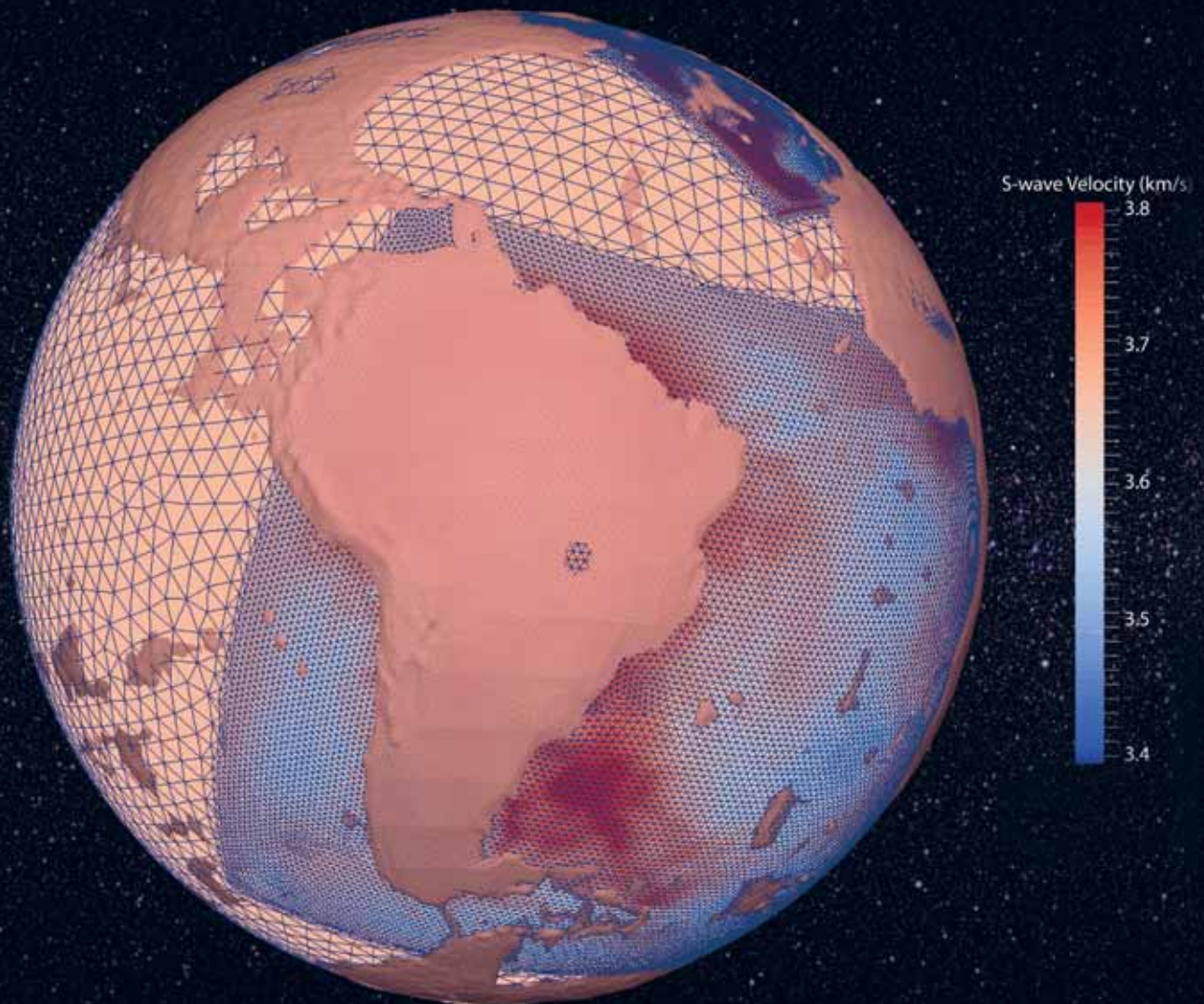


Master in Earth Sciences

Study Guide 2023/24



Master's Programme in Earth Sciences

Study Guide 2023/24

Issue April 2024

This Study Guide provides practical information on the Master's degree programmes in Earth and Climate Sciences. The legally binding documents for each Master's degree programme in the Department of Earth Sciences are:

– **Master's degree programme in Earth Sciences**

German version of the programme regulations "Studienreglement 2011 für den Master-Studiengang Erdwissenschaften"

↗ rechtssammlung.sp.ethz.ch/Dokumente/324.1.1003.11.pdf

– **Master's degree programme in Atmospheric and Climate Science**

German version of the programme regulations "Studienreglement 2006 für den Master-Studiengang Atmospheric and Climate Science"

↗ rechtssammlung.sp.ethz.ch/Dokumente/324.1.1003.20.pdf

– **Joint Master's degree programme in Applied Geophysics**

German version of the programme regulations "Studienreglement 2012 für den Joint Degree Master-Studiengang Applied Geophysics"

↗ rechtssammlung.sp.ethz.ch/Dokumente/324.1.1003.30.pdf

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Glossary

CAS	=	Certificate of Advanced Studies
D-ERDW	=	Department of Earth Sciences
D-GESS	=	Department of Humanities, Social and Political Sciences
D-USYS	=	Department of Environmental Systems Science
IDEA League	=	Network of leading universities of technology and science
RWTH	=	RWTH Aachen University
TUD	=	Delft University of Technology
UZH	=	University of Zurich
ECTS	=	European Credit Transfer System
Erfa	=	Earth Sciences student association
KP	=	Number of credits (ECTS)
FS	=	Spring Semester
HS	=	Autumn Semester

Table of contents

1	Studying Earth Sciences in Zurich	1
2	Course units and performance assessment	2
2.1	Registration of course units at ETH Zurich	2
2.1.1	Registration for excursions and field courses	2
2.1.2	Registration of projects, papers, or theses	2
2.2	Registration of modules at the University of Zurich	3
2.3	Examinations and performance assessment	3
2.4	Request for degree and graduation	4
3	Master's degree programmes in Earth Sciences	5
3.1	Learning goals	5
4	Master in Earth Sciences	6
4.1	Structure of the programme	6
4.1.1	Learning agreement – Study plan	6
4.1.2	Modules and electives	7
4.1.3	Science in Perspective	7
4.1.4	Master's Project Proposal	7
4.1.5	Master's Thesis	8
4.1.6	Student exchange	8
4.2	Major in Geology	9
4.2.1	Compulsory Geology module	9
4.2.2	Restricted choice modules from Geology offerings	10
4.2.3	Open choice modules and electives	11
4.3	Major in Engineering Geology	12
4.3.1	Compulsory Engineering Geology modules	12
4.3.2	Compulsory courses in Engineering Geology	13
4.3.3	Recommended courses in Engineering Geology (Electives)	14
4.4	Major in Mineralogy and Geochemistry	15
4.4.1	Compulsory Mineralogy and Geochemistry module	15
4.4.2	Restricted choice modules from Mineralogy and Geochemistry offerings	16
4.4.3	Open choice modules and electives	17

4.5	Major in Geophysics.....	18
4.5.1	Compulsory Geophysics modules.....	18
4.5.2	Restricted choice modules from Geophysics offerings	19
4.5.3	Electives in Geophysics	19
4.6	Open choice modules for all majors.....	20
5	Master in Atmospheric and Climate Science	23
5.1	Compulsory introductory course	23
5.2	Module courses.....	24
5.3	Elective courses.....	26
5.4	Laboratory and field work.....	26
5.5	Preparation for the Master's Thesis.....	27
6	Joint Master in Applied Geophysics	28
6.1	Time schedule	28
6.2	Courses of the Joint Master in Applied Geophysics.....	29
6.2.1	First term at TU Delft	29
6.2.2	Second term at ETH Zurich	29
6.2.3	Third term at RWTH Aachen	30
6.2.4	Master's project at TU Delft, ETH Zurich or RWTH Aachen	30
7	Continuing education – Beyond the Master's degree.....	31
7.1	Teaching Diploma in Geography	31
7.1.1	Requirements for Earth Sciences students ETH Zurich	31
7.1.2	Requirements for students from other backgrounds	32
7.1.3	Structure of the programme	33
7.1.4	Additional vocational pedagogical qualification.....	34
7.2	Certificate of Advanced Studies in Applied Earth Sciences	35
7.3	Doctorate	36
8	Further information.....	37
8.1	General information.....	37
8.2	Study advice	38
8.2.1	Study Administration and Study Coordination	38
8.2.2	Study advisors	39
8.2.3	Student mobility.....	39
8.3	Useful links.....	40

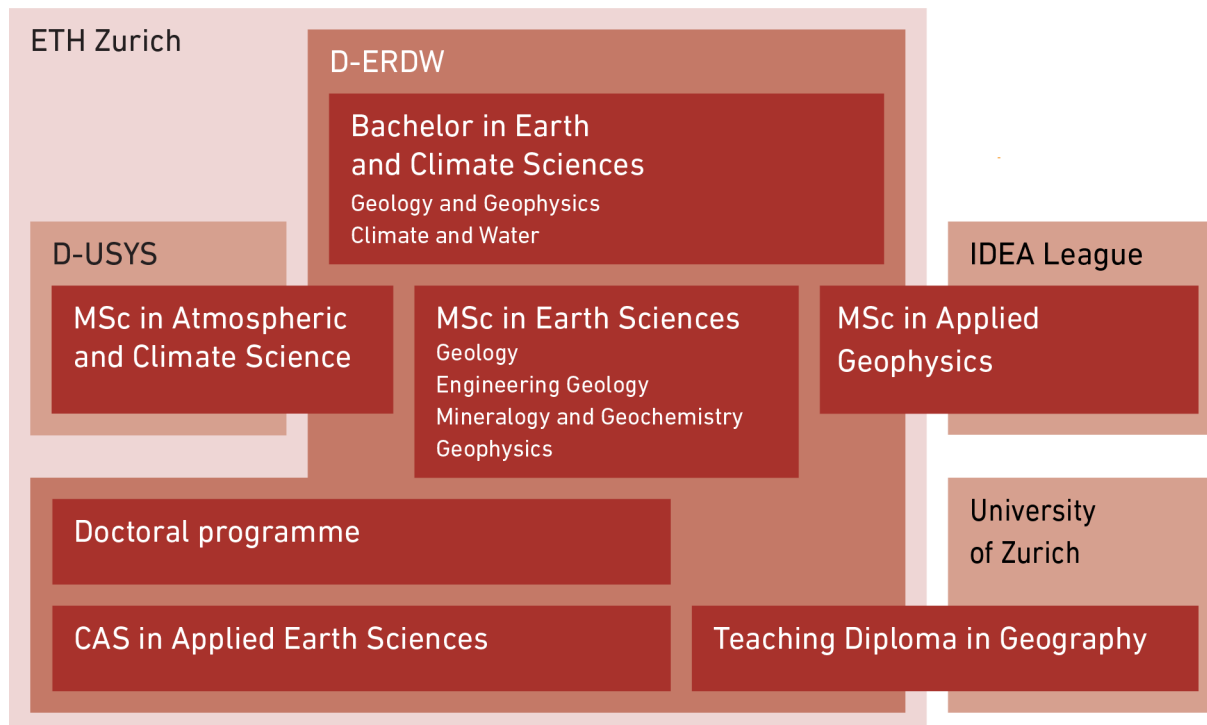
1 Studying Earth Sciences in Zurich

Earth Sciences at ETH Zurich present a study programme characterised by practical training and a rigorous science education. In addition to the study opportunities within the Department of Earth Sciences (D-ERDW) at ETH Zurich, there are opportunities to combine studies with industry or with programmes at other European universities including the University of Zurich or member universities of the European IDEA League.

The Department of Earth Sciences encourages collaborative study within different departments and universities. Earth Sciences have close ties to the Department of Environmental Systems Science (D-USYS) and to the Department of Geography at the University of Zurich with the goal of a coordinated educational programme to prepare a future generation of system-oriented natural scientists.

This Study Guide provides information about the goals, requirements, structural organisation, career possibilities, specialisations, and elective options associated with the Master's degree programmes in Earth Sciences. It should be noted that the programme regulations are the legal binding documents.

Regulations are published in the ETH Legal Collection. Important information about admission formalities can be found on the ETH website¹.



Master's degree programmes at the Department of Earth Sciences and involved partner institutions

¹ ethz.ch/en/studies/master/application

2 Course units and performance assessment

The study programme follows a credit system consistent with the European Credit Transfer System (ECTS). One credit (KP) corresponds to one ECTS, which is equivalent to 25–30 hours of work, including independent study.

Description of course units and details on performance assessments are listed in the legally binding course catalogue².

2.1 Registration of course units at ETH Zurich

Semester enrolment and all course registration is done via the web application myStudies³. The personal weekly schedule can be checked in accordance with the enrolments. The cancellation of a course must be done within the first four weeks of the semester.

Students at universities that have official cooperation agreements with ETH Zurich (such as the University of Zurich) may register as special students.

2.1.1 Registration for excursions and field courses

For administrative reasons, a special registration for excursions and field courses is needed through the web application “Excursions and Field Courses D-ERDW”. The application lists all excursions and field courses offered by the Department of Earth Sciences. After successful completion of the required excursion days or field courses, the credit points are automatically assigned to the corresponding course unit in myStudies.

2.1.2 Registration of projects, papers, or theses

Projects like a semester research project, the Master’s Project Proposal or the Master’s Thesis must be registered via myStudies (by selecting “projects/papers/theses”). The registration status is only definite after confirmation by the study advisor and/or the project supervisor.

² vorlesungen.ethz.ch

³ mystudies.ethz.ch

2.2 Registration of modules at the University of Zurich

Students from ETH Zurich may attend individual course units (modules) at the University of Zurich, take assessments and receive credit points. ETH Zurich recognises these academic achievements if they follow the valid regulation and with prior approval by the study advisor of the chosen major.

The registration at University of Zurich for students of ETH Zurich is called "Module Mobility - Registering for studies at more than one university"⁴. Students of ETH Zurich do not have to pay any fees. Note that there is only a short time frame to register for modules.

The assessments of modules taken at the University of Zurich by ETH students is sent to ETH Zurich electronically. After validation of the data, students receive an e-mail and can view the grade in their ETH transcript (myStudies).

2.3 Examinations and performance assessment

At ETH Zurich, there are the following types of performance assessments⁵:

- Session examinations additional registration for the exam in myStudies
- End-of-semester examinations additional registration for the exam in myStudies
- Semester performance assessments

The examination type of a course is published in the course catalogue⁶ and in myStudies⁷. The legally binding regulations concerning all types of performance assessments are described in the General Ordinance for Performance Assessments at ETH Zurich⁸.

⁴ uzh.ch/en/studies/application/chmobilityin (strict deadlines apply)

⁵ ethz.ch/students/en/studies/performance-assessments/examination-information

⁶ vorlesungen.ethz.ch

⁷ mystudies.ethz.ch

⁸ fedlex.admin.ch/eli/cc/2012/446/de

2.4 Request for degree and graduation

The request for degree can be submitted as soon as the minimum required credit points have been obtained. The request must be printed via myStudies, signed, and handed in to the Study Administration Office electronically or in person. Based on the request, the following documents are issued:

- Final academic record, with or without an addendum
- The diploma (degree) certificate

The successful completion of the Master's programme at the Department of Earth Sciences entitles graduates to bear the following academic titles (depending on the Master's degree programme chosen):

- **Master of Science ETH in Earth Sciences**
(MSc ETH Earth Sc)
- **Master of Science ETH in Atmospheric and Climate**
(MSc ETH in Atmos Clim Sc)
- **Master of Science in Applied Geophysics**

3 Master's degree programmes in Earth Sciences

The Department of Earth Sciences offers three different Master's degree programmes:

- **Master in Earth Sciences** with four different specialisations:
 - Major in Geology
 - Major in Engineering Geology
 - Major in Mineralogy and Geochemistry
 - Major in Geophysics
- **Specialised Master in Atmospheric and Climate Science**
- **Joint Master in Applied Geophysics**

The Master's degree programme may be extended by completing a continuing education programme such as a doctorate, the Certificate of Advanced Studies ETH in Applied Earth Sciences, or the Teaching Diploma in Geography, which is the accreditation to teach Geography at a Swiss high school.

3.1 Learning goals

The goal of each of our Master's degree programme is to prepare students for an occupation in one of the specialised fields of Earth Sciences. The common goals of all programmes include development of the following abilities:

- Conduct independent analysis to define an earth science thesis (problem) and to construct a research programme based on existing knowledge, literature, and independent observations.
- Solve complex earth science problems, including the independent use of observation, measurement, and model methods.
- Comprehensively present project results, verbally and in writing.
- Work in a team, both in a lead function or within a collaboration.

A broad and solid knowledge in the field of Earth Sciences makes graduates of the Master's degree programmes attractive candidates for governments, research institutions or private industry within the diverse areas of Earth Sciences.

4 Master in Earth Sciences

The Master's degree programme in Earth Sciences aims to enable students to handle complex problems and develop a broad range of skills. Compared to the Bachelor programme, students experience an increase in independence, in the subject choice, study structure, and the ability to participate in independent projects or an industry internship.

4.1 Structure of the programme

The modular structure of the Master's degree programme allows flexibility, but also ensures that the earth science fundamentals are adequately covered. The students define the main area of their educational path by choosing one of the four specialisations (majors).

		Geology	Engineering Geology	Mineralogy and Geochemistry	Geophysics
Science in Perspective (2 KP)	Master's Thesis (30 KP)				
	Master's Project Proposal (10 KP)				
	Total (78 KP)	Electives (25–30 KP, depending on major)			
		4 modules (48–53 KP, depending on major)			

Structure of the Master's degree programme in Earth Sciences (120 KP) with four specialisations

4.1.1 Learning agreement – Study plan

At the beginning of the Master's studies, students must set up an individual study plan outlining their planned modules and elective courses. This study plan ensures a well-ordered and rational programme while taking the student's individual ideas and expectations into consideration.

The study plan is discussed with and approved by the study advisor of the chosen major. It must be turned in to the study advisor within three weeks from the start of the semester. Subsequent changes are subject to approval by the study advisor.

4.1.2 Modules and electives

Courses are organised into topical blocks (modules) with a minimum of 12 credits. Within the chosen major students select at least four modules (48–53 credits).

At least 25–30 credits of elective courses are chosen from the complete offerings of ETH Zurich and the University of Zurich, allowing students either to deepen their knowledge in Earth Sciences or to complement it with studies in other disciplines.

For students interested in the Teaching Diploma in Geography, the additional requirements in Geography (see chapter 7.1.1) can be counted towards the electives.

A minimum amount of 78 credits must be completed in modules and electives.

4.1.3 Science in Perspective

All ETH Zurich students must attend two credits worth of courses at the Department of Humanities, Social and Political Sciences (D-GESS) to achieve a Master's degree⁹.

The Science in Perspective (SiP) coursework enables ETH Zurich students to perceive and analyse the societal context of their future activity as scientists and/or engineers. The aim of the SiP is to critically analyse and put specialist knowledge from the natural and technical sciences into a social context. They encourage holistic and future-oriented knowledge communication. This provides awareness of new ways of thinking and alternative scientific approaches and contributes to the personal development of students.

4.1.4 Master's Project Proposal

A major purpose of the Master's Project Proposal is to prepare students for their Master's Thesis. Effective organisation and accurate, concise writing are key to communicating in science. The Master's Project Proposal (10 credits) therefore aims to learn scientific work, such as defining a thesis topic and introducing students to methods of research and research communication. Integral part of the Master's Project Proposal is the one-off lecture "Conduct as a Scientist", which teaches the most important rules on scientific ethics.

The thesis topic is defined during the third semester (Autumn Semester) in consultation with the project supervisor, typically in one of the research fields associated with the selected major. Interdisciplinary projects involving co-supervisors from neighbouring fields are also possible.

The Master's Project Proposal and Master's Thesis are supervised by two or more supervisors/examiner (see chapter 4.1.5).

For detailed information on the Master's Project Proposal please refer to the guidelines¹⁰.

⁹ gess.ethz.ch/en/studies/science-in-perspective

¹⁰ erdw.ethz.ch/en/studies/documents

4.1.5 Master's Thesis

The Master's programme is concluded with the Master's Thesis (30 credits). The subject is defined in the Master's Project Proposal and, in most cases, will be integrated into one of the research groups at the Department of Earth Sciences. The maximum duration of the Master's Thesis is six months.

Before starting on the Master's Thesis, students must:

- Have obtained their Bachelor's degree.
- Have fulfilled all additional requirements (if any).
- Have successfully completed the Master's Project Proposal.

The Master's Project Proposal and Master's Thesis are supervised by:

- Main supervisor (mandatory)
- Additional supervisor (optional)
- Examiner (if necessary)

Supervisors are involved in the Master's Thesis. If the supervisor(s) belong to the same group an examiner belonging to another research group is necessary. The examiner will evaluate but not necessarily supervise the thesis.

At least one supervisor or examiner must be a professor/PD of the Department of Earth Sciences, the Institute for Atmospheric and Climate Science or one of the department's authorised senior researchers¹¹. Exceptions must be approved by the Director of Studies. The grades from all supervisors and examiners have equal weight for the final mark. Please refer to the guidelines¹² for further information.

4.1.6 Student exchange

Preparations for a student exchange should be started at least one year before the planned exchange semester. The ETH Student Exchange Office¹³ provides information about ETH-wide exchange programmes and helps with the preparation. The departmental exchange coordinator¹⁴ offers advice on the departmental exchange programmes and on setting up your study plan together with the study advisor of the chosen major.

Self-organised exchanges¹⁵ are only possible for students with an ETH Bachelor's degree. Any crediting for a self-organised exchange is only possible with prior approval by the Director of Studies.

¹¹ erdw.ethz.ch/en/studies/master/earth-sciences/thesis/authorised-supervisors

¹² erdw.ethz.ch/en/studies/master/earth-sciences/thesis

¹³ ethz.ch/students/en/studies/study-abroad

¹⁴ erdw.ethz.ch/en/studies/mobility

¹⁵ erdw.ethz.ch/en/studies/mobility/outgoing/self-organised-exchange

4.2 Major in Geology

The Major in Geology introduces students to concepts for exploring the significance of rock archives for basin formation and fill, mountain building, and climate and biological evolution. It teaches the relationships among geological structures, forces, and deformation rates that operate during tectonic activity.

4.2.1 Compulsory Geology module

The Major in Geology has one compulsory module, which introduces students to techniques for investigating the various properties of rocks and minerals.

Analytical Methods in Earth Sciences

Microscopy courses (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4047-00	Microscopy of Magmatic Rocks	HS	2 KP
651-4045-00	Microscopy of Metamorphic Rocks	HS	2 KP
651-4051-00	Reflected Light Microscopy and Ore Deposits Practical	HS	2 KP
651-4113-00	Sedimentary Petrography and Microscopy	HS	2 KP

Analytical Methods courses (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4055-00	Analytical Methods in Petrology and Geology	HS	3 KP
651-0046-00	Electron Microscopy Course (SEM and EPMA)	HS	3 KP
651-4117-00	Sediment Analysis	HS	3 KP
651-4063-00	X-Ray Powder Diffraction	HS	3 KP
651-4038-00	Microstructures and Rock Rheology	FS	3 KP

4.2.2 Restricted choice modules from Geology offerings

The restricted choice modules from the Geology offerings educate future professionals and academics in the main geological disciplines through an integrated presentation of the relationships between tectonic, sedimentary, climatic, and biogeochemical processes on our planet. Students choose at least two of the following modules.

Structural Geology

Compulsory courses (7 credits)

Number	Title	Semester	ECTS
651-4132-00	Field Course IV: Non-Alpine Field Course	HS/FS ¹⁶	3 KP
651-4022-00	Advanced Structural Geology with Field Course	FS	4 KP

Courses of choice (minimum of 5 credits)

Number	Title	Semester	ECTS
651-4111-00	Experimental Rock Physics and Deformation	HS	3 KP
651-3521-00	Tectonics	HS	3 KP
651-4038-00	Microstructures and Rock Rheology	FS	3 KP
651-4134-00	Tectonic Geomorphology	FS	6 KP
651-4144-00	Introduction to Finite Element Modelling in Geosciences	FS	2 KP

Palaeoclimatology

Compulsory courses (7 credits)

Number	Title	Semester	ECTS
651-4057-00	Climate History and Palaeoclimatology	HS	4 KP
651-4004-00	The Global Carbon Cycle - Reduced	FS	3 KP

Courses of choice (minimum of 5 credits)

Number	Title	Semester	ECTS
651-4043-00	Sedimentology II: Biological and Chemical Processes in Lacustrine and Marine Systems	HS	3 KP
651-4226-00	Geochemical and Isotopic Tracers of the Earth System	FS	3 KP
651-4056-00	Limnogeology	FS	3 KP
651-4044-04	Micropalaeontology and Molecular Palaeontology	FS	3 KP
651-4157-00	Past Droughts, Floods and Rainfall Variability	FS	2 KP
651-4157-02	Impact and Drivers of Past Ocean Circulation Change	FS	2 KP

¹⁶ Two-yearly recurring course. Held in Autumn or Spring Semester depending on destination.

Sedimentology

Compulsory courses (9 credits)

Number	Title	Semester	ECTS
651-4041-00	Sedimentology I: Physical Processes and Sedimentary Systems	HS	3 KP
651-4043-00	Sedimentology II: Biological and Chemical Processes in Lacustrine and Marine Systems	HS	3 KP
651-4150-00	Sedimentary Rocks and Processes	FS	3 KP

Courses of choice (minimum of 3 credits)

Number	Title	Semester	ECTS
651-4901-00	Quaternary Dating Methods	HS	2 KP
651-4063-00	X-Ray Powder Diffraction	HS	3 KP
651-4341-00	Source to Sink in Sedimentary Systems	HS	3 KP
651-4243-00	Seismic Stratigraphy and Facies	HS	2 KP
651-4080-00	Fluvial Sedimentology	FS	2 KP
651-4004-00	The Global Carbon Cycle - Reduced	FS	3 KP
651-4902-00	Quaternary Geology and Geomorphology of the Alps	FS	3 KP
651-4134-00	Tectonic Geomorphology	FS	6 KP
101-0302-00	Clays in Geotechnics: Problems and Applications	FS	3 KP

Biogeochemistry

Compulsory courses (6 credits)

Number	Title	Semester	ECTS
651-4044-04	Micropalaeontology and Molecular Palaeontology	FS	3 KP
651-4004-00	The Global Carbon Cycle - Reduced	FS	3 KP

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4057-00	Climate History and Palaeoclimatology	HS	4 KP
651-4043-00	Sedimentology II: Biological and Chemical Processes in Lacustrine and Marine Systems	HS	3 KP
651-4226-00	Geochemical and Isotopic Tracers of the Earth System	FS	3 KP
651-4044-02	Geomicrobiology and Biogeochemistry Field Course	FS	2 KP
651-4056-00	Limnogeology	FS	3 KP

4.2.3 Open choice modules and electives

Students choose at least one open choice module from the complete offerings (compulsory, restricted choice, or open choice modules) of the department. At least 25-30 credits within the electives must be completed to reach a total of at least 78 credits within the modules and electives (see chapter 4.1.2).

4.3 Major in Engineering Geology

The Major in Engineering Geology focuses on the interactions among people, engineered structures, and geology. Students learn to characterise and predict the behaviour of rocks and soils under near-surface loading conditions, such as in surface excavations, tunnels, and dams as well as below roads, buildings, and bridges. In addition, students learn how to identify, characterise, and cope with natural slope instabilities. They become familiar with fundamental and applied issues of groundwater use and geological waste disposal.

4.3.1 Compulsory Engineering Geology modules

The four compulsory modules of the Major in Engineering Geology cover the core skills of Engineering Geology and provide the foundation knowledge for study of the geo-environment, hazards, hydrogeology, soil and rock mechanics, foundation engineering and underground construction. Engineering geological and hydrogeological properties and processes in rocks and soils are introduced and applied to ongoing projects in Switzerland and abroad.

Fundamentals

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4023-00	Groundwater	HS	4 KP
651-4025-00	Rock Mechanics and Rock Engineering	HS	4 KP
651-4033-00	Soil Mechanics and Foundation Engineering	HS	4 KP

Methods

Compulsory courses (15 credits)

Number	Title	Semester	ECTS
651-4065-00	Geological Site Investigations	HS	3 KP
651-4125-00	Rock and Soil Mechanical Lab Practical	HS	3 KP
651-4064-00	Engineering Geological Field Course I (Soils)	FS	3 KP
651-4066-00	Engineering Geological Field Course II (Rocks)	FS	3 KP
651-4061-00	Hydrogeological Field Course	FS	3 KP

Integration

Compulsory courses (13 credits)

Number	Title	Semester	ECTS
651-4072-00	Engineering Geology of Underground Excavations	FS	5 KP
651-4074-00	Landfills and Deep Geological Disposal of Radioactive Waste	FS	3 KP
651-4070-00	Landslide Analysis	FS	5 KP

Industrial Internship

Compulsory course (12 credits)

Number	Title	Semester	ECTS
651-4071-00	Industrial Internship	HS/FS	12 KP

The “Industrial Internship” (third semester) is the fourth compulsory module for all students of the Major in Engineering Geology. The internship consists of 10 weeks practical work in a company. The internship concludes with a written report. If a student only does the industrial internship, a semester leave of absence enrolment is sufficient.

4.3.2 Compulsory courses in Engineering Geology

Engineering Geology Seminar and Alpine Engineering Geology Excursions

Compulsory course (3 credits)

Number	Title	Semester	ECTS
651-4068-00	Engineering Geology Seminar	FS	2 KP
651-4276-00	Alpine Engineering Geological Excursions	FS	1 KP

The “Engineering Geology Seminar” is compulsory for students majoring in Engineering Geology. The seminar consists of lectures given by all the students and by external guest scientists. The lectures given by the students refer to preliminary results of their Master’s Thesis.

In the seminar students learn to work with scientific literature and to approach problems from a scientific point of view. In addition, students learn to plan a longer project and to present and discuss scientific results. The attendance is thus a part of the Master’s Project Proposal and the thesis itself. Furthermore, the seminar gives an in-depth knowledge into a few selected research topics in Engineering Geology.

The “Alpine Engineering Geological Excursions” include 4 days of specialised engineering geologic excursions that are offered by the Engineering Geology group. The excursions increase the amount of field experience in alpine engineering geology as an essential component of the programme.

4.3.3 Recommended courses in Engineering Geology (Electives)

At least 25-30 credits within the electives must be completed to reach a total of at least 78 credits within the modules and electives (see chapter 4.1.2).

Students majoring in Engineering Geology are encouraged to deepen their knowledge in specific fields by choosing the recommended modules or an individual selection of courses of the open choice modules as electives.

Recommended modules in Earth Sciences

Module	Category
Sedimentology	Major in Geology
Structural Geology	Major in Geology
Mineral Resources	Major in Mineralogy and Geochemistry
Applied Geophysics	Open choice modules
Geographic Information Systems	Open choice modules
Glaciology	Open choice modules
Quaternary Geology and Geomorphology	Open choice modules
Remote Sensing	Open choice modules
Seismology	Open choice modules
Shallow Earth Geophysics	Open choice modules

The related courses are listed in the chapter of the major and the open choice module chapter.

Recommended courses in Geotechnics

Number	Title	Semester	ECTS
101-0307-00	Design and Construction in Geotechnical Engineering	HS	4 KP
101-0317-00	Tunnelling I	HS	3 KP
101-0302-00	Clays in Geotechnics: Problems and Applications	FS	3 KP
101-0318-01	Tunnelling II	FS	3 KP

4.4 Major in Mineralogy and Geochemistry

The Major in Mineralogy and Geochemistry provides students with a quantitative understanding of structure and properties of the materials that constitute Earth (rocks, minerals, melts, and fluids). It introduces the students to how these properties determine the dynamics and evolution of geological processes, such as magmatism, mountain building, the formation of energy and mineral resources, and the Earth itself.

4.4.1 Compulsory Mineralogy and Geochemistry module

The Major in Mineralogy and Geochemistry has one compulsory module, which introduces students to techniques for investigating the various properties of rocks and minerals. Students learn how diverse methodologies are used to solve real world problems.

Analytical Methods in Earth Sciences

Microscopy courses (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4047-00	Microscopy of Magmatic Rocks	HS	2 KP
651-4045-00	Microscopy of Metamorphic Rocks	HS	2 KP
651-4051-00	Reflected Light Microscopy and Ore Deposits Practical	HS	2 KP
651-4113-00	Sedimentary Petrography and Microscopy	HS	2 KP

Analytical Methods courses (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4055-00	Analytical Methods in Petrology and Geology	HS	3 KP
651-0046-00	Electron Microscopy Course (SEM and EPMA)	HS	3 KP
651-4117-00	Sediment Analysis	HS	3 KP
651-4063-00	X-Ray Powder Diffraction	HS	3 KP
651-4038-00	Microstructures and Rock Rheology	FS	3 KP

4.4.2 Restricted choice modules from Mineralogy and Geochemistry offerings

The restricted choice modules designed for the Major in Mineralogy and Geochemistry give students a quantitative understanding of the structure and properties of earth materials as well as of the dynamics and character of geological processes responsible for their formation. Students choose at least two of the following modules.

Mineralogy and Petrology

Compulsory courses (6 credits)

Number	Title	Semester	ECTS
651-4028-00	Physical Properties of Minerals	HS	3 KP
651-4039-00	Thermodynamics Applied to Earth Materials	HS	3 KP

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4233-00	Geotectonic Environments and Deep Global Cycles	HS	3 KP
651-4063-00	X-Ray Powder Diffraction	HS	3 KP
101-0302-00	Clays in Geotechnics: Problems and Applications	FS	3 KP

Petrology and Volcanology

Compulsory courses (3 credits)

Number	Title	Semester	ECTS
651-4032-00	Volcanology	FS	3 KP

Courses of choice (minimum of 9 credits)

Number	Title	Semester	ECTS
651-4233-00	Geotectonic Environments and Deep Global Cycles	HS	3 KP
651-4063-00	X-Ray Powder Diffraction	HS	3 KP
651-4108-00	Applied Geothermobarometry	FS	3 KP
651-4036-00	Field Excursion Module Mineral Resources	FS	3 KP
651-4032-01	Volcanology Field Course	FS	2 KP

Mineral Resources

Compulsory courses (6 credits)

Number	Title	Semester	ECTS
651-4037-00	Mineral Resources I	HS	3 KP
	Course of choice ¹⁷	HS/FS	3 KP

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4069-00	Fluid and Melt Inclusions: Theory and Practice	HS	3 KP
651-4221-00	Numerical Modelling of Ore Forming Hydrothermal Processes	HS	3 KP
651-4034-00	Resource Economics and Mineral Exploration	HS	3 KP
651-4036-00	Field Excursion Module Mineral Resources	FS	3 KP
651-4024-00	Mineral Resources II	FS	3 KP

Geochemistry

Compulsory courses (9 credits)

Number	Title	Semester	ECTS
651-4049-00	Conceptual and Quantitative Methods in Geochemistry	HS	3 KP
651-4227-00	Planetary Geochemistry	HS	3 KP
651-4226-00	Geochemical and Isotopic Tracers of the Earth System	FS	3 KP

Courses of choice (minimum of 3 credits)

Number	Title	Semester	ECTS
651-4229-00	Advanced Geochronology	HS	3 KP
651-4057-00	Climate History and Palaeoclimatology	HS	4 KP
651-4233-00	Geotectonic Environments and Deep Global Cycles	HS	3 KP
651-4010-00	Planetary Physics and Chemistry	HS	3 KP
651-4225-00	Topics in Geochemistry	HS	3 KP
651-4044-04	Micropalaeontology and Molecular Palaeontology	FS	3 KP
651-4004-00	The Global Carbon Cycle - Reduced	FS	3 KP
651-4228-00	Topics in Planetary Sciences	FS	3 KP

4.4.3 Open choice modules and electives

Students choose at least one open choice module from the complete offerings (compulsory, restricted choice, or open choice modules) of the department. At least 25-30 credits within the electives must be completed to reach a total of at least 78 credits within the modules and electives (see chapter 4.1.2).

¹⁷ As a compensation for Applied Mineralogy and Non-Metallic Resources I

4.5 Major in Geophysics

The Major in Geophysics is devoted to the study of the processes and structures of Earth's interior. Students learn to integrate geophysical field observations at Earth's surface with the modelling of physical processes and material properties within our planet.

The Major in Geophysics has a basic set of “toolbox” courses that provide knowledge of data processing, numerical modelling, and inverse theory, followed by fundamental courses in fluid dynamics, continuum mechanics, and potential theory. From this basis, they branch out into the diverse specialisations of Geophysics.

4.5.1 Compulsory Geophysics modules

Two modules are mandatory and provide students with the necessary technical tools to study all branches of Geophysics. The compulsory courses cover the core subjects of Geophysics and include geophysical methods such as geophysical data processing, numerical modelling, mathematical methods, and continuum mechanics.

Geophysical Methods I

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4005-00	Geophysical Data Processing	HS	3 KP
651-4241-00	Numerical Modelling I and II: Theory and Applications	HS	6 KP
651-4096-00	Inverse Theory for Geophysics I: Basics	FS	3 KP

Geophysical Methods II

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4007-00	Continuum Mechanics	HS	3 KP
651-4001-00	Introduction to Fluid Dynamics	HS	3 KP
651-4130-00	Mathematical Concepts in Geophysics	HS	3 KP
651-4013-00	Potential Field Theory	FS	3 KP

4.5.2 Restricted choice modules from Geophysics offerings

A choice of two restricted choice modules from within the Geophysics offerings allows students to delve more deeply into the main areas of Geophysics.

Seismology

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4021-00	Engineering Seismology	HS	3 KP
651-4015-00	Earthquakes I: Seismotectonics	HS	3 KP
651-4014-00	Seismic Waves II	HS	3 KP
651-4006-00	Seismic Waves I	FS	3 KP

Physics of the Earth's Interior

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4010-00	Planetary Physics and Chemistry	HS	3 KP
651-4008-00	Dynamics of the Mantle and Lithosphere	FS	3 KP
651-4017-00	Earth's Core and the Geodynamo	FS	3 KP
651-5107-00	Physics of Planetary Interiors	FS	3 KP

Applied Geophysics

Compulsory courses (14 credits)

Number	Title	Semester	ECTS
651-4240-00	Geofluids	FS	6 KP
651-4079-00	Reflection Seismology Processing	FS	5 KP
651-4087-00	Case Studies in Exploration and Environmental Geophysics	FS	3 KP

4.5.3 Electives in Geophysics

At least 25–30 credits¹⁸ of elective courses are chosen from the open choice modules or the complete offerings of ETH Zurich and the University of Zurich at Master's level, allowing students either to deepen their knowledge in Earth Sciences or to complement it with studies in other disciplines.

The chosen elective courses are part of the study plan, which is discussed with the study advisor. This ensures a well-ordered and rational programme while taking the student's individual ideas and expectations into consideration.

¹⁸ A total amount of 78 credits must be completed in modules and electives (see chapter 4.1.2).

4.6 Open choice modules for all majors

The following modules can be completed as open choice module within the two majors “Geology” and “Mineralogy and Geochemistry”. Each course can also be completed within the electives of all majors.

Basin Analysis

Compulsory courses (3 credits)

Number	Title	Semester	ECTS
651-4341-00	Source to Sink in Sedimentary Systems	HS	3 KP

Courses of choice (minimum of 9 credits)

Number	Title	Semester	ECTS
651-4243-00	Seismic Stratigraphy and Facies	HS	2 KP
651-4018-00	Borehole Geophysics	FS	3 KP
651-4232-00	Low Temperature Thermochronology	FS	3 KP
651-4134-00	Tectonic Geomorphology	FS	6 KP

Quaternary Geology and Geomorphology

Compulsory courses (5 credits)

Number	Title	Semester	ECTS
651-4901-00	Quaternary Dating Methods	HS	2 KP
651-4902-00	Quaternary Geology and Geomorphology of the Alps	FS	3 KP

Courses of choice (minimum of 7 credits)

Number	Title	Semester	ECTS
651-4077-00	Quantification and Modelling of the Cryosphere: Dynamic Processes (UZH)	HS	3 KP
651-1513-00	Field Studies on High Mountain Processes (UZH)	FS	6 KP
651-4134-00	Tectonic Geomorphology	FS	6 KP

Shallow Earth Geophysics

Compulsory courses (13 credits)

Number	Title	Semester	ECTS
651-4109-00	Geothermal Energy	FS	3 KP
651-4018-00	Borehole Geophysics	FS	3 KP
651-4106-03	Geophysical Field Work and Processing: Preparation and Field Work	FS	7 KP

Lithosphere Structure and Tectonics

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-3521-00	Tectonics	HS	3 KP
651-4015-00	Earthquakes I: Seismotectonics	HS	3 KP
651-4096-00	Inverse Theory for Geophysics I: Basics	FS	3 KP
651-4014-00	Seismic Waves II	HS	3 KP

Earthquake Seismology

Compulsory courses (9 credits)

Number	Title	Semester	ECTS
651-4021-00	Engineering Seismology	HS	3 KP
651-4015-00	Earthquakes I: Seismotectonics	HS	3 KP
651-4103-00	Earthquake II: Source Physics	FS	3 KP

Courses of choice (minimum of 3 credits)

Number	Title	Semester	ECTS
	Free electives	HS/FS	3 KP

Remote Sensing (UZH)

Compulsory courses (5 credits)

Number	Title	Semester	ECTS
651-4263-00	Remote Sensing and Geographic Information Science V (Remote Sensing Methods) (UZH)	HS	5 KP

Courses of choice (minimum of 7 credits)

Number	Title	Semester	ECTS
651-4257-00	Specialisation in Remote Sensing: SAR and LIDAR (UZH)	HS	6 KP
651-4269-00	Specialisation in Remote Sensing: Spectroscopy of the Earth System (UZH)	HS	6 KP
651-4278-00	Monitoring the Earth from Satellites: Radar Interferometry	FS	3 KP
651-2332-00	Specializing in Remote Sensing A: Seminars (UZH)	FS	6 KP

Glaciology

Compulsory courses (7 credits)

Number	Title	Semester	ECTS
651-3561-00	Kryosphäre	HS	3 KP
651-1504-00	Snow Cover: Physics and Modelling	FS	4 KP

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
101-0289-00	Angewandte Glaziologie	HS	3 KP
651-4101-00	Physics of Glaciers	HS	3 KP
651-4077-00	Quantification and Modelling of the Cryosphere: Dynamic Processes (UZH)	HS	3 KP
651-1581-00	Seminar in Glaciology	HS	3 KP
651-4162-00	Field Course Glaciology	FS	3 KP
651-1506-00	The High Mountain Cryosphere: Processes and Risks (UZH)	FS	3 KP
651-1513-00	Field Studies on High Mountain Processes (UZH)	FS	6 KP
101-0288-00	Snow and Avalanches: Processes and Risk Management	FS	3 KP

Geographic Information Systems (UZH)

Compulsory courses (5 credits)

Number	Title	Semester	ECTS
651-4267-00	Specializing in Geographic Information Science V (UZH)	HS	5 KP

Courses of choice (minimum of 7 credits)

Number	Title	Semester	ECTS
701-1776-00	Geographic Data Processing with Python and ArcGIS	HS	1 KP
651-4131-00	Introduction to Digital Mapping	HS	2 KP
651-4278-00	Monitoring the Earth from Satellites: Radar Interferometry	FS	3 KP
	Courses from the offerings of the Institute of Cartography and Geoinformation (D-BAUG)	HS/FS	2 KP

Palaeontology

Compulsory courses (3 credits)

Number	Title	Semester	ECTS
651-4044-04	Micropalaeontology and Molecular Palaeontology	FS	3 KP

Courses of choice (9 credits)

Number	Title	Semester	ECTS
	Courses to be discussed with Palaeontological Institute (UZH) or Climate Geology group	HS/FS	9 KP

5 Master in Atmospheric and Climate Science

The specialised Master's degree programme in Atmospheric and Climate Science (90 credits) leads to understanding of atmospheric processes and their interactions in space and time – from the molecular scale to the global scale and from short episodes to changes that require millions of years. Students acquire quantitative knowledge of atmospheric dynamics and physical / chemical exchange processes and cycles; they learn how to predict the evolution of the atmospheric flow from weather to climate time scales and how to interpret the uncertainty associated with these predictions.

The Master in Atmospheric and Climate Science offers an optional exchange programme with the University of Bern, which provides a wide variety of courses ranging from oceanography and palaeoclimatology to climate economics.

For detailed information about the Master's degree programme in Atmospheric and Climate Science, please visit the Institute for Atmospheric and Climate Science website¹⁹.

5.1 Compulsory introductory course

The Master's degree programme in Atmospheric and Climate Science entails a total of 90 credits. The students begin their studies during an introductory course prior to the start of the semester together with lecturers and staff of the institute as well as students in the corresponding programme of the University of Bern.

Introductory course

Compulsory course

Number	Title	Semester	ECTS
701-1213-00	Introduction Course to Master's Studies Atmosphere and Climate	HS	2 KP

¹⁹ iac.ethz.ch/edu/master

5.2 Module courses

During the first two semesters, the students attend a choice of modules (24 credits) and elective courses (20 credits). The students select three of five available modules and complete a minimum of 6 credits in each module, selected from a list of courses. The number of credits in the three modules must be a total of 24 credits. The five modules are structured as followed:

Weather Systems and Atmospheric Dynamics

The module “Weather Systems and Atmospheric Dynamics” encompasses the description and understanding of the fundamental processes that govern atmospheric motion on a wide range of scales (meso, synoptic, planetary). They form the basis of predicting and diagnosing weather and the longer-term climate evolution.

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4053-05	Boundary Layer Meteorology	HS	4 KP
701-1221-00	Dynamics of Large-Scale Atmospheric Flow	HS	4 KP
701-1226-00	Inter-Annual Phenomena and Their Prediction	FS	2 KP
701-1224-00	Mesoscale Atmospheric Systems – Observation and Modelling	FS	2 KP
701-1216-00	Weather and Climate Models	FS	4 KP

Climate Processes and Feedbacks

The primary goal of the “Climate Processes and Feedbacks” module is to understand the climate system with special focus on the atmosphere. Lectures will cover the basic physical processes of the atmosphere (thermodynamics, aerosol and cloud physics, radiation and dynamics). Application and analysis of certain aspects will be possible in the accompanying tutorials. Moreover, an overview of numerical methods that are used in weather and climate models with practical applications will be taught.

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
701-1251-00	Land-Climate Dynamics	HS	3 KP
701-1235-00	Cloud Microphysics	HS/FS	4 KP
701-1252-00	Climate Change Uncertainty and Risk: From Probabilistic Forecasts to Economics of Climate Adaptation	FS	3 KP
701-1228-00	Cloud Dynamics: Hurricanes	FS	4 KP
701-1216-00	Weather and Climate Models	FS	4 KP
701-1232-00	Radiation and Climate Change	FS	3 KP

Atmospheric Composition and Cycles

Knowledge of “Atmospheric Composition and Cycles” is fundamental to understanding air quality, atmospheric oxidation capacity and climate. This module can be optimally combined with several of the other modules.

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
402-0572-00	Aerosols I: Physical and Chemical Principles	HS	4 KP
701-1233-00	Stratospheric Chemistry	HS	4 KP
701-1238-00	Advanced Field and Lab Studies in Atmospheric Chemistry and Climate	FS	3 KP
701-1317-00	Global Biogeochemical Cycles and Climate	FS	3 KP
701-1234-00	Tropospheric Chemistry	FS	3 KP

Climate History and Palaeoclimatology

The module “Climate History and Palaeoclimatology” adds a long-term perspective to the Master’s programme. It introduces methods and approaches in palaeoclimatology. The students will have an understanding of the evolution of climate and its major forcing factors through geological time. They will be familiar with the use of most common geochemical climate “proxies” and be able to evaluate the quality of marine and terrestrial sedimentary palaeoclimate archives.

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
651-4057-00	Climate History and Palaeoclimatology	HS	4 KP
651-4044-04	Micropalaeontology and Molecular Palaeontology	FS	3 KP
651-4226-00	Geochemical and Isotopic Tracers of the Earth System	FS	3 KP
701-1317-00	Global Biogeochemical Cycles and Climate	FS	3 KP
651-4004-00	The Global Carbon Cycle - Reduced	FS	3 KP
651-4157-00	Past Droughts, Floods and Rainfall Variability ²⁰	FS	2 KP
651-4157-02	Impact and Drivers of Past Ocean Circulation Change ²¹	FS	2 KP

Hydrology and Water Cycle

The “Hydrology and Water Cycle” module introduces hydrological sciences, with particular attention to the weather/climate/land surface link. Atmospheric processes of weather and climate are closely related to the hydrological cycle and land surface processes. The interaction between atmosphere and the terrestrial hydrological system is two-way. Precipitation and evaporation drive the terrestrial hydrological system with important implications for ecosystems and our economy (e.g. floods and droughts) on the one hand. On the other hand, land surface processes affect the overlying atmosphere and thereby the climate system.

²⁰ Offered every second year

²¹ Offered every second year

Courses of choice (minimum of 6 credits)

Number	Title	Semester	ECTS
701-1253-00	Analysis of Climate and Weather Data	HS	3 KP
651-4053-05	Boundary Layer Meteorology	HS	4 KP
102-0468-10	Watershed Modelling	HS	6 KP
701-1251-00	Land-Climate Dynamics	HS	3 KP

5.3 Elective courses

Within the Master in Atmospheric and Climate Science, students are free to choose any courses offered at ETH Zurich (except certain language courses) to deepen or expand the content. Some optional courses covering the same field can be combined to a minor with 10 credit points. After consultation with the study advisor, courses from other programmes or universities can also be attended.

Elective courses (20 credits)

Choice of appropriate courses to increase the comprehensiveness of the modules

Number	Title	Semester	ECTS
	Elective courses	HS/FS	20 KP

A list of recommended courses and the available minors are published in the Study Guide of the Master's degree programme in Environmental Sciences, Major in Atmosphere and Climate²².

5.4 Laboratory and field work

Several practical courses are offered. Some of these courses are block courses (typically field work) in the first weeks of the Spring Semester break. Others will be carried out during the Spring Semester parallel to other courses.

Laboratory and field work**Courses of choice (minimum of 5 credits)**

Number	Title	Semester	ECTS
701-1262-00	Atmospheric Chemistry Lab Work	FS	2.5 KP
701-1264-00	Atmospheric Physics Lab Work	FS	2.5 KP
701-1260-00	Climatological and Hydrological Field Work	FS	2.5 KP
701-1266-00	Weather Discussion	FS	2.5 KP
701-1270-00	High Performance Computing for Weather and Climate	FS	3 KP

²² usys.ethz.ch/en/studies/environmental-sciences/documents/master

5.5 Preparation for the Master's Thesis

Preparations for the Master's Thesis will be started in the Master's Seminar offered in the second semester. At this time, the students will participate in exercises to develop writing skills, train oral presentation techniques, and promote teamwork.

The Seminar and Colloquium in Atmosphere and Climate will encourage the continued integration of the students into a research group and the institute.

Master's Seminar Atmosphere and Climate

Compulsory courses (6 credits)

Number	Title	Semester	ECTS
701-1211-01	Master's Seminar: Atmosphere and Climate 1	HS/FS	3 KP
701-1211-02	Master's Seminar: Atmosphere and Climate 2	HS/FS	3 KP

Colloquium Atmosphere and Climate

Compulsory courses (3 credits)

Number	Title	Semester	ECTS
651-4095-01	Colloquium Atmosphere und Climate 1	HS/FS	1 KP
651-4095-02	Colloquium Atmosphere und Climate 2	HS/FS	1 KP
651-4095-03	Colloquium Atmosphere und Climate 3	HS/FS	1 KP

Master's Thesis

Compulsory course

Number	Title	Semester	ECTS
651-4275-00	Master's Thesis	HS	30 KP

6 Joint Master in Applied Geophysics

The Joint Master in Applied Geophysics is a two-year joint degree programme offered by TU Delft, ETH Zurich, and RWTH Aachen University. Students spend one semester at each university and select a Master's Thesis project at one of the three locations.

The programme builds on the strengths and the complementary expertise in Earth Sciences at the three universities and provides the students with a comprehensive education in all areas of applied geophysics. The students become acquainted with basic processes and important state-of-the-art technologies in the field. Independent thinking and the integration of concepts and information are additional assets of the programme.

Please visit the IDEA League website for further information about the programme.

idealeague.org/geophysics

6.1 Time schedule

The following listing gives an approximate overview of the programme. Please refer to the programme website²³ for all important dates:

Year 1	
September – January	TU Delft
February – June	ETH Zurich
July – September	Summer break
Year 2	
October – February	RWTH Aachen
March – August	Master's Project

²³ idealeague.org/logistics-and-organisation

6.2 Courses of the Joint Master in Applied Geophysics

The Joint Master in Applied Geophysics comprises a significant number of core modules, a selection of specialised courses and a final research-oriented thesis project.

The programme comprises an average of 30 credits from each university and 30 credits for the Master's Thesis.

6.2.1 First term at TU Delft

The first term at TU Delft is focused on signal analysis, seismic and electromagnetic theory, and exploration geophysics.

A minimum of 24 credits must be completed from TU Delft subjects, whereby several courses are mandatory. A complete description of the core modules and optional electives can be found on the IDEA League website and in the course catalogue of TU Delft²⁴.

6.2.2 Second term at ETH Zurich

The education continues at ETH Zurich with courses on modelling, processing, and inversion of geophysical data. It is during this period that students design and execute geophysical field work during a practical summer course.

All course at ETH Zurich must be registered via myStudies. For excursions, an additional registration in the web application "Excursions and Field Courses D-ERDW"²⁵ is needed.

A minimum of 25 credits must be completed from ETH Zurich subjects, whereby several courses are mandatory. A complete description of the core modules and optional electives can be found on the IDEA League website and in the course catalogue of ETH Zurich²⁶.

Compulsory courses (total of 22 ECTS)

Number	Title	ECTS
651-4079-00	Reflection Seismology Processing	6 KP
651-4104-00	Geophysical Field Work and Processing: Methods	2 KP
651-4106-03	Geophysical Field Work and Processing: Preparation and Field Work	7 KP
651-4094-00	Numerical Modelling for Applied Geophysics	4 KP
651-4096-00	Inverse Theory I: Basics	3 KP

²⁴ studiegids.tudelft.nl

²⁵ exkursionen.erdw.ethz.ch

²⁶ vorlesungen.ethz.ch

Courses of choice (minimum of 3 ECTS)

Number	Title	ECTS
651-4240-00	Geofluids	6 KP
651-4087-00	Case Studies in Exploration and Environmental Geophysics	3 KP
651-4096-02	Inverse Theory II: Applications	3 KP
651-4109-00	Geothermal Energy	3 KP
701-0106-00	Mathematik V: Angewandte Vertiefung von Mathematik I - III	3 KP

6.2.3 Third term at RWTH Aachen

The Aachen term is centered around specialised applied and numerical methods (like machine learning in Geosciences), hydrogeophysics, engineering geophysics and borehole logging.

A minimum of 25 credits must be completed from TU Delft subjects, whereby several courses are mandatory. A complete description of the core modules and optional electives can be found on the IDEA League website and in the course catalogue of RWTH Aachen²⁷.

6.2.4 Master's project at TU Delft, ETH Zurich or RWTH Aachen

The Master's Thesis is the result of approximately six months of research, report writing, presentation and examination. There is sufficient time for students to make significant contributions to their topics. Many of the theses involve the integration of theory with data derived from field observations, field tests or laboratory work. The academic quality is guaranteed by integrating the thesis into the research activities of one of the partner universities or a suitable industrial, governmental or university laboratory.

The minimum credits required to start the Master's Thesis project is 80 credits.

TU Delft, ETH Zurich or RWTH Aachen (2nd year)**Compulsory courses (30 credits)**

Title	ECTS
Introduction to potential Master's Thesis topics	
Master's Thesis and Colloquium	30 KP

²⁷ online.rwth-aachen.de

7 Continuing education – Beyond the Master's degree

7.1 Teaching Diploma in Geography

ETH Zurich offers the opportunity to obtain a Teaching Diploma (Lehrdiplom) in Geography through didactic continuing education²⁸. The programme is only offered in German. The teacher training qualification provides an alternative career opportunity and can be completed with additional course requirements beyond the Master's degree. Students can start the Teaching Diploma once they have completed the Bachelor's degree.

7.1.1 Requirements for Earth Sciences students ETH Zurich

The following requirements in Geography²⁹ (28 credits) are compulsory for students with a:

- Bachelor and Master in Earth Sciences from ETH Zurich
- Bachelor in Earth Sciences from ETH Zurich and
 - Specialised Master in Atmospheric and Climate Science from ETH Zurich
 - Master in Environmental Sciences from ETH Zurich

All courses in Geography are taught at the University of Zurich and must be booked at the University of Zurich. The registration at University of Zurich for students of ETH Zurich is called "Module Mobility - Registering for studies at more than one university"³⁰. Students of ETH Zurich do not have to pay any fees. The deadlines are 31 July for the Autumn Semester and 31 January for the Spring Semester.

The booking of modules at the University of Zurich is only possible during the module booking period published in the course catalogue of the University of Zurich.

Courses in Human Geography (UZH)

Compulsory courses (15 credits)

Number	Title	Semester	ECTS
651-2601-00	Humangeographie I (UZH)	HS	5 KP
651-2613-00	Humangeographie III (UZH)	HS	5 KP
651-2612-00	Humangeographie II (UZH)	FS	5 KP

²⁸ ethz.ch/de/studium/didaktische-ausbildung

²⁹ Completion of the requirements in Geography (28 credits) during the Master's studies within the electives is possible with prior approval by the study advisor of the chosen major.

³⁰ uzh.ch/en/studies/application/chmobilityin (strict deadlines apply)

Courses of choice (minimum of 3 credits)

Number	Title	Semester	ECTS
651-2603-00	Geography. Matters. (UZH)	HS	4 KP
651-2600-00	Geographie der Schweiz (UZH)	FS	3 KP
651-2614-00	Humangeographie IV (UZH)	FS	5 KP

Courses in Physical Geography**Courses of choice (minimum of 5 credits)**

Number	Title	Semester	ECTS
651-3561-00	Kryosphäre	HS	3 KP
651-4903-00	Quartärgeologie und Geomorphologie	HS	3 KP
701-0501-00	Pedosphäre	HS	3 KP
651-4088-03	Physische Geographie III (UZH)	HS	5 KP
651-4088-04	Physische Geographie IV (UZH)	FS	5 KP
651-4902-00	Quaternary Geology and Geomorphology of the Alps	FS	3 KP

Courses in Cartography or Remote Sensing**Courses of choice (minimum of 5 credits)**

Number	Title	Semester	ECTS
651-2330-00	Fernerkundung und Geographische Informationswissenschaft III (UZH)	HS	5 KP
651-4031-00	Geographic Information System	HS	3 KP
651-4131-00	Introduction to Digital Mapping	HS	2 KP
103-0214-00	Kartografie GZ	HS	5 KP
651-4121-00	Fernerkundung und Geographische Informationswissenschaft II (UZH)	FS	5 KP

7.1.2 Requirements for students from other backgrounds

The regulation of the Teaching Diploma in Geography has been revised and is valid for students starting in Autumn Semester 2020. Therefore, the admission of students from universities other than ETH Zurich or with other backgrounds is based upon the personal dossier of the applicant.

7.1.3 Structure of the programme

The programme "Teaching Diploma in Geography" is offered in collaboration with the University of Zurich.

ETH Zurich course registration must be done in myStudies. All courses in Geography and most of the didactic courses are taught at the University of Zurich and must be booked at the University of Zurich. The registration at the University of Zurich for students of ETH Zurich is called "Registering for studies at more than one university, Master's level"³¹. Students of ETH Zurich do not have to pay any fees. Students must register at the latest by Friday before the beginning of the lecture period. The booking of modules at the University of Zurich is only possible during the module booking period published in the course catalogue of the University of Zurich.

The following courses are required for the Teaching Diploma:

Erziehungswissenschaften (EW)

Compulsory courses (13 credits)

Number	Title	Semester	ECTS
851-0242-01	Bewältigung psychosozialer Anforderungen im Lehrberuf (EW4)	FS/HS	3 KP
851-0240-00	Menschliches Lernen (EW1)	HS	2 KP
851-0238-01	Seminar Unterstützung und Diagnose von Wissenserwerbsprozessen (EW3)	FS/HS	3 KP
851-0240-01	Die Gestaltung schulischer Lernumgebungen (EW2)	FS	4 KP
851-0240-19	Lernwirksam Unterrichten (EW5): Abschluss Symposium	FS	1 KP

Courses of choice (2 credits)

Title	Semester	ECTS
Verschiedene Lehrveranstaltungen innerhalb des Wahlangebotes im Bereich Erziehungswissenschaften (EW)	HS/FS	2 KP

Fachdidaktische Ausbildung (FD)

The "Fachdidaktische Ausbildung" can be started once 16 credits of the requirement for Earth Sciences students and the course "Humangeographie I" has been completed.

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-4239-00	Fachdidaktik des Geographieunterrichts I (UZH)	HS	3 KP
651-2500-00	Fachdidaktik des Geographieunterrichts II (UZH)	FS	3 KP
651-4118-00	Fachdidaktik des Geographieunterrichts III (UZH)	FS/HS	3 KP
651-4120-00	Fachdidaktik IV: Mentorierte Arbeit	FS/HS	2 KP
651-4124-00	Prüfung Fachdidaktik	FS/HS	1 KP

³¹ uzh.ch/en/studies/application/chmobilityin (strict deadlines apply)

Berufspraktische Ausbildung (BPA)

Compulsory courses (15 credits)

Number	Title	Semester	ECTS
651-2519-01	Hospitationspraktikum (UZH)	HS	1 KP
651-2519-02	Übungslektionen im Rahmen der Fachdidaktik (UZH)	HS	2 KP
651-4137-00	Praktikumsjournal im Rahmen des Unterrichtspraktikum (UZH)	FS/HS	2 KP
651-2520-01	Prüfungslektion untere Stufe Geographie	FS/HS	1 KP
651-2520-02	Prüfungslektion obere Stufe Geographie	FS/HS	1 KP
651-2517-00	Unterrichtspraktikum Geographie I (UZH)	FS/HS	8 KP

Fachwissenschaftliche Vertiefung

Compulsory courses (12 credits)

Number	Title	Semester	ECTS
651-2517-02	Unterrichtspraktikum Geographie II (UZH)	HS/FS	6 KP
651-4136-00	Lernorte für Geographie und Geographiedidaktik (UZH)	HS	3 KP
651-4136-01	Lernorte für Geographie und Geographiedidaktik ³²	FS	2 KP
851-0242-10	Naturwissenschaftsdidaktische Grundlagen 1 (UZH)	FS	4 KP

The specialised courses with an educational focus in Geography have been restructured in Spring Semester 2017. Affected students and special cases will be considered individually during the transition period.

Elective courses

Courses of choice (6 credits)

	Title	Semester	ECTS
851-0229-00	Ausserschulische Lernorte nutzen ³³	FS	1 KP
	Lehrveranstaltungen aus dem Angebot des Wahlpflichtbereiches für den Lehrdiplomstudiengang oder aus dem fachspezifischen Wahlpflichtangebot	HS/FS	6 KP

7.1.4 Additional vocational pedagogical qualification

By completing additional modules (10 ECTS), the additional vocational pedagogical qualification (Berufspädagogische Zusatzqualifikation)³⁴ can be obtained. With this additional qualification, it is possible to teach at vocational baccalaureate institutions or at commercial vocational schools.

³² Offered only for ETH students who could not attend the course 651-4136-00 in Autumn Semester and will complete their Teaching Diploma in the same year.

³³ May also be completed within "Fachwissenschaftliche Vertiefung"

³⁴ ethz.ch/de/studium/didaktische-ausbildung/studienangebot/lehrdiplom-fuer-maturitaetsschulen.html#bpzq

7.2 Certificate of Advanced Studies in Applied Earth Sciences

The Department of Earth Sciences offers advanced training courses in applied Earth Sciences within the framework of a Certificate of Advanced Studies (CAS). The CAS in Applied Earth Sciences provides the opportunity for knowledge transfer from academia to practice within the context of lifelong learning. In addition, the continuing education courses promote the exchange of experience between practitioners and facilitate networking.

Three main topics are covered within the framework of the CAS in Applied Earth Sciences:

- **Geo-Resources:** The use of natural resources in particular geothermal energy and the protection of groundwater.
- **Geo-Constructions:** Understanding the behaviour of geological materials in soil- and rock engineering.
- **Geo-Risks:** Risk-management and analysis of natural hazards.

For each of the three main topics two four-day modules and an additional project module are offered, together comprising 6 credits. Each module is open to further education course participants who only want to take part in single modules.

Further information can be found on the CAS in Applied Earth Sciences website.

↗ cas-erdw.ethz.ch

7.3 Doctorate

The doctorate provides students with the opportunity to pursue an active and, for the most part, independent research project on the edge of scientific knowledge in Earth Sciences. The doctorate is the preliminary step for an academic career or a research position in industry or the public sector. The formal prerequisite for initiating a doctorate is a diploma, Master's or equivalent college degree that includes an independent project equal to the Master's Thesis. To enter the doctorate on the thematic basis of the Master is of secondary importance. Doctoral students in Earth Sciences are frequently chemists, physicists or even mathematicians. The candidate's eligibility for one or more departmental research groups is the crucial factor that determines admittance to the doctorate. Additional credit points may be required upon admission to the doctorate, depending on the professional qualifications of the candidate.

Usually, the doctoral students are hired for 3 to 4 years as assistants, funded from research grants from government, industry, or ETH Zurich. Prospective doctoral students may participate in the writing of a research proposal during their Master's degree by collaboration with a potential thesis supervisor, thereby participating in the project definition. More frequently, however, project positions are advertised internationally, and candidates are selected from the international talent pool. All doctoral students contribute to teaching or to the administration of the departmental laboratory infrastructures.

Formal ordinances concerning the doctorate are given by ETH Zurich rules of procedure.

➤ ethz.ch/en/doctorate

8 Further information

The following are sources of information concerning the general study programme and study planning at ETH Zurich.

8.1 General information

Organisation for students of Earth Sciences

The student association for Earth Sciences (erfa) organises student events and represents students' interests in the Teaching Commission, Grading Conference, and Department Conference.

➤ erfa.ethz.ch

Personal email address

All students receive a personal email address following admission to a study programme. Academic Services, the department, and lecturers communicate important information via email and not in printed form. Students should use the ETH email address for all communication and check it regularly.

➤ ethz.ch/students/en/service/it-services

ETH Zurich course catalogue

The course catalogue of ETH Zurich provides comprehensive information about the study programmes and procedures as well as an up-to-date online course catalogue. Furthermore, the contents and goals of specific lectures, exercises, and laboratory courses can be accessed.

➤ vorlesungen.ethz.ch

Information about the Department of Earth Sciences

The website of the Department of Earth Sciences contains general information about the department, study regulations and forms, an event calendar, and information about excursions and field courses.

➤ erdw.ethz.ch/en

8.2 Study advice

8.2.1 Study Administration and Study Coordination

Study Administration

For administrative questions concerning requests to the Director of Studies, announcements and permission for examinations, grade administration as well as requests to postpone military duty. Appointment required.

Mirjam Kandler, Department of Earth Sciences

✉ lehre@erdw.ethz.ch

Consultation hours by appointment. Please contact us by email.

Study Coordination

For requests or applications in connection with the study programmes as well as questions on courses and subject combinations. Appointment required.

Karin Mellini, Department of Earth Sciences

✉ karin.mellini@erdw.ethz.ch

Director of Studies

Prof. Dr. Andreas Fichtner, Institute of Geophysics

✉ andreas.fichtner@erdw.ethz.ch

8.2.2 Study advisors

For information and advice on subject combinations, specialisations, and study plans. Appointment required.

Geology

Prof. Dr. Vincenzo Picotti, Geological Institute

✉ vincenzo.picotti@erdw.ethz.ch

Engineering Geology

Dr. Larissa de Palézieux dit Falconnet, Geological Institute

✉ larissa.depalezieux@erdw.ethz.ch

Mineralogy and Geochemistry

Dr. Gregory De Souza, Institute of Geochemistry and Petrology

✉ desouza.gregory@erdw.ethz.ch

Geophysics

PD Dr. Jérôme Noir, Institute of Geophysics

✉ jerome.noir@erdw.ethz.ch

Specialised Master in Space Systems

Dr. Simon Stähler, Department of Earth Sciences

✉ simon.staehler@erdw.ethz.ch

Specialised Master in Atmospheric and Climate Science

Dr. Hanna Joos, Institute for Atmospheric and Climate Science, D-USYS

✉ hanna.joos@env.ethz.ch

Joint Master in Applied Geophysics

Prof. Dr. Hansruedi Maurer, Institute of Geophysics

✉ hansruedi.maurer@erdw.ethz.ch

8.2.3 Student mobility

For advice about exchange programmes, study plans for student exchange as well as for recognition of achievements obtained abroad. Appointment required.

Departmental exchange coordinator

Dr. Cédric Schmelzbach, Institute of Geophysics

✉ cedric.schmelzbach@erdw.ethz.ch

8.3 Useful links

Academic Services of ETH Zurich

➤ ethz.ch/en/the-eth-zurich/organisation/departments/academic-services

Application for a study programme at ETH Zurich

➤ eapply.ethz.ch

Application for a Master's degree programme

➤ ethz.ch/en/studies/master/application

Application at the University of Zurich

➤ uzh.ch/en/studies/application/apply

Childcare – Foundation kihz

➤ kihz.uzh.ch/en

Counselling and coaching

➤ ethz.ch/students/en/advice

Course catalogue of ETH Zurich

➤ vorlesungen.ethz.ch

Documents and forms of the Department of Earth Sciences

➤ erdw.ethz.ch/en/studies/documents

Erfa

➤ erfa.ethz.ch

ETH Alumni Association

➤ alumni.ethz.ch/en/

Excursions and field courses

➤ erdw.ethz.ch/en/studies/excursions-field-courses

Financial matters

➤ ethz.ch/en/studies/financial

General Ordinance for Performance Assessments at ETH Zurich

➤ www.fedlex.admin.ch/eli/cc/2012/446/de

Housing

➤ www.wohnen.ethz.ch/en

IDEA League

➤ idealeague.org

Joint Master in Applied Geophysics

➤ idealeague.org/geophysics

Legal action

➤ ethz.ch/students/en/studies/legal-action

Master in Atmospheric and Climate Science

➤ iac.ethz.ch/edu/master

Military service and studying

➤ ethz.ch/students/en/studies/administrative/militaerdienst

Module Mobility - Registering for studies at more than one university

➤ uzh.ch/en/studies/application/chmobilityin

myStudies, Help

➤ ethz.ch/applications/teaching/en/applications/mystudies

Plagiarism

➤ ethz.ch/students/en/studies/performance-assessments/plagiarism

Psychological Counselling Services

➤ www.pbs.uzh.ch/en

Student Services

➤ ethz.ch/en/the-eth-zurich/organisation/departments/student-services

Student Exchange Office

➤ ethz.ch/en/the-eth-zurich/organisation/departments/academic-services/student-exchange-office

Studying with special needs

➤ ethz.ch/en/studies/special-study-situations/studying-with-a-disability

Study Guide RWTH Aachen

➤ online.rwth-aachen.de

Study Guide TU Delft

➤ studiegids.tudelft.nl

Teacher Training (Didaktische Ausbildung)

➤ ethz.ch/de/studium/didaktische-ausbildung

Notes for study plan (MSc in Earth Sciences)

This template may be used as a draft for your learning agreement. The official learning agreement is entered in myStudies and must be approved by the study advisor of your chosen major.

My major

Modules and electives within the learning agreement

Four modules (48-53 ECTS)	Courses	ECTS	Semester

Electives (25-30 ECTS)	Courses	ECTS	Semester

Compulsory components outside of the learning agreement

Science in Perspective (2 ECTS)	Courses	ECTS	Semester

MSc Project Proposal and MSc Thesis	Semester

Reminder: Additional requirements must be fulfilled in the first year.

ETH Zurich
Department of Earth Sciences
Sonneggstrasse 5
8092 Zurich

erdw.ethz.ch/en/