500.000)

Kristine Asch

3D geomodelling in Europe

Laure Pizzella

Scientific vocabularies for basic geology in Europe

Kristine Asch, Christine Hörfarter

Open discussion and next steps

Moderator: Hans Georg Krenmayr

SUMMARY OF THE WORKSHOP

November 15th

The workshop began with a presentation on the history, structure, and objectives of both organizations, EGS and ASGMI.

EuroGeoSurveys (EGS) represents 37 geological survey organizations in Europe, providing public Earth Science knowledge. EGS has 10 expert groups, one of them is the the Geological Mapping and Modelling Expert Group, which presently focuses on a collaborative framework for the creation of transboundary geological data sets. The Geological Service for Europe (GSEU) project aims to create a sustainable future by delivering subsurface knowledge. Moreover GSEU calls for the following actions: establish a legal basis, implement a research agenda, strengthen policy support, expand the network, and raise awareness.

ASGMI is composed of 22 geological services from 21 countries. It has 13 Expert Groups working in different areas of Geology and has collaboration agreements with other international organizations such as EGS, USGS, IUGS, or UNESCO. Among the 13 expert groups, the achievements of the three most active groups are mentioned: Geochemistry, Mineral Resources, and Environmental Mining Liabilities. The ASGMI expert group on geochemistry has developed a manual on geochemical methodologies for Ibero-American countries, promoting collaboration through webinars with organizations like IUX and UNESCO. The ASGMI expert group on mineral resources has actively worked on projects such as the metallogenic map of Central America and the Caribbean, updating the metallogenic database for South America, and conducting an inventory of critical minerals in Iberoamerica. The ASGMI expert group on environmental mining liabilities is involved in projects such as developing manuals for abandoned mine inventory, risk characterization, and reprocessing/reuse, collaborating with organizations such as ECLAC and contributing to a guide on the reuse of environmental mining liabilities.

After the presentation of both institutions, the technical sessions commence. Hans Georg Krenmayr gives a presentation on national mapping programs and maps in Europe. EGS has established an expert group on Geological Mapping and Modeling, emphasizing the importance of harmonizing geological data across Europe, addressing challenges, and promoting the development of digital transboundary geological models. The workshop discusses geological map datasets, 3D models, and digital maps, highlighting the importance of making data findable, accessible, interoperable, and reusable (FAIR principles).

More concretely Workpackage 6 of the GSEU-Project has its focus on developing a reference multiscale data model for geology, including scientific vocabularies for lithology, anthropogenic deposits, and a new vocabulary for tectonic units in Europe. Other tasks within Workpackage 6 will develop toolboxes, recommendations, and network building to establish a community in the field of 3D geological modeling and visualization.

After the presentation of Hans Georg Krenmayr, Felipe Espinoza and Sofía Huapaya provide an overview of national mapping programs in South America, Central America, and the Caribbean. The geology of Central America is complex, with more than 14 islands and archipelagos covering 239,1681 square kilometers and a population exceeding 43 million people. Institutional structures for geological mapping in Central America are diverse, often tied to functions related to mining and development. Many institutions belong to ministries such as Energy and Mines, posing challenges for environmental compliance. Only three Central American countries—Honduras, Cuba, and the Dominican Republic—have well-defined geological mapping functions, acting as geological services. The rest have departments or offices within ministries, lacking a comprehensive geological focus. Despite being labeled as geological services, these institutions lack significant staffing. Cuba leads with the largest number of geologists, while other countries, even those with geological departments, have minimal geological expertise, making mapping a challenging task.

Geological mapping in Central America has two phases: maps produced from the 1960s to the 1980s for mining and petroleum purposes, and latter maps focused on territorial planning and risk management. The latter maps, however, often lack digital structure and standards. Geological information plays a crucial role in supporting geological services worldwide for addressing societal demands related to resources, hazards, and sustainable development.

Subsequently, some countries that are part of the ASGMI Geological Expert Group make presentations on their respective national geological mapping plans:

- Argentina's Geological Mining Service (SEGEMAR) is actively involved in geological mapping, with ongoing projects like the 1:250,000 scale mapping plan aiming for completion by 2030. Argentina collaborates with the Argentine Antarctic Institute to produce geological maps of Antarctica, contributing to the understanding of the region's geology. SEGEMAR ensures public access to geological information through the CBAM (Geological Environmental Mining Information System) for remote consultation, a digital library, and a physical repository.
- Chile's National Geology Plan focuses on generating and disseminating geoscientific knowledge, including geological mapping, Geophysics, Geochemistry, and Marine Geology. The program aims to support sustainable resource management and enhance public safety. Geological mapping programs in Chile utilize interactive platforms to cross-reference geological data with information on mineral deposits, providing valuable insights for mineral exploration. The aero geophysics program in northern Chile, covering areas like La Serena to Arica, used international collaborations for magnetism and spectrometry, resulting in 128 new publications and vital data for mining exploration. Chile's geochemistry program analyzes drainage sediment composition, generating 61 elemental maps. This aids both mining exploration and serves as an environmental baseline, detecting potentially harmful elements. Advances in digital data capture using smartphones and cloud platforms have optimized fieldwork and enhanced data availability in geological programs like geochemistry, fostering better interaction with the data.
- Implementation of Chile's National Geology Plan in 2011 significantly increased cartography production, with a fourfold rise in map creation rates, contributing to societal awareness through animated series and newsletters. Felipe Espinoza discusses the process of integrating field data into a GIS library, emphasizing the importance of standards in cartography. They highlight the role of internal and external reviewers in ensuring map quality.

- The geology department in Costa Rica, with limited resources, details the time and personnel required for geological mapping. For a 1:50,000-scale geological map, a team of five professionals can take 2 to 2.5 years, influenced by factors like lab analysis and sample logistics. Costa Rica has made significant progress, covering 36.2% of its territory with 37 published geological maps at 1:50,000 scale. They have 4 maps in preparation, illustrating the ongoing commitment to comprehensive geological mapping. David Jara reflects on achievements, including improved quality, adherence to international standards, and systematic workflows. However, challenges such as tropical climate complexities and budget limitations persist, emphasizing the need for a geological service.
- Cuba celebrates 140 years of geological cartography. The evolution is mentioned from the first sketch at a 1:2,000,000 scale to the current maps at a 1:50,000 scale being developed with funding from the Cuban state. Eleven maps have been completed, and work is underway on another 24, featuring indications of geological interest and a digital format. These new versions also include other achievements such as geotectonic updates, standardized terminology, and mapping of geological points of interest.
- Regarding Ecuador, the intervention begins with the introduction of the Geological and Energy Institute (IIGE), an institution established in 2018 focused on research and collaboration with various sectors. In Ecuador, regional-scale mapping (1:2,000,000 – 1:1,000,000) has been carried out with technical assistance from the French Institute of Petroleum and the British Geological Survey. Currently, projects involving geological research and the digitization of geological mapping are underway, with 47 geological sheets at a 1:100,000 scale and 7 sheets at a 1:50,000 scale completed. Approximately 40% of the continental territory has been covered.

In the roundtable, some aspects are mentioned, such as the institutional differences between Europe and Ibero-America posing a challenge for harmonizing geological mapping efforts, requiring consideration of historical, social, economic, and geographic factors.

Harmonizing geological data across regions involves challenges in semantic harmonization, and tools like artificial intelligence are becoming more critical, with ongoing developments expected.

November 16th

The second part of the joint ASGMI and EuroGeoSurveys workshop on geological mapping and modeling addresses the project of the International Quaternary Geological Map of Europe at a scale of 1:2.500.000. Kristine Asch explains that the ongoing project involves the collaboration of 36 countries to map Quaternary geological features, facing challenges related to vocabularies, data harmonization, and is expected to conclude in 2027.

Key locations are included, such as archaeological sites, with details like type, age, and data provider, following fair data principles for the benefit of the scientific community and the general public. The project faces challenges such as acquiring up-to-date data, harmonizing data across political borders, and the need for a data model that includes active and changing features.

Next, Laure Pizzella begins her presentation on 3D geomodelling in Europe. European coordination in 3D geological modeling aims to achieve objectives that include delivering data for 3D models, developing and sharing tools, guidelines, and effectively visualizing and communicating results.

Modelers from different countries face specific challenges when developing geological models, highlighting the diversity of approaches at the national level.

The GSEU project provides an opportunity for the European geomodelling community, fostering joint projects and utilizing the EGDI platform for 3D visualization. As part of the GSEU project, there is a focus on developing a toolbox associated with the EGDI platform, highlighting existing open tools and organizing semi-annual workshops.

Finally, Kristine Asch and Christine Hörfarther present on Scientific Vocabularies for Basic Geology in Europe. Projects such as GSEU are working on pan-European geological vocabularies to improve terminology clarification, semantic linking for knowledge generation and to facilitate the harmonisation of geological data.

SPARQL as a query language for RDF data (data based on the Resource Description Framework Standard) is like SQL for relational databases and enables the search for any connotation of a concept in a semantic network. The linking of geological information through semantic networks aims to extend knowledge beyond borders, to make it findable, available and interoperable, and finally yet importantly, it supports international teamwork.

The current GeoSphere Austria thesaurus is mentioned, and there is an invitation to watch a screencast to understand what this interface offers and how it works.

The workshop concludes with a roundtable where the following conclusions and next steps are mentioned:

- The importance of global cooperation in geological matters is emphasized, with a focus on the need to collaborate on projects such as tectonic mapping and geological evolution. In this regard, the possibility of drafting a white paper between both organizations on geological mapping is mentioned.
- It is concluded that strengthening communication between both expert groups would be of great interest, allowing for the sharing of information about events each group holds that may be of mutual interest. The possibility of continuing to organize joint events that serve as a platform for exchanging experiences between the two organizations is considered. The idea of organizing another workshop (if possible in a face-to-face-format) in the next 24-48 months is mentioned.
- ASGMI proposes some topics that they would be interested in addressing in upcoming joint events. Among them:
 - Present and future of mapping programs in Europe within geological services: financing models, experiences, projections.
 - Semantic interoperability, real contributions versus costs.
 - Marine Geology (e.g. EmodNet EU Project) and ocean floor mapping.
 - Quaternary Geology
 - Technical and content review processes (e.g. peer review) of the products generated by Workpackage 6 of the GSEU-project. Product update: methodology, traceability, tools...

- An opportunity for some personal communication of members of our Expert Groups might arise at the IGC in Busan/South Korea in August 2024.

At the end, it is commented that exist an opportunity for some personal communication of members of our Expert Groups might arise at the International Geological Congress in Busan/South Korea in August 2024 (IGC 2024).

The workshop concludes with words of gratitude from both organizations and congratulations for the organization, participation, and work of the translators.

Madrid, 2023 November 30th



Gracia Olivenza (General Secretariat ASGMI)