

Geo4Göttingen: Topics / Themes / Sessions

01 Earth and beyond

ID: 103

01.01 Multidisciplinary perspectives on solar system formation and evolution

Jan L. Hellmann, Timo Hopp

Max Planck Institute for Solar System Research, Germany

This session invites contributions that explore the formation and evolution of the solar system and the terrestrial planets using geo-/cosmochemical, mineralogical, and experimental investigations on meteorites and planetary materials as well as geophysical and dynamical modelling.

Our goal is to advance the understanding of the timescales and processes that shaped the solar system and the terrestrial planets by fostering interdisciplinary dialogue. Topics of particular interest include the dynamical evolution of the protoplanetary disk, the origin and transport of solar system materials within the disk, the formation and evolution of planetesimals and their components, planetary accretion, and planetary differentiation. We welcome research from diverse disciplines that addresses these key aspects.

ID: 104

01.02 Anthropogenic geomorphology

Georg Stauch¹, Felix Henselowsky²

¹University of Würzburg, Germany; ²Mainz University, Germany

Humans have been exerting a significant influence on the landscape for thousands of years. Since the beginning of industrialization, and especially since the mid-20th century, this influence has intensified globally. In the Anthropocene, humans have become the dominant factor for landscape changes. This session explores the multifaceted ways in which anthropogenic actions alter geomorphic processes and landforms. Urbanization, deforestation, mining, and agricultural practices significantly modify erosion rates, sediment transport, and river dynamics. Deforestation accelerates soil degradation and sediment yield, while mining activities create extensive landform changes and pollution. Agricultural practices, including terracing and irrigation, reshape landscapes and influence sediment deposition patterns.

The session will present case studies from diverse geographical regions, highlighting the variability and extent of human-induced geomorphic changes. Recent advancements in high-resolution Digital Elevation Models (DEMs) and remote sensing datasets provide unprecedented detail and accuracy in monitoring and analysing these changes. These new methods enable more precise quantification of geomorphic processes and better inform sustainable land management practices. By examining both historical and contemporary examples, the session will provide a comprehensive overview of the current state of knowledge and identify future research directions.

We welcome contributions dealing with anthropogenic landforms across all timescales. Topics can include quantitative or qualitative description of these landforms, or their influence on recent and past geomorphological processes. We especially welcome topics which highlight the influence on anthropogenic changes in the frame of a rapid changing climate. Contributions from young researchers and projects in an early stage are especially welcome.

ID: 107

01.03 Chaotic rocks - characteristics, formation and geodynamic significance

Carl-Heinz Gerd Friedel¹, Ali Abdelkhalek², Bernd Leiss², Maren Zweig³

¹Leipzig, Germany; ²Universität Göttingen, Abteilung Strukturgeologie und Geothermik, Germany; ³Dresden, Germany

Session Keynote: Ph D. Professor Andrea Festa (Italy)

For Geo4Göttingen2025, we propose including the topic 'Chaotic rocks - characteristics, formation and geodynamic significance' in the conference programme. The reason for emphasising this topic is, on the one hand, the widespread distribution of these geological structures in the neighbouring Harz Mountains and, on the other, the ongoing discourse on their formation.

We invite contributions on all types of chaotic rocks (mélanges, broken formations) and related sedimentary, tectonic and diapiric processes. This topic can be organised as part of sessions on 'Geodynamics' and related topics under the main theme Earth and beyond.

ID: 108

01.04 Latest Achievements in Scientific Ocean and Continental Drilling

Frank Wiese¹, Alexa Fischer², Katja Heeschen³, Henrik Grob⁴

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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 (e.g., landslides, earthquakes, volcanic eruptions) as well as the nature of georesources or the deep biosphere.

The session aims at summarizing the latest scientific achievements in ocean, continental and polar drilling and discuss also their socio-economic relevance. Of further interest are technical advances in scientific drilling and innovations in the systematic evaluation of well-logging data.

ID: 123

01.05 From mantle to crust: following melt and fluid evolution from source through the lithosphere

Carsten Jentzsch¹, Josua Pakulla²

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Session Keynote: Dr. Melanie Sieber (University of Potsdam)

Igneous rocks not only provide crucial insights into the heterogeneity of Earth's mantle, but also record the interplay of magmatic processes (melting, magma mixing, fractional crystallization, assimilation and metasomatism) as melt rises through the lithosphere. Subduction and plume activity are key drivers of mantle heterogeneity and the formation of the subcontinental lithospheric mantle. To better understand the processes that control the chemical composition of igneous rocks, this session focuses on integrated geochemical and petrological studies of mantle sources and wall-rock interactions. By focusing on how these processes are constrained by physicochemical properties derived from experimental studies and thermodynamic modelling, this session aims to provide a comprehensive perspective on the geodynamic contexts that shape igneous rocks.

We invite contributions that combine petrographic observations, major and trace element data, isotopic analyses, modelling, and laboratory experiments addressing (1) the processes and sources that form mantle heterogeneities, (2) the tracing of recycled material in primitive igneous rocks, (3) the deciphering of wall-rock interactions during magma ascent, and (4) the role of fluid saturation in fluid-melt immiscibility in both the mantle and the crust. By bringing together different perspectives and case studies, this session aims to broaden our understanding of magma evolution, its interactions with its surrounding rocks, and the broader geodynamic context recorded in the Earth's igneous record.

ID: 128

01.06 Tectonic Systems - TSK Open Session

Armin Dielforder¹, Philipp Balling², Michael Stipp³

¹Leibniz Universität Hannover, Germany; ²Friedrich-Schiller-Universität Jena, Germany; ³Martin-Luther-Universität Halle, Germany

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.

ID: 130

01.07 Stratigraphy in Earth System Science: methods, applications and case studies

Ralph Thomas Becker¹, Christina Ifrim², Mandy Zieger-Hofmann³

¹Universität Münster; ²Staatliche Naturwissenschaftliche Sammlungen Bayerns, Jura Museum, Eichstätt; ³Senckenberg Naturhistorische Sammlungen, Dresden

Session Keynote: Nina Wichern (Münster University)

Stratigraphy is an essential discipline within Earth System Sciences that enables to reconstruct the timing, duration, and succession of geological and palaeoenvironmental processes. Increasingly higher precision in relative and numeric dating are more and more combined with biogeochemistry, evolutionary change, planetary dynamics, orbital cycles, palaeoceanography, and mantle/crustal processes in order to reach a better understanding of the dynamics of a broad range of processes in the history of Earth. Stratigraphy also provides crucial contributions to solve applied geoscientific challenges, such as the exploration of resources, geothermal research, carbon capture and storage and other areas in economic geology. The Deutsche Stratigraphische Kommission (DSK; German Stratigraphic Commission) conveys this section and invites contributions from all fields of stratigraphy, whether be it biostratigraphy, lithostratigraphy, geochronology, chemostratigraphy, cyclostratigraphy, magnetostratigraphy, sequence stratigraphy, geochronology, or quantitative stratigraphy, and its interdisciplinary applications. We especially encourage young researchers to submit contributions.

ID: 147

01.08 Applications and Advancements in Sedimentary Provenance Analysis

Maximilian Dröllner¹, Jan Schönig¹, Paula Castillo²

¹Department of Sedimentology and Environmental Geology, Geoscience Center Göttingen, University of Göttingen, Germany; ²Institut für Geologie und Paläontologie, University of Münster, Germany

Session Keynote: Inês Pereira (University of Coimbra)

Sediments archive the geological and environmental conditions of past landscapes on our planet. Sedimentary provenance analysis seeks a holistic reconstruction of sediment generation, encompassing the formation conditions of minerals in source areas, their physical and chemical modifications during erosion, transport, deposition, and diagenesis, as well as their preservation in the sedimentary record.

This session invites contributions that utilize the detrital sedimentary record from the present day to the Archean to explore the interplay between tectonic, climatic, and surface processes, highlighting the potential of provenance studies to uncover insights into Earth's geodynamic evolution, paleogeography, and sedimentary systems. Submissions are encouraged from studies that leverage information recorded in single grains or bulk sediment compositions, employing classical approaches, novel analytical techniques, or combinations thereof. We welcome case studies as well as research presenting methodological advancements, including (but not limited to) innovations in geo- and thermochronology, automated mineralogy, multivariate discrimination of detrital grains, and the integration of statistical and machine-learning approaches for large, multi-proxy datasets. Contributions from early- and mid-career researchers, as well as interdisciplinary collaborations, are particularly encouraged.

ID: 159

01.09 HEATin'EUROPE during the Carboniferous and Permian: causes and effects

Wolfgang Franke, Bernd Leiss, Klaus Wemmer, Michael Tatzel

Universität Göttingen, Germany

Session Keynote: Shail, Robin (University of Exeter, Camborne School of Mines)

An ever growing amount of evidence reveals that HT magmatic and metamorphic events in the crust of Europe do not fit with the timing of subduction/collision in the Variscides, as it is recorded by the progradation of flysch sediments, tectonic deformation and metamorphism in the individual orogenic zones. U-Pb and K/Ar data on granulites, granitoids and slaty cleavage and also by high syn-diagenetic temperatures in palaeontologically dated radiolarian cherts show age clusters ranging between ca. 360 and 275 Ma. These clusters occur in all Variscan orogenic belts, but also in the Midland Valley of Scotland, where they are represented by pulses of basaltic volcanism. Clusters occur within tectonic zones of limited extent such as metamorphic domes or shear zones, which partly cut across sutures. In several areas, thermal events pre-date the end of marine sedimentation. These observations strongly suggest that the notoriously "hot" Variscan orogeny is strongly influenced by mantle plumes. We invite contributions on the thermal history of the European basement from the T-regime during diagenesis to syn- and post-orogenic thermal events.

ID: 152

01.10 The co-evolution of the Earth and life from the early Archean until today

Ariuntsetseg Ganbat¹, Dominik Sorger¹, Manuel Reinhardt¹, Sebastian Viehmann², Christine Heim³

¹University of Göttingen, Germany; ²Leibniz Universität Hannover, Institut für Erdsystemwissenschaften, Deutschland; ³Universität zu Köln, Institut für Geologie und Mineralogie, Deutschland

The geodynamic evolution of the Earth and its interaction with the atmosphere-hydrosphere systems through ca. 4.5 billion years of Earth's history created variable environmental conditions that provided habitats for life. Understanding the processes that governed the transformation into a habitable world from the formation of the lithosphere to the emergence of life is key to reconstructing planetary evolution and long-term habitability. The physico-chemical conditions prevailing in paleoenvironments, the timing of environmental changes, and the impact of Earth's landmasses and mantle in combination with its debated geodynamic evolution on the chemical composition of the oceans and atmosphere are, however, still incompletely understood.

With this session, we encourage contributions from the interdisciplinary fields of geochemistry, petrography, geophysics, structural geology, geodynamics, oceanography, sedimentology, mineralogy, and geo(micro)biology to understand the co-evolution of the dynamic Earth and its interactions with aquatic and sedimentary environments through deep time. We bridge the gap between lithospheric formation, the role of metamorphic processes in shaping the early crust, the onset of plate tectonics, and low-temperature processes such as surface weathering, hydrothermal alteration of the oceanic crust, microbial activity, sedimentation, and diagenesis. Moreover, the chemical evolution of the ancient oceans and atmosphere will be set in relationship with the contemporaneous magmatic evolution of the co-existing continental crust-mantle processes. This includes the reconstruction of magmatic processes, redox changes, the cycling of elements and their isotopes during high- and low-temperature processes, or the evolution of microbial habitats during critical intervals of environmental and climatic changes. Comparative studies with other terrestrial planets are also welcome to provide a broader planetary perspective on Earth's evolution.

ID: 118

01.11 Micropalaeontology—Advancements and Perspectives in Multiproxy Studies

Ella Quante^{1,2}, Peter Frenzel¹, Anna Pint¹

¹Friedrich Schiller University Jena, Germany; ²Max Planck Institute of Geoanthropology, Jena, Germany

The application of microfossils is since a long time not confined to the field of classical micropalaeontology anymore, but also evolving as integrated tools in multiproxy studies, within e.g., Quaternary Geology, Physical Geography, palaeoceanography, palaeoclimatology and geoarchaeology. Microfossil assemblage compositions, morphological variations, and shell chemistry allow various palaeoenvironmental and palaeoecological reconstructions in aquatic or terrestrial environments, and their biostratigraphical ranges are extremely valuable when correlating and assigning relative ages to strata. The small size of microfossils and their high diversity enable studying large associations, often with well preserved and complete individuals even from small samples as typical from sediment cores. However, e.g., preservation-issues, or sampling- and observer-bias may lead to inaccurate interpretations, and complicate the development and evolution of micropalaeontological proxies as integrated applications.

In this session, we welcome multiproxy studies using micropalaeontological applications, as well as classical micropalaeontological studies within geology, palaeobiology, and conservation palaeobiology. With this, the aim is to explore state-of-the-art advancements, arising difficulties, and further options of microfossils as tools in interdisciplinary projects.

ID: 127

01.12 Coastal dynamics in different timescales: from seconds to millennia

Lisa Feist¹, Cristina Val-Peón², Piero Bellanova³, Dominik Brill⁴

¹Geographisches Institut, Abteilung Physische Geographie - Landscape Geoscience, Georg-August-Universität Göttingen; ²Institute of Organic Biochemistry in Geo-Systems, RWTH Aachen University; ³Institute of Neotectonics and Natural Hazards, RWTH Aachen University; ⁴Cologne Luminescence Lab, Geographisches Institut, Universität zu Köln

Session Keynote: Dr. Armand Hernández (Universidade da Coruña, GRICA Group, Centro Interdisciplinar de Química e Bioloxía (CICA), A Coruña (Spain))

Coastal environments hold a strategic environmental and socioeconomic value, hosting a large and growing proportion of the global population. As highly dynamic systems, they are shaped by complex interactions between geological, oceanographic, and climatic processes operating across diverse timescales. From the rapid shoreline modifications caused by high-energy events like storms and tsunamis, to the long-term impact of sea-level rise, tectonic activity, and climate change, coastal systems are constantly evolving. Human activities, such as coastal development, fisheries, and tourism, further influence these dynamics, making it essential to understand the complex human-environment relationships in coastal areas.

This session invites contributions that explore the evolution and transformations of coastal environments across diverse biogeographical areas and chronological periods. We encourage interdisciplinary research approaches that investigate, reconstruct, and model coastal processes, emphasizing the interplay between natural (e.g., waves, tides, currents, sea-level change, sediment availability) and anthropogenic drivers. We particularly welcome contributions from Early Career Researchers, who can present fresh perspectives and bring innovative research ideas and technologies to the field (e.g., interdisciplinary approaches including biomolecular studies, modelling, archaeometry, paleontology, geochemistry, etc.). As global coastlines are facing significant challenges due to ongoing climate change and growing human pressure on ecosystems, this session serves as a timely and essential platform to share knowledge, discuss challenges, and explore innovative solutions for understanding and preserving our dynamic coastal environments.

ID: 153

01.13 Sedimentary basins as multi-proxy and multi-process recorders

Katharina Methner¹, Nevena (Andrić-)Tomašević², Domenico Ravidà³, Stefanie Tofelde⁴

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Sedimentary basins are exceptional archives of Earth's geological and environmental history, offering unique opportunities to study feedback mechanisms between tectonics, climate, Biosphere dynamics and surface processes. Formed through subsidence and sediment accumulation, sedimentary basins preserve records of crustal- to lithospheric-scale deformation, erosion, deposition, regional and global climatic changes, faunal and floral evolution and dispersal, and landscape transformation. Moreover, sedimentary basins are key targets for exploring and exploiting natural resources such as groundwater and critical minerals while also serving as potential sites for geothermal energy extraction, carbon sequestration and underground hydrogen storage. Finally, they preserve archaeological evidence of past human activities and ecological histories.

Here, we encourage contributions that employ multi-disciplinary approaches to decode basin sedimentary successions and dynamics, aiming to retrieve insights into (1) the evolution of depositional environments e.g. under changing climates or tectonic settings and (2) the interactions among the biosphere, hydrosphere, atmosphere and geosphere across various temporal and spatial scales.

The session invites contributions presenting applied, theoretical or modelling approaches that rely on sedimentological and structural analyses along with geochemical, geophysical, mineralogical, and/or paleontological tools. We welcome studies based on field observations, subsurface investigations, proxy reconstructions, as well as physical and numerical modelling that take a holistic approach to understanding the evolution of marine and terrestrial sedimentary basins as archives of Earth's history and resources.

ID: 112

01.14 „Geomorphology and sedimentology beyond boundaries“ – towards integrating geomorphology and sedimentary system science

Bastian Grimm¹, Anne Bernhardt², Laura Stutenbecker³, Stefanie Tofelde²

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Session Keynote: Prof. Dr. Kevin Norton (Universität Tübingen)

The shape of landscapes is the result of topography-building processes such as tectonic uplift and topography-reducing processes due to erosion and weathering processes, which are largely driven by climate conditions. The sedimentary products of erosional processes in mountain areas get transported via sediment routing systems towards depositional sinks. Information on past landscape adjustments, and hence past tectonic and climatic conditions, is thus stored in two types of 'archives': (1) in landscape morphologies and (2) in their sedimentary deposits.

Following this dynamic interplay between geomorphology and sedimentology, the session aims to bridge the gap between these two fields, fostering collaboration and dialogue among scientists who investigate the physical and chemical processes governing landforms and sedimentary systems.

We invite contributions that explore the integration of geomorphological and sedimentological frameworks, emphasizing novel methodologies, data- or model-driven approaches, and case studies that illustrate the synergy between these disciplines. By examining the interactions between landform evolution and sedimentary processes across a range of environments – ranging from river systems and coastal zones to arid landscapes and glacial settings – we seek to illuminate the multifaceted nature of sediment transport, deposition, and landscape evolution.

Our goal is to create an engaging platform for researchers to share their findings and discuss theoretical advancements, fieldwork challenges, and experimental studies that highlight the importance of interdisciplinary collaboration. Together, we hope to inspire innovative research approaches and promote a more cohesive understanding of sedimentary systems and geomorphic processes.

ID: 149

01.15 Taping records of environmental and climatic changes throughout the Quaternary

Nils Keno Lünsdorf¹, Mathias Vinneband², Felix Martin Hofmann³, Markus Fuchs⁴, Frank Lehmkuhl⁵

¹Georg-August University Göttingen, Department of Sedimentology and Environmental Geology, Göttingen, Germany; ²Université de Rennes, Géosciences Rennes, Département Dynamiques Continentale et Environnementale, Rennes, France; ³University of Freiburg, Institute of Earth and Environmental Sciences, Freiburg, Germany; ⁴Justus Liebig University Giessen, Department of Geography, Giessen, Germany; ⁵RWTH Aachen University, Department of Geography, Aachen, Germany

Session Keynote: Prof. Dr. Melanie Kranz-Bartz (Chair for Geomorphology and Geohazards, Ruhr-University Bochum, Institute for Geology, Mineralogy and Geophysics) "Dating of Quaternary archives"

The Quaternary with its strong cooling trend and the fundamental change from a 40 ka to a 100 ka glacial-interglacial cycle world (Mid-Pleistocene transition), spawned a considerable diversity of climatic- and environmental records. Especially archives of the last glacial-interglacial cycle can be of particularly high temporal resolution (i.e. lake sediments, loess-paleosol-sequences (LPS), speleothems, peat, etc.). Accessing and correlating these high-resolution archives in space and time allows reconstructing rates in paleoenvironmental change and documenting related processes at climatological relevant timescales.

Detecting signal of environmental change on such high temporal resolution (i.e. centennial to millennial timescales) requires very dense sampling and is challenging for analysis. In order to correlate such archives, robust age models are of prime importance. Thus, we welcome contributions that (1) introduce novel approaches in Quaternary geochronology or refinements of established geochronometric methods, that (2) aim to account for analytical challenges, and that (3) specifically seek to connect Quaternary archives in order to achieve a more holistic perspective relative to considerations of single archives.

ID: 158

01.16 Integrated stratigraphy as an approach to constrain timing of environmental changes throughout Earth's history

Arne Ulfers¹, David De Vleeschouwer²

¹LIAG Institute for Applied Geophysics, Germany; ²Institute of Geology and Paleontology, University of Münster

In Earth's history, significant changes in global climate, disruptions of biogeochemical cycles, and mass extinctions have occurred repeatedly. Understanding these events within their stratigraphic context and to constrain their timing, requires an integrated approach that encompasses various stratigraphic domains.

In this session, we invite contributions from fields such as lithostratigraphy, magnetostratigraphy, astrochronology, and chronostratigraphy. These contributions should provide evidence for different events in Earth's history across geologic time, whether of global relevance or as case studies of regional events placed in a wider context. Furthermore, we address new methods to correlate stratigraphic units and to improve the spatial and temporal assessment of environmental changes.

ID: 142

01.17 Understanding Magmatic Systems: From Mush to Magma and Beyond

Maren Kahl¹, Felix Marxer², Martin Oeser-Rabe²

¹Ruhr-Universität Bochum, Germany; ²Leibniz Universität Hannover, Germany

Session Keynote: Alberto Caracciolo (University of Perugia, Italy/ University of Iceland, Iceland)

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 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 time scales 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 that combine field observations, high-resolution geochemical data, thermodynamic and numerical modelling, diffusion chronometry, machine learning, and experimental petrology to shed light on magma storage, mixing, crystallisation, volatile dynamics and timescales of these processes. Studies that integrate multidisciplinary approaches or develop new tools for understanding the temporal and spatial evolution of transcrustal magmatic systems are especially welcome.

This session seeks to foster discussion on the dynamics of magma reservoirs, the critical timescales and processes governing magma accumulation and transfer, and the eruption-triggering mechanisms that can operate even during volcanic dormancy.

ID: 144

01.18 Regional Geology – the wider Göttingen area, Germany and beyond

Alena Broge¹, Alexander Malz², Guido Meinhold³, Jasmaria Wojatschke⁴, Robert Schöner⁵

¹University of Göttingen, Germany; ²Landesamt für Geologie und Bergwesen Sachsen-Anhalt; ³TU Bergakademie Freiberg; ⁴Bundesanstalt für Geowissenschaften und Rohstoffe; ⁵Landesamt für Bergbau, Energie und Geologie (LBEG), Germany

Session Keynote: Carita Augustsson; University of Stavanger (Universitetet i Stavanger), Norway

Despite centuries of geological investigation, the geological knowledge of Germany keeps evolving. New methods foster many advances and new ideas. E.g., 3D models replace maps as the basic sources of geological information. Isotopic age dating is becoming faster, cheaper and available for new minerals and processes. Thermochronology allows to estimate eroded thicknesses and date their removal while geochemical and isotopic whole-rock and in situ mineral studies constrain provenance and sediment dispersal. 3D reflection seismics and digital elevation models image the subsurface and landforms at high resolution and are made available by new legal regulations. New tasks including the site search for a radioactive waste repository or exploration for geothermal energy have revived interest in regional and local geology.

We invite contributions on all aspects of Germany's geology. Studies presented need not be restricted to the German territory, but any topic connected to or bearing on the geology of Germany is welcome. One prospective focus is the wider area around the conference venue. This region at the southern edge of the Central European basin system has undergone a varied basin evolution since the Rotliegend. We look forward to contributions addressing the complex interplay of deposition, erosion and multiple tectonic overprinting through advances in stratigraphy, sedimentary geology and structural evolution. Regional geological jigsaw pieces investigated by different methodological approaches (e.g. field studies, modelling, GIS & remote sensing) will be presented and discussed. We encourage students to present results from their mapping or student research projects.

ID: 160

01.19 Diagenetic Fingerprints in Energy Transition: Understanding Reservoir Evolution for Multiple Resource Application

Luca Caracciolo¹, Linda Bonnell², Robert Lander², William Heins³

¹Friedrich-Alexander Universität Erlangen-Nürnberg, Germany; ²Geocosm Lcc, CO, USA; ³Getech plc, UK

Session Keynote: Dr. Per Asveth (Norwegian University of Science and Technology (NTNU), Oslo, Norway)

Subsurface sandstone reservoirs serve multiple critical functions in the energy transition: as sources of hydrocarbons, geothermal heat, and lithium, while offering storage potential for captured carbon, generated hydrogen, and compressed air. Regardless of the fluid type or flow direction, the porosity and permeability structure of these reservoirs fundamentally controls the success of future energy and climate change mitigation developments.

Understanding and predicting spatial distributions of porosity and permeability in sparsely sampled subsurface volumes is therefore essential. The initial reservoir properties are controlled by source rock lithology, sediment production and transport processes, grain breakdown, and hydrodynamic sorting. These depositional characteristics form the template for subsequent modifications through diagenesis and structural deformation. While diagenesis and faulting can reduce permeability by orders of magnitude, fracturing may enhance it by creating interconnected flow networks. The nature and magnitude of these modifications are intrinsically linked to both depositional characteristics and burial histories.

This session welcomes contributions that advance our understanding of coupled depositional-diagenetic-structural processes and their impact on reservoir properties. We encourage submissions exploring innovative prediction approaches, diagenetic processes, structural-diagenetic interactions, and practical applications for sustainable energy development. Contributions may include field studies, experimental work, numerical modeling, and theoretical frameworks.

Progress in these topics will directly support the successful implementation of subsurface solutions for a sustainable energy future.

ID: 163

01.20 Process oriented microfabric characterisation of geomaterials

Rebecca Kuehn¹, Anna Rogowitz², Rüdiger Kilian¹, Bernd Leiss³

¹MLU Halle, Germany; ²University of Innsbruck, Austria; ³University of Göttingen, Germany

Session Keynote: Ismay Venice Akker (Dipartimento di Geoscienze, University of Padua, Italy)

Microstructures and crystallographic preferred orientations (CPO) in geomaterials can be used to identify, interpret and quantify deformation, metamorphic, diagenetic or magmatic processes. While those interpretations are classically used to solve tectonic and geodynamic questions, fundamental changes in mechanical, physical and chemical properties of geomaterials also play a key role in assessing modern societal problems such as the energy transformation. Hence microstructure analysis helps to solve riddles from the geologic past as well as geomaterial-related challenges of the future.

Microstructural analysis includes, but is not limited to, the quantitative assessment of particle shape properties, of grain and pore size distributions, spatial correlations, as well as the orientation and misorientation data measured in 2D or 3D (or even 4D).

In this session, we invite contributions investigating all kinds of geologic or societal problems by means of the analysis of microstructure and CPO data, obtained by all kinds of techniques from any natural rock, experimental work as well as microstructural modelling.

ID: 121

01.21 Advances in Geochronology: from tradition to avant-garde

Aratz Beranoaguirre^{1,2}, Valby van Schijndel³, Rebecca Volkmann³

¹Goethe Universität Frankfurt, Germany; ²FIERCE (Frankfurt Isotope & Element Research Center); ³GFZ Helmholtz Centre for Geosciences

Geochronology provides the temporal framework for the study of geologic processes, which helps in understanding the rates and durations of the processes that shape our planet. Continuous improvement on well-established techniques, in conjunction with recent methodologies and capabilities, provides a level of detail and complexity in geochronological investigations that is unprecedented. This session seeks to provide an overview of the current status of geochronological methods and their applications. We thus invite contributions about advances in analytical techniques, innovative data reduction strategies and novel applications that integrate geological information with geochronological data.

ID: 104

01.22 Anthropogenic geomorphology

Georg Stauch¹, Felix Henselowsky²

¹University of Würzburg, Germany; ²Mainz University, Germany

Humans have been exerting a significant influence on the landscape for thousands of years. Since the beginning of industrialization, and especially since the mid-20th century, this influence has intensified globally. In the Anthropocene, humans have become the dominant factor for landscape changes. This session explores the multifaceted ways in which anthropogenic actions alter geomorphic processes and landforms. Urbanization, deforestation, mining, and agricultural practices significantly modify erosion rates, sediment transport, and river dynamics. Deforestation accelerates soil degradation and sediment yield, while mining activities create extensive landform changes and pollution. Agricultural practices, including terracing and irrigation, reshape landscapes and influence sediment deposition patterns.

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ID: 133

01.23 Fluvial Anthropospheres - Exploring Central European Floodplain Transformations

Charlotte Engelmann¹, Johannes Keßels², Martin Offermann³, Ella Quante^{4,5}, Johannes Schmidt^{3,6}

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Floodplains are global hotspots of sensitive socio-environmental changes, exceptionally dynamic landscapes, and key areas of cultural and natural heritage. Due to their high land-use capacity and the simultaneous necessity of land reclamation and risk minimisation, societies have radically restructured Central European floodplains. Case studies available to date show that human-induced impacts on floodplain morphologies and environments and the formation of specific fluvial societies reveal fundamental changes in the medieval and preindustrial modern periods. According to the current scientific consensus, up to 95% of Central European floodplains have been extensively restructured or destroyed. Therefore, questions arise as to whether or since when it is justified to understand Central European floodplains as a 'Fluvial Anthroposphere'. Moreover, ecological consequences of direct and indirect anthropogenic measures are increasingly visible in Central European floodplains. Our session will value research with interdisciplinary approaches (e.g. geoscientific, historical, archaeological) studying the fluvial Anthroposphere. This session welcomes studies focussing on when and why humans significantly impacted floodplain formation in especially the medieval and up to (post)industrial modern periods, and how anthropogenic and natural processes modified floodplains. The goal of our session is to contribute to disentangling the questions concerning the significant controlling human factor in floodplain formation, and how humans, in interaction with natural processes and other chains of effects, have modified floodplains.

ID: 122

01.24 Fieldwork as common playground: the importance of geological survey to unravel Earth processes

Alessia Tagliaferri, Enrico Pigazzi, Nalan Lom

Heidelberg Universität, Germany

Session Keynote: Filippo Luca Schenker (University of Applied Sciences and Arts of Southern Switzerland (SUPSI))

Geological survey is the essential tool to develop our knowledge and understanding of internal and external processes of Earth. It serves to unravel surface processes in the field of geomorphology, geoenvironment and applied geology, as well as sub-surface processes aiming to geodynamic reconstructions. Cartography is the fundamental base for structural geology and for the realisation of geological sections, which are ultimately used as instruments in the location of economic resources. Furthermore, geological mapping is the starting point for the study of metamorphic basements, for petrology, and for stratigraphic reconstructions. The implementation of this field-based results in numerical and analogue modelling studies is pivotal.

In the last decade, we sadly witnessed to a decreased interest in promoting fieldwork and supporting the young geologists willing to put effort in this wonderful and rewarding discipline. This session aims to provide a place for any field-related contribution, ranging from the pure geological mapping to any study where fieldwork played a role in shaping new ideas and original discoveries. We encourage contributions from any geological discipline, focusing on sub-surface 2D and 3D reconstructions, structural geology, petrology, stratigraphy, ore-deposits, applied geology, geomorphology, and more. By exploring diverse areas, we aim to enhance collaboration and discussion, besides showing the value of geological survey.

ID: 165

01.25 Geochemical Databases and Data Analysis Tools

Gerhard Wörner, Marie Traun, Matthias Willbold

GZG ABt. Geochemie, Germany

Geochemical data volumes are ever increasing across the Earth, Environmental and Planetary Sciences. Harvesting the value of big data, machine learning and AI in geochemistry requires access, reusability and reproducibility of these data. Providing for easy open access and well-curated synthesis data systems requires funding agencies, scientific journals including their reviewers and editors as well as individual researchers to advance the principles of FAIR data (Findable, Accessible, Interoperable, Reusable) in geochemistry and cosmochemistry research.

GEOROC (<https://georoc.eu/>) and PetDB (<https://search.earthchem.org/>) are leading, open-access sources of carefully curated geochemical datasets of terrestrial igneous and metamorphic rock and minerals that provide easy access to comprehensive datasets of millions of geochemical measurements. These databases have enabled the use of "big" geochemical data for researchers around the world and form the basis of new and exciting research in Earth System Science and facilitate data analytics and machine learning techniques in modern geochemistry.

We invite contributions by anyone who has used large geochemical data for their research and in education, industry and policy. We specifically welcome abstracts presenting novel applications and new data analysis tools. We also aim to reflect on the history and future of big data in geochemistry and how to keep the quality service to the community alive. Join us to learn more about the various ways GEOROC and PetDB data contribute to the research landscape in geochemistry and beyond (e.g. archaeometry, geo health, remote sensing).

ID: 164

01.26 Alpine-Zagros-Himalayan Orogenic System: Case Studies

Humaad Ghani, Renas Koshnaw, Jonas Kley

University of Göttingen, Germany, Germany

The closure of the Neo-Tethys Ocean and the evolution of the Alpine-Zagros-Himalayan orogenic system reflect a complex interplay of tectonic processes, climatic influences, and surface dynamics across various spatial and temporal scales. This session focuses on multidisciplinary approaches that integrate geological, geochronological, and numerical methodologies to enhance our understanding of these intricate orogenic systems.

We welcome contributions addressing the following themes:

1. **Chronological Constraints on Deformation:**
Investigations using geo- and thermochronology, combined with structural geological analysis, to establish the timing and rates of deformation across different segments of the orogenic system.
2. **Modeling Tectonic and Surface Interactions:**
Studies leveraging structural, kinematic, and numerical modeling to explore how tectonic processes, erosion, sedimentation, and climatic factors drive the evolution and active deformation of orogenic systems.
3. **Multiscale Analyses:**
Research encompassing diverse spatial and temporal perspectives, ranging from local fault mechanisms to regional tectonic frameworks, and from rapid deformation episodes to prolonged orogenic cycles.

This session aims to bring together experts from various disciplines and regions to advance our understanding of the interconnections between tectonics, climate, and surface processes in shaping orogenic systems.

ID: 137

01.27 The BROMACKER project: A novel combination of multidisciplinary research and science communication in a UNESCO Geopark

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⁵Managementbüro des UNESCO Global Geopark Thüringen Inselsberg – Drei Gleichen

Session Keynote: Stuart S. Sumida; 隅田 スチュアート, President, Society of Vertebrate Paleontology, Professor of Biology; California State University San Bernardino, USA)

The early Permian Fossilagerstätte Bromacker in the UNESCO Global Geopark Thüringen Inselsberg - Drei Gleichen provides an exceptional window into the evolution of early terrestrial vertebrates and their ecosystems. The site preserves extraordinary fossils in terms of tracks, traces, and burrows as well as body fossils of both invertebrates and vertebrates, and is unique in its simultaneous co-occurrence of vertebrate body fossils and tracks in Lagerstätten-quality. Moreover, it showcases the earliest evidence of a complex terrestrial vertebrate ecosystem (modern trophic pyramid) and includes spectacular vertebrate fossils with distinct autecological specializations such as herbivory, bipedality and fossoriality. The BMBF-funded 5-year (2020-2025) BROMACKER project is unique in combining multidisciplinary research with innovative, experimental and multimedia science communication formats, involving the general public with novel and interactive formats. The research focuses on geology, palaeoclimate, paleoecology, and biodiversity, using approaches such as sedimentology, geochemistry, drilling, taxonomy, phylogeny, bone histology, biomechanics, ichnology, and 3D modelling. This work is accompanied by special exhibitions, social media, podcasts, 360° projections, interactive website, school projects, as well as in-person and live virtual public tours and events at the excavation site, in the partner institutions and external venues. This comprehensive approach of communicating the scientific processes and results to different audiences successfully stimulates the understanding for geoscientific research in the general public and increases the acceptance of research in general and even the visitor numbers at the excavations and in the entire region. This session aims to present the combined efforts of this highly interdisciplinary research and science communication project.

ID: 129

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

Lisa Richter¹, Jörg Lang¹, Thomas Mann¹, Nils-Peter Nilus², Marc Wengler², Axel Liebscher², Felina Schütz¹

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The safe and permanent deep geological disposal of radioactive waste is a key societal challenge for the 21st century. Geological information such as lithology, depth and extent of potential host-rock formations and the characterisation of material properties (e.g. mechanical strength, thermal conductivity, sorption capacity, 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 disciplines. 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 as well as numerical simulations of repository systems. Contributions that address ways to reduce uncertainties in the characterisation of properties, prediction of processes and scenarios, and estimation of long-term safety are specifically welcome.

ID: 167

01.29 Environmental Hazards and Risks

Michael Dietze¹, Michael Krautblatter²

¹Georg-August University, Germany; ²Technische Universität München, Germany

Environmental hazards are a standing and accelerating threat to the global society. Although they can stem from different systems, such as atmospheric, hydrologic, marine, volcanic, and seismic, their impacts are equally catastrophic. It is thus key to improve our understanding of hazards and risks in terms of anticipation, forecasting, early warning, operation, assessment and mitigation. Likewise, we require an improved interaction of science with the population, politicians and decision makers. This session brings together researchers across disciplines, working on isolated, cascading and coupled hazard problems, on mechanistic process understanding, or on the reconstruction of dynamics, impacts and magnitude-frequency relations. We explicitly include a wide range of disciplines that can reveal such insights such as geomorphology, (engineering) geology, geophysics, geochemistry, sedimentology and paleontology.

02 Life

ID: 131

02.01 The Tethys Ocean – the cradle of modern tropical life

Alexander Nützel¹, Thomas Neubauer¹, Evelyn Kustatscher², Baran Karapınar³, Wolfgang Kießling⁴, Axel Munnecke⁴

¹SNSB-Bayerische Staatssammlung für Geologie und Paläontologie, Germany; ²Tiroler Landesmuseen/Museum of Nature South Tyrol; ³School of Earth and Environment, University of Leeds; ⁴Friedrich-Alexander-Universität Erlangen-Nürnberg

Session Keynote: Dr. Elke Schneebeil-Hermann (Paläontologisches Institut, Zürich, Schweiz)

The Tethys, an extensive tropical ocean, played a pivotal role for the evolution of marine life over a long period of time. The configuration of the peculiar Pangaea–Tethys–Panthalassa situation formed by the Variscan orogeny and concluded with the Alpine orogeny. The existence of an east-west stretching ocean, predominantly located in the tropical and subtropical realms, was likely a major driver of marine and terrestrial diversification. Extensive shelf areas, commonly with intense reef growth, micro-continents such as Cimmeria and SE Asian terranes, as well as continental lowlands accommodated thriving biota.

We invite contributions from all disciplines across earth and life sciences linked to the biotic and geologic evolution of the Tethys Ocean and related basins (Paleo-Tethys, Neo-Tethys, Paratethys), including, but not limited to, works on fossil faunas or floras, their diversity, evolution, ecology, taxonomic composition and large-scale diversification trends, as well as studies on tectonics, sedimentology and geochemistry. Contributions on associated continental (terrestrial and freshwater) taxa or regions are equally welcome.

ID: 141

02.02 Trace fossils as indicators for the ecology, function, physiology and behaviour of fossil organisms and their evolution in the context of palaeoenvironmental change

Michael Buchwitz¹, Jens Lallensack², Anna Pint³

¹Museum für Naturkunde Magdeburg, Germany; ²Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; ³Friedrich-Schiller-Universität Jena

Session Keynote: Jens Lallensack (Departamento de Ciência da Computação, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil)

Recent advances in palaeoichnology, the study of fossil traces, are the result of methodological improvements, such as the use of modern scanning, imaging and modelling techniques that allow for a more rigorous documentation, the application of quantitative approaches on ichnological data (e.g. geometric morphometrics, AI-supported classification methods), a more exact assignment of trace producers that also accounts for evolutionary changes in morphology, lifestyle and behaviour of potential tracemaker groups and the direct observation of trace formation by extant organisms (actualistic studies, neoichnology). Furthermore, new ichnofossil discoveries and the re-investigation of known occurrences have led to an increase in the amount of available ichnological data whose accessibility improved due to digital data collections. This Geo4Göttingen session shall be a forum to present and discuss new research results, methods and developments that concern trace fossils, their geological and biological context. We welcome invertebrate and vertebrate palaeoichnology and neoichnology studies, but also encourage the presentation of research work from related fields (e.g. palaeoecology, sedimentology, functional morphology, developmental biology and ethology) that include ichnological data.

03 Climate

ID: 132

03.01 Recent Advances in the Geological Research of Marine Environments

Gerhard Bohrmann, Miriam Römer, Wolfgang Bach, Alexander Diehl

University of Bremen, Germany

Session Keynote: Claudio Argentino (UiT The Arctic University of Norway, Tromsø)

The ocean covers 71% of our Earth's surface and plays a central role in energy and mass transfers of the global Earth system. Ninety percent of the ocean is remote and deep and its seabed is poorly explored, although it represents a key interface between the geosphere and hydrosphere. The deep ocean floor is shaped by magmatic, hydrothermal, sedimentary and diagenetic processes, many of which are still poorly understood. It is considered by many to be an indispensable source of raw materials for the energy transition and a promising location for carbon removal. The basic research needed to develop and manage the responsible use of the seabed is challenged by the inaccessibility of this unique environment. State-of-the-art research vessels with advanced deep-sea technology, such as robotic seabed drill rigs and giant-piston coring, submersibles, ROVs and AUVs as well as acoustic and seismic systems are used to investigate various processes on the seabed and in the subsea floor, some

of them in 4D. International research drilling programs have carried out basic research for several decades, which contributed greatly to the understanding of the interaction between the Earth's crust, water masses, ice caps, atmosphere and the living world today and in the past. To this session we invite all geoscientists to present exciting results from ship expeditions and marine investigations of recent years.

ID: 117

03.02 Subsurface Storage of CO₂ - Applied Geoscientific Aspects

Frauke Schulze, Gabriela von Goerne

BGR, Germany

Storage of CO₂ in the deep subsurface is one of the options for greenhouse gas emission reduction involving the geosphere. For this dedicated session, we invite posters and oral presentations to any geoscientific aspects of CO₂ storage in the subsurface including, but not limited to issues of storage potential assessment, site characterization, geo-technical feasibility, storage safety, monitoring technologies, and environmental impacts.

We want to foster understanding about options of safe long time-storage on- and offshore Germany. This includes consideration of experience gained with CO₂ storage in other countries. Talks about ongoing site characterization, operation, performance, and monitoring results are appreciated. Topics related to long-term safety and climate effectiveness of CCS and other nature based CO₂ reduction approaches are welcome also. As they may bridge topics related to other conference themes such as "climate", "resources", and "life" some of these might be attributed to other sessions, when the final program will be established.

ID: 161

03.03 Ice as a material in a changing climate

Johanna Kerch¹, Nicolas Stoll², Alexandra Zuhr³

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Session Keynote: Steven Franke (University of Tübingen)

The cryosphere is a highly sensitive and dynamic component of the Earth's climate system. Glaciological research strives for gaining more knowledge on critical processes in ice sheets, mountain glaciers and polar oceans. All activities have the material ice at their core, which is strongly affected by changing temperatures. Thus, as a geoscientific frontier, the study of ice as a material is essential for advancing our understanding of the complex interactions between ice and climate.

This session provides a platform for researchers to present their work on the properties and behaviors of ice as a geomaterial, with a focus on laboratory and field methods for studying ice in a changing climate. Contributions are invited from a wide range of disciplines, including glaciology, geophysics, and climate science, to explore the diverse aspects of ice as a material and its role in shaping our planet's climate.

ID: 126

03.04 All about carbonates

Guntram Jordan¹, Helen King², Elena Sturm¹, Claudia Trepmann¹

¹Ludwig-Maximilians-Universität München, Germany; ²Utrecht University, The Netherlands

Session Keynote: Prof. Oliver Plümper (Utrecht University, Department of Earth Sciences, The Netherlands)

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, carbonatic volcanology, biomineralization, bioinspired materials and technologies, the development and application of specific analytical techniques, methods of data analysis, as well as theoretical modelling and simulation.

ID: 146

03.05 Advances in Paleoclimate Proxies and Their Applications

David Bajnai¹, Jens Fiebig², Andreas Pack¹

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Reliable information about past temperature, atmospheric gas concentration, ocean chemistry, and other aspects of the Earth's climate system is crucial to understand past (and future) climate change. Quantitative paleoclimate proxy data (physical, chemical, or biological indicators of past climate conditions) that are preserved in terrestrial and marine archives underpins a large portion of our knowledge on changes in Earth's climate. Accurate interpretation of such proxy records requires accurate analytical methodology, proper statistical data treatment, and detailed knowledge of the patterns how proxy composition responds to variations in key parameters and processes characteristic of primary archive formation and its secondary alteration.

This session focuses on recent developments in the field of paleoclimate proxy research, including the development of new proxies (e.g., clumped isotopes, triple oxygen isotopes, metal isotopes) and the application of existing proxies to new research questions. We seek contributions related to advances in analytical techniques and studies that address the thermodynamic and kinetic behavior of both traditional and novel proxies and test their susceptibility to diagenetic alteration. We also welcome examples of how applying new approaches improves our understanding of Earth's climate history from the Archean to the present. Possible topics further include concurrently applying multiple independent proxies or integrating paleoclimate proxy data with climate model simulations.

ID: 145

03.06 Multiscale characterization of structure, flow and transport dynamics in fractured porous media and karst systems

Jannes Kordilla¹, Uli Maier², Alexandru Tatomir^{2,3}, Judith Flügge⁴, Lysander Bresinsky⁵

¹Institute for Environmental Assessment and Water Research, Spain; ²Georg-August-University Göttingen, Germany; ³BGE mbH, Peine, Germany; ⁴Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Head of Geological Disposal Division, Braunschweig; ⁵University of Kassel, Institute for Water, Waste, Environment, Civil and Environmental Engineering, Kassel, Germany

Session Keynote: Pierre Adler (Sorbonne University)

Fractured porous and karst systems represent some of the most complex geological systems due to their broad geometry spectrum and scale-dependent hydraulic and transport properties. Their global prevalence makes them critically important to a wide range of disciplines, including hydrogeology, groundwater resource management, geothermal energy, CO₂ sequestration, nuclear waste disposal, earthquake and volcano risk assessment, as well as petroleum and mining engineering. Such systems require an extensive suite of methods for their study, spanning laboratory experiments, field investigations, numerical modeling, and analytical approaches. The inherent multiscale nature presents challenges in bridging micro- and macro-scales, which is essential for accurately predicting processes such as groundwater recharge, solute transport, long-term storage properties and responses to both natural and anthropogenic changes. This session invites contributions from pore to field scales, focusing on structural and geological characterization, flow and transport processes in both the vadose and phreatic zones, and approaches for multiscale coupling. Topics of interest include, but are not limited to: (1) Innovative techniques: Advances in laboratory methods, in-situ field measurements, and analytical tools for understanding properties and dynamics across scales; (2) Modeling and simulation: Development and application of models for complex flow and transport processes to enhance predictive accuracy and practical implementation; (3) Environmental applications: Studies on groundwater resources, contamination mitigation, environmental impact assessments, and the role of fracturing in earthquake and volcanic hazards; (4) Resource optimization: Research aimed at improving safety and efficiency in underground storage and the sustainable utilization of geothermal resources.

ID: 150

03.07 Risks from a Changing Cryosphere

Jan Nitzbon^{1,2}, Mehriban Aliyeva^{1,3}, Sofia Antonova¹

¹Alfred Wegener Institute, Germany; ²Georg-August-Universität Göttingen, Germany; ³Vrije Universiteit Amsterdam, The Netherlands

Session Keynote: Susanna Gartler (Universität Wien)

Climate change is particularly pronounced in the high latitudes and high altitudes of the Earth, which also contain most of its cryosphere, comprising permafrost, mountain glaciers, ice sheets, snow, and sea ice. Climatic and environmental changes are putting the cryosphere under pressure, causing not only feedbacks on the climate itself, but often having detrimental consequences for ecosystems and human livelihoods.

In this session we want to bring together natural scientists and applied scientists who are concerned with impacts, hazards, and risks associated with changes in all components of Earth's cryosphere, including, for example, extreme weather events, permafrost thaw, glacier retreat, or sea ice loss. The origin of hazards can be natural (e.g. sea level rise, blizzards, cold spells, landslides) or anthropogenic (e.g. contaminants in permafrost soil, microplastics in snow). The methodology of the studies could include but is not limited to field work, geospatial mapping, text mining, remote sensing, and numerical modelling. We particularly invite contributions which are exploring novel methodologies, combining established methods in innovative ways, or generally taking a transdisciplinary approach.

ID: 168

03.08 Earth Surface Systems and tipping elements in a changing climate

Michael Krautblatter¹, Michael Dietze², Friedhelm von Blanckenburg³

¹Technische Universität München, Germany; ²Georg-August University, Germany; ³Freie Universität Berlin, Germany

Earth Surface Systems react sensitively to climatic and tectonic forcing. The resulting change is often highly non-linear, to a large extent due to feedbacks that drive system resilience and stability and due to tipping elements where these feedbacks fail. With the expected changes in the foreseeable future, both quantification of past system evolution and the anticipation of future system behaviour, and of key controls in the interaction between surface compartments becomes a major scientific issue. Here we invite contributions on system behaviour that provide insights into feedbacks and mechanisms that ensure resilience in climate-controlled Earth Surface System behaviour. These can include conceptual, field, lab, and modelling studies. They may address time scales from modern to the Quaternary times and beyond (e.g. PETM) and can encompass controls by biota, evolutionary change or the effects of tectonic, climatic, and topographic boundary conditions. We explicitly include a wide range of disciplines that can reveal such insights such as geomorphology, geology, geophysics, geochemistry, sedimentology and paleontology.

04 Resources

ID: 113

04.01 Prospection and extraction of critical and strategic raw materials in Europe

Antje Wittenberg¹, Meta Dobnikar²

¹Federal Institute for Geosciences and Natural Resources (BGR), Germany; ²GEOLOGICAL SURVEY OF SLOVENIA (GeoZS), Slovenia

Session Keynote: Axel A.O. Wenke (New Energy and BD in Neptune Energy)

The *Critical Raw Materials Act* (CRMA, Regulation (EU) 2024/1252) of the European Union (EU) has been in force since May 2024 and aims, among other things, to promote national exploration and mining for critical and strategically important raw materials within the EU. An initial series of *Strategic Projects* have already been identified and are underway.

In this session, we would like to discuss the experiences in regards to *Strategic Projects* and the upcoming measures in this context. These actions will complement and build upon the results of the required national exploration programmes and other exploration activities. We therefore welcome contributions from researchers, government representatives, industry and critical observers of the sector involved in activities in these areas. That session will also address the importance of communicating exploration phases and results through classification and communication tools such as 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.

ID: 114

04.02 Lithium Resources

André Stechern¹, Valentin Goldberg²

¹Bundesanstalt für Geowissenschaften und Rohstoffe (BGR); ²BWG Geochemische Beratung

Session Keynote: Michael Schmidt (Deutsche Rohstoff Agentur (DERA))

The global demand for lithium is accelerating due to the increasing need for lithium-ion batteries in electric vehicles and renewable energy storage systems. As a cornerstone of the green energy transition, lithium plays a critical role in achieving climate targets. Demand is projected to rise significantly, from approximately 400,000 tons of lithium carbonate equivalent (LCE) in 2020 to an estimated 1.5 to 3 million tons by 2030.

Currently, around 100 kt of LCE are produced annually, primarily from two sources: pegmatite deposits and salar brines. This surge in demand has driven extensive research and development efforts across multiple domains: (1) defining exploration criteria for magmatic and sedimentary lithium deposits; (2) advancing extraction and beneficiation technologies for both primary ores and recycled materials; and (3) exploring unconventional lithium resources, such as geothermal or hydrocarbon reservoirs.

A deeper understanding of the formation, characteristics, and origins of lithium deposits is essential for improving exploration strategies and assessing undiscovered resources. This session invites contributions from all areas of lithium research, spanning geological studies, innovative exploration tools, and advancements in extraction and processing technologies. Contributions addressing the social and environmental aspects of lithium mining, including public acceptance of potential mining projects in Europe, are also highly encouraged.

ID: 116

04.03 Understanding Metal Enrichment Processes – Advances in the Genesis, Evolution, and Geodynamics of Ore Deposits

Maximilian Korges¹, Marie Guilcher², Nicolas Meyer³, Simon Hector⁴

¹University of Potsdam, Germany; ²Helmholtz Institute Freiberg for Resource Technology, Germany; ³University of Tübingen, Germany; ⁴KIT - Karlsruhe Institute of Technology, Germany

Session Keynote: Clifford Patten (University of Innsbruck)

Ore geology research is crucial for ensuring the sustainable supply of critical materials required for modern technologies and renewable energy systems. By advancing our understanding, mining can minimize its environmental impacts and support the transition to a low-carbon economy. Thus, ore geology research is vital for fundamental science and for the sustainable future of society. This session focuses on understanding the processes that govern the formation, distribution, and evolution of mineral deposits within the Earth's crust. It will also explore the latest research on ore-forming systems, integrating geochemical, petrological, isotopic, and possibly geophysical approaches to unravel the complexities of ore genesis in diverse tectonic settings. Innovative ideas or concepts for modeling the evolution of mineral systems are invited, showcasing research that combines field-based observations, experimental studies, and computational simulations. Multidisciplinary studies are welcomed, as they facilitate a comprehensive understanding of ore-forming processes by bridging traditional boundaries between mineralogy, petrology, geochemistry, and tectonics. Case studies from a wide array of ore deposit types, including magmatic, magmatic-hydrothermal systems, volcanic massive sulfides, sediment-hosted deposits, and carbonatite complexes, will illustrate the global scope of research in ore geology. Participants will gain insight into the fundamental mechanisms driving ore formation and the geodynamic processes that have shaped the distribution of mineral resources over geological time. This session is designed for academic researchers, graduate students, and scientists with expertise in mineralogy, petrology, geochemistry, and tectonics. It will provide a forum for presenting cutting-edge research, fostering dialogue, and inspiring new investigations in the field of ore geology.

ID: 134

04.04 Hydrogen in the energy transition –white to green hydrogen and subsurface storage

Maximilian Hasch¹, Maria Belén Febbo², Chaojie Cheng³, Christian Ostertag-Henning¹, Tobias Björn Weisenberger⁴

¹BGR (Federal Institution for Geoscience and Ressources, Germany), Germany; ²Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences; ³Institute of Applied Geosciences, KIT – Karlsruhe Institute of Technology; ⁴Geology and Sustainable Mining Institute, University Mohammed VI Polytechnic (UM6P), Benguerir, Morocco

Session Keynote: Niklas Heinemann (University of Edinburgh; UK)

Hydrogen is a key element of the energy transition. Due to its potential as an energy carrier, cyclic hydrogen storage can help balance periodic energy deficiency and excess caused by seasonal renewable energy production and changing demand. The unique properties of this gas pose challenges that invite research on all aspects of the hydrogen value chain from production over transport to storage. Findings of large quantities of natural hydrogen and estimates of hydrogen existing globally in the subsurface have increased interest in the possibility of prospecting and exploiting naturally occurring hydrogen. Geologic hydrogen could become a low-carbon primary energy resource.

We welcome contributions on formation, migration, and trapping of natural hydrogen, as well as contributions on all aspects of hydrogen underground storage from suitable storage settings to the risk of bio-geochemical hydrogen consumption. Contributions are encouraged from field-based studies, laboratory experiments, modelling, and simulation studies that address those important processes, either in the natural occurrence of hydrogen or during subsurface hydrogen storage. The investigations can encompass a wide range of mechanisms on micro- to macroscopic scales, including first attempts to come up with guidelines in exploration for natural hydrogen or its resource assessment.

ID: 148

04.05 Applied and Technical Mineralogy: promoting sustainable solutions through deeper understanding of materials and material processing

Elisabeth Eiche^{1,2}, Christoforos Zamparas^{1,2}

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Increased needs in raw materials in a rapidly changing natural and built environment requires more than ever to focus on innovative sustainable solutions. In this context, synthesizing adapted minerals, repurpose secondary minerals, studying new materials or extending their scope of application are conceivable and practical solutions. Tackling associated mineralogical and material science challenges before a successful implementation requires that relevant processes are understood and respective minerals and materials are well characterized. For this purpose, theoretical principles, sophisticated *Applied and Technical Mineralogy* methodologies and modeling approaches are applicable.

We welcome contributions from academia and industry, related to mineralogy, crystallography, materials science and engineering studies. The topics range from concrete and cement, battery active materials, clay mineralogy, ceramics, glass, and urban waste to medical mineralogy aspects. The contributions could relate to synthesis and evaluation of phases, crystal growth, recycling and relevant processes, green chemistry approaches, environmental aspects of material production and degradation, critical element extraction or release from recycled materials, the use and development of analytical methodologies, experimental mineralogy applications, and modelling studies.

ID: 111

04.06 Coupled Fluid-Rock Deformation: Unraveling Multiscale THMC Dynamics for Fundamental Geological Processes and Societal Challenges

Oliver Plümper¹, Timm John², Daniel Koehn³

¹Utrecht University, Netherlands, The; ²Freie Universität Berlin, Germany; ³GeoZentrum Nordbayern, Germany

Session Keynote: Florian Füsseis (RWTH Aachen)

Fluid-rock interactions, coupled with deformation processes, play a critical role in shaping Earth's lithosphere and addressing societal challenges like carbon sequestration, hydrogen generation, geothermal energy, and critical metal generation. This session examines the fundamental mechanisms governing these interactions across scales, focusing on the interplay of thermal, hydraulic, mechanical, and chemical (THMC) processes.

Topics include fluid transport in deforming rock, reactive transport processes, mineral transformations, fracture propagation, and permeability evolution under extreme conditions. Key areas such as subduction zone dehydration, mantle wedge metasomatism, extensional basin dynamics, and mid-ocean ridge hydrothermal systems provide insights into lithospheric evolution, while applications in energy transition and sustainable resource management highlight their societal relevance.

Innovative experimental techniques, including in situ observations under extreme conditions, isotope analysis for tracing fluid pathways, high-resolution imaging of microstructures, advanced multiscale modelling approaches, and the application of machine learning for data analysis and predictive modelling, play a fundamental role in exploring THMC processes. These approaches bridge natural geological systems with industrial applications, enhancing carbon capture, optimizing geothermal reservoirs, advancing sustainable resource extraction, and understanding the genesis of critical metals.

This session invites contributions employing advanced methodologies to illuminate fluid-rock interactions and deformation processes. Together, we will explore how advancements in THMC modelling, reactive transport analysis, machine learning, and experimental techniques drive solutions to critical energy and environmental challenges and enhance our quantitative understanding of geological processes within the lithosphere.

ID: 102

04.07 Mineralogy of Secondary Raw Materials

Daniel Vollprecht¹, Jeanette Meima², Schirmer Thomas³

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Session Keynote: Monika Kasina (Jagiellonian University Krakow, Poland)

Mineral wastes & by-products (e.g. mine tailings, waste rock, slags, ashes, dusts, spent ceramics, construction & demolition wastes, excavated materials) represent the largest stream of secondary raw materials; their mineralogy, chemistry, and physical properties determine their recyclability, which can be enhanced by tailoring specific properties during production. For instance, the release of contaminants in solutions and the hydraulic reaction/reactivity regulate the utilization of mineral wastes as inorganic binders. The specific physical and chemical properties of the mineral phases in secondary raw materials determine their extractability by mineral processing methods such as froth flotation or magnetic separation.

This session addresses mineralogical/geochemical contributions to the circular economy, ranging from environmental studies such as the migration of contaminants, to resource-oriented investigations approaching the recovery of metals from secondary raw materials and the utilization of wastes and by-products as a whole, especially in construction industry or agriculture, to close anthropogenic material cycles.

05 Materials

ID: 136

05.01 Spectroscopic methods in modern geosciences

Melanie Kaliwoda^{1,2}, Elena Sturm²

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Session Keynote: Prof. Dr. Lutz Nasdala (Uni Wien, Institut für Mineralogie und Kristallographie)

Spectroscopic methods are a cornerstone of mineral studies. These methods have the capability to acquire information at multiple scales, from atoms to molecules, to chemical bonds, and to elucidate crystal structures, physical properties and more. This session addresses all aspects of the geosciences that focuses on the investigation of mineralogical issues using the wide array of spectroscopic approaches. Such approaches include, but are not limited to, UV/Vis, IR, Raman, XAS, Mössbauer, EPR, NMR, MS, LIBS, Brillouin as well as synchrotron-based spectroscopies and in-situ or remote sensing spectroscopies. Contributions from investigations that involve other spectroscopic methods are also encouraged. Spectroscopic research from all aspects of mineral sciences will be considered, including studies focused on sedimentary, metamorphic, plutonic, and deep Earth minerals, as well as applications to environmental issues, cultural heritage, gemology, soil science, planetary materials, meteorites, and more.

ID: 109

05.02 Understanding (geo)materials with advanced experimental and computational methods

Marie Münchhalphen¹, Michael Fischer², Claudia Weidenthaler³

¹Ruhr University Bochum, Germany; ²University of Bremen, Germany; ³Max Planck Institute for Coal Research, Mülheim an der Ruhr, Germany

Session Keynote: Dr. Martin Ende (MLU Halle, Germany)

Geological and geo-inspired materials will play a key role in tackling current societal challenges, including, among others, the reduction of CO₂ emissions, the storage of energy from renewable sources, the remediation of environmental pollution, and the sustainable utilisation and recycling of critical elements. State-of-the-art experimental and computational methods can deliver unprecedented insights into such materials, contributing to their microscopic understanding and allowing the targeted development of new materials with improved properties. This session aims to bring together scientists who employ experimental methods (e.g., diffraction, electron microscopy, spectroscopy) or computations (e.g., molecular dynamics, density functional theory) in the study of minerals and synthetic materials.

Contributions focused on method development and on the application of existing methods to relevant materials are equally welcome, provided that the characterisation advances the understanding of structure and/or properties. Submissions combining experimental and theoretical approaches are explicitly encouraged.

ID: 156

05.03 Archaeometry – Geosciences4Humanities

Andreas Kronz¹, Thomas Rose², Katrin Westner²

¹University of Göttingen, Geoscience Center, Germany; ²Deutsches Bergbau-Museum, Bochum, Germany

Session Keynote: Katrin Zerbe (Deutsches Elektronen-Synchrotron DESY)

Archaeometry is a multifaceted discipline at the interface between the natural sciences and the humanities. Geoscientific methods of mineralogy, geochemistry, petrology and geomorphology also find widespread applications here.

These include newly developed or improved sampling and analytical methods for compositional and isotope measurements, experimental archaeometry for the reconstruction of historical technologies in metallurgy, ceramics and glass production or building material extraction, provenance studies of lithic materials, metals, glass, and ceramics, as well as studies dedicated to human-environment interactions.

Establishing databases containing chemical and isotopic datasets of both raw materials (e.g. rocks, sediments, ore minerals) and manufactured products (metals, ceramics, glass, stone, pigments) has made considerable progress in recent years, benefiting archaeometric research.

We encourage anyone with an interest in any of the above topics to participate in our session and particularly welcome contributions of early career researchers.

ID: 125

05.04 Biogeochemistry, geomicrobiology, and biomineralogy

Juraj Majzlan¹, William D. Orsi², Elena Sturm²

¹Friedrich-Schiller-Universität Jena, Germany; ²Ludwig-Maximilians-Universität München, Germany

Session Keynote: Prof. Mihaly Posfai (University of Pannonia, Department of Earth and Environmental Sciences, Hungary)

This session aims to bring together research scientists to share and discuss the current state-of-the-art and latest breakthroughs in the field of biogeochemistry, geomicrobiology, and biomineralogy. This highly multi- and interdisciplinary field spans both the abiogenic and biogenic world and includes scientific communities from geochemistry, mineralogy, crystallography and structural chemistry, paleontology, geobiology, biochemistry, biophysics, and materials science. Therefore, the session topics will generally focus on the understanding of mineral earth and life interaction and cover the aspects of global biogeochemical cycles over short- and long-time scales, geomicrobiological processes in terrestrial and marine environments (e.g., Earth's surface incl. the critical zone, as well as the "deep biosphere"), dynamics and processes of microbial communities in relation to complex geo-bio-interactions, understanding biomineralization process and their role of in the context of Earth and Life evolution, fundamentals of structure- morphogenesis-properties-functionality relationships in biominerals and biological hard tissues, design and fabrication of biomimetic and bioinspired materials, development and application of specific analytical techniques, methods of data analysis, as well as theoretical modeling and simulation. The session is organized as part of the activity of the IMA working group on biomineralogy.

06 Crosscutting Methods

ID: 139

06.01 Data Management, Research Data Infrastructures, AI-Applications and 3D Visualization Techniques: Meeting Today's and Future Needs in Geosciences

Heidrun Louise Stueck¹, Jennifer Ziesch², Jewgenij Torizin¹, Kristen Elger³

¹Federal Institute for Geosciences and Natural Resources, Germany; ²State Office for Mining, Energy and Geology (LBEG), Germany; ³Helmholtz Centre for Geosciences (GFZ), Germany

Session Keynote: Dr. Kerstin Lehnert (Lamont Doherty Earth Observatory of the Columbia University; NY, US)

As Earth and Environmental Sciences become increasingly data-driven, (geo)data management, advanced 3D visualization techniques and AI-applications as well as robust research data infrastructures are transforming the way we explore, analyze, and understand our complex data. This session brings together these interdisciplinary fields to address current challenges and explore future opportunities for geoscientific research and applications.

Data management and 3D visualization techniques are essential for effectively utilizing and communicating geological information, from large-scale regional models to detailed regional studies. At the same time, research data infrastructures, including repositories, synthesis databases, and digital information systems, provide the backbone for data sharing and interdisciplinary research.

This session invites contributions on:

- Data Management: Innovations in data processing, database management, and handling of large-scale or complex geoscientific datasets.
- Research Data Infrastructures: Current developments in repositories, synthesis databases, and information systems, with a focus on the FAIR data principles, interoperability between repositories, and quality improvement.
- 3D Visualization Techniques: Approaches to effectively communicate complex geological 3D data, including strategies to engage the public and scientific communities.
- AI/ML Applications and Case Studies: Exploring the role of AI and ML in advancing data acquisition and analysis, optimizing visualization techniques, and streamlining workflow automation.

This session invites researchers from academia and geological surveys, industry professionals and IT enthusiasts to come together and to share experiences, perspectives, and innovative ideas. By emphasizing both, the technical and collaborative aspects of geoscience data management and visualization, the session seeks to contribute to the development of tools and infrastructures that will shape the future of Geosciences.

ID: 143

06.02 Recent Advances in Fossil Imaging

Julien Kimmig, Jannik Weidtko

Abteilung Geowissenschaften, Staatliches Museum für Naturkunde Karlsruhe, Germany

Session Keynote: Sarah Jacquet (Department of Geological Sciences, University of Missouri, USA)

This session will bring together an array of scientists who are tackling the application of imaging fossils with modern techniques. Methods covered include elemental imaging, synchrotron data, CT data and other imaging techniques. This is especially pertinent as there has been exceptional development in how we consider and explore fossils in 2D and 3D over the last 10 years and the number of researchers and methods tackling this topic has increased significantly. This session aims to span topics in vertebrate, invertebrate, botanical, and trace fossil research and examine how imaging methods can be used to understand these sub-fields, producing a unique, cross-disciplinary environment. This will present an important opportunity to bring this distinguished group of thinkers together, and allow researchers across these fields to interact, developing connections that would likely not otherwise be possible. This is especially important as researchers from different parts of paleobiology seldom find themselves in the same sessions. We are therefore especially motivated to have researchers from different backgrounds from across all aspects of paleobiology present during this session, such that an integrated examination of the imaging frontier of paleobiology can be explored.

ID: 119

06.03 3D Geological Modelling: Methods, Applications, and Regional Insights

Frithjof A. Bense¹, Heidrun Stück¹, Jennifer Ziesch², Gabriela von Goerne¹

¹Federal Institute for Geosciences and Natural Resources (BGR); ²State Authority for Mining, Energy and Geology (LBEG)

Session Keynote: Prof. Florian Wellmann, PhD (Head of Institute Computational Geoscience, Geothermics and Reservoir Geophysics, RWTH Aachen University; Head of Business Area Georesources, Fraunhofer IEG, Scientific Director, ABC/J Geoverbund, Co-Founder Terranigma Solutions GmbH)

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.)

ID: 135

06.04 Stressors in Hydrogeology: Interactions and Impacts

Nadine Goeppert¹, Thomas Heinze², Tobias Licha²

¹Freie Universität Berlin, Germany; ²Ruhr Universität Bochum, 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.

ID: 157

06.05 Linking physical, chemical and (micro)biological controls to biogeochemical turnover in groundwater

Vitor Cantarella¹, Adrian Melling¹, Christian Griebler²

¹Kassel Universität, Germany; ²Universität Wien

The capacity of an aquifer to facilitate microbially mediated geochemical reduction of dissolved electron acceptors (including oxygen, nitrate and sulfate, and extending to chlorinated hydrocarbons) depends on multiple interrelated factors. These include the availability of electron donors, the expression of microbial transcripts and enzymes that mediate electron transfer, hydrolysis, and adequate nutrient and reactant replenishment to maintain microbial activity.

The complete reduction of dissolved electron acceptors requires sufficient contact time with reduced solid phases due to the relatively slow reaction kinetics of electron transfer or hydrolysis from solid-phase sources. Groundwater flow patterns define contact times and are governed by boundary conditions and hydraulic conductivity. The hydraulic conductivity is primarily determined by pore-size distribution, which in turn depends on sediment granulometry and packing – characteristics that reflect the sedimentary deposition.

Comprehensive characterization and quantification of geochemical reactions in aquifers require an interdisciplinary approach. Molecular-biological analyses of active microbial genes and transcripts can identify specific potential and ongoing reactions, while advanced geophysical methods can detect reaction hotspots. Sedimentological studies provide crucial information about potentially reactive facies and zones of favorable hydraulic conductivity. Numerical modelling can integrate these diverse datasets to constrain reaction parameters and improve predictions. Here, we invite abstracts that tackle the quantification of biogeochemical reactions in groundwater and / or reaction bottlenecks, via interdisciplinary frameworks to address research questions and challenges related to redox processes in aquifer systems. We particularly welcome approaches that enhance hydrogeological investigations via a combination of methods across the fields of hydrogeology, modelling, geomicrobiology, biogeochemistry and (bio)geophysics.

ID: 172

06.06 Geophysical exploration of geological structures in the subsurface

Manuel Hobiger¹, Michael Schmitz¹, Thomas Spies²

¹Federal Institute for Geosciences and Natural Resources (BGR), Federal Seismological Survey, Nuclear Test Ban, Hanover, Germany; ²TU Clausthal, Institute of Geotechnology and Mineral Resources, Clausthal-Zellerfeld, Germany

This session aims at bringing together diverse applications of geophysical exploration techniques at shallow and deeper subsurface levels, addressing critical themes in Earth Sciences with direct implication for the development of human societies. The focus ranges from near-surface to intermediate-depth environments and structures, including the characterization and monitoring of environmental processes at the Earth's surface, shallow geological structures, geothermal reservoirs, carbon capture and storage sites, or sites for nuclear waste repositories.

The session welcomes contributions of a wide range of geophysical methods, including, but not limited to, seismic, gravimetric, magnetic and electromagnetic methods. We want to foster discussions on the challenges and opportunities associated with geophysical exploration at different scales. The session provides a platform for researchers, industry professionals, and students to share research and technological advancements in geophysical exploration methods.

07 Application

ID: 138

07.01 From paleoseismic trenches to seismic building codes and safety analyses for nuclear installations in Germany: progress in seismic hazard assessment

Thomas Spies¹, Diethelm Kaiser², Christian Brandes³, Jochen Hürtgen⁴

¹Clausthal University of Technology (TU Clausthal), Germany; ²Federal Institute for Geosciences and Natural Resources (BGR), Germany;

³Leibniz University Hannover, (LUH), Germany; ⁴RWTH Aachen University, Germany

Knowledge of seismicity of the past is the key to reliable seismic hazard assessment. In intraplate settings strong earthquakes occur infrequently so that very long periods of time have to be covered. Neotectonic, paleoseismic and geomorphological studies deliver evidence for such events in the last hundred thousands of years. From historical sources, information on earthquakes can be extracted in Germany from about 800 AD on. Instrumental seismology provides data since about 1950. Yet, the existing data bases like the German Paleoseismological Database and the German Catalogue of Historical Earthquakes are still incomplete and need a lot of supplement and re-evaluation as a result of ongoing research. The same is true for compilations of active faults in Germany.

Based on seismicity of the past, seismic hazard can be estimated using deterministic and probabilistic methods. The results are used in seismic building codes and in safety analyses for special structures like nuclear installations. A very prominent example is the site selection of a repository for high-level nuclear waste in Germany. In this session we kindly invite contributions from a wide range of topics and disciplines like paleoseismology, geomorphology, neotectonics, remote sensing, seismology and earthquake engineering to present their progress in the achievement of data and development of methods as well in the development of procedures to incorporate seismic hazard in building codes and site selection. Also studies on induced seismicity are welcome.

ID: 154

07.02 Geothermal energy — Potential and utilisation of geothermal energy resources for the heat transition

Alena Sophie Broge¹, Michael Erb², Evelin Pechan³, Simone Röhlings³

¹Georg-August-Universität Göttingen, Germany; ²Leibniz Institute for Applied Geophysics (LIAG), Germany; ³Bundesanstalt für Geowissenschaften und Rohstoffe, Germany

Session Keynote: Kristian Bär (TU Darmstadt)

Geothermal energy represents one of the most promising and sustainable pathways toward a carbon-neutral future with studies showing that the heat transition is not possible without geothermal energy. However, the inherent complexity of subsurface systems and site-specific geological variations present significant challenges and require extensive preliminary studies. As a result, medium-deep and deep geothermal systems are currently in limited use.

We encourage submissions covering shallow, medium-deep, or deep geothermal systems as well as heat and cold storage. Topics of interest include, but are not limited to, regional geological settings comprising advanced field-based (e.g. 3D-field surveys) lithological and structural analysis, analogue studies, geophysical surveys, hydrological modelling, lab experiments and reservoir modelling. Insights in to ongoing and planned projects, reservoir stimulation management and monitoring, thermal engineering and innovative geothermal utilisation methods are also appreciated.

We explicitly welcome studies in non-traditional settings, incentivizing rollout into underexplored regions for long-term development.

ID: 169

07.03 Quantifying surface and near-surface dynamics with remote sensing and geophysics

Anette Eltner¹, Janek Walk², Josefine Umlauf³

¹Technische Universität Dresden, Germany; ²Julius-Maximilians-Universität Würzburg, Germany; ³Universität Leipzig, Germany

Landscape activity mainly manifests by the dynamics at its surface and the thin active zone below. In an era of escalating change and unclear reactions of the Earth System to shifting boundary conditions and tipping elements, it becomes increasingly important to collect and efficiently analyse measurement data that depicts those system reactions. As such, it is crucial to fuse techniques that are able to yield high resolution, spatially distributed, time-resolved and integrative information on how the surface and near-surface space of our planet operates. We invite contributions from the fields of remote sensing, terrestrial and air-borne close range sensing, instrumental field data collection, and near-surface geophysics. We particularly welcome studies that show how to fuse such diverse data to gain new insight into how our planet operates during the great environmental transient currently unfolding. We include a wide range of disciplines such as geomorphology, (engineering) geology, geophysics, geochemistry, and sedimentology.

ID: 170

07.04 Challenges in geoscientific applications

Thomas Hoffmann¹, Elisabeth Dietze²

¹Bundesanstalt für Gewässerkunde, Germany; ²University Göttingen, Germany

Session Keynote: Dr. Ralph Schielen (TU Delft, Faculty of Civil Engineering and Geosciences (CiTG), The Netherlands)

How can geoscience contribute to solve the grand societal challenges of climate change, resource limitation, CO₂ and waste storage, conservation and restoration of valuable environmental systems? What knowledge and skills are essential for geoscience applications in a governmental and non-governmental context, industry, and education outside of academia? This session invites colleagues to report from application of geoscience to solve social issues, especially welcoming studies focusing on environmental management of geomorphic processes and systems including sediment management and nature-based solutions. We target exchange between members of universities, research institutions, public and private institutions as well as decision makers and teachers training the next generation of geoscientists. The session aims to identify institutional and other obstacles that may prevent an effective knowledge exchange between science and society.

08 Early Careers

ID: 120

08.01 Young Scientist Session

Fiene Stoepeke¹, Fritz-Lukas Stoepeke², Bastian Grimm³, Rebecca Volkmann⁴, Nils Overbeck⁵

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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 who attend a conference for the first time or who are not sure 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 give young scientists a platform to present and discuss their latest research in a conference environment with a diverse audience.

ID: 166

08.02 Building Bridges – Erfahrungen aus der geowissenschaftlichen Praxis für den Karriereweg

Christian Kiesl, Friedwolt Weber, Christoph Hilgers, Andreas Günther-Plönes

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.

ID: 173

08.03 Tilly Edinger Symposium

Vanessa Julie Roden¹, Joachim T. Haug²

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The Tilly Edinger Award is aimed at young researchers (up to 5 years post-doctoral) and is awarded for outstanding research achievements within paleontology and related disciplines with a paleontological focus. With this award, the Paläontologische Gesellschaft commemorates the paleontologist Tilly Edinger (1897-1967), who established the field of comparative paleoneurology. She embodied the virtues that characterize the award named after her: scientific interest, courage to break new ground, and determination to set and achieve (scientific) goals.

The candidates for the Tilly Edinger Award will present an overview of their research in this symposium. The selection of candidates focuses on the interdisciplinarity, innovation, and methodological diversity of their research. The award will be presented at the end of the conference.

Information on submission requirements for the award application can be found on our website:

www.palges.de/en/about-us/awards/tilly-edinger-award. The submission deadline is June 30, 2025.

In addition to the award application, please submit an abstract to the conference organizers according to their requirements and deadline.

09 The Public

ID: 171

09.01 Open Educational Resources (OER) in Geosciences: From Basics to Practice

Marlen Schumann¹, Wolfgang Schwanghart², Nancy Walter³, Elisabeth Dietze⁴

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Open Educational Resources (OER) are becoming increasingly relevant in higher education, yet many teachers and researchers are still unfamiliar with how to use, to create themselves and publish them effectively. This interactive workshop provides a structured introduction to OER, guiding participants from the fundamentals to discipline-specific applications in geosciences and geography education. In the first part, participants will learn about the principles of OER, licensing models, and the benefits of open educational practices. Building on this foundation, the second part will focus on subject-specific platforms where high-quality OER materials can be found and published. Through hands-on activities, participants will explore how to create and share their own open resources, gaining practical experience in developing accessible and reusable educational materials. The workshop is designed to be interactive, combining theoretical input with practical exercises. By actively engaging in OER development, participants will learn how to curate their own discipline-specific material collections. This process can also contribute to support a Community of Practice for geosciences educators, fostering collaboration and the exchange of Open Educational Resources. This session is aimed at teachers, researchers, and instructional designers in geosciences and geography education who are interested in leveraging OER for innovative and sustainable teaching practices.

ID: 105

09.02 Museen als Fenster in die Forschung

Christina Ifrim

Staatliche Naturwissenschaftliche Sammlungen Bayerns, Germany

Wissenschaftskommunikation ist wichtiger denn je. Naturkundemuseen sind vor allem für die Kommunikation geowissenschaftlicher Forschung eine gute Plattform. In dieser Session sollen Projekte und Konzepte vorgestellt werden, in denen direkt aus der Wissenschaft berichtet wird. Die Session soll einen Überblick über existierende Ansätze geben und zum Ideenaustausch anregen. Von Wissenschaftler:in bis Museumspädagog:in sind alle eingeladen, Projekte aus ihren Museen vorzustellen.

ID: 106

09.03 What Do We Know About Learning and Teaching Geosciences? – Geoscience Education Research and Outreach

Sylke Hlawatsch^{1,6}, Sharon Locke^{2,4}, Gilla Simon^{3,5}

¹Richard-Hallmann Schule Trappenkamp, Germany; ²Center for STEM Research, Education, and Outreach, Department of Environmental Sciences, Southern Illinois University Edwardsville, USA; ³Bavarian State Collections of Natural History, Museum Mensch und Natur, Germany;

⁴International Geoscience Education Organisation (IGEO); ⁵German Mineralogical Society (DMG); ⁶German Geological Society (DGGV)

Session Keynote: Cheryl L.B. Manning (Earth Systems Science Education Research and Consulting, LLC, Evergreen, Colorado)

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 and 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 preconditions of the learners and teachers (e.g. their interests, their conceptions, their competences), 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 different countries.

Reports on best practice in outreach activities are also welcome.

References Weinert, F. E. (ed.). (2014). Performance measurements in schools (3rd ed.). Beltz.

ID: 110

09.04 WORKSHOP - Why not consider adding a bit of research to your teaching? Introduction to empirical geoscience education research on the competencies of school or university students

Sharon Locke^{1,3}, Sylke Hlawatsch^{2,4}

¹Center for STEM Research, Education, and Outreach, Department of Environmental Sciences, Southern Illinois University Edwardsville, USA;

²Richard-Hallmann-Schule, Trappenkamp, Germany; ³International Geoscience Education Organisation (IGEO); ⁴German Geological Society, Section Geoscience Education

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

The target audience for this workshop is any instructor seeking to begin research in their geoscience course. 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 student learning and performance and to identify effective teaching resources that can be shared with the community. This workshop will focus on common types/existing inventories of quantitative geoscience education research and describe analytical methods suitable for it.

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 and understand how to analyze their research findings.

10 Open Topic

10.01 Open Topic