Research

Hydrogeology+

The area of study known as hydrogeology looks at a very wide spectre of problems that are connected to groundwater. The course is very much presented as an applied science, since Slovenia's main source of drinking water is groundwater. Groundwater is also important from the point of view of developments; almost all construction, where work is done into the ground, comes into contact with groundwater. Additionally, it is also important to understand the dynamics of groundwater from the point of view of environmental protection. Next to air, groundwater is the second most frequent medium for spreading pollutants. We consequently come into contact with hydrogeology in numerous areas in the course of our everyday work.
The course in hydrogeology gives students an introduction to the basics of the natural water cycle, including the fundamentals of the appearance of groundwater in the geosphere and groundwater dynamics. Students additionally get acquainted with the basics in groundwater protection and the laws behind the transfer of pollutants in aquifers. The course pays special attention to solving practical problems, everything from capturing water in order to provide drinking water for local inhabitants to what steps to take when faced with construction that is under the direct influence of groundwater.

Engineering Geology and GIS+

The Engineering Geology course at the Chair of Applied Geology is directed toward using knowledge of geology in order to solve practical problems when it comes to human-based incursions into the environment (ground) and remedying the consequences of these incursions. When constructing large facilities at the surface and under it, engineering geology finds the mutual influences between the facility and the ground. The goal of this area of study is to provide the student with a basic understanding of engineering geology that will help him or her with practical work in the field (building foundations for buildings, research and constructing roads in different geological conditions, engineering-geological forecast maps, etc.) and provide the necessary knowledge to ascertain the consequences of interventions in the terrain (landfills, environmental geology, etc.) as well as manage natural threatening phenomena (landslides and earthquakes). Students get acquainted with engineering and geology units and the general engineering-geological characteristics of Slovenian terrain, the properties of soils and rocks, destructive processes, the basics of seismic regioning, the reasons behind landslides, the types of landslides, debris flows and other mass movements and their remediation.
The field of Geographic Information Systems (GIS) in geology encompasses the use of practical and modern computer software in order to capture and save spatial data in relational databases, prepare geological and other thematic maps, manage data and, above all, make spatial analyses and 2-D and 3-D data displays. Spatial analyses include point queries, analyses of vector data and plant analyses in order to prepare thematic geological maps and maps of threat, vulnerability and risk.

Karst Geology and Physical Geology+

Knowledge about the Karst, the most important still available source of large quantities of drinking water, is becoming more relevant with each passing day. 45% of all land in the Republic of Slovenia is represented by Karst; unlike most of the civilised world, it is also relatively densely populated. This represents additional

problems, both from the point of view of Karst living technology and the protection of Karst waters. At the same time, Slovenian Karst is also the cradle of karstology and one of the most important areas for researching Karst in the world. Slovenian karstologists are among the leading world experts, having developed several new research methods in the last couple of decades. The course in Karst Geology includes solving various problems from the wider area of speleogenesis, geotechnical aspects of living on karstic land and the exodynamics of karstic areas. At their core, various karstic forms are changed (specifically modified) geological structures that are very much different from, for example, the much more known fluvial structures because of the special conditions under which they are formed. Consequently, we are quickly faced with erroneous identification when first starting to examine them; this in turn takes away any credibility from further research/technological use.
In the context of the Surface and Undergorund Karstic Forms and Processes theme, we will pay special attention to concrete karstic forms as a basis for further work; we will look at their range and the original geological structures and physical and chemical processes which brought about these present features.
Surface karstic processes generally work vertically. Consequently, there is not much accumulation in the karstic world; the underground and structural forms, which denudation brings to the surface, maintain their identity to a certain degree. The Dynamics of the Karstic Surface in Relation to the Underground Karst-Formation Processes theme pays special attention to the analysis of originally underground surface karstic phenomena and their link to the local and regional geological structure. Speleogenesis – a phase in the diagenesis of rocks – centres on the formation of karstic caves from the viewpoint of the rock cycle. In this context, study of the first formational karstic processes and of the paleokarst also represents an important phase; this is one of the key aspects of studying the paleoenvironment and of oil geology. A phase in the development of the Karst aquifer, speleogenesis is directed toward the conditions behind and understanding of the transition from a fissured aquifer to a channel one. We will also stress the relationship between lithological and structural conditions. This information is equally important for analysing concrete Karst water sources as well as for developing the strategy of sustainable living in karstic areas. Larger construction work in the area of the Karst inevitably stumbles upon different karstic phenomena. Special mapping of the Karst includes the geological mapping of karstic caves, the mapping of surface caving and the structural mapping of the Karst.
Physical geology as well as process and experimental geomorphology include a synthesis of endodynamics and exodynamics. That is why they cover the entire field of geology. Process and experimental geomorphology are essential when it comes to upgrading knowledge about Karst Geology. Since Physical Geology is partially covered by the holder of the Chair and is not taught in the scope of other courses, it makes sense to retain it in this framework.

Geochemistry+

Geochemistry is a science that looks at the composition of the Earth and the distribution of chemical elements and their isotopes in the Earth. It also looks at the laws governing this distribution. Geochemistry employs chemical principles in order to explain the mechanisms behind the past and present workings of geological systems, for example the Earth’s mantle, crust, oceans and atmosphere. It is one of our strongest tools to solve problems in crystallography, mineralogy, petrology, sedimentology, soil science, when studying ore deposits and in environmental and geomedical sciences. It studies the distribution of major and trace elements as well as stable and radioactive isotopes in igneous, metamorphic and sedimentary rocks, the atmosphere, hydrosphere and the biosphere. It enables their classification and interpretation and the determination of the processes and environment in which they were formed. A special branch of geochemistry is isotopic geochemistry, which measures stable and radioactive isotopes. Measuring radioactive isotopes is crucial for

determining the age and origin of rock; measurements of stable isotopes, meanwhile, are used to determine paleotemperatures and the different processes leading to the fractionation of stable isotopes. The modelling of geochemical processes mainly includes the computer, thermodynamic and mathematical processing of geochemical data in systems with several components. It is possible to calculate the pH, the redox potential, reactions, solubility and consequently the mass transport.

The fields of environmental geochemisty and geomedicine look at discovering the natural background of different elements in the environment and the separation of the geogenic from the anthropogenic impact, which can represent a source of pollution and harmful influence on living things.

Dostopnost

Applied Geophysics+

The field of study called Applied Geophysics deals with physical methods used for studying underground geological structures using measurements of natural and artificially induced physical fields with the aim of discovering mineral deposits and energy sources as well as for research in the context of various incursions into the environment. With the exception of depth drilling, geophysical methods are the only ones that enable us to research underground geological structures, giving other geological research a third dimension (depth). Applied geophysics is part of geophysics – a science that looks at the physical properties of the Earth, i.e. its solid part, the hydrosphere and the atmosphere. General or global geophysics looks at the physical properties of the planet Earth as a whole. Students will first acquire some general knowledge of geophysics and then use it to move on to applied geophysics.

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