Students of the Master course "Polar and Alpine environments" watching the view from an esker. Close to Värriö, north-eastern Finland. Photo: Karin Ebert.
1. Introduction

The Department of Physical Geography and Quaternary Geology (from 1 January 2015: Department of Physical Geography) is one of the larger departments at Stockholm University and is the largest Earth Science and Geography department in northern Europe. Here, professors, lecturers, researchers, PhD students and technical/administrative staff, coming from around the world, together create a dynamic research and education environment. Within one building, we have all the facilities of a modern university: library, laboratories, and equipment to conduct advanced scientific studies and offer stimulating and prize winning education to current and prospective students.

We conduct multi-disciplinary research in the fields of environmental, resource use and sustainability issues; geography; geomorphology and glaciology; hydrology and water resources; landscape ecology; paleoclimatology and quaternary geology; and remote sensing and geographical information systems (GIS). The department is equipped with a state-of-the-art GIS and remote sensing cluster, and microscopy, sediment and dendroclimatology laboratories. We have field activities at two research stations: one in the Kebnekaise mountains of Sweden (Tarfala Research Station) and one in Greece (Navarino Environmental Observatory).

Our research is oriented towards furthering our understanding of short- and long term natural conditions and processes of the world we live in, the impacts of society on the natural environment, and societal responses to environmental challenges. We thereby investigate the fields of global environmental changes, our natural environment and its interaction with human societies. The behavior of past and present systems and interactions between systems are modelled for predictions of future trends.

The department takes pride in providing a broad high-quality education at undergraduate, Masters, and Ph.D. levels, attended by students from all over the globe. Our educational mission is to provide an environment in which the students develop the knowledge, intellectual skills, and technical and communicative skills required to synthesize information, think critically, and develop solutions as the basis for success in employment or academic careers.

We carry out undergraduate education in geography, earth sciences, integrated biology-earth science, and in environmental sciences. We offer a wide range of Masters education subjects, tailored to our research profiles, and taught in English. Doctoral education consists of four years and, given its high standard and international staff, it constitutes an important cornerstone of the department’s profile.

Karin Holmgren
Head of the Department
History

Geography was established at Stockholm University as a subject in its own right in 1912, but it was not until 1929 that the first professor, Hans W:son Ahlmann, was appointed. He held this position until 1950. Gunnar Hoppe was appointed professor in 1954, one year before the division between Physical Geography and Human Geography commenced. Professor Hoppe retired in 1980 and was succeeded by Gunnar Östrem, Wibjörn Karlén, and, in 2003, by Peter Kuhry. Hans W:son Ahlmann, particularly interested in Arctic research, led several expeditions to the Arctic and initiated the establishment of a glaciological research station in the Swedish mountains, the Tarfala Research Station. Valter Schytt was appointed professor of glaciology in 1970 and held the position until 1985. Per Holmlund succeeded him in 1999.

Gunnar Hoppe pioneered the incorporation and interpretation of aerial photographs in geomorphological research. His strong interest in remote sensing led to the creation of a professorship in remote sensing at the Department of Physical Geography in 1980, a position held by Leif Wastenson until 2001. Johan Kleman succeeded him. Leif Wastenson developed and expanded the field of remote sensing leading to the establishment of a professorship in ecological geography, held by Margareta Ihse between 1997 and 2008. In 2005, following a strategic decision to develop the Department’s profile in hydrology, a new professorship in hydrology, hydrogeology and water resources was established. The position is held by Georgia Destouni.

As long as geology has been a subject at Stockholm University, Quaternary Geology has received considerable attention. Two early professors of geology, Gerard De Geer (1897-1924) and Lennart von Post (1929-1950) had international reputations in Quaternary geology, De Geer for his invention of the clay-varve dating method and von Post as the father of pollen analysis. In 1956 von Post’s successor, Ivar Hessland, created an assistant professorship, the first holder of which was Carl-Gösta Wenner, who gave the department new direction towards applied geology. In 1962 Quaternary Geology became an independent subject and in 1963 a Department on its own. Jan Lundqvist succeeded Wenner in 1980 and became the first full professor of Quaternary geology at Stockholm University. Lundqvist retired in 1993 and was succeeded by Bertil Ringberg, and, from 2002 to 2007, by Barbara Wohlfarth.

The Department of Physical Geography and the Department of Quaternary Research amalgamated to create the Department of Physical Geography and Quaternary Geology on January 1, 2001. Research interests of other professorships at the department are in tropical geography (prof. emeritus Carl Christiansson), paleoclimatology (Karin Holmgren and Gunhild Rosqvist), glaciology (Margareta Hansson and Peter Jansson), paleoglaciology (Clas Hästestrand and Arjen Stroeven), landscape ecology (Sara Cousins), and Quaternary geology (Frank Preusser and Stefan Wastegård). Together with the aforementioned professorships we successfully straddle both traditional and innovative directions in physical geography and Quaternary geology.
2. Current Research

Research groups in the fields of ecological geography, geomorphology and paleoglaciology, glaciology, hydrology, paleoclimatology, quaternary geology, remote sensing and GIS, and tropical geography contribute to four research profiles described below. All research groups are involved in the Bert Bolin Centre for Climate Research program (2.5).

2.1. Glaciers and polar environments

Research themes and areas
Research focusses on glaciers, ice sheets and cold (permafrost) environments in a global perspective. Study areas include Antarctica and Greenland, alpine environments in Scandinavia (and elsewhere), and the tundra regions. In a temporal perspective we are working with three different time intervals: the entire quaternary period (last 2.5 million years), the present (last 200 years) and the future. Research activities can be subdivided into:

- Climate related processes and impacts of Global Change.
- Glacial processes and ice physical properties
- Paleoglaciological inverse and numerical modelling of past and present ice sheets.
- Coupling between high latitude land ecosystems and the global climate system.

A significant number of projects are linked to Tarfala Research Station in the Kebnekaise massif where the department is running an extensive monitoring programme. Tarfala is used as a platform for both education and for national and international research programmes.
Ongoing projects

1. Snow volume estimation from InSAR / Brown I
2. Multi-scale investigations of microwave snowpack observations (MIMSO) / Brown I, Ingvander S, Jansson P
3. Modelling the transfer of supraglacial meltwater to the bed of glaciers through moulins and lake drainages / Clason C
4. Modelling the Late Weichselian Scandinavian Ice Sheet and its sensitivity to surface meltwater-enhanced basal sliding / Clason C
5. Investigating flow pathways and transit times for the dispersal of hydrocarbon pollution on Rabots glacier, Kebnekaise / Clason C
6. Mapping and analysis of glacial geomorphology from multibeam bathymetry on the bed of the Baltic Sea and the Gulf of Bothnia / Clason C
7. The impact of glacial erosion on northern shields (GEONORTHS) / Ebert K, Kleman J
8. The north Greenland Eemian ice drilling (NEEM) / Hansson M
9. The European Programme on Ice Coring in Antarctica (EPICA) / Hansson M
10. Erosion of Tibet investigated using cosmogenic nuclide analysis / Heyman J
11. Climate, glaciers and permafrost in the Swedish mountains / Holmlund P
12. Subglacial thermal conditions through a glaciation phase / Holmlund P
14. Terrestrial history of the Muonionalusta meteorites / Hättestrand C
15. The hydrology and dynamics of the Greenland ice sheet / Jansson, P
16. Glacier mass balance and tree rings as indicators of atmospheric circulation / Jansson P
17. Frozen landscapes in transition: improving predictions of ice sheet stability in a warming world by numerical modeling / Kirchner N
18. Marginal ice dynamics / Kirchner N
19. CARBO-north project / Kuhry P
22. Ensuring disaster risk reduction via sustainable wetland development in Zambia / Steve Lyon S, Lindborg R
23. Landscape partitioning and lability mapping of soil organic matter in permafrost terrain / Palmtag J
24. On the age and origin of glacial overdeepening in the Alps / Preusser F
25. The fate of hydrocarbon pollution in Kebnekaise / Rosqvist G, Jarsjö J
26. Simulation of the Cordilleran Ice Sheet through a glacial cycle / Seguinot J, Stroeven A.P, Kleman J, Zhang Q
27. Paleoglacialogy of the northern sector of the Cordilleran ice sheet / Stroeven A.P, Margold M
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2.2. Climate, environment and landscape development

*Research themes and areas*

Our research is aimed at describing climate, environment and landscape changes in time and space, and understanding underlying processes and causes. Investigations address recent and rapid change as well as long term evolution over millions of years. We work over the whole world with ongoing projects in the Nordic countries, the rest of Europe, Africa, South-America, northern Russia, Canada, China, Antarctica and Greenland.

We make use of long instrumental records as well as natural archives such as lake sediments, peat deposits, ice cores, drip stones, tree rings, glacial sequences and archeological evidence to investigate changes in climate, environment and associated biological, chemical and physical processes. The comparison between multiple archives allows a better reconstruction of past changes at local, regional and global scales. We interpret landscape, landforms and sediment layers to understand landscape development. Regional reconstructions of landscape and ice sheet development are performed through a combination of spatial analyses based on aerial photos, satellite images, digital terrain models and field mapping with studies of sediments and their stratigraphy, and dating of landforms and sedimentary deposits. We apply computer simulations to study the functional behaviour of the climate system under conditions different from those of today and to investigate how glaciers, ice sheets and global sea level are affected by climatic change. We also develop statistical methods to compare paleo-proxy data and climate model simulations.

Coring for sediments in a wetland, Cherangani Hills, Kenya. A current project explores climatic variation during the last c. 1000 years. Photo L-O Westerberg.
Ongoing projects

1. Reconstruction of environmental and climate changes in Vindelfjällen, northern Sweden, using lake sediments / Berntsson A
2. Speleothems in Warm Climates – Holocene records from the Caribbean and Mediterranean / Boyd M
3. Current expansion and past dynamics of small-holder irrigation farming in African drylands, measuring landscape, labor and climate interactions / Caretta MA, Börjeson L, Westerberg L-O
4. Measuring earthquake periodicity and calculating chemical weathering rates with a portable XRF and cosmogenic isotopes / Fritzon R, Goodfellow B, Stroeven A.P, Skelton A
5. Precipitation control on chemical weathering / Goodfellow B
6. Chemical and mechanical processes of granitoid weathering / Goodfellow B
7. Controls of tor formation, Cairngorm Mountains, Scotland / Goodfellow B
8. Multiproxy dendroclimatology in Greece / Grudd H, Krusic P
9. Tree-ring density and stable isotopes from Torneträsk, northern Sweden / Grudd H
10. Pollution investigations in trees / Grudd H
11. Finding the key to shipwreck preservation / Grudd H
12. Climate vs past human use in mountain forest ecotones, Sweden The Scottish Pine Project / Gunnarson B
13. The north Greenland Eemian ice drilling (NEEM) / Hansson M, Wastegård S
14. Environmental history and climate change in relation to historical land use changes in East Africa / Higgins L, Westerberg L-O, Risberg J
15. Holocene Climate Variability in southern Greece / Holmgren K, Finné M, Sundqvist
17. Late Quaternary climate variability and vegetation dynamics in southern Greece / Holmgren K, Boyd M, Finné M, Norström E, Sundqvist H
18. European isotope-climate reconstruction for the last 2000 years based on lake sediments, speleothems and treerings / Sundqvist, Holmgren K
19. Formation and age of Veiki moraine, northern Sweden / Hättestrand M, Hättestrand C
20. Frozen landscapes in transition: improving predictions of ice sheet stability in a warming world by numerical modeling / Kirchner N
23. Key sites for relief identification on the South Swedish Dome / Lidmar-Bergström K
24. Plains, steps, hilly relief, and valleys in northern Sweden – review, interpretations, and implications for conclusions on Phanerozoic tectonics / Lidmar-Bergström K
25. Tephrochronology of the north Atlantic region during the early Holocene / Lind E, Wastegård S
26. Ensuring disaster risk reduction via sustainable wetland development in Zambia / Steve Lyon S, Lindborg
27. Cross-timescale perspective on Modern River Deltas: Insights from Save River Delta, Mozambique / Massuanganhe E, Westerberg L-O, Risberg J, Alm G
28. Climate data-model comparisons for the last millennium / Moberg A, Grudd H
29. A statistical framework for comparing paleoclimate data and climate model simulations / Moberg A, Zhang Q
30. Euro-Atlantic climate variability during the last millennium: atmospheric circulation and extreme events / Moberg A
31. Past climate variability and environmental change in southern Mozambique / Norström E
32. Landslides in the central Kenyan highlands: Risks and actors / Nylund M, Westerberg L-O, Borgström I
33. Climate dynamics and environmental change during the Eemian Interglacial (MIS 5e) in Fennoscandia inferred from a unique sediment sequence at Sokli (northern Finland) / Plikk A, Helmens K
34. Holocene climate and glacier change in northern Sweden / Rosqvist G
35. Reconstructions of past changes in precipitation using geochemical signatures in lake sediments / Rosqvist G
36. Environmental changes in the eastern parts of Lake Mälaren, west of Stockholm, during the last 8000 years / Risberg J
37. Construction of palaeogeographical maps for eastern Svealand for the last 7000 years / Risberg J
38. Climate change in southern Mozambique during the last 4000 years / Risberg J
39. Climate change in northwestern Tanzania / Risberg J
40. Black carbon aspect of climate change / Rosqvist G
41. Modelling plant species dispersal in fragmented landscapes / Cousins S, Schmucki R
42. Early Holocene deglaciation and the Holocene thermal maximum at high latitudes as recorded by multi-proxy evidence / Shala S, Helmens K
43. Constraining the chronology of glacial advances on Svalbard–Kapp Ekholm revisited / Preusser F
44. Reconstructing the environmental history of Arabia / Preusser F
45. Towards a revised chronology of the glaciation history of northern Switzerland / Preusser F
46. Geoarchaeology of Amiternum, central Italy / Preusser F
47. Testing the potential of OSL to date glacial sediments from Estonia / Preusser F
48. Reconstructing sea-level change on Ruhnu Island, Baltic Sea / Preusser F
49. Geoarchaeology of Beidha, Jordan / Preusser F
50. Investigating potential geohazards along the coast of Oman / Preusser F
51. Landslide scars in the Kenyan highlands: Physical and chemical topsoil changes and landslide susceptibility assessment under tropical conditions / Wahlstrand A, Borgström I, Westerberg L-O
52. Sharpening the tools—improving tephrochronology around the Atlantic Sea / Wastegård S
53. SMART project (synchronising marine and ice-core records using tephrochronology) / Wastegård S
54. Potrok Aike Lake sediment archive drilling project / Wastegård S
55. Factors affecting mangroves of the Rufiji Delta and impact on the livelihood of surrounding communities / Mwansasu S, Westerberg L-O, Brown I, Dahlberg A
56. Greenland in a warming Arctic / Zhang Q, Li Q
57. Atmospheric modelling using space-based observations of stable water isotopes / Zhang Q

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The picture shows stalagmite EH1, which was collected from Alepotrypa Cave, Greece in 2014.

The middle dark section contains a large amount of charcoal and dust from the burning of animal dung in the cave. This activity occurred between 8000-5000 years BP, during the Neolithic period, while the cave was inhabited.

The cave closed during an earthquake, and the clear material at the top of the stalagmite grew while there were no people in the cave.

This stalagmite has been used as a proxy for human activity, for vegetation and soil biological activity above the cave, and for rainfall amount during the Holocene.

Photo: Meighan Boyd.
2.3. Landscape analysis and geomatics

Research themes and areas
Research and education in these fields comprises methods development in satellite image processing, air photo interpretation, positioning, geographical information systems, and the application of these methods to a wide variety of geoscientific, bioscientific, landscape ecological and environmental issues. Study areas are in Sweden, other Nordic countries, the British Isles, Russia, Canada, South America, Eastern Africa, Southeast Asia, Antarctica and Greenland.

Research in glacial and periglacial environments include glacial geomorphological mapping for reconstructions of paleoglaciological and long-term landscape evolution, the mapping of recent dynamics in permafrost landscapes, and glaciological remote sensing. Remote sensing and modelling techniques are developed to monitor changes in water quality and coastal ecosystems. The research of landscape ecological questions includes vegetation mapping for change detection in sensitive mountainous environments, analysis of landscape ecological structures, and mapping and monitoring of biodiversity and biological values in cultural landscapes. GIS is applied for monitoring and analysis of the cultural landscape and for environmental management and protection in urban/semiurban areas.

The Department has been instrumental in the development of the National Atlas project and its GIS components, as in applied projects of landscape and habitat inventory and monitoring in cooperation with the Swedish Environmental Protection agency in the Landscape Monitoring project of the agricultural landscapes, LiM, and the Natura 2000 program.

Remnant habitats (deciduous forests and grasslands) important for species richness in an intensively managed agricultural landscape in Selaön, south-eastern Sweden. Photo: Sara Cousins.
Ongoing projects

1. Measuring environmental change in Darfur, Sudan: implications for the conflict / Brown I
2. Land use change and effects of functional and spatial connectivity on historical and present biodiversity patterns / Cousins S, Aggemeyr E
3. Historical land use influence on dispersal and diversity of grassland species in rural landscapes / Cousins S, Auffret A
4. Changes in wetland distribution and consequences for biodiversity and ecosystem services / Cousins S, Ermold M
5. A multiscale, cross-disciplinary approach to the study of climate change on natural resources, ecosystem services and biodiversity (EKOKLIM) / Cousins S, Ermold M, Lindborg R, Plue J, Auffret A, Lindgren J
6. Linking management and feedback across scales in social-ecological systems - examples from forest ecosystem / Eriksson I
7. Effect of agricultural land use on biodiversity and function in Swedish wetlands / Ermold M
8. Studies of actual and medieval vegetation in summer farming areas of Snorre Sturlansson, Iceland / Ihse M
10. Influence of Environmental and Social factors on Wildlife Dispersal Areas in Malagarasi-Moyovosi Ramsar Site, Western Tanzania / Kalumanga E, Cousins S
11. Harnessing Biodiversity for Sustaining Agricultural Production and Ecosystem Services (SAPES) / Lindborg R
12. Ecosystem services in agricultural landscapes: the development of a framework for assessing synergies and dealing with trade-offs among multiple services / Lindborg R
13. How do seed banks contribute to species persistence in fragmented landscapes? / Plue J, Cousins S
14. Ensuring disaster risk reduction via sustainable wetland development in Zambia / Steve Lyon S, Lindborg
15. EMMA Environmental Mapping and Monitoring with Airborne laser and digital images / Skånes H
16. NorthScape (Nordic network for land use and land-cover monitoring). A Network project between Denmark, Norway, Sweden, Iceland and Finland / Skånes H
17. Habitat restoration in fragmented landscapes: effects on biodiversity and ecosystem functions / Waldén E, Lindborg R

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2.4. Land and water resources

*Research themes and areas*

We investigate natural processes and anthropogenic effects in different land, soil and water environments and their changes in space and time.

The research relates also to other Earth and environmental sciences, and to environmental monitoring, management and regulation of land and water resources in different applications. We carry out research for different parts of the world on:

- Land, water and waterborne substance interactions, flow and transport dynamics and changes in space and time.
- Freshwater interactions with climate, coastal and marine waters, snow/ice and socio-economic systems.
- Land and water resources in different physical, biogeochemical, ecological and cultural environments.
- The interaction between climate extremes, air pollution, soil conditions and forest ecosystems.
- Climate feedbacks and effects on land-water systems within the cross-disciplinary Stockholm University Climate Research Environment (Bert Bolin Centre for Climate Research)

In this research, we use, develop and couple tools such as hydrological flow and solute-pollutant transport models, geographical information systems and remote sensing for both basic process quantifications and different applications.

Kongsfjorden, Svalbard. Photo: Ewa Lind.
Ongoing projects

1. Finding the source: Where does the excess water in Arctic rivers come from? / Bring A
3. Pan-Arctic hydrological and biogeochemical responses to climate change / Destouni G, Märd Karlsson J, Lyon S, Dyurgerov M, Peterson G
4. The subsurface water system role for land-to-atmosphere and land-to-sea vapor-water partitioning and solute mass flows / Destouni G, Asokan S, Prieto C, Darracq A.
6. FutureLearn: Utveckling av ett simulerings- och visualiseringsverktyg för flöde- och transportprocesser inom hydrologisk utbildning / Frampton A
7. Flow and tracer transport in crystalline fractured media / Frampton A
8. The role of permafrost, hydrological and ecosystem shifts for arctic hydro-climatic interactions and carbon fluxes / Janze E
10. The role of permafrost, hydrological and ecosystem shifts for arctic hydro-climatic interactions and carbon fluxes / Jantze E
11. Quantifying the potential of carbon dioxide storage, long-term retention and surface return flow minimization in Swedish bedrock / Jarsjö J, Destouni G, Desouche C
13. Improved streamflow and flood monitoring using remotely sensed LiDAR data / Lam N, Lyon S, Nathansson M
14. The invisible carbon – an early indication of ecosystem change / Lyon S
15. LiDAR 2.0: better utilization of current and next generation LiDAR data / Lyon S
18. Cross-scale modeling of coupled hydrological-permafrost interactions and carbon transport in a changing climate / Lyon S, Frampton A
19. Ensuring disaster risk reduction via sustainable wetland development in Zambia / Lyon S, Lindborg R
20. The Dynamics of Mountains, Landscape, and Climate in the Distribution and Generation of Biodiversity in the Amazon/Andean Forest (US National Science Foundation) / Manzoni S
21. Controls over C Sequestration: Physiology vs. Physics (US National Science Foundation) / Manzoni S
22. Quantifying a safe operating space for human use of coastal groundwater under multiple change pressures/ Mazi A
23. Seawater intrusion risks and controls for safe use of coastal groundwater under multiple change pressures - Analytical evaluation and exemplification for Mediterranean aquifers / Mazi, A
24. Intensively exploited Mediterranean aquifers: resilience to seawater intrusion and proximity to critical thresholds / Mazi, A
25. Classification and comparative study of Mediterranean coastal aquifers subject to climate changes with the use of the analytical single-potential, sharp-interface solution / Mazi A
26. Hydro-climatic trends and interactions in the Mediterranean region / Mazi A, Destouni G
27. Identifying key landscape features which contribute to the ecosystem service of waterborne nutrient and pollutant retention / Quin A, Destouni G
29. The effect of biomass withdrawal on the nutrient balance in forest soils / Schlyter P, Stjernquist I
32. Determining and mapping spatial distributions and thawing rates of inland permafrost under climatic change in the Arctic and Sub-Arctic / Sjöberg Y
33. Mapping permafrost using ground penetrating radar for validation of hydrological modeling of permafrost distributions / Sjöberg Y
34. Modeling permafrost spatial distributions and thawing rates in arctic and sub-arctic Sweden using recession flow analysis / Sjöberg Y
35. Green Infrastructures for ecological sustainability and human well-being: a network of forest rural and urban landscapes as laboratories for integrative research / Stjernquist I

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2.5. The Bolin Centre for Climate Research

Founded in 2006, the Bolin Centre for Climate Research is a multi-disciplinary consortium of researchers led by Stockholm University that conducts fundamental research on critical processes in the climate system. It involves researchers mainly from the Faculty of Science, Stockholm University as well as the Rossby Centre and KTH. The research program strives to understand natural climate evolution and variability, as well as changes imposed by the increasing human impact on the Earth System. It aims to build next generation expertise and knowledge on climate-influencing processes, over a range of time-scales and subsystems while addressing related societal issues. The challenge is to effectively harness national scientific expertise in a growing international effort to understand, mitigate and adapt to climate change.

The research is structured into six multidisciplinary cross departmental research areas:

• Oceans-atmosphere dynamics and climate
• Clouds, aerosols, turbulence and climate
• Hydrosphere, Cryosphere and Climate
• Biogeochemical cycles and climate
• Historical to millennial climate variability
• Orbital to tectonic climate variability

Climate modelling, database management and a Climate Research School are cross-cutting activities. This research is implemented through the coordination of the Bolin Centre Directorate, the oversight of the Bolin Centre Board and the guidance of external and internal Science Advisory Boards.

The Bolin Centre for Climate Research is a collaboration between the Departments of Meteorology, Environmental Science and Analytical Chemistry, Physical Geography and Geological Sciences at Stockholm University together with FLOW at KTH Royal Institute of Technology and the Rossby Centre at the Swedish Meteorological and Hydrological Institute.
2.6. Navarino Environmental Observatory (NEO)

Navarino Environmental Observatory (NEO), a cooperation between Stockholm University, the Academy of Athens and TEMES S.A., the developer of Costa Navarino, is dedicated to research and education on the climate and the environment of the Mediterranean region. Located at Costa Navarino, NEO will develop into a dynamic hub where scientists from all over the world conduct frontline research, develop new tools and methods, as well as meet to exchange knowledge and ideas.

Navarino Environmental Observatory in Peleponessos, Greece. Photo: Giorgos Maneas.

Covering a wide range of topics of both local and global relevance, the research activities of NEO are carried out by scientists from the Bert Bolin Centre for Climate Research at Stockholm University and the Atmospheric Environment Division of Biomedical Research at the Academy of Athens. Atmospheric composition and meteorological parameters are continuously monitored in order to track the origin of particulate and gaseous pollutants and detect climate change signals. Global and regional scale modeling is applied for climate projections and future pollution level simulations. Hydrological research, monitoring and evaluation are undertaken in order to understand past, present and future processes and to develop suitable water resource management strategies for the region. Tectonic, climate, environment and landscape studies are carried out on a long-term perspective, in order to understand the physical science basis of our earth, and on a short-term perspective, in order to understand the role of natural versus human induced climate/environmental changes. An important perspective is to analyze the role of physical factors in the context of tourism and urbanism. All monitoring activities are linked to international networks.

The establishment of NEO is a very important step toward strengthening Swedish-Greek cooperation in the area of climate and environmental research. The operation of NEO presents a real example of how the academic community and the private sector can work together to focus on issues of great importance to society and nature.
2.7. Tarfala Research Station

Tarfala research station is owned and run by Stockholm University and it is open between mid-March to early May and from late June to mid-September. The station is located in northern Sweden, 200 km north of the Arctic circle. Every year researchers and students worldwide visit Tarfala to study the effects of climate on glaciers, rivers, the sub-Arctic alpine ecosystem and landforms.

Tarfala Research Station has its own program for monitoring climate effects on sub-Arctic nature including measurements of glacier mass balance, mountain meteorology, glacial hydrology, snow-chemistry, permafrost, and high-alpine vegetation development. This data provides scientists with a unique and detailed record of short- and long-term effects of climate change.

Four glaciers are located in the Tarfala valley of which Storglaciären is the most well known and one of the best studied glaciers in the world. The elevation of the Kebnekaise south summit was measured to be 2097.5 m the 27 August 2014 and it is for the moment Sweden’s highest peak!

Starting up the winter / spring season in March at Tarfala Research Station. Photo: Gunhild Rosqvist.
3. Publications 2014


42. **Helmens, K. F.** 2014. The Last Interglacial Glacial cycle (MIS 5-2) re-examined based on long proxy records from central and northern Europe. *Quaternary Science Reviews*. 86, 115-143.


4. Publication series

Ongoing

Dissertations from the Department of Physical Geography and Quaternary Geology, 2006-
Reports from the Department of Physical Geography and Quaternary Geology, 2002-
Tarfala Research Station Annual Reports, electronic pdf-based series, 1998-

Past

Thesis in Quaternary Geology, 2002-2005
Thesis in Geography with emphasis on Physical Geography, 2001-2006
The Department of Physical Geography, Stockholm University Dissertation Series, 1994-2000
Research Report, Department of Physical Geography, 1968-2000
Meddelanden från Naturgeografiska institutionen, 1965-1994

Students on the Biology-Earth Science program doing field work close to Navarino Environmental
Observatory at Gialova lagoon in Greece. Photo: Christina Schaffer.
5. Education

The goal of the undergraduate education at the Department of Physical Geography and Quaternary Geology is to offer a high quality education, reflecting the research profile of the Department, and meeting the society’s need for theoretical and practical competence within the fields of education. The department offers education at undergraduate (bachelor's) level in geography, earth sciences, integrated biology-earth science, and in environmental studies. In addition, a wide spectrum of graduate (master’s level) programmes and courses are given, reflecting the research profiles of the department. Every year almost 2000 students attend our undergraduate and graduate education.

At Stockholm University degrees are structured as:
First cycle: Kandidatexamen (Bachelor’s Degree) 3 years
Second cycle: Magisterexamen 1 year, Masterexamen (Master’s Degree) 2 years;
Third cycle: Licentiatexamen 2 years, Doktorsexamen (Doctorate) 4 years.

Stockholm University uses the European Credit Transfer and Accumulation System, ECTS. One academic credit (Sw. högskolepoäng or hp; Eng. translation Higher Education Credit or HEC), corresponds to one ECTS credit or approximately 3 days of full time studies. One semester is composed of 30 credits, corresponding to approximately 20 study weeks, and a full study year is composed of 60 credits, corresponding to 40 study weeks.

5.1. Bachelor's level (First Cycle)
Three undergraduate (Bachelor's) programmes are given by the Department of Physical Geography and Quaternary Geology:
Bachelor’s programme in Geography
Bachelor’s programme in Earth Science
Bachelor’s programme in Biology-Earth Science

Bachelor’s programme in Geography
The Geography programme includes courses up to 180 credits, which correspond to three years of full-time studies:
1-30 credits: Geography I, 30 credits
31-60 credits: Geography II, 30 credits
61-90 credits: Geography III, 30 credits
91-165 credits: Elective and Optional courses
166-180 credits: Geography, Degree Project (Bachelor’s Thesis), 15 credits

The Department of Physical Geography and Quaternary Geology and the Department of Human Geography at Stockholm University collaborate within the geography education, and much of the education is integrated physical and human geography. Every year around 100 students start their Geography studies. They study geography either as a part of ordinary university studies or as a part of the theoretical education within the teachers' training programme at Stockholm University. Geography can be studied within a programme framework or as independent courses. Seen over a period of ten years, the influx of students has increased substantially. One reason for this increase is the elevated interest, and need for knowledge, in the field of geography in a world where globalization is steadily increasing.
Bachelor’s Programme in Earth Science
The Bachelor’s Programme in Earth Science (180 credits) is given in collaboration with the Department of Geological Sciences at Stockholm University. Courses can be taken within the programme framework or as stand-alone courses, both study paths leading to a Bachelor’s Degree. Within the programme, the first year (60 credits) consists of mandatory courses where students learn the basics in earth science: Physical Geography and Quaternary Geology (30 credits) and Geology (30 credits), respectively. After the first year the students specialize within Physical Geography, Hydrology, Quaternary Geology, Geology, Marine Geoscience, or Geochemistry. The programme is completed with a 15 credits Degree Project (Bachelor’s Thesis), which at the Department of Physical Geography and Quaternary Geology is either in Quaternary Geology, Physical Geography, or in Hydrology and Hydrogeology. Together with the Department of Geological Sciences we also have an internet based Bachelor Programme in Earth Science autumn since 2014.

Bachelor’s Programme in Biology-Earth Science
The Biology-Earth Science study programme encompasses 180 credits, and is carried out in collaboration with the Department of Biology Education at Stockholm University. The programme consists of 90 credits mandatory courses in earth sciences and environmental issues and 90 credits in biology. A 15 credits Degree Project (Bachelor’s Thesis) ends the programme. A distinctive feature of the programme is the integration between Earth Science and Biology. The Earth Science parts focus particularly on Biogeography, Climatology, Geomorphology, Cartography, Soil
Science, Aerial Photograph Interpretation and GIS, and Environmental Issues and Nature Conservation.

Environmental Studies
The Department of Physical Geography and Quaternary Geology offers a wide range of courses on Environmental Issues on Bachelor's level (first cycle). The courses are independent courses that are optional within the study paths of the bachelor programmes in Geography, Earth Science, Biology, and many other subjects.

5.2. Master's level (Second Cycle)
The Department of Physical Geography and Quaternary Geology offers advanced courses in Glaciology and Glacial Geomorphology, Climatology and Palaeoclimatology, Palaeoecology, Quaternary Geology, Hydrology and Hydrogeology, Geographic Information Systems, Cartography, Remote Sensing and Landscape Ecology. In addition the department offers courses in Political Ecology, Environmental Issues and Environment and Health Protection. The courses provide the prospective geoscientist and geographer with an overall breadth to be used in working with, for example, nature and environmental control, geoscientific examinations, planning, risk assessment and research.

The advanced courses are compiled in a number of Master’s Programmes. These are all two years long and always include a research task in the form of a Degree Project. The programmes in general start with 1.5-2 semesters of mandatory courses with a certain topical emphasis. Thereafter the students take 1-1.5 semester of elective or optional courses and finish the programmes with a Degree Project of 1-2 semesters.

Master’s Programmes
• Environment and Health Protection
• Environmental Management and Physical Planning
• Geography
• Geomatic with Remote Sensing and GIS
• Glaciology and Polar Environments
• Hydrology, Hydrogeology and Water Resources
• Landscape Ecology
• Physical Geography and Quaternary Geology
• Quaternary Science and Climate Development

The Department of Human Geography also hosts the Master’s programme in Globalization, Environment and Social Change, 120 credits together with our department and the Department of Economic History.

Summer courses
The summer course “Glaciers and High Mountain Environments 7.5 credits” is a glaciology field course held at the Tarfala Research Station, northern Sweden. The field-based part of the course introduces different methods of measurement and analysis and the study of glacial and periglacial landscapes and processes. Another summer course, “Ecohydrology - a Mediterranean Perspective 7.5 credits”, is based on theory and field-based experimentation relevant for ecohydrology. The field-based part of the course is held the Navarino Environmental Observatory (NEO) in Greece. We also have a summer course on first level: “Urban Farming – Planning, Environment and Health 7.5 credits”.

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5.3. Postgraduate (Third Cycle) education

The postgraduate education program at the Department of Physical Geography and Quaternary Geology, Stockholm University, includes courses, seminars, excursions and the writing and defence of a Licentiate and a Doctoral thesis. Students can choose to either graduate in “Physical Geography” or in “Quaternary Geology”. The success of our postgraduate programme is reflected in the amount and quality of Doctoral theses produced (see section 6 in this report for a list of recent theses). Below, we will tabulate currently enrolled students and their projects within each examination subject.

*Geography, Physical Geography:*

Elsa Aggemyr
*Land use change and effects of connectivity on past and present plant patterns in the archipelago*

Robin Blomdin
*Paleoglaciology and paleoclimate history of Central Asia bordered by the Kunlun Shan, Tian Shan and Altai Mountains*

Meighan Boyd
*Speleothems in Warm Climates – Holocene records from the Caribbean and Mediterranean*

Lucas Dawson
*Systems dynamics and scenario-based modelling for integrated management and adaptive governance of functional green infrastructure and natural resource analysis at multiple spatial scales*

Benoit Dessirier
*Multi-phase flow in porous and fractured media*

Matti Ermold
*Changes in wetland distribution and consequences for biodiversity and ecosystem services*

Ruben Fritzon
*Earthquake periodicity in southern Greece from geochemical and geochronological studies of fault surfaces*

Ping Fu
*Glacial Geomorphology of the Haizi Shan area, SE Tibetan Plateau*

Natacha Gribenski
*Comparison of dating methods for glacier chronology in the Central Asia mountains*

Christian Helanow
*Theory for water routing through ice sheets*

Lindsey Higgins
*Environmental history and climate change in relation to historical land use changes in East Africa*
Charlotta Högberg
Atmospheric modelling using space-based observations of stable water isotopes

Simon Jakobsson
Woody or treeless pastures? Linking subsidy systems, farmers decisions and management for understanding biodiversity patterns

Elin Jantze
The role of permafrost, hydrological and ecosystem shifts for arctic hydro-climatic interactions and carbon fluxes

Fernando Jaramillo
Nutrient sources, retention-attenuation and transport in hydrological catchments under climate change

Elikana Kalumanga
Movement and distribution of wild mammals in Malagarasi-Muyovozi Ramsar site, North-West Tanzania

Daniel Ketzer
Potential of Agrovoltaic systems to reduce land use competition between food and energy production

Alexander Koutsouris
Land management effect on water resources in Tanzania, Africa

Paul Krusic
Dendroclimatic reconstruction: Eastern Mediterranean region

Norris Lam
Improving streamflow and flood monitoring using LiDAR

Jessica Lindgren
Small remnant habitats additive value for biodiversity and ecosystem services in intensively utilized landscapes

Elidio Massuanganhe
Modeling sustainability of the Mozambican coastal zone – Geomorphology and changes of the Mozambican coast

René Mbanguka
Modelling water resources effects of land-water management in Tanzania, Africa

Andrew Mercer
Accuracy of methods used for monitoring regional glacier mass balance changes

Simon Mwansasu
Factors affecting mangroves of the Rufiji Delta and impact on the livelihood of surrounding communities
Michaela Nylund
*Mass movements in the Kenyan highlands – Land use and vulnerability*

Juri Palmtag
*Landscape partitioning and lability mapping of soil organic matter in permafrost terrain*

Romain Pannetier
*Modelling permafrost dynamics, permafrost hydrology and related solute transport under climate change*

Jan Pietron
*Basin-scale hydrological spreading of pollutants and wetland opportunities for reducing them*

Matthias Siewert
*High-resolution mapping of soil organic matter storage and remobilization potential in periglacial landscapes*

Ylva Sjöberg
*Determining and mapping spatial distributions and thawing rates of inland permafrost under climatic change in the Arctic and Sub-Arctic*

Claudia Teutschbein
*Hydrological modelling for climate change impact assessment*

Rebecka Törnqvist
*Basin-scale hydrological och pollutant load impacts of land use and climatic changes*

Lucile Verrot
*Soil moisture and linked hydrological flow and transport changes*

Anna Wahlstrand
*Mass movements in the Kenyan highlands – Tropical soils and vulnerability*

Emelie Waldén
*Effects of local and regional processes on biodiversity in restored semi-natural grasslands*

Carl Österlin
*Systematisk modellering för utveckling av metoder, prioriteringsverktyg och indikatorer för integrerad natur- och kulturmiljövård*

Tam Nguyen Thanh
"*Integrated rice-fish farming-safeguarding biodiversity for sustainable food production in the Mekong Delta, Vietnam*"

*Quaternary Geology:*

Hans Johansson
*Late Quaternary tephrochronology of the Azores*
Torbjörn Karlin  
*Deep ice core analysis of processes in the climate system*

Anna Plikk  
*Climate dynamics and environmental change during the Eemian Interglacial (MIS 5e) in Scandinavia inferred from a unique sediment sequence at Sokli (northern Finland)*

Sandra Sitoe  
*Reconstructing flooding events in the Limpolo River flood-plain area, Mozambique*

6. Dissertations in 2014

*Dissertation covers 2014. Photo: Malin Stenberg de Serves.*


ANNIKA BERNTSSON, 2014: The sensitivity of Swedish alpine lakes to hydro-climatic changes during the Late Holocene. Dissertation No. 44. Faculty opponent: Dr. Peter G. Langdon.


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<tr>
<th>Name</th>
<th>Date</th>
<th>Degree</th>
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<td>31 January</td>
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<td>Mård Karlsson, Johanna</td>
<td>21 November</td>
<td>PhD, Physical Geography</td>
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</table>

7. International exchange

We have perfect preconditions for international exchange. Our department is popular among incoming students from our partner universities (and other universities). This has always been the case but English Master Courses have increased our popularity. Some students get back to us after their Erasmus-stay as visiting students to write their thesis here. We can observe an increased interest among our own students to study in other countries.

Erasmus exchange (coordinator: Karin Ebert)

- Brussels / Belgium
- Freiburg / Germany
- Innsbruck / Austria
- Berne / Switzerland
- Leuven / Belgium
- Ostrava / Czech Republic
- Grenoble / France
- Aachen / Germany
- Gent / Belgium
- Turku / Finland
- Patras / Greece
- Kiel / Germany
8. Financial support

<table>
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<tr>
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9. Staff (autumn 2014)

Department Chairman/Head: Professor Karin Holmgren
Vice Chairman: Docent Jerker Jarsjö
Head of administration Sabina Pracic

**PROFESSORS**

Cousins, Sara professor of Physical Geography
Destouni, Georgia professor of Hydrology, Hydrogeology and Water Resources
Hall, Adrian adjunct professor of Geomorphology
Hansson, Margareta professor of Environmental Science with emphasis on Physical Geography/Quaternary Geology

Harbor, Jonathan affiliate professor
Holmgren, Karin professor of Physical Geography
Holmlund, Per professor of Glaciology
Hättestrand, Clas professor of Physical Geography
Jansson, Peter professor of Physical Geography
Kleman, Johan professor of Remote Sensing
Kuhry, Peter professor of Physical Geography
Kuylenstierna, Johan visiting professor of Water Resources
Näslund, Jens-Ove adjunct professor in Environmental Risk Assessment
Preusser, Frank professor of Quaternary Geology with emphasis on Environmental Reconstruction
Rosqvist, Gunhild professor of Geography, especially Physical Geography
Stroeven, Arjen professor of Physical Geography
Sverdrup, Harald visiting professor
Wastegård, Stefan professor of Quaternary Geology

**ACADEMIC STAFF**

*Associate Professors (PhD, Docenter)*

Berg, Håkan senior lecturer
Brown, Ian senior lecturer
Dahlberg, Annika senior lecturer
De La Torre Castro, Maricela senior lecturer
Gunnarson, Björn director of studies, researcher
Helmens Femke, Karin researcher
Holzkämper, Steffen senior lecturer
Jansson, Kristian senior lecturer
Jarsjö, Jerker senior lecturer
Kirchner, Nina docent
Lindborg, Regina senior lecturer
Lyon, Steve senior lecturer
Moberg, Anders senior lecturer
Risberg, Jan senior lecturer
Seibert, Jan senior lecturer

*PhD*

Auffret, Alistair researcher
Ballarotta, Maxime postdoctor
Berntsson, Annika researcher
Borgström, Ingmar senior lecturer
Bring, Arvid researcher
Clason, Caroline postdoctor
Frampton, Andrew senior lecturer
Gowan, Evan postdoctor
Grudd, Håkan data base coordinator
Hind, Alistair postdoctor
Hugelius, Carl-Gustaf researcher
Hättestrand, Martina researcher
Heyman, Jakob postdoctor
Ingvander, Susanne researcher
Kalantari, Zahra researcher
Lea, James postdoctor
Manzoni, Stefano senior lecturer
Persson, Klas postdoctor
Plue, Jan senior lecturer
Quin, Andrew postdoctor
Rogberg, Peter researcher
Sannel, Britta senior lecturer
Shala, Shyhrete researcher
Schlyter, Peter senior lecturer
Skånes, Helle senior lecturer
Stjernquist, Ingrid senior lecturer
Sundqvist, Hanna researcher
Westerberg, Lars-Ove senior lecturer, director of undergraduate studies
Winterdahl, Mattias postdoctor
Zhang, Qiong senior lecturer
Öberg, Helena postdoctor

PhLic, MSc, BSc
Ekner, Bo PhLic, lecturer
Fridfeldt, Anders BSc, lecturer, director of undergraduate studies
Karlsson, Sven PhLic, researcher
Nordström, Anders PhLic, senior lecturer

Postgraduate students (PhLic, MSc, BSc)
Agemyr, Elsa
Blomdin, Robin
Boyd, Meighan
Bring, Arvid
Dawson, Lucas
Dessirier, Benoit
Ermold, Matti
Finné, Martin
Fritzon, Ruben
Gribenski, Natacha
Helanow, Christian
Higgins, Lindsey
Högberg, Charlotta
Jakobsson, Simon
Jantze, Elin
Jaramillo, Fernando
Johansson, Emma
Johansson, Hans
Kalumanga, Elikana
Katransiotis, Christos
Ketzer, Daniel
Koutsouris, Alexander
Krusic, Paul
Lam, Norris
Lindgren, Jessica
Massuanganhe, Elidio
Mbanguka, René
Mercer, Andrew
Mwansa, Simon
Mård Karlsson, Johanna
Nylund, Michaela
Palmtnag, Juri
Pannetier, Roman
Pietron, Jan
Plikk, Anna
Seguinot, Julien
Siewert, Matthias
Shala, Shyhrete
Sitoe, Sandra
Sjöberg, Ylva
Stoltz, Jonathan
Than Nguyen, Tam
Thorslund, Josefin
Verrot, Lucile
Waldén, Emelie
Wahlstrand, Anna
Weiss, Niels
Österlin, Carl

Teaching assistants
Andersson, Marcus, BSc
Ekstedt, Karin. MSc
Hamré, Moa, BSc
Gilljam, Carl, MSc

Administrative staff
Blåndman, Susanna BSc, BA, human resources administrator
Damberg, Maria MSc, study advisor
Ebert, Karin PhD, education coordinator
Hansson, Erik MSc, educational administrator
Henriksson, Carina BSc, senior administrative officer
Holmlund, Moa MSc, educational administrator
Hörnby, Kerstin MSc, educational administrator
Isdal, Maija-Liisa BSc, financial administrative officer
Karlin, Torbjörn MSc, station manager Tarfala research station
Karpegård, Madeleine financial administrative officer
Maneas, Giorgos MSc, station manager Navarino Environmental Observatory
Person, Karin BSc, administrator
Pracic, Sabina MSBA, head of administration
Reuterswärd, Karin PhLic, educational administrator, study advisor
Schaffer, Christina MSc, educational administrator
Stenberg de Serves, Malin PhD, communicator
Stolarska, Monika financial administrative officer
Sturesson, Elisabeth MSc, educational administrator
Trygger Bergman, Sophie MSc, educational coordinator
Åkerblom, Lena educational administrator

**TECHNICAL STAFF**

Alm, Göran PhLic, systems engineer
Berglöf, Rasmus systems engineer
Brotén, Bengt technician
Cabrera, Yanduy caretaker
Jacobson, Rolf web editor
Levi, Lea MSc, research assistant
Li, Qiang, PhD, scientific programmer
McGlynn, Laura MSc, research assistant
Muliyil Asokan, Shilpa PhD, research assistant
Prieto, Carmen PhD, research engineer
Segerström, Rebecka research assistant
Sjöström, Jenny MSc, research assistant
Skantz, Johan caretaker
Spångberg, Martin systems engineer
Wennbom, Marika MSc, research engineer

**PROFESSORS EMERITI**

Christiansson, Carl
Ihse, Margareta
Lidmar-Bergström, Karna
Lundén, Bengt
Lundqvist, Jan
Karlén, Wibjörn
Miller, Urve
Ringberg, Bertil
Wastenson, Leif
Østrem, Gunnar DSc
Our INK (Intressanta Naturvetenskapliga Kvinnor) team ready to run "Vårruset" in May at Stora Skuggan. From the left: Sussie, Johanna, Moa, Maria, Hanna and Caroline.