Topics:

01) ID 152

Building Bridges – Erfahrungen aus der geowissenschaftlichen Praxis für den Karriereweg

Günther-Plönes, Andreas*
BDG Berufsverband Deutscher Geowissenschaftler e. V., Germany

Diese Session bietet Absolventinnen und Absolventen des Studiengangs Geowissenschaften eine einzigartige Gelegenheit, den Übergang von der akademischen Ausbildung in die Berufswelt erfolgreich zu gestalten. Unter dem Motto „Building Bridges“ berichten berufstätige Geowissenschaftlerinnen und Geowissenschaftler aus verschiedenen Fachrichtungen und Branchen aus ihrem Berufsalltag.

Die Teilnehmenden erhalten wertvolle Einblicke in die Praxis, die Bandbreite geowissenschaftlicher Berufsfelder und die Herausforderungen, die mit einem Berufseinstieg verbunden sind. Die Vortragenden teilen ihre persönlichen Erfahrungen, geben Tipps zu Bewerbungsstrategien und Karriereplanung und zeigen Wege auf, wie man sich im Wettbewerb um begehrte Stellen erfolgreich positioniert.

Die Session fördert nicht nur den Wissenstransfer, sondern bietet auch zahlreiche Möglichkeiten zum Netzwerken. Teilnehmende können individuelle Fragen stellen und aus erster Hand erfahren, wie sie ihre Kompetenzen und ihr Studium optimal auf dem Arbeitsmarkt einsetzen können.

Ob in der Forschung, in der Rohstoffindustrie, im Umweltsektor, in der Geothermie oder in der Kampfmittelräumung – die Veranstaltung hilft, Klarheit über die eigenen beruflichen Ziele zu gewinnen und neue Perspektiven zu entwickeln.

Die Session wird vom Berufsverband Deutscher Geowissenschaftler organisiert und richtet sich sowohl an Studierende kurz vor ihrem Abschluss als auch an Absolventen, die ihre Karriere starten möchten. Gemeinsam bauen wir Brücken zwischen Theorie und Praxis, Studium und Beruf – für einen erfolgreichen Start in die geowissenschaftliche Arbeitswelt.

02) ID 110

Young Scientist Session

Stoepke, Fiene* (1); Sawall, Joshua (2); Bahr, Louisa (3)
1: GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Wischhofstr. 1-3, 24148 Kiel, Germany;
2: State Museum of Natural History Karlsruhe, Department of Geosciences, Erbprinzenstr. 13, 76133 Karlsruhe;
3: Institut für Geologie, Universität Hamburg, Bundesstraße 55, 20146 Hamburg, Germany

The Young Scientist Session offers all young scientists the opportunity to present their latest research among peers. Anyone without a PhD as well as anyone who obtained their PhD within the last 3 years will be considered a young scientist. We especially encourage young scientists attending a conference for the first time, or those unsure whether their topic fits in another session, to submit contributions. This session invites contributions from all areas within the geosciences. This includes, but is not limited to, contributions based on the latest project, the BSc or MSc thesis, or the progress of a PhD project. The Young Scientist Session aims to provide a platform for young scientists to present and discuss their latest research with a diverse audience in a conference environment.

03) ID 125

Deciphering the Archean Earth: Crustal Evolution, Geodynamics, and Early Life

Torres Mancinelli, Fernanda* (1); Dziggel, Annika (1); Hoffmann, Elis (2)
1: Ruhr-Universität Bochum, Germany; 2: Freie Universität Berlin

The Archean Eon records the formation of Earth's earliest continental crust, the establishment of fundamental geodynamic processes, and the emergence of life. This session invites contributions that explore the geological, geochemical, geochronological, and geophysical record of the Archean Earth. We seek studies that provide new constraints on Archean crustal growth and stabilization, TTG genesis, metamorphic processes, and the evolution of the lithosphere. Contributions addressing the onset and style of plate tectonics, vertical versus horizontal tectonic regimes, and comparisons between Archean and younger geodynamic systems are particularly welcome. We also encourage interdisciplinary studies linking Archean geology with early atmosphere–hydrosphere evolution, mineral systems, and the evidence for early life. Field-based studies, analytical advances, experimental work, and numerical modelling are all within the scope of this session.

04) ID 108

Evolution of Ocean Chemistry and Earth-System Coupling Through Deep Time

Krayer, Johanna* (1); Zahnow, Fabian (2)

1: Leibniz University Hannover, Germany; 2: Ruhr University Bochum, Germany

The physicochemical development of Earth's oceans is closely linked to planetary habitability. Precambrian marine environments likely differed significantly from modern oceans. Key parameters such as temperature, pH, redox state, and nutrient availability remain incompletely understood and are subject to ongoing debate. Reconstructing ocean chemistry and conditions through time, and investigating interactions between the hydrosphere, atmosphere, biosphere, and lithosphere, is essential for understanding early Earth environments and their role in the emergence and evolution of life.

This session will highlight the dynamic evolution of the hydrosphere and its coupling to other Earth spheres, drawing on records preserved in sedimentary archives. Emphasis is placed on surface and near-surface processes such as continental weathering, element cycling and hydrothermal interactions, which control seawater composition and the formation of marine sediments. A central objective is to critically evaluate the preservation of primary environmental signals in sedimentary rocks and the impact of diagenesis on these records over billions of years.

We invite contributions from (bio-) geochemistry, isotope geology, sedimentology, mineralogy, and (paleo-)oceanography that reconstruct ancient seawater composition, environmental and redox conditions, nutrient cycling, and marine habitats across critical intervals of Earth's history. We particularly encourage submissions from early-career researchers, as well as studies utilizing modern analogues or experimental approaches to illuminate ancient Earth processes. This session seeks to foster interdisciplinary exchange and integrative perspectives to advance our understanding of early ocean conditions and their significance for the evolution of Earth's surface environments and life.

05) ID 123

Novel geochemical proxies for tracing modern and ancient Earth's climate conditions

Kaufmann, Andreas B.*; Klamt, Viona
Leibniz University Hannover, Germany

Understanding deep-time climatic and environmental variability is fundamental to constraining the evolution of the Earth system and its major perturbations, including volcanism, mass extinctions, ice ages, and oceanic anoxic events. This session highlights recent advances in geochemical approaches and proxy development for reconstructing modern and ancient climate and environmental conditions from aquatic and sedimentary records. A particular focus is placed on the growing application of stable isotopes (e.g., Li, C, O, Mg, V, Fe, Ni, Cu, Zn, Mo, Sb, Sn, W, Hg, U), which have provided new insights into processes operating across the coupled hydrosphere–biosphere–pedosphere–geosphere system, from micro- to regional scales. Contributions are invited that advance proxy

development and calibration in modern and ancient environments, improve analytical precision (e.g., mass spectrometry), refine experimental and methodological constraints, and integrate data–model approaches. The session welcomes novel applications of isotopic tracers to ancient and modern sedimentary and aquatic records, methodological innovations that enhance interpretation of geochemical signals, and interdisciplinary studies that illuminate mechanisms, feedback, and thresholds underlying major geochemical and environmental perturbations through Earth history. By integrating cutting-edge modern geochemical tools with deep-time perspectives, this session aims to showcase how aquatic and sedimentary records document the coupled evolution of climate and surface environments across modern and ancient times.

06) ID 114

New frontiers in high-temperature experimental research

Fonseca, Raúl*; Beyer, Christopher; Bissbort, Thilo; Minchenkova, Anastasiia
Ruhr-University Bochum, Germany

Experimental petrology has long provided fundamental constraints on high-temperature processes operating in planetary interiors, from magma generation and differentiation to melt–solid and fluid–solid interactions. In recent years, the field has expanded beyond its classical boundaries, increasingly incorporating stable isotope geochemistry, quantitative mineralogical approaches, and more systematic strategies for data analysis. This session aims to encourage contributions that reflect this broader and more comprehensive view of experimental studies of high-temperature systems.

We invite submissions that employ experimental approaches to investigate magmatic and other high-temperature processes, while placing emphasis on geochemical and mineralogical perspectives. Contributions may address, for example, elemental and stable isotope partitioning, equilibrium and kinetic isotope fractionation, redox processes, or the textural and chemical evolution of minerals and melts under controlled laboratory conditions. Studies that explicitly link experimental constraints to processes operating across scales, from micron-scale mechanisms to planetary-scale implications, are particularly encouraged.

The session is also open to contributions that make use of analytical, numerical, or data-driven approaches to support or extend experimental and geochemical observations. Such approaches may include computational or statistical methods, as well as selective applications of machine learning, for data synthesis, interpretation, uncertainty assessment, or model development, provided they are closely tied to experimental petrology, stable isotope geochemistry, and mineralogical context.

By bringing together experimental petrologists, stable isotope geochemists, mineralogists, and researchers employing quantitative approaches, this session aims to foster cross-

disciplinary exchange and highlight emerging directions in the study of high-temperature Earth and planetary materials.

07) ID 113

Spectroscopic methods in modern geosciences

Kaliwoda, Melanie* (1) Sturm, Elena (2), Joseph, Fabio (2)
1: MSM Mineralogische Staatssammlung München - LMU München, Germany;
2: LMU - Ludwig-Maximilians-Universität München Germany

Spectroscopic methods are fundamental tools in geoscience research. They enable the investigation of materials across a wide range of spatial and temporal scales, from atomic and molecular structures to chemical bonding, crystal structures, and physical properties. This session is dedicated to all areas of the geosciences that focus on the study of mineralogical questions using the broad spectrum of available spectroscopic techniques.

Contributions employing, but not limited to, UV/Vis, infrared (IR), Raman spectroscopy, X-ray absorption spectroscopy (XAS), Mössbauer spectroscopy, electron paramagnetic resonance (EPR), nuclear magnetic resonance (NMR), mass spectrometry (MS), laser-induced breakdown spectroscopy (LIBS), as well as synchrotron-based methods are welcome. Studies involving in-situ, or remote sensing spectroscopic approaches are particularly encouraged. In addition, investigations applying other emerging or specialized spectroscopic techniques are also within the scope of this session.

We invite contributions covering the full breadth of mineral sciences, including spectroscopic studies of sedimentary, metamorphic, plutonic, and deep Earth minerals. Applications to interdisciplinary fields such as environmental geoscience, cultural heritage, gemology, soil science, planetary materials, meteorites, and related topics are equally encouraged. This session aims to provide a comprehensive forum for showcasing recent advances and novel applications of spectroscopic methods in mineralogical and geoscientific research.

08) ID 115

Progress in LA-ICP-MS analytics - geochronology and trace elements

Hueck, Mathias* (1); Zeh, Armin (2); Schuth, Stephan (1)
1: Ruhr-Universität Bochum, Germany; 2: Karlsruher Institut für Technologie

This session will highlight recent progress in LA-ICP-MS analytics and their application in the geosciences, particularly for geochronology and trace element analysis. We encourage

submissions from a variety of approaches, including, but not restricted to, tandem ICP-MS/MS geochronology, trace-element mapping, coupled geochronology/mineral chemistry/isotope signatures, as well as their applications for petrochronology , and ore-forming processes. The session welcomes both methodological contributions outlining new analytical advancements and innovative applications of LA-ICP-MS on a wide range of geological questions.

09) ID 153

Tectonic Systems - TSK Open Session

Stoepke, Fiene (1); Trepmann, Claudia (2); Stipp, Michael (3); Kley, Jonas* (4)
1: GEOMAR Kiel; 2: Ludwig-Maximilians-Universität München; 3: Martin-Luther-Universität Halle; 4: Georg-August-Universität Göttingen

The open session on tectonics, structural geology, and crystalline geology provides a forum to present and discuss recent research results from active and fossil tectonic settings. We welcome both process-oriented and regional studies that provide insights into a wide range of geodynamic processes, from rifting and ocean spreading to subduction, collision, and intraplate deformation. This session will bring together a diverse community that builds on and advances multimethodological research including mapping, microstructural, geochemical, geochronological, and petrological analyses, as well as analogue and numerical modelling, and concept development. As such, we invite both overarching and thematic presentations from early career to senior scientists.

10) ID 122

Harnessing Earth’s mantle: from planetary evolution to continental stability and mineral resources

Klöcking, Marthe* (1); Bussweiler, Yannick (2); Tappe, Sebastian (3)
1: Universität Münster, Germany; 2: Universität zu Köln, Germany; 3: Technische Universität Bergakademie Freiberg, Germany

Earth’s mantle has fundamentally shaped the evolution of our planet and continues to contribute to its habitability. Magmas derived from mantle melting control volatile degassing from Earth’s interior to the atmosphere, contribute to surface heat flow and plate tectonics, and play an important role in metal and nutrient cycling to deliver critical ingredients for life and technological development. The lithosphere supports long-lived stability of the continents, hosting life and most of the resources human society relies upon. The asthenosphere provides insight into planetary evolution through a chemical record of past

melting episodes, crust formation and recycling through subduction, and the addition or removal of material through ancient meteorite impact events.

This session explores current understanding of the Earth's mantle and magmas derived from it. We invite contributions from analytical, experimental and computational geochemistry and petrology that study the mantle through direct (e.g. abyssal peridotites, ophiolites, xenoliths) or indirect samples (e.g. magmatic products, intraplate volcanism). Interdisciplinary studies including, for example, economic geology, geodynamics, geophysics or thermodynamics are very welcome.

11) ID 124

Ore-Forming Processes and Mineral Systems

Hector, Simon* (1); Dziggel, Annika (2); Kolb, Jochen (1)
1: Karlsruhe Institute of Technology; 2: Ruhr-Universität Bochum, Germany

Ore deposits record the interaction of magmatic, metamorphic, sedimentary, and hydrothermal processes that concentrate metals in the Earth's crust. This session welcomes contributions that investigate the sources, transport, and deposition of metals across a range of tectonic settings and scales. We invite studies integrating field observations, geochemistry, isotopes, geochronology, fluid inclusion analysis, experimental approaches, and numerical or conceptual models. Contributions linking ore formation to crustal evolution, fluid–rock interaction, and mineral system frameworks are particularly encouraged. The session aims to promote cross-disciplinary discussion and improve our understanding of the processes controlling metal enrichment.

12) ID 126

Magmatic to Epithermal Mineralization: Linking Processes, Timing, and Metal Transport

Korges, Maximilian* (1); Falkenberg, Jan (2); Hsu, Ying-Jui (3); Fußwinkel, Tobias (4)
1: University of Potsdam, Germany; 2: Technical University Berlin, Germany; 3: University of Bonn, Germany; 4: RWTH Aachen, Germany

How does the Earth concentrate metals in the crust, and what controls where and when ore deposits form? This session explores the formation of magmatic, magmatic-hydrothermal, and epithermal ore systems, shedding light on the processes that create some of the world's most important mineral resources relevant for the sustainable development of our society.

We welcome contributions that examine the formation and evolution of these ore systems in continental crustal settings, aiming to improve our understanding of how metals are sourced, transported, and deposited, and how these processes interact across spatial and temporal scales. Studies highlighting the processes controlling magma evolution, fluid behaviour, and the interactions between melts, fluids, minerals, and host rocks are particularly valuable, as are contributions exploring links between magmatism, deformation, and mineralization. A wide range of approaches is encouraged, including (but not limited to) fieldwork, petrography, whole-rock, mineral and isotopic geochemistry, geochronology, fluid inclusion studies, experimental work, and numerical or conceptual modelling. We particularly welcome interdisciplinary studies that integrate methods and perspectives from multiple subdisciplines, as these provide powerful insights into the complexity of ore-forming systems. By bringing together researchers from diverse backgrounds and scales of investigation, this session aims to foster discussion on emerging concepts, unresolved questions, and reveal future directions in critical metals research with a focus on ore-forming processes and implications for mineral exploration.

13) ID 121

News from the Variscan Belt: from crust to mantle and back

Meinaß, Henri* (1); Fazlikhani, Hamed (2); Zeh, Armin (3)
1: TU Darmstadt, Germany; 2: GeoZentrum Nordbayern Erlangen, Germany; 3: KIT, Karlsruhe Germany

This session invites contributions providing new constraints on the evolution of the Variscan Belt in Central Europe and beyond. It aims to cover the entire lifecycle, from Cadomian Belt destruction to Variscan amalgamation and collapse. Contributions may include paleontological, structural, geophysical, petrological, and isotope-geochronological studies, as well as integrated multidisciplinary approaches. Furthermore, we encourage contributions on recent advances in pressure–temperature–time (P–T–t) path reconstructions, provenance and sedimentary analyses, and large-scale geodynamic modeling.

14) ID 102

Understanding Magmatic Systems: From Mush to Magma and Beyond

Kahl, Maren* (1); Marxer, Felix (2); Oeser-Rabe, Martin (2)
1: Ruhr-Universität Bochum, Germany; 2: Leibniz Universität Hannover, Germany

Magmas are dynamic mixtures of liquids, solids, and gases that undergo complex physical and chemical processes as they ascend from the mantle to their final resting places within the crust or on Earth’s surface. Understanding magmatic plumbing systems is fundamental to advance our knowledge of volcanic hazards, crustal evolution, and ore mineralisation. This session aims to explore the dynamics of magmatic systems, from their mush-dominated

states to mobile magma that may be emplaced or erupted, addressing key questions about magma generation, transport, storage, and evolution.

Recent advances in geochemical analysis, petrological investigations, geophysics, experimental petrology, and computational modelling have significantly enhanced our ability to constrain the architecture of magmatic systems, quantify dynamic processes, assess timescales of evolution and investigate critical transitions from dormancy to eruption. However, challenges remain, including estimating magma storage depths, understanding crystal-melt relationships, integrating temporal and thermal constraints, and calibrating models with experimental and natural observations.

We invite contributions based on field observations, high-resolution geochemical data, thermodynamic and numerical modelling, diffusion chronometry, machine learning, and experimental petrology to shed light on the dynamics of magma reservoirs (e.g. storage, mixing, crystallisation), volatile dynamics in igneous systems, the critical timescales and processes governing magma accumulation and transfer, and the eruption-triggering mechanisms that can operate even during volcanic dormancy.

15) ID 139

Mineral physics

Münchhalfen, Marie*; Schreuer, Jürgen
Ruhr-Universität, Germany

A thorough understanding of the physical properties of minerals is essential for understanding the deep Earth, particularly for interpreting the propagation of seismic waves. Furthermore, knowledge of the anisotropic elastic and thermal expansion behavior at non-ambient conditions of the crystal species involved is indispensable for example for current developments in geothermobarometry and applications such as the containment of radioactive waste in appropriately resistant crystalline materials. We invite contributions focusing on anisotropic physical properties of crystals at various conditions and their benefits for solving geoscientific problems and for applications.

16) ID 138

Minerals as advanced materials

Schreuer, Jürgen* (1); Schorr, Susan (2); Yusenko, Kirill (1)
1: Ruhr-Universität, Germany; 2: Helmholtz Zentrum Berlin für Materialien und Energie, Germany

Minerals are not only constituents of rocks but often serve as prototypes for families of structurally related synthetic compounds that are promising candidates for various technical applications. Both, understanding and predicting mineralogical processes, and the design of new materials having specific properties rely on the knowledge of structure-property relationships which in turn require a thorough characterization of the relevant structural and physical properties. We invite contributions focusing on advanced methods for the investigation of structural and/or physical properties of minerals as well as on the elaboration of corresponding structure-property relationships.

17) ID 104

Advanced Analytical Methods: Insights into challenging and dynamic (Geo)Material Processes

Zimmer, Sinje* (1); Hauke, Kerstin (1); Stephan-Scherb, Christiane (2)
1: Forschungsgemeinschaft Feuerfest e. V., Germany;

2: Martin-Luther-University Halle-Wittenberg, Germany

The formation, structure, and properties of natural and anthropogenic materials are linked by challenging physicochemical conditions. Understanding the underlying processes and formalisms requires dedicated experiments combined with the use of complementary classical and advanced analytical methods on various length scales.

The ability to probe materials under their actual operating or formation conditions is essential for uncovering fundamental mechanisms and guiding technological innovation. In situ analytical methods - ranging from Raman and infrared spectroscopy to X-ray diffraction and electron microscopy - provide real-time, multi-scale observations of structural, chemical, and physical transformations. The unique capability of these techniques to resolve dynamic processes, especially in challenging environments like high temperatures, unlocks new insights inaccessible through ex situ measurements.

Advanced analytical techniques accessing the structure from atomic to microscales, ranging from diffraction and spectroscopy by X-rays, electrons or neutrons, to imaging by electron microscopy or Raman spectroscopy enable fundamental insights into challenging structure-property relations.

This session invites contributions showcasing the breadth and impact of advanced analytical approaches and data analysis across natural and synthetic materials. By capturing processes as they unfold, these methods not only answer critical research questions but also serve as enablers for the discovery and optimization of new materials. We encourage submissions that highlight novel applications, methodological advancements, and interdisciplinary insights, from geosciences to advanced engineering.

Join us to explore how complementary analytics are reshaping our understanding of material behavior and driving innovation in science and industry.

18) ID 105

„Mineralogy and Innovation: Solutions for Sustainable and Climate-neutral Building Materials“

Goetz-Neunhoeffer, Friedlinde* (1); Kirchberger, Irina (1,2); Villmow, Sophia (3); Fischer, Michael (4)
1: Friedrich-Alexander-Universität Erlangen-Nürnberg, Geozentrum Nordbayern, Mineralogie, Germany; 2: Universität Bern, Institut für Geologie, Fachstelle Sekundärrohstoffe, Switzerland; 3: Heidelberg Materials AG, Leimen, Germany; 4: Universität Bremen, Geowissenschaften, Kristallographie, Germany

The development and refinement of sustainable building materials and CO_2-neutral materials will play a key role in overcoming current challenges in the field of CO2-emission reduction. The focus is on researching the mineralogical, physical, and chemical properties of innovative cementitious materials or mineral composites that either reduce the ecological footprint of building materials or actively contribute to CO_2 storage in minerals.

The presentations can therefore cover various aspects: from the use of secondary raw materials to reduce material consumption, to advanced processes for binding CO_2 in cement and concrete, to magnesium-based building materials that are considered environmentally friendly alternatives to conventional cementitious materials. The session aims to bring together scientists who employ experimental methods (e.g., XRD, SEM, spectroscopy etc.), use simulation calculations or combine both approaches in the study of CO2-storing minerals, new sustainable building materials or supplementary materials for cements.

Scientists from research and industry are invited to present their scientific findings. The aim is to open up new perspectives for sustainable and CO_2-neutral building materials and to promote scientific dialogue.

19) ID 118

Applied Mineralogy and Geochemistry of Secondary Raw Materials along the Cradle-to-Grave Pathway

Eiche, Elisabeth* (1); Gantz, Cornelius (2); Gronen, Lars (3)
1: Karlsruhe Institute of Technology, Germany; 2: Deutsches Lithiuminstitut GmbH; 3: Institut für Baustoff-Forschung e.V.

The transition towards a sustainable and resource-efficient society requires a cradle-to-grave perspective not only on the use of primary materials but also on secondary resources,

acknowledging that one industry's waste may serve as another's raw material. Secondary raw materials therefore play a key role in closing anthropogenic material cycles.

This session welcomes contributions addressing processes and concepts along the entire cradle-to-grave pathway of secondary raw materials and technical minerals. It focuses on the mineralogical and geochemical characterization of secondary resources, including solid and liquid residues such as mine tailings, slags, ashes, industrial residues and wastewater, as well as construction and demolition wastes. Contributions addressing mineral processing and metallurgical approaches are also encouraged, including beneficiation strategies, extractive metallurgy, and the optimization of material and value streams for the selective recovery of valuable and critical elements. Aspects of applied and technical mineralogy, serving as a basis for recycling, reuse, and resource recovery, are an integral part of this session.

Environmental considerations—such as contaminant mobility, long-term stability, and interactions with natural systems—are essential for evaluating both secondary raw materials and engineered mineral phases, Hence, related contributions are also welcome

Overall, this session highlights how mineralogical, geochemical, and technical mineralogy approaches support the sustainable utilization of secondary raw materials and the development of adapted mineral systems within circular economy strategies.

20) ID 116

Mineral systems in ancient and modern marine environments

Pedemonte Castro, Giovanni*; Volkmann, Rebecca
GFZ Helmholtz-Zentrum für Geoforschung, Germany

Mineral deposits hosted in ancient sedimentary basins are of great metallogenic importance, historically being one of the most important sources of metals in the world. They record fundamental interactions between fluids, rocks and sediments, and the ocean through geological time. Studying modern analogues allows us to obtain key insights about the formation processes of these ancient deposits. Direct observation and sampling improve our understanding of metal sources, transport mechanisms, redox controls, and basin-scale fluid circulation.

This session aims to bring together studies that explore mineral deposits in ancient marine environments and their modern analogues, emphasizing conceptual links across temporal and spatial scales. We welcome contributions addressing a wide range of marine-related mineral systems, including but not limited to: Kupferschiefer-type deposits, Mississippi Valley–type (MVT), clastic-dominant (CD-type), and volcanogenic massive sulfide (VMS) systems. Particular emphasis is placed on studies that integrate observations from modern marine analogues, such as hydrothermal vents, sediment-hosted metal accumulations, and

metal-rich brines. Such comparisons provide powerful constraints on fluid–rock interaction, metal provenance, depositional processes, and post-depositional modification.

Contributions may include field-based studies, experimental and numerical modelling, geochemical and isotopic approaches, basin analysis, or multi-scale mineral system frameworks. By bridging modern processes and mineral deposits, this session seeks to foster the cross-disciplinary dialogue between researchers working on marine geochemistry, economic geology, sedimentology, and tectonics, ultimately advancing our understanding of how marine environments control the formation and preservation of mineral resources.

21) ID 144

Geo-derived materials in early use

Klein, Sabine* (1); Westner, Katrin J. (1); Ruppiene, Vilma (2)
1: Deutsches Bergbau-Museum Bochum, Germany; 2: Ruhr-Universität Bochum, Institut für Archäologische Wissenschaften, Germany

Applied geoscientific material analysis and methodical approaches from geochemistry are frequently employed to identify archaeological materials and their geological provenance, reflecting their important role in archaeometric research. The wide range of naturally occurring materials used by mankind is mirrored by an equally wide range of man-made materials used in art as well as for utility and ritual purposes. The archaeological spectrum comprises lithic objects, ceramics, building materials, minerals and gems, glass, glazes, and metals, with variable value and meaning conveyed by specific objects. At all times, market parameters such as the availability of natural resources, fuel and energy consumption; the complexity of production processes; the abundance of skilled workers; and production conditions have influenced whether man-made products were reserved for the elite or were distributed more widely, up to an industrial scale. This conference session aims to pronounce the relevance of geoscientific approaches in materials-based archaeology for addressing a range of archaeological questions.

22) ID 151

Geology of Germany

Broge, Alena Sophie* (1); Wojatschke, Jasmaria (2); Malz, Alexander (3); Kley, Jonas (1)
1: University of Göttingen, Germany; 2: Bundesanstalt für Geowissenschaften und Rohstoffe; 3: Landesamt für Geologie und Bergwesen Sachsen-Anhalt

Despite centuries of geological investigations, the knowledge of regional geology keeps evolving. Due to new legal regulations, the availability of geoscientific data and growing, multiple demands for Germany’s geological potential, regional geologic studies remain timely and important. These investigations are supported and enhanced by new concepts and

innovative methods. Whole rock and mineral studies such as isotopic age dating, thermochronology and geochemical analysis are becoming faster, cheaper and more precise for an increasing number of rocks and minerals, thus allowing the identification and classification for a wide variety of processes. Geophysical data acquisition and processing allows high-resolution imaging of deep geological structures. Modern 3D modelling and visualization approaches, high-performance computing, and the integration of machine-learning algorithms in data processing can help to raise our understanding of regional geology to a higher level.

We invite contributions covering all aspects of geological investigations, from local studies to regional models and throughout Germany´s geological history. We welcome studies dealing with all aspects connected to or bearing on the geology of Germany, including regions across its borders.

23) ID 117

Beyond Flat Maps: 3D Scanning, 3D Printing, Immersive Visualization and Web Technologies in Geosciences

Ziesch, Jennifer* (1); Stück, Heidrun (2); Lehné, Rouwen (3)
1: Landesamt für Bergbau, Energie und Geologie, Germany; 2: Bundesanstalt für Geowissenschaften und Rohstoffe, Germany; 3: Hessisches Landesamt für Naturschutz, Umwelt und Geologie, Germany

Three-dimensional technologies play an increasingly important role in the geosciences, particularly in the acquisition, visualization, communication, and dissemination of spatial data. This session focuses on applied and technical 3D approaches that complement, but do not replace, classical geological 3D modelling.

This session invites contributions on:

Applied 3D Scanning in Geosciences

Practical use cases of laser scanning, photogrammetry, and microscopic 3D scanning for capturing geological outcrops, samples, cores and structures across scales.

Applied 3D Modeling and Processing Workflows

Processing workflows for transforming scanned data into interpretable and reusable 3D datasets for visualization, communication and applied analysis.

3D Printing and Physical Visualization

Use cases demonstrating how 3D printing supports tangible understanding, communication, and teaching of geological structures and datasets.

Immersive Visualization with VR and AR

Practical examples of virtual and augmented reality supporting geological interpretation, training, education, and stakeholder engagement.

Interactive and Web-Based 3D Visualization

Browser-based 3D visualization, web viewers, data streaming, and lightweight dissemination of geoscientific 3D content for scientific, educational, and public audiences.

By bringing together researchers from academia and geological surveys, along with technical experts and practitioners, this session aims to highlight how modern 3D technologies enhance geoscientific workflows, improve communication, and open up new perspectives beyond traditional two-dimensional representations.

24) ID 120

3D Geological Modelling: Methods, Applications, and Regional Insights

Bense, Frithjof A.* (1); Stück, Heidrun (1); von Goerne, Gabriela (1); Ziesch, Jennifer (2)
1: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Germany; 2: Landesamt für Bergbau, Energie und Geologie (LBEG)

Objective and topics to be covered: This session explores recent advances in 3D geological modelling, focusing on technical innovations, methodological approaches and regional case studies that enhance subsurface understanding. Key aspects include data integration, structural geology modelling, and visualization, which improve geological interpretations.

This session provides a platform to share insights, discuss best practices, and present case studies on 3D geological modelling. Contributions from various disciplines demonstrating practical applications are highly encouraged.

Topics of interest include but are not limited to:

Integrating diverse geological data into 3D models

Advancements in structural geology modelling and visualization

Uncertainty in 3D models: Quantification, assessment, and case studies

Regional 3D modelling: Capturing geological variability and supporting regional assessments

Parametrization of 3D volume models: Incorporating key parameters (e.g. seismic velocity, porosity, temperature)

Applications of 3D modelling: static & dynamic simulation, reservoir characterization, mining geology, hydrogeology

Remote sensing and surface-based 3D modelling: Aerial imagery, drone photogrammetry, and LiDAR for analysing surface processes (e.g. mass movements, subsidence, erosion etc.)

25) ID 133

Geo- and thermochronology of near-surface processes: advances and new perspectives

Kranz-Bartz, Melanie* (1); Hueck, Mathias (1); Heller, Beatrix (2)
1: Institute of Geosciences, Ruhr University Bochum, Germany; 2: ISTerre, Université Grenoble-Alpes, France

Understanding Earth`s long-term evolution depends on strong chronological frameworks that accurately determine the timing, rates, and mechanisms of geological processes. Over recent decades, geochronological techniques such as cosmogenic nuclides, trapped-charge dating, and thermochronology have greatly improved in precision, accuracy, and applicability across various geomorphological, geodynamical, and sedimentological targets. Advances in analytical methods, including enhanced mass spectrometry, in situ dating, and new isotopic systems, now facilitate more precise and reliable age determinations, aiding in reconstructing Earth's history over different spatial and temporal scales. At the same time, progress in data interpretation, inverse modelling, and integration with geodynamic, geomorphological, and sedimentary frameworks has revolutionized the use of chronological data for testing Earth system processes.

This session aims to showcase the latest developments in near-surface geo- and thermochronology, highlighting how these advances enhance our understanding of Earth's history. We invite studies using diverse geo- and thermochronometers, radiometric dating, and multi-chronometer techniques to address key issues in tectonics, landscape change, climate-tectonic interactions, and sediment transport, among others. Method developments, in addition to application studies, are very welcome. Moreover, contributions exploring potential biases and inconsistencies in geochronological data and model comparisons are also encouraged. We look forward to submissions from all areas of the geoscience community, with a special encouragement for early-career scientists to present their research.

26) ID 129

Assessment of fault activity for seismic hazards: Integrating observations across methods and timescales

Prince, Erick*; Verdeccia, Alessandro; Kaerger, Lauretta
Ruhr University Bochum, Institute for Geosciences

Seismic hazard assessment is an important component of societal risk management, particularly with respect to urban development, critical infrastructure, disaster prevention, and more recently, nuclear waste storage. Therefore, understanding the history and activity of fault zones is crucial for reliable seismic hazard assessments. Seismic hazards are commonly estimated based on historical and instrumental seismicity through deterministic

and probabilistic approaches. Instrumental seismology provides data from about 1950 onwards, while historical sources document earthquakes dating back to around AD times, but must be considered incomplete in many instances. Hence, even the existing databases for active faults and past earthquakes require substantial supplementation and constant re-evaluation as a result of ongoing research. Neotectonic, paleoseismological, archeoseismological and geomorphological studies provide evidence for earthquakes occurring on timescales of hundreds of thousands of years. However, understanding (potential) past fault activity is not always straightforward. Fault zones with long earthquake recurrence intervals, or those located regions where deformation rates are low, pose challenges in the determination and monitoring of their activity. In this session, we invite contributions dealing with the determination of fault activity that span a wide range of topics and disciplines, including paleoseismology, tectonic geomorphology, seismology, remote sensing and modeling. We especially welcome innovative approaches that advance detection, characterization, and quantification of fault activity.

27) ID 150

Stratigraphy – dissecting geological time

Ifrim, Christina* (1); Becker, Ralph Thomas (2); Zieger-Hofmann, Mandy (3)
1: Staatliche Naturwissenschftliche Sammlungen Bayerns, Germany; 2: Universität Münster; 3: Senckenbergische Naturwissenschaftliche Sammlungen Dresden

The German Commission on Stratigraphy presents this session open to all fields of stratigraphy. This crucial geoscience discipline provides increasingly higher precision in relative and absolute dating of strata and fossil successions by the combined study of faunas, floras, geochemistry, planetary dynamics, orbital cycles, palaeoceanography, and mantle/crustal processes. New data and multidisciplinary approaches are invited in order to reach a better understanding of the dynamics of a broad range of processes in the history of Earth. Contributions to applied geoscientific challenges that require and apply geological time aspects, such as the exploration of strata-bound resources, geothermal research, carbon capture and storage, and other areas of economic geology are welcomed. We expect contributions from all fields of stratigraphy, whether it be biostratigraphy, lithostratigraphy, geochronology, event stratigraphy, chemostratigraphy, cyclostratigraphy, magnetostratigraphy, sequence stratigraphy, or emerging fields, e.g. time-related modelling of the geo- and biosphere.

28) ID 147

Through the Lens of Sedimentary Archives: Understanding Climate Variability during the Cenozoic from a Sedimentological Perspective

Bührig, Laura H.* (1); Falkenroth, Michaela (2)
1: University of Potsdam, Germany; 2: TU Darmstadt, Germany

Cenozoic climate variability is recorded in a vast variety of sedimentary archives. This session seeks to connect researchers working on paleoclimate reconstruction at different spatial and temporal scales.

We invite contributions that explore responses in sedimentary systems to climate forcing throughout the Cenozoic from terrestrial hinterlands, across continental margins, to deep-sea basins. Emphasis is placed on multiproxy approaches that integrate sedimentology with other fields such as geochemistry, geochronology, geophysics, palaeontology, palynology, or numerical modelling. Studies may address, for example, climate-driven changes in sediment supply, transport processes, facies characteristics and depositional architectures, as well as the preservation and resolution of climate signals in different sedimentary environments.

The session welcomes research ranging from detailed outcrop- and core analyses to basin-scale stratigraphic syntheses, including source-to-sink perspectives. Contributions combining field data with forward or inverse modelling are encouraged, as are studies that test proxy sensitivity or compare sedimentary paleoclimate archives with model outputs. By bringing together researchers working within different scientific frameworks the session aims to foster interdisciplinary knowledge exchange and inform strategies for addressing present-day climate-related environmental challenges.

29) ID 109

Latest Achievements in Scientific Ocean and Continental Drilling

Grob, Henrik* (1); Kunkel, Cindy (2); Bornemann, André (3)
1: Kiel University, Germany; 2: GFZ Helmholtz Centre for Geosciences, Germany; 3: Federal Institute for Geosciences and Natural Resources, Germany

In national and international Earth science programs, scientific drilling is the primary tool to obtain a wealth of relevant data from rock archives, which are otherwise not accessible. These enable us to understand and project climatic and environmental variability, geodynamic processes and geohazards such as earthquakes, landslides and volcanic eruptions, natural resources, the deep biosphere and other topics of socio-economic relevance.

The session aims at summarizing the latest scientific achievements in ocean, continental and polar drilling, as well as technical advances in scientific drilling and innovations in the systematic evaluation of well-logging data.

30) ID 137

Lake Systems and Sediments: Linking Past Records, Present Processes, and Future Perspectives Under Ongoing Environmental and Climate Change

Roeser, Patricia* (1); Schwalb, Antje (2)
1: University of Bonn, Germany; 2: Technische Universität Braunschweig, Germany

Natural and artificial lakes are important freshwater resources, and their sediments provide information about the history of biodiversity as well as climate and human activities. These natural laboratories with well-defined boundary conditions provide key insights into the Earth System, integrating and preserving information from their hydro(geo)logical and atmospheric catchments. Lake-internal physical and (bio)geochemical processes respond sensitively to climate and changes in the environment, affecting water quality, and at the same time autochthonous and allochthonous sediments make excellent archives of environmental and human-induced changes from local to regional scales.

This session brings together a holistic view of lake systems, ranging from deciphering sedimentary archives to understanding how proxies are modulated by modern processes within a lake or its catchment, including extreme events. We welcome contributions dealing with (i) the reconstruction of environmental change and human impact based on lake sediments, from deep time to the more recent era; (ii) investigations of modern internal lake processes, including the carbon cycle; (iii) studies of hydrological interactions between lakes and their catchments, and how these processes affect sedimentation; (iv) the planned creation of artificial lakes, e.g., from mine pits, and aspects related to the changes these will impose on their environment, and the intricate relationship between water quality and sedimentation. The session is open to contributions based on different approaches, for example, inorganic, organic and/or multi-proxy studies, including sedDNA and emerging contaminants, as well as remote sensing and data-driven or modeling approaches to past and future water quality.

31) ID 132

Reconstructing past environmental and ecological dynamics with sedimentary proxies

Nettersheim, Benjamin* (1); Obreht, Igor (2); Wegerich, Niklas (1); Bauersachs, Thorsten (1)
1: Institute of Organic Biogeochemistry in Geo-Systems, RWTH Aachen University, Germany; 2: Institute of Geosciences, Johannes Gutenberg University Mainz, Germany

Earth´s history is a history of constant changes. Climatic warming and cooling, sea level rise and fall, flooding or desiccation of lakes and continental basins, and associated biological changes are all imprinted in the sedimentary record. Ecological change is further shaped by evolutionary inventions, extinctions and the invasion of new species. Understanding the

timing, drivers and consequences of climatic, environmental and ecological changes is essential for constraining and projecting future trajectories.

With this interdisciplinary session, we encourage contributions from organic and inorganic geochemistry, geo(micro)biology, sedimentology and (micro)paleontology that employ sedimentary proxies to reconstruct past environmental and ecosystem dynamics across a range of spatial and temporal scales. Contributions may encompass secular changes across different periods in Earth history, mass extinctions or local changes in lakes, marine basins or terrestrial environments, as well as high resolution climatic and paleo-ecological reconstructions. We also encourage contributions towards the development of new climatic and environmental proxies, as well as studies presenting novel methodologies and analytical, experimental, or integrative approaches in Earth system science.

32) ID 103

Stressors in Hydrogeology: Interactions and Impacts

Heinze, Thomas* (1); Göppert, Nadine (2); Licha, Tobias (1)
1: Ruhr-University Bochum, Germany; 2: FU Berlin, Germany

Groundwater systems are increasingly impacted by a complex interplay of natural and anthropogenic stressors, challenging their quality and quantity. Climate change, land-use shifts, agricultural intensification, industrial activities, and urbanization are altering groundwater recharge dynamics and introduce new classes of contaminants. On the other hand, the sustainable management of groundwater resources is challenged by overlapping uses, such as irrigation, drinking water production, shallow geothermal energy, and growing cooling water demand. These stressors often interact synergistically and amplify their impacts.

This session will explore the multifaceted interactions of stressors in hydrogeology. Topics of interest include the sources, transport mechanisms, and fate of contaminants in aquifers, in particular of emerging pollutants such as microplastics and pharmaceuticals; the effects of salinization and nutrient loading; variations in groundwater hydraulics; thermal alterations; and the role of natural hydrochemical and microbiological processes in modulating these impacts.

We aim to highlight innovative approaches for assessing, monitoring and mitigating these challenges, including modeling frameworks, geochemical analysis, strategic development, and integrated management applications. By emphasizing the interactions and cumulative impacts of stressors, we aim to advance the understanding and stewardship of groundwater resources in an era of escalating pressures.

33) ID 134

All about carbonates

Sturm, Elena* (1); King, Helen (2); Trepmann, Claudia (1); Jordan, Guntram (1)
1: Ludwig-Maximilians-Universität München, Germany; 2: Universität Bremen, Germany

This session aims to bring together research scientists to share and discuss the current state-of-the-art and the latest breakthroughs in the fields of (bio-)mineralogy, crystallography, geochemistry, microfabrics and geology of carbonate minerals and rocks.

These highly multi- and interdisciplinary fields encompass both the abiogenic and biogenic worlds, naturally including diverse of scientific communities. Consequently, the session will cover a broad range of topics, including the nucleation and growth of carbonate minerals, their deformation and transformation, the formation of amorphous carbonate phases, the reactivity of carbonates at the catchment scale, the global carbon cycle, geological CO2 sequestration and storage, sedimentological processes such as diagenesis, carbonatitic volcanology, biomineralization, bioinspired materials and technologies, the development and application of specific analytical techniques, methods of data analysis, as well as theoretical modeling and simulation.

34) ID 106

CO_2 Budget in Mining and Carbonate Reservoirs

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1: Research and Development Center, University of Sulaimani, Iraq; 2: Department of Geology, Faculty of Science, Palacký University Olomouc, Czech Republic

Mining is a major contributor to CO_2 emissions. However, these emissions can be mitigated by harnessing CO_2 in processes such as leaching, water treatment, and sequestration. Such approaches not only reduce emissions but also enhance resource recovery and improve waste management.

This session highlights field and laboratory-scale leaching experiments, the application of CO_2 in water treatment, and sustainable sequestration methods that stabilize CO_2 in mineral forms, utilizing mine tailings for both waste management and carbon capture.

In addition, the session welcomes research addressing the CO_2 budget in carbonate reservoirs. Sequestration in these reservoirs poses challenges due to geological complexities related to porosity and permeability. Yet, carbonate reservoirs are widespread globally and often located near major anthropogenic CO_2 sources, making them highly relevant for effective containment strategies.

35) ID 112

Carbon Sequestration and Storage – Developments in Research and Application

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With the new German carbon dioxide storage and transport law (KSpTG) that has come into force end of 2025, Germany is now prepared for applied CCS-solutions. This should provide a new momentum to ongoing research and discussions around CCS. For this dedicated session, we therefore invite oral presentations and posters related to research and applications around subsurface CO_2 storage. Topics can include but are not limited to CO_2-value-chain concepts, storage potential assessment and site characterization, storage safety, monitoring technologies, subsurface pressure management and potential environmental impact.

Since years we are receiving insights and new data from CCS-projects around the world. We now would like to shed some light on the status of growing knowledge, on ongoing and new developments in research and case studies. How are we dealing with the chances and challenges of CCS? Where and how can we safely apply it as a greenhouse gas emission reduction-tool, also in Germany?

To better understand and discuss these issues, contributions about other CO_2-reduction approaches are welcome also. There are diverse options and applications for geoscientific and technical solutions of carbon sequestration and storage. We would like to embrace a wide spectrum in this session to foster spread of knowledge and closer interaction between the different fields of research.

36) ID 127

Underground Geothermal Research Laboratories (URLs): Mineralogical and Petrological Frontiers on Crystalline Geothermal Systems

Deon, Fiorenza*; Kiri, Luca
Helmholtz Centre for Geosciences, GFZ, Potsdam, Germany

Underground Research Laboratories (URLs) offer exceptional opportunities to investigate crystalline rocks for geothermal utilization focusing on mineralogical and petrological features, geochemical processes controlling alteration and mineral transformations in subsurface environments.

This session focuses on mineralogical and petrological research related to underground geothermal laboratories in crystalline settings, emphasizing the role of minerals and rocks in governing the evolution, performance, utilization and sustainability of crystalline reservoirs.

Contributions addressing hydrothermal alteration, reaction pathways, mineral and textural in crystalline environments are welcome.

Contributions based on observations from underground geothermal laboratories, deep boreholes as well as studies combining field data with microanalytical techniques, experimental mineralogy and petrology, and thermodynamic or reactive transport modeling are welcome.

This session aims to highlight the fundamental processes in crystalline environments and the use of crystalline rocks for geothermal purposes along with the exchange between mineralogists, petrologists, and experts in applied geothermal science within the community.

Submissions may focus on the following topics:

Mineralogical and petrological characterization of geothermal reservoir crystalline rocks such as granite and granodiorite

Hydrothermal alteration at depth

Mineral reactions, phase equilibria, and reaction kinetics under geothermal conditions

Scaling, mineral precipitation, and dissolution processes in geothermal systems

Insights from underground geothermal and research laboratories

Experimental, analytical, and in-situ monitoring approaches

Implications for geothermal energy utilization and long-term reservoir evolution

37) ID 145

Geothermal energy for the heat transition

Röhling, Simone* (1); Nokar, Kim-Roya (2); Schäfer, Ingo (2)
1: Bundesanstalt für Geowissenschaften und Rohstoffe, Germany; 2: Geologischer Dienst NRW

Converting the heating sector, currently dominated by fossil fuels, to a climate-neutral heat supply is one of the most pressing issues of our time. Studies show that a heat transition is not possible without geothermal energy. The potential of this base-load-capable, climate-neutral renewable energy source is enormous, but in many places the use of medium- and deep-geothermal energy is still in its infancy. This is an area where geoscientists, among others, can make a significant contribution. In this session we will talk about current investigation methods and research in the field of medium-deep and deep geothermal energy, as well as ongoing and planned projects. We warmly invite contributions on geological, hydraulic and petrophysical characterisation of geothermal reservoirs, on thermal engineering and innovative geothermal utilisation methods along with examples of national

and international projects and case studies. Insights into thermal energy storages are also appreciated.

38) ID 136

Characterization of geothermal-reservoir rocks and rock masses

Reiss, Miriam (1); Duda, Mandy (2); Renner, Jörg* (2)
1: Johannes Gutenberg Universität Mainz; 2: Ruhr-Universität Bochum, Germany

We aim to bring together people who investigate cores from geothermal reservoirs or rock samples on any other grounds considered representative for deep reservoirs and people who study geothermal reservoirs or their analogues on field scale, be it by surface inspection, borehole measurements, or geophysical surveys targeted at related depths. On the one hand, we hope to foster exchange among and between the growing number of groups pursuing laboratory tests for physical property characterization and experts for analogue selection and characterization. On the other hand, we specifically hope to trigger an interdisciplinary discussion on the scale issues involved in relating sample properties, inlcuding microstruture, to rock-mass properties, their solution pivotal for significant interpretation of survey results and for setting up reservoir-scale numerical modelling. The call for abstracts is neither restrictive in the specific physical properties examined or exploited, nor the approach followed, be it descriptive, experimental, theoretical, or numerical. Contributions from all related fields welcome!

39) ID 130

Subsurface Thermal Systems for Renewable Energy: From Geothermal Production to Underground Thermal Energy Storage

Ahrens, Benedikt* (1,2); Reinsch, Thomas (2,3); Backers, Tobias (3); Nehler, Mathias (2)
1: Technische Hochschule Georg Agricola, Department of Geo-Resources and Process Engineering, Bochum, Germany; 2: Fraunhofer IEG, Fraunhofer Research Institution for Energy Infrastructures and Geotechnologies IEG, Bochum, Germany; 3: Ruhr-University Bochum, Institute of Geosciences, Faculty of Geography and Geosciences, Bochum, Germany

This session addresses the subsurface as a key component for renewable thermal energy, with two complementary but often separately developed system classes: geothermal energy provision and underground thermal energy storage (UTES). We focus on the thermal, hydraulic, and geomechanical processes that control heat extraction, heat injection, and long-term performance across scales, from pore to reservoir.

We invite contributions on deep and shallow geothermal energy systems, including resource assessment, reservoir characterization, stimulation and fluid circulation strategies, well and field performance, and monitoring of thermal breakthrough and induced responses. In

parallel, we welcome studies on UTES concepts such as aquifer thermal energy storage, borehole thermal energy storage, and cavern or mine-based storage, with emphasis on storage efficiency, thermal losses, operational strategies, and environmental constraints. Across both themes, contributions on coupled THM processes, heat and solute transport, reactive effects, and the role of heterogeneity and anisotropy are encouraged. Experimental, field-based, and modeling approaches are equally welcome.

40) ID 148

Underground Thermal Energy Storage Systems (UTES) Leveraging the Subsurface for Sustainable Heating and Cooling

Hahn, Florian*; Rolf, Tobias
Fraunhofer IEG, Germany

Underground Thermal Energy Storage (UTES) systems—such as Aquifer (ATES), Borehole (BTES), and Mine Thermal Energy Storage (MTES)—play an increasingly vital role in enabling low-carbon heating and cooling solutions. By storing excess heat or cold seasonally in suitable subsurface formations, UTES technologies help balance fluctuating renewable energy supply with year-round energy demand and contribute to climate-neutral energy systems.

This session invites contributions that advance scientific understanding, technological innovation, and practical deployment of UTES systems. We welcome studies on geological, hydrogeological, geochemical, and engineering aspects that influence storage performance and long-term system behavior. Interdisciplinary examples combining geoscience, energy engineering, and environmental monitoring are especially encouraged.

Topics of interest include characterization of subsurface properties, thermal-hydraulic-mechanical-chemical (THMC) processes, design and optimization of UTES systems, and integration with heat pumps or district energy networks. We also seek contributions on monitoring approaches—such as geophysics, distributed temperature sensing, and tracer tests—and assessments of environmental impacts including groundwater protection, thermal plumes, and geochemical evolution.

Real-world case studies from urban, industrial, or mining environments are highly welcome, including the use of flooded mines for thermal storage. Submissions focusing on regulatory frameworks, risk assessment, socio-economic evaluations, or strategies for scaling UTES technologies from pilot to commercial deployment are also encouraged.

This session aims to bring together researchers, industry experts, and policymakers to discuss opportunities and challenges in advancing UTES technologies for a sustainable and resilient energy future.

41) ID 131

Capture and use of Methane from abandoned municipal waste deposits

Otto, Frank* (1); Kanitz, Jürgen (2); Erdmann, Stefan (3); Rudek, Alexander (4); Forsting, Jürgen (5)
1: Technische Hochschule Georg Agricola (THGA), Germany; 2: GGT GbR, Bochum, Germany; 3: Stadt Bochum, Bochum, Germany; 4: Mull & Partner Group, Germany; 5: CDM Smith GmbH, Bochum, Germany

Only in Germany we expect about 1,000 abandoned municipal waste deposits. These sites were often former open-cast mines that were used for waste disposal after the end of raw material extraction, mainly in the 1960s and 1970s. They were closed in the 1980th and normally hidden below some soil. The waste still has a high organic content, which is metabolized into landfill gas by microbial degradation processes under oxygen exclusion. This gas mixture should have a content of about 60 vol.% Methane and 30 vol.% CO2, sucked from gas wells. If the volume flow is sufficient and the methane concentration is at least 40% by volume, the extracted gas can be used for energy recovery. Without sucking this gas, it will migrate into the atmosphere for some hundred years. With sucking and using this gas the process will be finished after 20 years. This will drastically reduce the site's ecological footprint.

If the extracted gas has a content of Methane less than 40%, normally there is a leakage in the system and atmospheric air is sucked. Depth-zonal measurements in an actively ventilated gas well allow the gas flow and gas composition to be examined across the depth. This method makes it possible to detect leaks and pneumatic short circuits. These sources of error can be sealed using a sealing method involving PU foam. As part of a pilot project in cooperation with the city of Bochum, the existing gas collection system at a site is to be optimized for energy use.

42) ID 140

Underground Storage and Natural Occurrences of Hydrogen: Fundamentals and Key Challenges

Hasch, Maximilian* (1); Cheng, Chaojie (2); Febbo, Maria Belen (3); Weisenberger, Tobias Bjorn (4); Ostertag-Henning, Christian (1); Gaus, Garri (5)
1: Federal Institution for Geoscience and Ressources (BGR), Germany; 2: Karlsruhe Institute of Technology (KIT), Germany; 3: Helmholtz Centre for Geoscience (GFZ), Germany; 4: Geology and Sustainable Mining Institute, University Mohammed VI Polytechnic (UM6P), Morocco; 5: Fraunhofer Research Institution for Energy Infrastructures and Geotechnologies (IEG), Germany

Hydrogen is increasingly recognized as a key component of the global energy transition, but its large-scale deployment depends on safe, efficient, and cost-effective supply and storage solutions. What can we contribute from the geoscience aspects? Underground hydrogen storage in porous media and caverns offers a promising method for storing (energy balancing

via green hydrogen storage), while naturally occurring geologic hydrogen represents an untapped resource with significant potential as a supply. Both underground storage and natural hydrogen resources present unique and shared scientific and engineering challenges. This session invites contributions that advance our understanding of the fundamental and applied aspects of subsurface hydrogen systems. Topics include, but are not limited to:

Physical and chemical processes governing hydrogen generation, consumption, migration, and trapping in porous media.

Reservoir and caprock integrity under operational hydrogen environments naturally and artificially.

Hydrogen-rock-brine interactions, microbial activities, and implications for long-term retention.

Exploration and characterization of natural hydrogen accumulation and geological signatures

Modeling and monitoring approaches for multiphase flow, reactive transport, and geophysical detection.

We encourage interdisciplinary studies combining reservoir engineering, geochemistry, microbiology, and geophysics. This session aims to foster dialogue on the challenges and opportunities of hydrogen in the subsurface, bridging fundamental science with practical implementation.

43) ID 128

Geosciences for the safe disposal of radioactive waste – site selection, long-term safety, host rock characterisation and analogue studies

Schütz, Felina* (1); Lang, Jörg (1); Liebscher, Axel (2); Richter, Lisa (1)
1: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Germany; 2: Bundesgesellschaft für Endlagerung mbH (BGE), Germany

The safe and permanent deep geological disposal of radioactive waste is a key societal challenge for the 21st century. Geological information such as lithology, tectono-structural characteristics, depth and extent of potential host-rock formations and the characterisation of the disposal systems rock properties (e.g. composition, structure, mechanical strength, thermal conductivity, sorption capacity, diffusion characteristics, etc.) are crucial for the site-selection process and serve as valuable input parameters for subsurface models and numerical simulations regarding the long-term integrity of a potential repository.

As safe disposal of radioactive waste requires an interdisciplinary approach and a broad spectrum of geoscientific disciplines and knowledge, we welcome in this session contributions from all geoscientific fields. Studies may address the properties and processes relevant to the site-selection process and the long-term safety of deep geological radioactive

waste repositories and include geological and geophysical field studies, in-situ and laboratory investigations of potential host rocks, studies on radionuclide mobilisation, migration and retention, numerical simulations (multiphysics, coupled) of repository systems and their potential future evolutions, as well as analogue studies.

44) ID 135

Integrative Research on the Earth System and Societies

Zeeden, Christian* (1); Gerten, Dieter (2); Vinnepand, Mathias (3)
1: LIAG-Institut für Angewandte Geophysik; 2: Potsdam Institute for Climate Impact Research (PIK); 3: Universität Freiburg

The ongoing and rapid change of the Earth system is attributable to pressures of human societies including the emission of greenhouse gases or the degradation of ecosystems. In response, research activities in the Earth, environmental and social sciences have expanded in the past decades, improving our understanding of the Earth system's and subsequent societal responses to the anthropogenic pressures.

However, the interplay of multiple biogeophysical and societal processes requires a deeper integration of the different research strands, ideally combined with a focus on sustainability transformations. This session will reflect on critical gaps in current research on the human footprint on the Earth system, and explore the potentials of a more explicit integrative and transformative research on Earth and societies. We invite contributions that the geoscientific community can make to such a research agenda, preferably together with other disciplines, and with a large-scale (global) perspective.

45) ID 107

Europe's Critical Raw Materials Act - Perspectives and challenges on domestic production and exploration

Wittenberg, Antje* (1); Masurenko, Chris (2)
1: Federal Institute for Geosciences and Natural Resources (BGR), Germany; 2: ECTerra

Strengthening Europe´s raw material resilience, for example by sourcing critical and strategically important raw materials from domestic sources, is the aim of the Critical Raw Materials Act (CRMA, Regulation (EU) 2024/1252). Several Strategic Projects are currently underway and are expected to be in production by 2030. At the same time, national exploration programs are focused on general exploration while the bridging link between general exploration and mining done by target exploration is so far not issued by the CRMA.

This session addresses the experiences related to geological, technical, and societal challenges associated with Strategic Projects, the national exploration programmes (NEP)

and other exploration activities complement by experiences gained on non-critical raw materials of domestic importance. Contributions aiming to provide new ways to explore, extract and process primary raw materials (e.g. German research programme EGARoh) are very welcome as well as contributions from researchers, government representatives, industry and critical observers of the sector involved in activities in these areas. Contributions discussing the importance of communication in all phases of exploration and project development are welcome, including those that have gained experience with the United Nations Framework Classification for Resources (UNFC). We believe the exchange of experiences and the lively discussions in this session will be a benefit for the conference and above.

46) ID 146

Museums as windows into research

Ifrim, Christina*
Staatliche Naturwissenschftliche Sammlungen Bayerns, Germany

Science communication is more important than ever. Natural history museums are a good platform particularly for the communication of geoscientific topics. This session is dedicated to the presentation of projects and concepts with direct insight into research. It is meant to provide an overview over existing approaches and iniciate the interchange of ideas. Everybody from scientists to museum educators is invite to present projects in and from their museum.

47) ID 149

From Collection to Display: Curating and Communicating Geological and Mineralogical Collections

Kleinschrot, Dorothée* (1); Kehrer, Christin (2); Bussweiler, Yannick (3); Kreher-Hartmann, Birgit (4); Müller, Sebastian (5)
1: Mineralogisches Museum, Universität Würzburg, Germany; 2: Geosammlungen TU Freiberg, Germany; 3: Geomuseum, Universität Köln, Germany; 4: Mineralogische Sammlung, Universität Jena, Germany; 5: Mineralogisches Museum, Universität Marburg, Germany

University collections and museums for mineralogy and geosciences play a central role as knowledge repositories. They preserve both material and immaterial testimonies of the history of science and collecting, ensuring the long-term availability of objects with scientific, cultural, and historical relevance. As archives of sites that are often no longer accessible, they form an indispensable basis for current and future research questions.

For researchers, these collections offer unique reference specimens, while enabling students to engage in research-based learning using original specimens.

Beyond this, university museums and collections play a central role in science communication, offering schools and the public access to geoscientific knowledge. Through exhibitions, educational programs, and a wide range of science outreach initiatives, they enhance public understanding of geoscientific topics while promoting cultural education.

This session is dedicated to the diverse tasks, potential, and current challenges of geoscientific collections and offers a forum for interdisciplinary exchange between collection and curating practice, research, teaching, and science communication.

48) ID 143

Significance and Future of Data Infrastructures for the Geochemical Research Community

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1: Uni Göttingen, GZG, Abt. Geochemie und Isotopengeologie, Germany; 2: GFZ Data Services, GFZ Potsdam, Germany

Compositional data on rocks and minerals in compiled data sets and/or data bases become increasingly available. Harvesting the value of these data products requires access, reusability and reproducibility of these data as the basis of new and exciting research in Earth System Science. Only large, curated and quality-controlled geochemical data products will facilitate modern data analytics and machine learning techniques in geochemistry.

For this session we seek contributions from three data-related topics and invite contributions that...

(1) use large geochemical data for their research, education, environmental studies, and in the mineral industry,

(2) present novel applications and new data analysis tools, and

(3) report on the needs and requirements to maintain and develop geochemical data products and services for future research

49) ID 141

From Sample to Paper: Making Research Outputs Visible, Citable and Sustainable

Lorenz, Melanie* (1); Elger, Kirsten (1); Heyer, Karl (2); Semmler, Malte (2)
1: GFZ Helmholtz Centre for Geosciences, Germany; 2: Goettingen State and University Library, Germany

Open Science encompasses more than just publishing your papers in open access; it involves sharing all your scientific results, including samples, data, and software, ensuring they are

interconnected. This workshop, offered by FID GEO (the Geosciences Information Service) and GFZ Data Services (a geosciences domain repository), provides a practical introduction to publishing research outputs in a transparent, reusable and sustainable manner. You will also learn about the important role of domain repositories as partners to researchers.

ORCID is a key starting point as it provides researchers with a unique and persistent identifier. Adding your ORCID to all your publications guarantees consistent attribution of all your research outputs.

On a practical level, the workshop focuses on the structured description and publication of metadata for physical samples, the documentation and publication of research data and research software. Particular attention is given to linking and citing all research outputs and integrating them into traditional scientific publications.

In addition, the workshop introduces the key legal and organizational aspects of Open Science publishing. These include the sensible use of Creative Commons licenses and the various routes to Open Access (gold, green, diamond). It also addresses common uncertainties: What must be open? What can be open? How can openness be reconciled with scientific reputation, funding conditions, and institutional requirements?

The workshop is aimed at early-career scientists looking to develop sound publication practices from the outset, as well as senior researchers seeking to expand or update their existing workflows.

50) ID 142

What do we Know About Learning and Teaching geosciences? - Geoscience Education Research and Outreach

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Schools should enable young people to make informed decisions regarding sustainable development of planet Earth. However, German geoscientists and geoscience institutions have repeatedly expressed their concern about the lack of basic geoscience knowledge among the general public and the limited geoscience school education. This is disturbing, because an in depth understanding about the functioning of the Earth as a system, e.g. the development of natural resources or the climate, is an essential prerequisite. Research into teaching and learning has shown that problem solving is not possible without knowledge of the subject matter (Weinert, 2014).

Invited are researchers that have been involved in geoscience school education and teacher training, also as part of geography, biology, chemistry, physics education to present and discuss their findings. With this session we aim to illustrate the field of geoscience education research (“fachdidaktische Forschung” in German). We are looking forward to learn for example about prerequisites of the learners and teachers (e.g. their interests, their conceptions, their competencies), the effects of geoscientific learning environments on the cognitive, social, motivational development of the learners, the analysis of alternative teaching concepts or assessments on the situation of geoscience education in various nations.

Furthermore reports on best practice outreach approaches are welcome.

References Weinert, F. E. (Ed.). (2014). Leistungsmessungen in Schulen (3. Aufl.). Beltz.

51) ID 111

WORKSHOP I Would you like to know more about how your teaching is impacting your students? Are you looking for evidence of success in your out-of-classroom programs? Join us for this introduction to empirical geoscience education research and evaluation

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This workshop will introduce participants to existing surveys that can be used "off-the-shelf" to examine student learning and other factors such as science interest, identity, and belonging.

The target audience for this workshop is any instructor seeking to begin or strengthen their research and/or evaluation in their geoscience course or program. Participants may be experienced researchers in other aspects of the geosciences, school teachers, and geoscientists working in outreach who have previously given little thought to education research.

Conducting research in your geoscience course can help enhance future student learning and performance. The results can also be published in journals that feature the scholarship of geoscience education and exemplary teaching and learning resources. This workshop will feature on existing concept inventories and other survey types for geoscience education research and describe suitable analytical methods for interpreting the data.

We anticipate that participants teaching similar courses or at similar types of institutions may find value in working collaboratively.

Goals

As a result of participation in the workshop, participants will be able to outline some basic steps to investigate a geoscience education research question in one of their classes or programs and understand how to analyze their research findings.

Interested in the workshop? Email kontakt@sylke-hlawatsch.de

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Open Topic