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# SCIENTIFIC SESSIONS

## Session 1. Geodynamics, orogenic cycles and mineral systems

The formation of ore bodies is intimately linked with deep-seated and surface geologic processes such as deformation metamorphism, magmatism, fluid circulation, alteration, erosion and deposition. The activation of these processes is in turn directly controlled by the Earth's dynamics. Therefore, by considering mass transfer from mineral to Earth-scale and within a comprehensive framework, the understanding of geodynamics provides a first-order guide for the genesis of ore deposits. Conversely, the ore-forming processes provide unique clues for deciphering the geologic processes involved in any given geodynamic context. This session aims to bring together researchers from a wide range of specialties in order to discuss the nature of the links between geodynamics and ore-deposit genesis, from the impact of Earth accretion and differentiation on the distribution of metals, to the role of geological processes on metal concentration from mineral to ore-body scales.

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## Session 2. Porphyry and epithermal deposits

This session welcomes innovative contributions related to the association between porphyry  $\text{Cu}\pm\text{Mo}\pm\text{Au}$  and epithermal  $\text{Au-Ag}\pm(\text{Cu-Zn-Pb})$  deposits: the most important classes of non-ferrous metal mineral resources on our planet. Research may describe theoretical, experimental or observational studies devoted to the origin and architecture of these systems, and may focus on exploration models and methods, tectonomagmatic controls, ore-forming processes, and case studies.

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## Session 3. Fluids and ore genesis

The “Fluids and ore genesis” session welcomes innovative contributions devoted to the role of fluids in ore genesis, from mantle to surface conditions. Research may describe theoretical, experimental or observational studies and cover all aspects of ore genesis. Cross-disciplinary relevance of the contributions across the range of ore deposit types in which fluids are involved is encouraged. Examples of areas covered include, but are not restricted to: fluid-rock and fluid-fluid interactions; hydrodynamics; metal transport and mineral solubility; thermodynamics; origin and composition of fluids; fluid inclusion analysis.

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## **Session 4. Developments in elementary and isotope geochemistry, source tracing and geochronology**

This session is devoted to the presentation of the recent developments in elementary and isotope geochemistry, across a range of different methods (TIMS, ICP-MS, LA ICP-MS, SIMS) and elements. The session will examine how these analytical advances have improved our understanding of ore deposits through the tracing of metal sources, constraining the concentration processes, and determining deposit ages and duration.

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## **Session 5. Strategic metals: their sources, and ore-forming processes**

Germanium, Ga, In, REE, Nb, Ta, Li, W, Bi, Te are considered as strategic metals and are being increasingly used across a range of high-tech industrial (e.g., mobile phones, computers) and renewable energy applications (photovoltaic cells). Increasing demand worldwide has intensified research into the geology and geochemistry of these elements. This session will incorporate innovative contributions to the understanding of their crustal cycles, and the factors controlling their concentration in minerals. We encourage both geological investigations, and state-of-art geochemical, isotopic and experimental approaches.

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## **Session 6. Magmatic (Ni-Cu-Cr-PGE) mineral systems: ore forming processes and geodynamic setting**

The session is aimed at reviewing ore forming processes and geodynamic environment of the magmatic (Ni-Cu-Cr-PGE) mineral systems, from magmatic intrusions to massive sulphide bodies. Any aspect of ore formation may be illustrated and we invite transverse studies involving field studies, host-rock petrology, PGE mineralogy, isotope geochemistry and/or experimental approaches. Contributions involving the role of fluids for the origin, transport and deposition of PGE and chrome are welcome, as well as studies of more unusual types of deposit. Unlike most mineral resources, which are generally concentrated in a wide range of crustal reservoirs, nickel and platinum group elements are concentrated either in the core or in the mantle of our planet. In punctuated events throughout Earth history, large cataclysmic magmatic events have had the capacity to transport and concentrate these metals from their deep source to upper crustal levels. Contributions, that investigate the complex emplacement mechanism of these magmas and constrain the role that volatiles played in the emplacement and metal endowment of these systems, will then be welcomed. As these deposits are windows into the deep mantle of our planet, emphasis will be drawn upon how magmatic ore forming processes provide insights into fundamental questions regarding the evolution and dynamics of the Earth System.

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## Session 7. REE and other mineralization associated to carbonatites and alkaline rocks

This session is devoted to ore deposits associated with alkaline igneous rocks (including carbonatites), and to the petrogenesis of such systems. Research dealing with the structural setting, geology, petrology, experimental petrology, and element and / or isotopic geochemistry is invited, as well as studies on the value chain up to the market trends of REEs and related metals.

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## Session 8. Iron ores including IOCG

Natural iron resources occur primarily as oxides constituting iron-rich formations (i.e. Precambrian banded iron formation (BIF) of Archean age, or to a lesser extent, Phanerozoic iron formations). Ore-deposits of economic interest, however, generally involve secondary geological processes that are able to increase the primary iron concentration. These iron-ores occur in different geological settings (in near-surface as well as deep environments) and result from several superimposed enrichment-processes, as suggested by the presence of distinct generations of iron oxides. This session aims to bring together studies focused on the origin and mechanisms of iron accumulation in chemical sediment (and by extension to the study of early Earth environmental conditions) and the contribution related to secondary iron concentration including supergene and metamorphic contexts. Scientific approaches including mineralogical characterization and geochemical studies as well as experimental studies are warmly encouraged. This session will also include contributions focused on Iron Oxide Copper Gold deposits (IOCG).

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## Session 9. Organic matter and ore deposits: where the molecular world meets the mineral

This session will explore the numerous aspects of the role of organic matter in relation to geological metal resources. Involvement of organic matter is often invoked in the formation of ore deposits. Yet organic matter is molecular, and can be gaseous, liquid, solid, in aqueous solution, chemically well-defined (such as methane) or complex (kerogen, bitumen), and even alive (e.g. bacterial)! Its chemical and physical properties are numerous and change with the conditions of the geological environment. Therefore, investigating “mineral-organics interactions” is certainly the main current challenge. Ore deposit geology is thus an ideal playground in which specialists of organic matter can interact with those from the mineral world to unravel the often subtle interlacing of the geological cycles involving organic carbon, micro-organisms, minerals and fluids.

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## Session 10. Concentration processes in sub-surface environments

This session will be devoted to the mechanisms of metal enrichments in surficial environments such as laterites, (paleo)-placer deposits, and (paleo)-brines.

We welcome contributions dealing with: the sources of the ore-forming elements; enrichment processes and mechanisms (physical, chemical & biochemical); the ore-forming mineralogical associations leading to concentrations of e.g. Ni-Co, Au, PGE, REE, Nb, Ta concentrations along lateritic profiles, Zr, Ti, REE, Au, PGE concentrations in (paleo)-placer ore deposits, or Li, (K, Mg) concentrations in brines.

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## Session 11. Marine mineral resources

Global increases in metal demand, trade barriers, and increasing conflicts over land use are bringing the resource potential of the deep-sea back onto the table. The past years have seen a significant increase in exploration activities in the high seas and exclusive economic zones by both nations and industry alike. We invite contributions related to all aspects of marine mineral deposits. We especially welcome papers related to the geology of new discoveries, developments in exploration strategy, and the resource potential of deep-water commodities.

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## Session 12. Processing of low-grade ore deposit

Developing metal recovery from low-grade ore deposits (soft and hard rocks), and by- and co-product valorization are priorities for metallurgical processing. Proper resource and investment evaluations of low-grade ores require a combination of geological information, modeling and geometallurgical pilot tests. This session seeks contributions on the origin of the metal concentrations, processing of metals, and environmental issues related to mining.

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## Session 13. Gems and industrial minerals

Understanding where, when, how and why gem and industrial mineral deposits are formed is important from more than a purely academic perspective. The genetic models provide guidelines for exploration, contribute to a conceptual understanding of the processes involved, help to predict the location of undiscovered gem and mineral deposits and help to develop new mineral processing theories. This session groups together presentations highlighting the geology, mineralogy and crystallography, geochemistry, tectonic and structural setting of gem deposits, including archaeogemmology, and industrial minerals (natural or synthetic), in order to respond to the new challenges in the industry and gemstone markets.

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## Session 14. Geometallurgy

An ore deposit can be regarded in one of two ways: either by trying to unravel the complex history of the ore formation process or by trying to anticipate mining and beneficiation problems during operation. This downstream-looking approach, bridging the gap between geology and mineral engineering, has become a key to success in modern mining operations. The goal of this session is to foster dialogue between disciplines and to raise awareness among the geological community about the new tools and techniques that contribute to the geometallurgical modeling of a deposit. Papers dealing with advanced ore characterization (e.g., core scanning, automated mineralogy), spatial modeling, online monitoring of ore particles (remote mineralogy, mineral balancing) or with any topic related to minerals and mineral engineering (e.g., process mineralogy) are welcomed.

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## **Session 15. Phytomining strategic metals and other elements from naturally mineralised soils and mineral wastes**

Phytomining of nickel has been developed over the past 20 years and is now close to reaching commercial implementation as phytotechnology in temperate/Mediterranean conditions. Plant selection and breeding, and crop and soil management, have been optimized in North America and Europe. More recently, however, adapted biometallurgy has been developed for the optimization of the phytomining process for both temperate and tropical environments, with a vision of adding value to the bio-ore and the production and refining of pure salts for electroplating and metallic catalysts for organic syntheses and pharmaceuticals etc. Nickel phytomining is now a process under consideration for application in tropical lateritic mining environments. Phytomining could be the first step towards a self-funded and sustainable ecological restoration plan for mined lands. Furthermore, other resource-limited elements (e.g., Co, Mn, Au, Pt, Pd, REEs) are now emerging as another focus for phytomining potential. There is therefore an ongoing need for optimizing phytomining ‘crops’ under field conditions by adopting novel and new agroecological approaches, and by considering the logistics of the process and the ecosystem services ultimately rendered. All of these topical issues will be discussed in this special session, which will be entirely devoted to phytomining.

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## **Session 16. Social and environmental issues in sustainable mining practices**

The general public has a rather negative opinion of the mining industry in developed countries. This is partly due to historical reasons (bad mining practices and poorly-conducted mine closures), the lack of explicit raw material ethic policy from the operators and to the strong expectations of the public. This session aims to address these issues through the presentation of case studies on resource extraction, geometallurgy, environmental dissemination and management, return of land to a viable post-mining use and rehabilitation of abandoned mining areas. Experience and expertise in the fields of impact of mining operations, public involvement in mine planning are welcome, together with contributions that highlight the role of academic research from all disciplines in the development of a sustainable mining industry.

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# SYMPOSIA

## Symposium A. Metallogeny of North and West Africa

This session highlights the major advances made during the last decade in our understanding of the metallogeny of Northern and Western Africa. Innovative contributions dealing with North or West African mineral deposits will be welcome, regardless of the geological environments or geological processes.

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## Symposium B. 3D modeling - in honor of J.L. Mallet

The 3D modeling session welcomes advanced contributions on 3D subsurface earth models with a special focus on mineral deposits, resource evaluation, targeting, ore forming and structural geological processes related to mineral resources. Papers may concern new methodological insights for modeling complex geological structures related to mineral resources (e.g., implicit and explicit methods, potential field approaches, advanced meshing), as well as advanced restoration and other 3/4D techniques (surface, volume, geo-mechanical restoration approaches, THMC [Thermo-Hydro-Mecha-Chemical] coupled processes, ...) used to reconstruct the geological scenarios leading to ore-deposit formation. Contributions on multi-disciplinary and sub-surface data reconciliation that integrate several geophysical & geochemical exploration methods with 3D modeling are also welcome. Real 3/4D case studies showing the role of models in targeting, exploration, resource evaluation and understanding ore-deposits are particularly encouraged. This session will be in honor of Pr. Jean-Mallet, a pioneer in 3D geomodeling.

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## Symposium C. Uranium deposits - in honor of Michel Cuney

This symposium welcomes papers dealing with uranium metallogeny and geochemistry. The session will illustrate the extreme diversity of uranium deposits and contributions could cover a wide range of geological environments (igneous, hydrothermal, sedimentary or superficial) and geological processes. Presentations of non-conventional deposits are welcomed. This session will be in honor of Michel Cuney, whose scientific career was devoted to deciphering the uranium geological cycle.

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## **Symposium D. Sediment-hosted deposits - *in honor of Jan Pašava***

This session covers the broad range of deposits in sedimentary basins, including sedimentary exhalative, Mississippi Valley type, vein-type and stratiform copper deposits. Potential contributions include: the large-scale geodynamic setting of mineralization; lithological and structural controls on deposits; the origin of the metals and sulphur; the geochemistry of the mineralizing fluids and their complexing capacity; precipitation mechanisms, the critical factors that determine ore genesis; and the relationships between the formation of different ore types.

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## **Symposium E. Volcanogenic Massive Sulfide ore deposits - *in honor of James Franklin***

Volcanogenic Massive Sulphide (VMS) deposits represent major sources of base and precious metals in a wide variety of geologic environments. However, there remain many unanswered problems that affect both metallogenic understanding and mineral exploration. The session will be devoted to the major challenges for VMS including their epigenetic and syngenetic features, the source of the metals, their regional distribution and their geologic, geochemical and geophysical footprints.

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