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Nordisk Vulkanologisk Center



ISLANDS UNIVERSITET

Nordic Volcanological Center Nordvulk Report 2004-2008

Report on activities, organisation, financing and outlook for Nordvulk
in relation to Nordvulk's 2008 evaluation.

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Summary. Nordvulk is a Nordic center for research and research training in volcanology and related fields within the Institute of Earth Sciences, University of Iceland. Nordvulk's activities are according to a contract between the Nordic council of Ministers (Nordisk Ministerråd – NMR) and the University of Iceland. Iceland with its unique geological settings is used as a “laboratory area” to study volcanological processes and through training of young Nordic scientists Nordvulk has advanced understanding of how volcanoes work. One of the key activities of Nordvulk is a research fellowship program, through which at least five positions are offered to young Nordic scientists every year. Some of the research fellow projects are performed in close collaboration with researchers at other Nordic universities. Another key activity of Nordvulk, dependent on external funding, is to arrange international summer schools in volcanology and related fields, the most recent in August 2007. Senior researchers at the Institute of Earth Sciences linked to Nordvulk maintain strong ties to scientist from Nordic countries, in addition to international contacts. Since 2004, Nordvulk scientists and research fellows have published more than 70 scientific papers. Merging of the Nordic Volcanological Institute with geoscience units at the University of Iceland in 2004, and the formation of the Institute of Earth Sciences and Nordvulk in the present form, have successfully lead to a stimulating research environment for researchers and Nordic research fellows, as well as improved resources of supervision and collaboration for the Nordic research fellows. In 2007, Nordvulk was further integrated into a thematic research group in volcanology focusing on “Understanding volcanoes”, at the Institute of Earth Sciences. Funding from NMR is presently at a minimum level for sustaining present activity of Nordvulk. The recent decrease in funding from NMR has though been partly counterbalanced by increased funding from the Icelandic government, the University of Iceland and temporary research support, thus sustaining similar level of activity as in earlier years.

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1. Organisation and administration

The Nordic Volcanological Center (Nordvulk – Nordisk Vulkanologisk Center) has been operating within the Institute of Earth Sciences at the University of Iceland since July 1, 2004. An initial contract between the Nordic Council of Ministers (NMR) and the University of Iceland about the operation of Nordvulk, which was prepared with support from Iceland's Ministry of Education, Science and Culture, lasted from July 1, 2004 until end of 2007. The contract was extended by one year, until the end of 2008. Annex 4 of that contract describes the programme for Nordvulk for 2004-2008 that was agreed upon. The overall aim of Nordvulk is to increase Nordic collaboration in volcanology and related fields. This should be accomplished through research, research training, and offering of facilities for volcanological research.

Nordvulk is advised by a Nordic programme committee for Nordvulk, a group of Nordic geologists that includes one senior geoscientist from each of the Nordic countries. This programme committee meets twice a year.

The Institute of Earth Sciences, which Nordvulk is a part of, is a young institute and is still adjusting to the merging of different research groups from the University of Iceland, the Science Institute and the former Nordic Volcanological Institute. Volcanology is one of three research themes that the Institute focuses on and in 2007 it was decided to strengthen the role of thematic groups within the Institute. Researchers and students interested in volcanology now form one “volcanological” thematic group (see: http://www2.norvol.hi.is/page/ies_understanding_volcanoes).

Research of the volcanology group is under a programme entitled “Understanding volcanoes”. There are presently 29 members in the group, including the five young Nordic researchers funded by NMR. Nordvulk is now integrated into this thematic group.

The manager of Nordvulk (“Nordvulk’s centerleder”) is presently also the leader of the thematic group. This is reflected in the accompanying organisational chart for the Institute of Earth Sciences (Figure 1).

Nordvulk is securely embedded within the Institute of Earth Sciences (IES). According to the University’s regulation IES, it is run by a director, working under a board of directors. The board of directors for the Institute of Earth Sciences consists of five persons, three selected by the staff of the institute, one representative from the Nordic programme committee for Nordvulk, and one researcher from outside of Iceland. The same board of directors has been at the institute since its establishment in 2004. The work duties of the director for the Institute of Earth Sciences are presently temporarily in the hands of an executive committee of six people, which oversees the daily running of the Institute. The manager of Nordvulk is a member of this executive committee and handles matters relating to Nordvulk and communication with NMR. A significant reorganisation process is taking place at the University of Iceland. The current plan includes forming a new Department of Earth Sciences uniting the research and teaching in geosciences at the university into one unit, reflecting a “promotion” of geoscience at the University. The 2004 merging of Nordvulk with the research groups at the University and establishment of the Institute of Earth Sciences has increased the number of geoscience researchers and students to a critical mass necessary to warrant a separate Department in Earth Sciences.

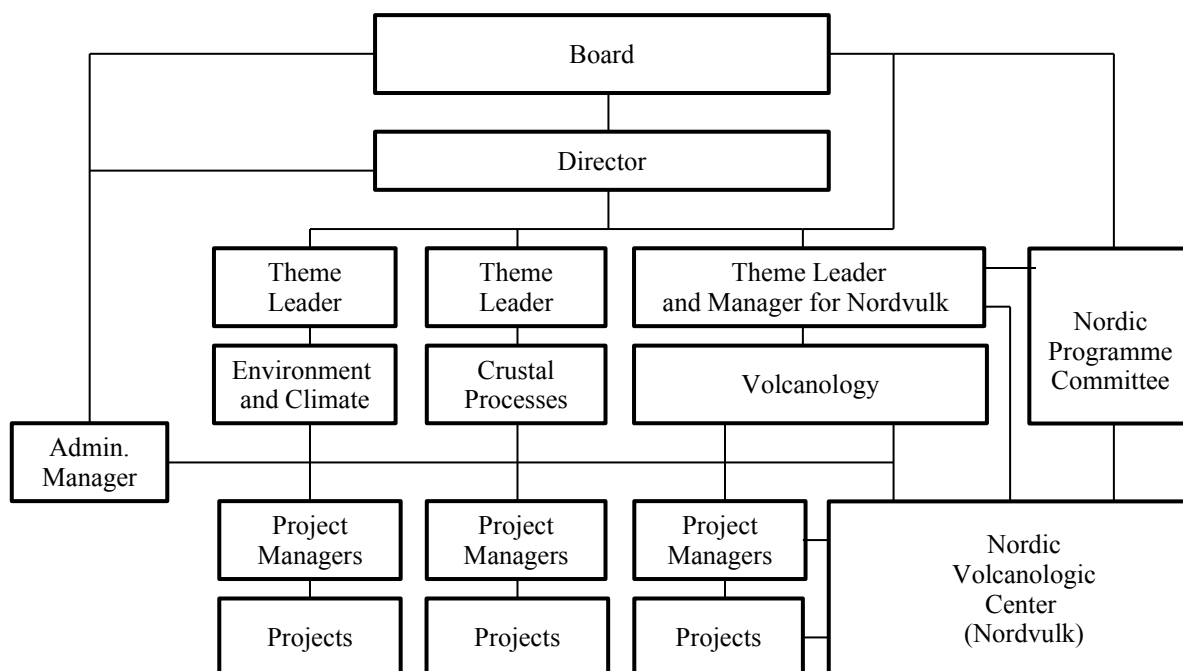


Figure 1. Institute of Earth Sciences - Thematic organisation chart. This structure is not rigid, personnel can participate in more than one thematic group and volcanology has strong links with crustal processes as well as environment and climate.

Personnel

Nordvulk can be considered a Nordic “gateway” to the science and studies of active volcanoes. One of the most important ways to achieve this is through five positions for young Nordic researchers that are granted for 12 months at a time. Students or postdoctoral researchers come from all of the Nordic counties to fill these positions, getting an opportunity to work on research projects in collaboration with the Nordvulk research group.

In 2007 five new persons joined Nordvulk as young Nordic research fellows. Of these, two were postdoctoral researchers, Jakob Kløve Jakobsen who finished a Ph.D. degree at the University of Aarhus, Denmark, and Anders Schomacker who finished a Ph.D. degree at the University of Lund, Sweden. Two Ph.D. students began as well, one who is utilizing his work at Nordvulk as a part of a Ph.D. degree at the Technical University in Luleå in Sweden (Per Ingvar Eriksson) and another who is using her Nordvulk work for a part of a Ph.D. at the University of Helsinki, Finland (Hanna Sisko Kaasalainen). The fifth new research fellow (Sæmundur Ari Halldórsson) finished his Masters project at the University of Iceland in the middle of 2007 and subsequently started at Nordvulk. The Nordic programme committee for Nordvulk did recommend expansion of the programme for young Nordic research fellows if possible within the funding scheme of Nordvulk. As a result of that, one additional research fellow was appointed for the first time in 2007, in addition to the five regular positions. This is a Danish Ph.D. student enrolled at the University of Iceland (Marie Keiding). Her funding was mostly through external support from the University of Iceland, but with additional contributions from Nordvulk sources.

In addition to the young Nordic researchers, the centre offers one position for a Nordic senior researcher in volcanology. This is a special time-limited position at Nordvulk for a senior researcher, preferably from one of the other Nordic countries other than Iceland. Erik Sturkell

from Sweden holds this position, conducting research on crustal deformation and volcano dynamics.

The individuals who are working under the theme of “Understanding volcanoes” at the Institute of Earth Sciences are either directly or indirectly linked with Nordvulk. They all contribute to the research “atmosphere” that the young Nordic researchers experience while in Iceland. Those who are directly related to it have the Nordic Volcanological Center as a part of their address on publications.

Curriculum vitae for seniors researchers linked with Nordvulk are found in Appendix 1.

2. Activities 2004-2008

Research

Nordvulk’s research projects are within the broad field of volcanology. Their aim is to understand fundamental processes that form and shape the crust of the Earth, as well as our environment. Focus has been on international collaboration and contacts, and research projects that are of international relevance, strengthening Nordvulk as a “Nordic gateway” for volcanology for international researchers, as well as researchers from the other Nordic countries.

The research studies broadly fall in two groups. Each research topic is approached by combining multidisciplinary observations with theoretical modelling. The research spans the generation and evolution of pockets of magma at depth in the mantle, their transport through the mantle and crust of the Earth, emplacement of magma within the crust or its catastrophic eruption to the surface, along with its environmental and social consequences, including surface deformation and seismicity.

Magmatic processes and volcanic systems:

- Magma generation
- Magma transport
- Magma chambers and intrusions
- Volcanic systems
- Magmatic-Tectonic interaction

Volcanic eruptions and environmental effects:

- Physics of volcanic processes
- Eruption precursors
- Eruptions
- Eruptive products and eruption history
- Local and global environmental effects
- Volcanic Hazards and their mitigation

Nordvulks research efforts are conducted in close collaboration with a large number of research institutions and individuals around the world. This is best witnessed by the many joint scientific publications that reveal the many active collaborators. Funding for research projects often comes through joint submissions of project proposals to Rannís (the Icelandic Centre for

Research), The National Science Foundation in the US, and EU-projects. Many of the current projects Nordvulk is working on are described in what follows, but the overall general research activity, and the collaborative nature of the research, is apparent from the list of publications found in Appendix 2.

(see also http://www2.norvol.hi.is/page/nordvulk_publications).

Some of the individuals collaborating with Nordvulk scientists are listed below along with research efforts.

Senior researchers directly linked with Nordvulk

(use Nordvulk as a part of their address – formerly at the Nordic Volcanological Institute)

Origin and quantity of volcanic gases in rift-zone volcanism (Niels Óskarsson). This research is mostly based on the studies of volatiles dissolved in silicate inclusions in rock-forming minerals and in the residual volatiles in the degassed groundmass. Quantification of volatiles is the basis for estimating the volume and composition of volcanic plumes. These data can be used as input parameters in models for atmospheric dispersion of volcanic gases. Dissolved water which is the most abundant volcanic volatile has significant effects on mineral-melt equilibria of magmas. Quantification of pre eruptive water content thus improves petrochemical modeling. Early results from petrogenetic modelling based on measured water content of Mt. Hekla, S-Iceland is found in Hoskuldsson et al., 2007. A part of this research is based on Ion-Probe analysis at the Grant Institute, University of Edinburgh in cooperation with Dr. Robert Hinton. Atmospheric and environmental effects of volcanic gases are also studied by analysis of soluble acids and salts that adhere to volcanic ash particles. These studies are made in cooperation with Dr. Sven Duggen, IFM-GEOMAR, Kiel, Germany.

Elemental contribution from precipitation in hydrothermal alteration estimated by isotopic analysis (Niels Óskarsson, Karl Grönvold). This research is focused on the strontium isotope ratios of alteration minerals in the uppermost volcanic strata - which by the same time are the crustal domains of hydrothermal systems. The meteoritic (rainwater) source carries sea-water strontium into the bedrock. The seawater-derived strontium stands out in the monotonous isotopically depleted rock-strontium and is a measure of past water-rock interaction. Isotopic studies on hydrothermal alteration are a continuation of mineralogical studies on the breakdown of igneous feldspar in the hydrothermal environment and dissolution-precipitation reactions of feldspar in cooperation with Daniel Larsson, Lund University, Sweden.

Magma-crust interaction inferred from xenocryst content of rift-zone basalts (Niels Óskarsson, Karl Grönvold). Xenocrysts captured into magmas during ascent through the crust can be detected by isotopic analysis (Sr, Nd, Pb). Several outcrops of plagioclase porphyritic lavas along the Icelandic rift-zones may indicate a massive remobilization of earlier crustal material. Where this occurs the interpretation of geochemical, and in particular isotopic data, has to be reevaluated. The Nordvulk project of S. A. Halldorsson is based on this line of research. The existence of xenocrysts in primitive lavas has been addressed in several studies on the Theistareykir volcanic system in N-Iceland in cooperation with Dr. Dan McKenzie and Dr. John MacLennan, University of Cambridge, England.

List of research projects and collaborators for Karl Grönvold are found in his curriculum vitae in Appendix 1.

Crustal deformation in Iceland observed by GPS (Thóra Árnadóttir). As a member of the crustal deformation group at the Institute, Thóra is working on several projects aimed at

increasing our understanding of plate spreading, earthquakes, glacial rebound and magmatic unrest through measurements and modelling of crustal deformation in Iceland. She is currently collaborating on an international project titled “High rate continuous GPS observations in Iceland” (<http://www.norvol.hi.is/~thora/ondvegi.html>). The project is funded by the Icelandic Research Fund (PI: Thóra), NSF (2 projects led by Peter LaFemina and Rick Bennett) and the ETH research fund (PI: Sigurjón Jónsson) and conducted in close collaboration with the staff at the Icelandic Meteorological Office. The goals of the project are to study a range of dynamic processes related to earthquakes and volcanic events as well as the temporal and spatial variation in slower processes, such as plate spreading, volcano and earthquake deformation and glacial rebound.

Other research projects include studies of the post-seismic deformation in the South Iceland Seismic Zone following two M6.5 earthquakes in June 2000, which forms a part of Judicael Deciem’s PhD research project at the University of Iceland. Her other PhD student, Marie Keiding, is a young Nordic research fellow. Marie is working on crustal deformation and earthquake studies on the Reykjanes Peninsula, described below.

Recent GPS measurements in a network that extends over the whole of Iceland show significant uplift rates over a broad area in central and southeast Iceland. Thóra is currently working with Dr. Björn Lund (Uppsala University) on models of glacial isostatic adjustments caused by visco-elastic response due to the thinning of the four largest glaciers in Iceland. The GIA modelling will provide constraints on the rheology of the crust and mantle under Iceland, using data from a much larger area than previous studies in Iceland. Thóra is also the Icelandic representative in a new COST Action ES0701

(http://www.cost.esf.org/index.php?id=205&action_number=ES0701).

The project brings together leading geodesists and geophysicists in Europe with the aim to improve constraints on models of GIA in the polar regions and thus to better define the polar ice mass contributions to present-day global sea level rise.

Iceland geodynamics – rheology and magmatic systems: Constraints from satellite radar interferometry and other geodetic techniques (Freysteinn Sigmundsson).

The research projects broadly fall in two categories, those associated with response of the Earth to load changes on the surface aimed at understanding rheological structure of Iceland and those aimed at understanding the behaviour of volcanic systems. The work is conducted in close collaboration with other members of the crustal deformation group at the Institute of Earth Sciences, including Thóra Árnadóttir, Erik Sturkell, Rikke Pedersen, Andy Hooper, Páll Einarsson, Benedikt G. Ófeigsson (Ph.D. student) and Per Erikson (Ph.D. student), as well as a large group of scientists from around the world. While all kind of geodetic data have been used, Freysteinn has been emphasizing the use of interferometric analysis of synthetic aperture radar satellite images (InSAR). The basic observations are maps of crustal deformation produced by InSAR. A data base of hundreds of synthetic aperture radar (SAR) images from ERS-1, ERS-2, Envisat and Alos satellites has been collected at Nordvulk under the leadership of Freysteinn. A series of projects have utilized this data, including a number of student projects, most recently with new time series analysis techniques developed by Andy Hooper. These data are complemented with other geodetic data, and other constraints, to understand the processes responsible for producing the observed changes. Projects relating to rheology include a study of the elastic response of the Earth to annual change in the mass of Iceland’s ice caps, the effects of varying glacial mass on subglacial volcanoes, uplift associated with thinning of the Vatnajökull ice cap, and most recently the modification of mantle melting due to present day glacial retreat and stress changes in shallow crust. For magmatic systems, projects include studies of the duration and scale of magma flow in volcanic systems and how that relates to the dynamics of magmatic systems. Emphasis has been on putting crustal deformation into broad context with geodynamics. Overview of crustal deformation results in Iceland are presented in the book “Iceland geodynamics: Crustal deformation and divergent plate tectonics” by

Freysteinn published by Springer/Praxis in 2006. Freysteinn is involved as well in project relating to mitigation and understanding of volcanic unrest and volcanic hazards. International collaborators include Carolina Pagli, former Ph.D. student now at University of Leeds, Andy Hooper who is transferring from Nordvulk to Delft University of Technology, the Netherlands, Kurt Feigl, University of Wisconsin, USA, Tim Masterlark, University of Alabama, Virginie Pinel Université de Savoie, France, Ronni Grapenthin now at University of Alaska, and researchers at the volcanological center, University of Azores.

Senior Nordic researcher

Magma movements (Erik Sturkell). Main emphasis has been on conducting geodetic measurements, campaign GPS-measurements and optical levelling tilt measurements, to infer time series of crustal deformation at a number of Icelandic volcanoes, including Krafla, Askja, Grímsvötn, Katla, Eyjafjallajökull, Hekla and Hengill. These observations have improved the understanding of the deformation field caused by magma chambers seated at different levels within the crust. The research has enabled the creation of long time series of volcano deformation, thereby gaining better knowledge about their behavior and internal pressure changes. These observations have also been used to evaluate volcanic unrest, and contributed to volcano hazards evaluation. The results provide an increased understanding about the dynamic and complex picture of overlapping deformation patterns generated by volcanoes in a plate boundary environment. Important aim of the research has been to increase the general understanding about the magmatic and tectonic processes responsible for volcanic eruptions. GPS observations have been complemented by real-time methods (seismic monitoring, volumetric strain etc) and other geodetic data and time series (GPS, tilt and InSAR). Results from these methods, as they complement each other, have allowed improved models of shallow magmatic systems. The goal is to increase the understanding dynamics of central volcanoes and the plate boundary.

The current glacial thinning of Vatnajökull and associated glacio-isostatic deformation provides a unique opportunity to study the solid Earth response to global warming. Time series of uplift, which reach back to 1997, make it possible to determine if the current uplift rate, which is more than 25 mm/yr at the glacier edges, will remain constant or if it will accelerate. The deformation at subglacial volcanoes are a mixture of contributions from two sources; volcanic and glacio-isostatic deformations. The separation of local deformation caused by changes in a shallow magma chamber from the wider distributed glacial-isostatic deformation is challenging. In addition to projects related to Iceland, Erik is involved in an extensive survey of the Ordovician marine impact structure in Lockne (Jämtland) and the 35.5 My old Chesapeake Bay impact crater in Virginia.

International collaborators include Alan Linde and Selwyn Sacks at Carnegie Institution of Washington, James G. Moore at US Geological Survey, Menlo Park, CA, USA, Thierry Villemin at University of Savoy, Chambéry, France, Peter LaFemina at Pennsylvania State University, PA, USA, Hazel Rymer at Open University UK, Jens Ormö at Centro de Astrobiología (INTA/CSIC), Torrejón de Ardoz, Spain, Maurits Lindström at University of Stockholm, Sweden, and Gregory S. Gohn, J. Wright Horton, Jr. and David S. Powars at U.S. Geological Survey, National Center, Reston, VA, USA

Senior researchers indirectly linked with Nordvulk

The following senior scientists are members of the thematic group in volcanology, but indirectly linked with Nordvulk: Ármann Höskuldsson Áslaug Geirsdóttir, Bryndís Brandsdóttir, Guðrún Larsen, Magnús Tumi Guðmundsson, Páll Einarsson, Sigurður Reynir Gíslason, and Olgeir Sigmarsson. One example of research activity of the indirectly linked researchers is provided in the following paragraph. These scientists have not used Nordvulk as a

part of their address, but as members of the thematic group in volcanology they contribute to the research environment in volcanology that the Nordvulk research fellows are exposed to. Importantly, some of these have supervised or directly collaborated with Nordvulk research fellows, and all are members of an even larger group at the institute of Earth Sciences that forms a body of potential supervisors for the research fellows. Potential supervisors for Nordvulk research fellows are therefore not only found within the thematic group in volcanology. Since the other thematic focus areas (Fig. 1) relate to volcanology as well – there are individuals in these groups that can supervise Nordvulks research fellows.

Evolution of the Reykjanes ridge for the past 24 MA (Ármann Höskuldsson). Ármann is working on projects to better understand the evolution of Iceland and its volcanism. During summer 2007 a NSF funded project started, aiming at understanding the evolution of the Reykjanes Ridge and its connection to the volcanic zones in Iceland. Detailed bathymetry, magnetic and gravity data were collected with R/V Knorr for 32 day in summer 2007. The project is in collaboration with Dr. Richard Hey and Dr. Fernando Martinez both at University of Hawaii. In connection to this a parallel project is run in relation to the Vestmannaeyjar volcanic area (a propagating rift), funded by Viðlagasjóður, NSF and the University of Iceland research fund. Detailed bathymetric study has revealed numerous volcanic vents on the ocean floor around the islands. Coring on the shelf around the islands has been undertaken. Analysis of the cores is foreseen to give better ideas on timing of volcanism in the area and the nature of rift propagation in the Eastern Volcanic Zone.

Other research projects are, at Myvatn, N-Iceland looking at the Hverfjall eruption (2500 BP), the phaeocrater formation in “Laxár Hraun” younger (2000 BP), in SE-Iceland the Öræfajökull 1362 AD eruption which is the largest historic explosive eruption in the northern hemisphere, crustal melting and rhyolites erupted in the Askja 1875 eruption, emplacements of the basaltic mass flows in the Sida district S-Iceland, generation of rift zone calderas in Iceland. These projects are in collaboration with University of Bristol (UK), IPGP Paris (France), University of Edinburgh (Scotland), Vanderbilt University (USA) and University of Barcelona (Spain).

Projects of present Nordvulk research fellows:

Present Nordvulk research fellows include Anders Schomacker, Hanna Sisko Kaasalainen, Jakob Kløve Jakobsen, Marie Keiding, Per Ingvar Eriksson, and Sæmundur Ari Halldórsson. Outline of their research is found in the following, and additional information about their background, is found at:

http://www2.norvol.hi.is/page/nordvulk_researchfellow

i) *DYNAMICE (glacier-volcano DYNAMics in ICEland)* (Anders Schomacker, post-doc). This project aims at detecting and quantifying changes in modern glacial environments caused by volcanic activity. Changes may be due to volcanoglacial jökulhlaups, tephra deposition etc. Analyses of multi-temporal digital elevation models (DEMs) are used to quantify the effects of such events. The DEM analyses are followed up by field investigations, mainly in the Mýrdalsjökull area. The project is coordinated by Anders Schomacker, and funded by Nordvulk and the Royal Swedish Academy of Sciences. Researchers from Lund University, Sweden and University of Copenhagen, Denmark collaborate within DYNAMICE.

ii) *The transport and deposition of metals and sulphur compounds in volcanic geothermal environments* (Hanna Sisko Kaasalainen, Ph.D. student). In addition to major sulphur species (hydrogen sulphide, sulphates and sulphur dioxide) that play a key role in the fluxes and

transportation of metals associated with sulphur compounds, other sulphur species (such as thiosulphate, polythionates, polysulphides) may be of importance. The main focus of this project is on the geothermal surface environments, where the major control on sulphur and metal chemistry is set by the oxidation of reduced fluid and consequent formation of acid-sulphate waters. The project is a part of PhD degree research work, the main advisor at Institute of Earth Sciences is Andri Stefánsson (who is in the thematic group on Environment and climate).

iii) *Origin of the three magmatic series in Iceland* (Jakob Kløve Jakobsen, post-doc). A prerequisite to improve our understanding of mantle melts is identification of primary magma compositions. One approach to constrain the geochemical compositions of primary melts is to study melt inclusions which are small pockets of trapped melt formed within crystals isolated from the rest of the magma. This project focuses on melt inclusions trapped in phenocrysts from hyaloclastites from Hengill, Hekla and Heimaey in order to elucidate the parental magma compositions of three different magma series in Iceland. The project is led by Jakob Kløve Jakobsen, collaborating with researchers at University of Iceland, Laboratoire Magmas et Volcans, CNRS Université Blaise Pascal, France, and Swedish Museum of Natural History.

iv) *Crustal deformation and the state of stress along Reykjanes Peninsula, an oblique plate boundary* (Marie Keiding, Ph.D. student). The Mid-Atlantic plate boundary comes onshore on the Reykjanes Peninsula and forms a diffuse and highly oblique plate boundary zone, in which both left-lateral motion and extension is accommodated. In this project we are examining the relationship between surface deformation and earthquakes, with the aim of improving our understanding of the underlying processes that govern the plate boundary deformation in the area. The study is a PhD research project at University of Iceland for Marie Keiding, with main supervisors Thóra Árnadóttir at Nordvulk and Björn Lund at Uppsala University, Sweden.

v) *Magma flow directions in dykes inferred from magnetic studies* (Per Ingvar Eriksson, Ph.D. student). One of the enigmatic features of accretion of oceanic crust is the mode of emplacement of dyke swarms in volcanic systems. Far stretched regional dyke swarm may be fed from a single magma chamber located under the central volcano (horizontal flow of magma dominating), or magma flow may be dominantly vertical from a magma reservoir stretched along the ridge axis. The project aims to reveal flow directions by looking at magnetic textures revealed from anisotropy of magnetic susceptibility on orientated specimens. The project is a part of studies aimed for a doctoral thesis in applied geophysics at the University of Technology in Luleå, Sweden. Supervisors are Freysteinn Sigmundsson and Leó Kristjánsson (who is in the thematic group on crustal processes) at University of Iceland and Sten-Åke Elming at Luleå University of Technology, Sweden.

vi-a) *Oxygen isotopic systematics of the Þjórsa lava* (Sæmundur Ari Halldórsson). The Þjórsa lava, the largest Holocene fissure lava (25 cubic kilometers) within the Icelandic rift system, is unique for its unusual plagioclase-porphyritic character (about 5-10% plagioclase), although it is compositionally comparable to many tholeiitic fissure lavas in Iceland. Detailed studies of this lava field include the effect of oxidation on crystallization processes along the flow distance, the effect on oxygen isotopes during the oxidation and eventual reaction with the substrate, and oxygen isotopic systematics of this hybrid type of rift zone basalt.

vi-b) *Isotopic systematics of the Krafla fires (1975-1984) and other Holocene rifting events within Krafla Volcano* (Sæmundur Ari Halldórsson). There is an excellent control of the Krafla magmatic activity, both temporarily and geographically. Radiogenic isotopes are being used to deepen the understanding of magmatic and volcanic processes at Krafla. The aim here is to use the extensive geological and chemical database, along with new mass spectrometry observations of isotopes. Along with these projects, Sæmundur has participated in international

collaboration with researcher at the University of Hawaii and at the Scripps Institution of Oceanography, where he will start working on a PhD degree in September 2008.

It is clear from the above list that Nordvulks research training of research fellows is conducted in collaboration with a group of institutions and individuals. As outlined above, collaborators for projects of present Nordic research fellows include: Uppsala University, University of Technology in Luleå, Lund University, Swedish Museum of Natural History, Sweden, University of Copenhagen in Denmark, Laboratoire Magmas et Volcans, CNRS Université Blaise Pascal, France, University of Hawaii and the Scripps Institution of Oceanography, USA. The collaborative efforts include both Ph.D. and post-doc projects.

Nordvulk researchers with other sources of funding

Nordvulk receives funding from various sources to support additional researchers. These sources include grants from Rannís, the Icelandic centre for research, EU-projects, grants from the University of Iceland research fund for research projects and Ph.D. students, Eimskip University Fund for Ph.D. students, the research fund of Reykjavík Energy, and the energy research fund of the Landsvirkjun power company.

Crustal deformation observed by InSAR in active volcanic and tectonic regions of Iceland (Rikke Pedersen, post-doc). Rikke's post-doctoral research focuses on crustal deformation observed by InSAR, modeling of the deformation and inference of temporal evolution. Her past projects include examining the relationship between stress state of the crust and seismic release during volcanic crisis. Her current project focuses on recreating deformation patterns observed in InSAR images of the Northern Volcanic Zone through 2D and 3D finite element models. Various rheological models are investigated to try to discriminate between likely deformation processes ongoing in the area of active plate spreading. International research collaboration: A range of research projects in crustal deformation processes are carried out with considerable cooperation between both national and international partners. Rikke's main research projects within the past year have been focused on the Northern volcanic zone, Eyjafjallajökull and Katla volcanoes. These projects include close cooperation with partners from University of Wisconsin (Dr. Kurt L. Feigl), University of Alabama (Dr. Timothy Masterlark), Institut de Physique du Globe de Paris (Dr. Claude Jaupart and Dr. Elske de-Zeeuw van Dalfsen).

A number of smaller projects involve a number of additional partners. Icelandic partners: Icelandic Meteorological Office and National Land Survey of Iceland. International partners: University of Wisconsin (USA), University of Alabama (USA), Institut de Physique du Globe de Paris (France), US Geological Survey, Menlo Park (USA), University of Miami (USA), Carnegie Institution of Washington (USA), Cambridge University (UK), Université de Savoie (France), Azores University (Portugal)

Crustal deformation in relation to deep seated magma accumulation: Multi-temporal InSAR method and finite element models (Benedikt G. Ófeigsson, Ph.D student). Some Icelandic volcanoes show evidence of deep seated magma sources that reside in the ductile lower crust. The aim of the project is to conduct detailed studies of deformation of selected magmatic systems, with special focus on capturing deformation field due to such deep sources utilizing interferometric analysis of synthetic aperture radar images (InSAR), and develop understanding of them by detailed modelling. In order to constrain the properties of such magma sources (i.e. location, shape, pressure changes e.g.) non-elastic rheology needs to be taken into account. The

deformation field associated with these magma sources is spread over a large area and difficult to detect with conventional InSAR. New improved analysing technique based on time series analyses of large sets of InSAR data makes it feasible to constrain such wide spread deformation. Hekla, with its suggested deep magma chamber, has been chosen as the first target area, with time series analysis being conducted with ERS and ENVISAT radar images. The project is a part of PhD degree research work, the main advisor at Institute of Earth Sciences being Freysteinn Sigmundsson.

Crustal deformation in North Iceland following the Krafla rifting episode (1975-1984) (Judicael Decriem, Ph.D. student). Early GPS studies in Iceland showed a significant increase in the spreading rates across the Northern Volcanic Zone, up to 56 mm/yr in 1987-1990, compared to the approximately 20 mm/yr long term average across Iceland. The observations were interpreted as a significant post-rifting transient signal following the Krafla Fires. Our project examines whether a significant post-rifting signal is still present, and estimating temporal and spatial evolution of stress changes caused by the post-rifting transient on the nearby Húsavík-Flatey fault. The work includes analysing and modelling of GPS measurements in North Iceland. The modelling includes an extensive comparison of semi-analytical methods that have been used to compute the surface deformation due to visco-elastic relaxation, such as the deformation transient following the Krafla rifting. The project is a part of the PhD research project of Judicael Decriem at the Institute of Earth Sciences. Judicael's main advisor is Thóra Arnadóttir.

Volcanic hazard assessment and palaeoenvironmental reconstruction (Dr. Kate T. Smith). Kate's post-doc research combines both palaeoenvironmental reconstruction and natural hazard studies, particularly focusing on ice-volcano interaction, jökulhlaup events and tephra fallout. An important goal of this work is to, where appropriate, practically apply the results of geological research to hazard management practises. Ongoing projects involve collaboration with researchers at Iceland Geosurvey, University of Edinburgh and within the Nordic Volcanological Center and the Institute of Earth Sciences:

1. Reconstruction of Holocene jökulhlaups from Snæfellsjökull using geomorphology, sedimentology and tephrochronology. Funded by Vegagerðin and The Leverhulme Trust (UK).
2. Reconstruction of glacial fluctuation patterns and jökulhlaup events from the southern margin of Mýrdalsjökull. The project is funded by the Icelandic Road Administration and the Royal Scottish Geographical Society.
3. Volcanic hazard assessment and mapping at Snæfellsjökull volcano using GIS. Funded by Vegagerðin and the post-doctoral fund of the University of Iceland.
4. Tephra fallout and sedimentation modelling for assessment of hazard in the vicinity of Hekla volcano. Funded by Landsvirkjun.

Environmental impacts of volcanic hazards on rural areas: use of volcanological data to improve response time in rehabilitation of areas affected by eruptions (Sylviane L.G. Lebon, MSc student in Environmental Sciences and Natural Resources Management at the University of Iceland): Even though volcanic products are known to have beneficial impacts on land fertility, long recovery times and significant decreases in agricultural productivity are frequently observed in rural areas following eruptions. This can have significant implications for rural populations as well in terms of overall food production capacity of a region/country in the short to medium term. Through the analysis of case studies in a number of areas around the world where volcanic eruptions have significantly affected agricultural activities, this work aims to determine whether -and how- volcanological data can be used at an early stage in rehabilitation planning in order to minimise the impact on local communities. The mainsupervisors of this study are Freysteinn Sigmundsson and Sigurður Reynir Gíslason.

Interaction of faults and eruptive fissures on the Reykjanes Peninsula (Amy Clifton)

Amy's current research combines the use of GIS mapping and analytical methods along with numerical modeling to better constrain the types of tectonic events that are likely to occur during the next episode of fissure eruptions on the Reykjanes Peninsula. These include possible fault movements, likely eruption sites and probable lava flow paths. Amy's research is focused on understanding the structural and tectonic development of oblique rift zones. In particular, she has studied the tectonic evolution of the Reykjanes Peninsula oblique rift zone during post-glacial times. Her past research investigated the role of faulting in accommodating strain at the Hengill volcanic center in particular and along the Reykjanes Peninsula plate boundary zone as a whole. This was accomplished by combining detailed mapping both in the field and using aerial photos with GIS analytical methods.

Crustal deformation from Multi-temporal InSAR: Combination of persistent

scatterer and small baseline methods (Andrew Hooper). Andy's post-doctoral research has been focused on developing and applying a technique specifically for volcanic areas that combines the advantages of two categories of multi-temporal InSAR methods; persistent scatterers and the small baseline method. This combination of methods has proved to provide data of superior quality compared to conventional InSAR within areas where coherence may be limited. The new technique has been applied to several volcanic areas in Iceland: Eyjafjallajökull, Katla and the Upptýppingar region of the Kverkfjöll volcanic system.

Other projects

Hekla volcano (Guðrún Sverrisdóttir). Guðrún is a geologist within the Nordvulk team, working mostly within the geochemical laboratory, but leads also two projects on Hekla volcano. One of the projects is on the *isotope systematics of the Hekla rock suite*. The eruption history of Hekla is relatively well known, but the relationship of the evolved volcanism of Hekla central volcano and the basaltic lavas and hyaloclastites in the vicinity has not been explained in details. The aim of this project is to define this relationship by means of extensive isotope studies, along with major and trace element analysis, and eventually put a time constraint on the beginning of the rift propagation in the area. The other project is on "*The Hekla lahar*" and *small scale experiments to simulate processes in debris flows*. Following an ongoing project of mapping and sedimentological research of a large lahar deposit originating from an eruption in Hekla about 4000 years ago, some small scale experiments on the same material are in progress. The research aims to explain processes producing this specific deposit and similar deposits consisting of a mixture of pumice and rock fragments.

Research training: Program for Nordic research fellows

Close to 100 Nordic geoscientists have held a research fellow position at Nordvulk since the onset of the Nordic Volcanological Institute in 1974 and later at the Nordic Volcanological Center within the Institute of Earth Sciences (see Appendix 3). Most of the Nordic research fellows have held a M.Sc. degree upon arrival in Iceland, and the positions at Nordvulk have thus provided the fellows with early scientific experiences and training. During the last years, the Nordvulk program committee has emphasised that the research fellow positions should primarily be offered to fellows that are enrolled in a Ph.D. program at one of the Nordic universities, or they should be granted to post-doctoral researchers.

The merging of Nordvulk and the Institute of Earth Sciences has opened a new perspective in research planning for the research fellows. On the positive side there is a wider array of

available research topics within the present host institution. In particular, this applies to volcano-seismology and volcano-glaciology which together with the volcano-deformation studies that were run at the Nordic Volcanological Institute forms an effective platform for geophysical volcanology. Similarly, the advanced geochemical and petrological facilities that were run at the Nordic Volcanological Institute merge well with experimental and geothermal studies that were run at the University. The combined array of research topics relating to volcanology, in a broad context, at the Institute of Earth Sciences appeals to young Nordic researchers of widely different background in geosciences and different interests in volcanology. The merge has also increased the pool of researcher available for supervising and collaborating with Nordic research fellow. Presently there are over 20 researchers at Institute of Earth Sciences that are potential supervisors to Nordvulk research fellows (both within the volcanological thematic group, as well as in other groups)

What might be pointed out as a negative side of the present status of Nordvulk is the fact that practically all research within the Institute of Earth Sciences, except the projects of the Nordic research fellows, are to a large extent supported by soft money that is derived from research funds obtained by the individual staff members. There is usually great uncertainty in amount and time span of soft money for research project, complicating in some case the involvement of Nordic research fellows in such projects. On the other hand, the involvement of Nordic research fellows can strengthen such projects. Granting of Nordvulk research fellows position for more than 12 months at a time could facilitate their involvement in various projects.

Research training: Visiting students and scientists

Over the years Nordvulk has hosted many visitors that have stayed for long or short time to work on various collaborative projects, both senior researchers and graduate students.

Senior researchers visiting recently for an extended time include:

Dr. Ramon Hansen from the Delft University of Technology, Netherlands, Dr. David Kadko, University of Miami, Dr. John Sinton, University of Hawaii, and Dr. Kurt Feigl, University of Wisconsin.

Every year Nordvulk researchers are contacted by a large number of students, who wish to participate in active research projects, as part of their academic studies. We have only been able to accommodate a fraction of these requests. Recent visiting students include:

Eva Karlsson, a student from Sweden spent 6 months at Nordvulk in 2007-2008 working on a research project for her Master's thesis on the evolution of the Thingvellir graben and rheology of rifts. The Master's thesis was a joint project between the University of Umeå, Sweden, and Nordvulk.

Ronni Graphentin, a student from Germany spent 6 months at Nordvulk in 2006 working on a research project for his Diploma degree at University of Berlin, working on the response of the solid Earth to annual fluctuation of ice mass at Icelandic glaciers.

Pierre Dublanchet, a student from France is spending 5 months at Nordvulk in spring 2008. His research project is a part of his Master's thesis work at the Ecole Normale Supérieure in Paris. The project involves analysis of GPS data collected in Hengill volcano to examine the crustal deformation in the area during 2001-2005, following the period of inflation and high seismic activity in 1994-1998. The supervisor of his project is Thóra Árnadóttir.

Research training: Summer schools and international program in Earth Science

Nordvulk has arranged a series of international summer schools in volcanology and related fields. The funding for this activity has come entirely from individually funded grant proposals, submitted by the Nordvulk staff members and their international collaborators to Nordforsk, the National Science Foundation, USA, EU Environment programmes and Rannís, the Icelandic Center for Research. There is great international interest in this activity and a secure source of funding, effectively acting as seed money for international grant applications, would allow us to organise the summer schools on a more regular basis. The most recent summer school was held August 20-29, 2007 at Lake Myvatn in north Iceland on the theme “Geodynamics and magmatic processes”. The school included over 50 researchers and students, from all the Nordic countries, as well as participants from Britain, Ireland, USA and South Africa. The organizing committee included members from United States Geological Survey, Pennsylvania State University, and University of Oslo, in addition to Nordvulk. Nordic participation in the school was mostly funded by a special grant from Nordforsk. The school was held at Lake Mývatn in north of Iceland. The school consisted of a combination of lectures by international senior researchers in the field from around the world, poster presentation from all participants, field trips to explore the geology of North Iceland, and ample time for discussions.

Past summer schools include:

- 1995: Tectonics and volcanism at divergent plate boundaries, (sponsored by NorFA)
- 1996: Ocean crust and Ophiolites, (sponsored by NorFA and TMR)
- 1997: Active processes at Ocean Ridges, (sponsored by NorFA and NSF)
- 1998: Greenland Ice Cores and North-Atlantic climate, (sponsored by NorFA and TMR)
- 2000: Plume-Ridge Interactions, (sponsored by NorFA, Rannís and NSF)
- 2002: Environmental effects of large volcanic eruptions on the Northern Hemisphere (sponsored by NorFa)
- 2003: Tectonic - Magmatic interaction (sponsored by NorFA, Rannís and NSF)
- 2007: Summer School on Geodynamics and Magmatic Processes

Some further information about past summer schools is found in Appendix 4.

No summer school is planned for 2008. Instead Nordvulk is contributing to the preparation for the IAVCEI (International Association of Volcanology and Chemistry of the Earth’s Interior) meeting in Iceland in August this year, and to the related field trips. Nordvulk is also involved in preparing the International Geological Congress that will take place in Oslo in the beginning of August this year.

The Nordvulk staff participate in an international program in Earth Science for foreign students that is offered at the University of Iceland (<http://www.raunvisindi.hi.is/page/jl-foreignstudents>). The program is for one year and offers a range of topics, including volcanology, for students in Earth science. The program has been very popular, attracting students from all over the world.

Research facilities

Nordvulk has access to all the research facilities at the Institute of Earth Sciences (see Appendix 5). In particular, the facilities outlined in the contract between the Nordic Council of Ministers and the University of Iceland are all functioning and used for projects of research fellows. These include a geochemical laboratory, electron microprobe and mass spectrometer for geochemical research, geophysical laboratory including equipment to conduct crustal deformation measurements, as well as cars and field equipment. In 2007 a major upgrade of the electron microprobe was carried out, covered mostly by external funds.

3. Finances

2007 was the first year in which funding from NMR to the operation of Nordvulk was drastically lowered in comparison with earlier years, in accordance with the contract between NMR and University of Iceland. In 2006 funding from NMR was 88.9 million ISK (Icelandic kronas), but in 2007 it was reduced to 58.400 million ISK. This decrease in funding was *partly* counterbalanced by an increase in funding from Icelandic authorities and by temporary research grants, which ensured a similar level of activity at Nordvulk in 2007 as in previous years.

Nordvulk is a part of the Institute of Earth Sciences, which is a part of the Science Institute, University of Iceland. Nordvulk's accounting and audit is a part of the Science Institute's accounting process. Each research project is accounted for separately and the same applies to large equipment, research laboratories and various other items. Each scientist at the Science Institute may be running more than one project and receiving grants from various sources. A financial report is prepared for each project. This means that projects, salaries and other costs paid by funds provided by NMR can be identified and accounted for. The Science Institute accounts are audited by the Icelandic National Audit Office and that includes the accounts of the Nordic Volcanological Center.

Nordvulk's 2007 income statement includes the following as income: contribution from NMR (58.4 millions ISK), contribution from Icelandic state budget (57.3 mISK), and research funds (57.2 mISK). Research funds include all grants received from both domestic and foreign funds, including projects funded by the European Union. Furthermore, indirect benefits in support of volcanology (listed at the end of this section) are estimated about 54 mISK.

Nordvulk's 2007 main expenses are:

Salaries. Salary costs of permanent staff related to Nordvulk, the Nordic research fellows who are temporarily hired, and the salary of the Nordic senior researcher. They include both direct wages and payroll related costs, such as pension-fund contributions for persons directly linked with Nordvulk. In 2007 salaries for Ármann Höskuldsson and Ólafur Guðmundsson are reported under these costs. Total costs are 95.8 mISK in 2007.

Research projects, laboratories and computing. All costs directly related to the running of research projects, laboratories, equipment and computers. This include salaries for persons hired on the basis of those projects. Total costs 45.6 mISK in 2007.

Travel, subsistence and conferences. All cost of travel, daily allowance and other expenses related to conferences, meetings and research trips both in Iceland and abroad. Only costs paid by Nordvulk funds are stated. Total costs 8.8 mISK, covered by Nordvulk base funding. Costs of this type paid directly by research projects funded by research grants are included in the category above.

Housing costs. Rental cost of storage garage at Hvaleyrarbraut/Héðinshús and costs of running two field stations (Helluhraun and Dyngja). Total costs 3.3 mISK.

Administrative costs. Include expenses for office supplies and operation and the costs relating to the IES board and Nordvulk program committee. Total costs 6.4 mISK.

Equipment purchases. 13.6 mISK. Including a major upgrade of an electron microprobe

Other costs. 2.9 mISK.

Support to Nordvulk's activities from the Science Institute and University of Iceland in 2007: Nordvulk receives substantial indirect support from the Science Institute and the University of Iceland. Three University professors as well as three senior scientists in volcanology are members of the thematic group in volcanology with their salaries provided by sources external to Nordvulk. Furthermore, scientists from Nordvulk who are members of the University teachers union can receive payments from a special fund depending on their activity, and can as well apply for some travel support every other year. The total benefit to Nordvulk in terms of indirect salary costs are estimated about 42 million ISK (listed under "Additional salaries").

The University provides Nordvulk office and laboratory space at the Askja building. Nordvulk does, at present, not bear any cost for utilities, maintenance or cleaning of this space. The estimated annual benefit to Nordvulk is about 5 million ISK.

Nordvulk staff has full access to the Science Institute office staff and technician. This includes but is not limited to all accounting, payroll and purchasing service, aid in hiring and acquiring work and residence permits for foreign nationals. A car owned by the Science Institute that can be used for errands in and around Reykjavík, is available to Nordvulk. This is estimated to amount to approximately 7.5 million ISK per year.

Appendix 5 gives further information on the financial situation of Nordvulk and the Institute of Earth Sciences.

4. Nordvulk's future: Opportunities, vision and strategy

Nordic ministers have expressed an interest in increased globalisation of Nordic collaboration in coming years, with focus on energy, climate, and environment, as well as highest-quality research. Nordvulk is presently involved in several projects relating to these focus areas, and will explore possibilities of linking to new collaborative Nordic projects in these fields, when they appropriately overlap with volcanology. Geochemical/geophysical research on heat transfer, rate of heat flux in geothermal areas and its relation to volcanoes is an integral part of energy research. Furthermore, Iceland's northerly location also makes it an important study area for glaciology with implications for global sea-level rise and climate change. The unloading of the crust due to the current rapid melting of the glaciers has a direct effect on subglacial volcanic systems in Iceland and elsewhere, causing enhanced melt generation, thus potentially enhancing the risk of future eruptions.

The Opportunities

The Nordic countries contain, in Iceland, one of the world's best studied and accessible areas of active volcanism and tectonics and the only large sub-aerial part of a mid-oceanic ridge. As such, it is one of the best field laboratories in the world for volcanological studies.

Understanding the volcanic activity of the Earth and its related tectonic activity, particularly in view of the hazards volcanism creates for an increasingly populous Earth, is an important scientific priority. Frequent eruptions of different types, ranging from small with local effects to large catastrophic eruptions (like Laki 1783-84 eruption) with global effects, provide unique opportunities to study the various effects of volcanic activity.

The Icelandic volcanic area has therefore offered, and continues to offer, Nordic scientists an invaluable opportunity to develop globally significant skills in this key area of science.

Vision for the future

Nordvulk's vision for the future is to:

- maintain and further strengthen the development of a powerful group of leading Nordic geoscientists with experience and expertise in volcanology, through research training;
- continue our basic research and widen the scope as part of the thematic group in volcanology and related fields;

- take advantage of the new emphasis at the University of Iceland on graduate education by encouraging more formal collaboration in geoscience education between the University of Iceland and other Nordic universities, for example in the form of joint Ph.D. degrees;

- develop its role as a centre for international scientific collaboration and research in volcanology and related fields;

- apply its skills to the understanding and mitigation of worldwide volcanic and related tectonic hazards and support practical and theoretical training of scientists from countries that suffer from volcanic hazards.

Strategy

Nordvulk's strategy to achieve our vision:

Continuation of Nordic research in volcanology: Positions for young Nordic research fellows (minimum 5 man-year) and a position for a distinguished Nordic senior researcher, including research funding, should be kept as top priority. The framework for the positions for young Nordic research fellows needs to be modified in order to attract highly qualified young scientists in the future. A serious consideration should be given to whether the positions should exclusively be announced as graduate student or post-doctoral positions in volcanology, for 2 years (with a 1 year possible extension), as defined within the thematic group of the Institute of Earth sciences. The establishment of longer term positions than the current one year posts, would attract young researchers with strong personal initiative in science and at the same time favour publications of scientific results. The aim of the research fellow program should be to prepare the grant holders for professional participation in volcanology on an international level, as well to give them skills applicable across a wide range of geoscience and environmental studies.

Increasing Nordvulk's role in education in geoscience:

The operation of summer schools focusing on specific themes of interest in volcanology and related fields should be continued with secure funding. The summer schools should be aimed at post-graduate students in geosciences, with active Nordic participation. A summer school in volcanology where international lectures represent the state of the art in their fields of research is the most effective means of announcing Nordvulk within the Nordic academic communities. Moreover, a summer school aims at participants who are, by personal interest, potential future grant holders at Nordvulk.

Consideration should be given to if Nordic "geoexcursions" in volcanology to Iceland should be offered, as was done prior to 1995 (with fixed funding from NMR). Such geoexcursions, ideally combined with the summer schools, are a natural forum for the exploration and definition of future research themes. Personal encounter of students, young researchers, former Nordvulk research fellows, and active Nordic, as well as international researchers, is undoubtedly the most creative means to reinforce research in volcanology.

Nordvulk as an integrated part of a thematic group in volcanology: Grouping of all volcanological research at the Institute of Earth Sciences, University of Iceland, within the

thematic group in volcanology focusing on “Understanding volcanoes” has strengthened collaborative research through use of joint facilities and resources. Nordvulk aims at leading the thematic group in volcanology. Nordic research fellows benefit from being exposed to the wide focus of the volcanological research community at University of Iceland, in terms of improved resources of supervision, collaboration and facilities.

Nordvulk as an international center for volcanological research: The Institute of Earth Sciences offers stimulating research environment for young researchers and Nordic research fellows in connection with the geoscience graduate program within the University of Iceland, as well as the possibilities for Nordic research fellows to use their Nordvulk research as a part of Ph.D. studies at other Nordic universities. The identity of Nordvulk is highlighted through individual research projects funded by NMR, the government of Iceland, University of Iceland and other sources. International collaboration has been important factor in Nordvulk’s academic stature, and Nordvulk’s researchers are interested in sustaining and expanding these important connections.

Nordvulk’s rapid response to eruptions and volcanic unrest: Nordvulk realizes the immediate need to mitigate hazards in the case of volcanic eruptions. Nordvulk will therefore contribute to rapid response to eruptions and volcanic unrest in Iceland, and elsewhere if appropriate, aiming at providing information to population and civil defence authorities. Furthermore, unique scientific information can be collected during eruptions and volcanic unrest periods, emphasizing the importance of rapid science response to such events

Nordvulk’s outreach and PR activities: Nordvulk has the opportunity to advance public understanding of volcanic and seismic hazards for the benefit of society and science. Nordvulk’s aim is to significantly update its website, and ensure flow through it of new material of interest to scientists, public and politicians. More information about Nordvulk’s activities is needed, as well as information about volcanic eruptions. Increased visibility within the “Nordic system” is also aimed for, e.g. through increased information flow the Nordic Council of Minister Office information department. Nordvulk is interested in further utilizing its network of Nordvulk alumni, as a basis for a stronger “Nordic volcanological network”. We aim to increase the visibility of Nordvulk within universities of the other Nordic countries to ensure that Nordic geoscience students are aware of Nordvulk.

Concluding remarks

As described in this document, Nordvulk’s research falls into the broad field of volcanology. The research spans the generation and evolution of pockets of magma at depth in the mantle, their transport through the mantle and crust of the Earth, emplacement of magma within the crust or its catastrophic eruption to the surface, along with its environmental consequences. Other Nordvulk research projects deal with volcano-ice interaction, geothermal systems, and plate boundary tectonics. Each research topic is approached by combining multidisciplinary observations with theoretical modelling. Nordvulk’s aim is to continue research at a broad front in volcanology in coming years, as described at the beginning of chapter 2.

The vision and associated strategy presented here to assure Nordvulk’s leading role in volcanology in the future is only realistic if funding to Nordvulk can be maintained at its present level or, preferably, increased in the coming years. The current level of base funding from the Nordic Council of Ministers (NMR), the Icelandic Ministry for Education, Science and Culture, and the University of Iceland, represents the bare minimum needed to maintain our current efforts. The financial contribution from NMR will be utilized for operation of Nordvulk’s basic elements, and related activities, including: Positions for Nordic research

fellows (minimum 5), position for a Nordic senior researcher, funding of research projects for research fellows, and contribution towards costs of research facilities

Increased base funding to Nordvulk would allow us to enhance our current research efforts as well as strengthen our role as an international center in volcanology and related fields. A modest increase in funding would, for example, enable us to establish an international visiting program for senior geoscientists at Nordvulk resulting in more active collaboration than presently. Also support to increase outreach (such as funding for a dedicated outreach officer) would help us increase our visibility in the Nordic community as well as the internationally. Furthermore, Nordvulk aims to seek funding to establish a new international post-doc position at Nordvulk, in order to strengthen the globalisation aspect.

Appendix 1:

Nordvulk: Curriculum for senior researchers

Curriculum vitae for Senior researchers, directly linked with Nordvulk

Freysteinn Sigmundsson - Curriculum Vitae

Janúar 2006

Origin

Born July 22, 1966. Married, 3 children

Education

1985-1988: University of Iceland, BS degree 1988, Geophysics

1988-1989: University of Colorado at Boulder, USA

1989-1990: University of Iceland, M.Sc. degree 1990, Geophysics

1990-1992: University of Colorado, Ph.D. degree 1992, Geophysics

M.Sc. thesis entitled "Viscosity of the Earth beneath Iceland, comparison of model calculations with geological data (in Icelandic with English abstract)" evaluates rheology of crust and mantle under Iceland utilizing geological observations of post-glacial rebound.

Ph.D. thesis entitled "Crustal Deformation Studies in Sub-aerial Parts of the World Oceanic Rift System: Iceland and Afar" is based on application of the Global Positioning System geodetic measurements to study deformation associated with the Hekla 1991 eruption in Iceland, the study of glacio-isostatic crustal movements caused by historical volume change of the Vatnajökull ice cap, and a study of the tectonic implications of the 1989 Afar earthquake sequence in Ethiopia.

Award

May 2005: Hvatningarverðlaun Vísinda- og tækniráðs (Iceland's Science and Technology Council award for excellence in science at early age).

Professional positions

Summer jobs 1986-1988:

National Energy Authority Iceland, research assistant. Geophysical prospecting of geothermal fields.

1988-1989:

University of Colorado, research assistant. Deformation monitoring of the Long Valley Caldera using long-baseline water-tube tiltmeter, and research on application of the Global Positioning System (GPS) for tectonic studies.

1989-1990:

University of Iceland, research assistant. Research on post-glacial rebound, GPS, and crust/mantle structure in Iceland.

1990-1992:

University of Colorado, research assistant. Research on crustal deformation in sub-aerial parts of the world-oceanic rift

system, Iceland and Afar, and application of the Global Positioning System for tectonic studies. Holder of a NATO Science Fellowship in 1990, and NASA Global Change Fellowship in 1992. Led a GPS-expedition to Tibet in 1991 to participate in trans-Himalayan geodetic measurements.

1992-1999:

Nordic Volcanological Institute, research geophysicist. Principal field of work: Research on active processes at volcanoes, and crustal deformation related to volcanic and seismic activity using GPS geodesy. Comparison of crustal deformation and seismicity. Application of satellite remote sensing techniques to study geological processes and measure deformation, including InSAR, interferometric analysis of synthetic aperture radar images acquired by radar satellites. Interest and research work is reflected by the titles of publications. Many co-authors on joint papers are long-term collaborators. Involved in research on volcanoes in various parts of the world, including Iceland, Azores, Greece, and La Reunion, France. Actively involved in European collaborative research on volcanism (Furnas and Santorini laboratory volcano projects) and seismic risk (Earthquake Prediction Research in a Natural Laboratory 1 and 2), funded by the Commission of European Communities, Environment programme.

1999 – June 31, 2004:

Nordic Volcanological Institute, director. Responsible for the daily running of the institute, including promoting research and developing and carrying out budgetary plans. Responsible to the Nordic board of directors (five persons, one from each of the Nordic countries) that governed the institute. Preparation of matters for the board, and close interaction with it to carry out strategic decisions taken by it. Close interaction with the Nordic Council of Ministers and the Ministry of Education, Science and Culture in Iceland, the funding bodies of the Nordic Volcanological Institute. Interaction with the National Science Foundation, USA, e.g. for summer schools jointly sponsored by NSF and Nordic sources. Involvement in a long process of strategic discussions, changes, and reforming associated with the merging of the Nordic Volcanological Institute with University of Iceland on July 1, 2004, following a decision of the Nordic Council of Ministers.

The director position was 50% administrative position and 50% for research. The research time was used to continue work on crustal deformation studies, including many cooperative projects, as well as building up facilities for InSAR analysis of crustal deformation. Work is reflected in publications. Icelandic leader in EC-funded RETINA project (Realistic Evaluation of Temporal Interaction of Natural Hazards) to study the interaction of earthquakes, volcanoes, and landslides). Participant in the EC-funded PREPARED project (Application of practical experience gained from two recent large earthquakes in the South Iceland seismic zone in the context of earthquake prediction research to develop technology for improving preparedness and mitigating risk)

Since July 1, 2004:

Academic researcher at the Nordic Volcanological Centre, Institute of Earth Sciences, University of Iceland.

Other

Advisor for research fellows at the Nordic Volcanological Institute, and graduate students at the University of Iceland, University of Pisa, Italy, and Lund University, Sweden. Co-advisor for Ph.D. students in Toulouse, UK, and California. Instructor on courses at the University of Iceland, including a graduate reading course on the Dynamics of the Earth's crust in 2002. Instructor on a course on the mitigation of volcanic hazards, European School of Climatology and Natural Hazards, Italy, 1994.

Advisor for the Icelandic Civil Defence Authorities since 1994, member of scientific panel.

Member of the United Nations Disaster Assessment and Coordination team (UNDAC) since 2003. Participation in UNDAC mission to Morocco in February 2004 in response to the Al Hoceima M6.5 earthquake.

Advisor for United Nations Office for the Coordination of Humanitarian Affairs (OCHA) on natural hazards and risks in Indonesia, following the December 26, 2004 earthquake and tsunami catastrophe. Mission to Sumatra (Banda Aceh) to evaluate risks and provide advice on continuing series of events April 20 – May 6, 2005.

Member of a scientific council for the European Center for Geodynamics and Seismology in Luxembourg, 2002 - 2006.

Associate editor for Journal of Geophysical Research, 2002 - 2006.

Member of the board of the Icelandic-United States Educational Commission (The Fulbright Institute in Iceland) since 2002, appointed by the Icelandic Minister for Education, Science and Culture

In organising committee for international summer schools held by the Nordic Volcanological Institute, including the 1997 NORDVULK summer school on Mid-Ocean Ridge active processes, the 2000 summer school on Plume-ridge interaction, 2003 summer school on Tectonic-magmatic interaction and 2007 summer school on geodynamics and magmatic processes. Member of a planning committee for the General Assembly of the European Seismological Commission in Reykjavik in 1996, and the chairman of an organising committee for the 25th Nordic Geologic Winter meeting held in Reykjavik in January 2002. Convenor of special sessions at international geoscience meetings, including an extensive session on dynamics of magma chamber and magma transport in the Earth's crust, at the Fall meeting of the American Geophysical Union, 2002. In organizing committee for Natural Sciences conference, University of Iceland, April 2004.

Numerous invited talks at international conferences. Numerous media interviews and newspaper articles on earthquakes and magmatic activity in Iceland.

Evaluated to be qualified for the position of a professor of geophysics at the University of Iceland by an international committee in 1998, and in 2005 evaluated qualified for the director position of the Institute of Earth Sciences, University of Iceland.

Publications (see publication list at: <http://www.raunvis.hi.is/~fs/FS-ritskra.html>)

Professional memberships

American Geophysical Union
Geoscience Society of Iceland
Iceland Glaciological Society

Níels Óskarsson - Curriculum Vitae

Origin

Born 23, August 1944. Iceland.

Education

Compulsory school and High School in Reykjavík, Iceland.
1963-1967: Gothenburg Institute of Technology, Sweden; Building engineering.
1976: B. Sc. in geology, University of Iceland.
1978: B. Sc. Hon. in geology, University of Iceland.

Publications (see publication list at: <http://www.raunvis.hi.is/~nielso/NO-ritskra.html>)

Professional positions

1968-1970: Planning and construction projects with the Standard Oil Company (ESSO) in Iceland.
1970-1974: Technical assistant in geology at the Science Institute, University of Iceland: Geochemical analysis
Tephrochronological field work and Quaternary geology.
1974-1978: Technical assistant at the Nordic Volcanological Institute, Reykjavík. Primary duties to run geochemical

Laboratory and give training in geochemical analysis for grant holders of the institute.
1978-2004: Research Geochemist at the Nordic Volcanological
2004 - present Research Geochemist at the Institute of Earth Sciences.

Póra Árnadóttir - Curriculum Vitae

February 2008

Origin

Born on 17 December, 1963 in Reykjavík, Iceland.
Married, 3 children

Education

1989-1993 [Geophysics department, Stanford University](#) Graduate studies in Geophysics. Ph.D. Geophysics in 1993.
1986-1989 [Department of Geosciences, Princeton University](#) Graduate studies in Geophysics. M.A. Geophysics in 1989.
1983-1986 [University of Iceland](#) Undergraduate studies in Geophysics, B.S. in Geophysics in 1986.

Professional positions

2004 - present: Research scientist at the Nordic Volcanological Center, Institute of Earth Sciences at the University of Iceland, Reykjavík, Iceland
2000 - 2004: Research scientist at the Nordic Volcanological Institute, Reykjavík, Iceland
1998 - 2000: Research scientist at the Icelandic Meteorological Office Reykjavík, Iceland
1995-2000: Research Associate in the Dept. of Geosciences, Princeton University
1994 - 1995: Research Fellow in the Research School of Earth Science at Victoria University of Wellington (VUW), Wellington, New Zealand.

Area of research:

My research focuses on crustal deformation measurements (GPS and InSAR), modeling and geophysical interpretation. I am currently collaborating with several research groups in an international project titled "High rate continuous GPS observations in Iceland", funded by the Icelandic Research Fund (PI), NSF (co-PI) and the ETH research fund (<http://www.norvol.hi.is/~thora/ondvegi.html>). Other research projects include studies of the co-seismic and post-seismic deformation in the South Iceland Seismic Zone following two M6.5 earthquakes in June, 2000, and the May 2008 M6.3 earthquake. During the past year, I have been conducting a study of glacial isostatic adjustments observed by GPS in Iceland.

Puplications (see publication list at: <http://www.norvol.hi.is/~thora/THA-ritskra.html>)

Professional memberships

[American Geophysical Union \(AGU\)](#)
[Iceland Glaciological Society](#)
[Geoscience Society of Iceland](#)

Current graduate students

[Marie Keiding](#) Title of PhD project: Crustal deformation and the state of stress along an oblique plate boundary: the Reykjanes Peninsula, southwest Iceland.
[Judicael Decriem](#) Title of PhD project: Active deformation in South Iceland observed by space geodetic methods.

Karl Grönvold – Curriculum Vitae

Education:

1964-68 University of Edinburgh B.Sc. (Hons.). Main subject Geology. Second subjects Chemistry, Physics and Computer Science.

1968-72 University of Oxford. Department of Geology and Mineralogy. D.Phil.

Employment:

1964-72 Part time employee of the National Energy Authority in Reykjavik.

1972-74 Geologist/Geochemist at the Geothermal Department of the National Energy Authority in Reykjavik. Responsibilities and activities included geothermal prospecting, geologic mapping, geochemical analysis and drilling supervision. Took part in setting up geochemical laboratory for water analyses and the development of sampling procedures for high- and low temperature geothermal fluids. Responsible for setting up a XRD and thin section facilities for mineral work on hydrothermal alteration. Computer programming for the reconstruction of reservoir water composition in high temperature fields.

1974-03 Geologist/Geochemist at the Nordic Volcanological Institute in Reykjavik.
Interim director 1980 and 1998-99.

2003-08 Geologist/Geochemist at the University of Iceland.

Responsibilities and activities at NVI and University of Iceland:

Setting up and running an electron microprobe from 1976 and a MC-ICP-MS (with clean labs) from 1999 to the present. The microprobe was rebuilt in 1994 and again in 2008. The microprobe has been moved between building twice and the mass spectrometer once – in both cases without outside assistance.

Served as consultant in buying and setting up two SEMs jointly owned with the Innovation Centre Iceland.

Setting up Electrophoresis instrumentation. A Geodimeter for crustal movement monitoring was bought and operated from 1977. All these instruments required extensive external and internal funding activities.

From the beginning the NVI had 5 research fellows (mainly at post-graduate level) I generally supervised 2-3 each year. Seven finished a PhD and three MSc, Five PhD students from the UK were co-supervised, Funding and managing of 7 international summer schools.

Consultant for UNESCO on volcanoes and civil defence – one mission and three working groups.

Recent activities and collaborators include:

Most Icelandic volcanic eruptions since Heimaey 1973 with a number of Icelandic colleagues.

Geology, volcanic history and geochemistry of the Northern rift zone volcanics in Iceland in collaboration with Kristján Sæmundsson and Haukur Jóhannesson ISOR.

Geochemistry of Theistareykir, North Iceland. Main collaborators are Dan McKenzie and John MacLennan from Cambridge UK. Other collaborators in Theistareykir include Andreas Stracke ETH. Nobu Shimizu WHOI John Eiler CalTec and Eric Hauri CIW.

Geology and geochemistry of Holocene lava flows in the Western Rift Zone. With Jon Sinton Hawaii, Kristján Sæmundsson ISOR and Sæmundur Ari Halldórsson UoI

Volcanic ash layers found in the Greenland ice cores GRIP and NGRIP. With Anette Mortensen ISOR, Sigfus J Johnsen and co-workers at GFY/CPH.

Ash layers in oceanic sediments around Iceland. John Andrews and Anne Jennings Boulder/Colorado.

U-Th disequilibrium studies in Recent volcanic. Ken Rubin Hawaii

U-Th isotopes and Radon fluxes in Icelandic ground-waters. David Kadko Miami.

Noble gas and Nitrogen isotopic ratios in Icelandic geothermal fluids. David Hilton SCRIPPS and Thobias Fisher New Mexico

Teaching experience

At the University of Iceland. Main courses in Physical Geology, Geochemistry, Petrology, Various courses for foreign students in General Geology, Geology of Iceland. Volcanology and Igneous Geochemistry/Petrology.

Menntaskólinn við Hamrahlíð (Grammar School), Reykjavík. General Geology in the adult education program (1974-1986).

Curriculum vitae for Nordic senior researcher

Carl Erik Olof Sturkell – Curriculum Vitae

Born: 22 June 1962 in Danderyd
Citizenship: Swedish

Marital status: Single

Languages: Swedish, English and some German

Present position:

University of Iceland
Sturlugata 7
101 Reykjavík, Iceland
+354 525 5475
e-mail: sturkell@hi.is

Academic training:

Begun the Geovetarinjen (160p) (the geoscience program four years) autumn 1983, at Stockholm University, graduated the autumn 1988. Received the degree of M.Sc 1991.

Admitted as a research student in marine geology 17/1 1989, Stockholm University.

Licentiate of Philosophy in may 1994 with the thesis "Structure and dynamics of transform faults in Iceland"

Doctor of Philosophy in March 1998 with the thesis "The Origin of the marine Lockne impact structure, Jämtland"

Docent in geology at the Stockholm University at the 22 of November 2007. The docent is directly comparable to a habilitation and can be translated to nominal professor.

Work and field experience:

University of Iceland, Institute of Earth Sciences

Present work place, since 1/7-2008.

Nordic Volcanological Center

Employed as senior research scientist in volcanology 1/1-2005 to 30/6-2008. Currently working with crustal deformation studies at plate boundary and the active volcanoes.

University of Technology, Tallinn, Estonia

Invited as guest professor in Marine Geology and Geophysics at the Institute of Geology, Tallinn University of Technology, for six months during the time period October 2007 to March 2008. During the stay I gave a course of 30h in Marine Geology and Geophysics.

The Icelandic Meteorological Office:

Worked at the geophysical section of the Meteorological Office in Reykjavík from 16/3-2000 to 31/12-2004. The work involved monitoring and analysis of crustal deformation by the means of GPS, InSAR and strain measurements. The department of geophysics runs six strain stations and a seismic network (the SIL network) to measure earthquake activities and crustal deformation in near real-time.

The Nordic Volcanological Institute:

Worked at the institute from 1/6-1991 to 31/5-1993 and from 1/7-1998 to 15/3-2000. First as young researcher for three years and one year and nine months on funding from the Icelandic research council for monitoring volcanoes. The Nordic Volcanological Institute run a program for young researchers from the Scandinavian countries. This program provides maximum funding for three years.

Took part in the survey of the Tjörnes Fracture zone (northern Iceland) during 1991. The project included seismological monitoring and refraction seismic, using Portable Recording Stations (PRS).

Worked in a project of concerning crustal deformation at the Reykjanes Peninsula (1992) and the Askja central volcano (1998), using the Global Positioning System (GPS).

The impact project:

This work was conducted within the frame of a PhD program at the Stockholm University, during the time period 1/7-1993 to 30/6-1998. In this project I did an extensive survey of the Ordovician marine impact structure in Lockne (Jämtland). The study includes geological mapping, geophysical (gravity and magnetometry) and geochemical methods. Also other impact structures and suspected structures are investigated, e.g. the suspected Hummeln structure with drilling, mapping and geophysical methods.

Marine geology at Stockholm University:

Marine survey (reflection seismic) in the lake Hummeln (Småland) during the winter 1988-89. Marine survey of the area east of Gotland with the research vessel Professor Stockman 22/9-6/10 1989. This survey included bathymetry and sea-bed sampling. Survey of the Lake Lockne (Jämtland) with reflection seismic, bathymetry and magnetometry, in the winter 1989-90. In 1993 a major reflection surveys on the Baltic Sea with the Lithuanian research vessel R/V Vejas in cooperation with the Baltic colleges.

Worked in a research group in the project "Analysis of the Palaeozoic bedrock in the Baltic Sea"

The board for custodian of national monuments (Riksantikvarieämbetet):

Worked for the board in a project the origin of constructing material and its weathering. During the spring 1989 in a project concerning Ordovician limestone from Kinnekulle and Brunflo and in the autumn with weathering problems of the Lingulid sandstone in Västergötland.

The national ordnance survey of Sweden:

Worked as measuring technician during the summers of 82, 83, 84, 88 and 90, a total time of 5½ months. Operated geodetic instruments, such as leveling instruments, theodolite and geodimeter.

Teaching experience:

Lectures (exceeding 250 hours) in sedimentology, geophysics, palaeontology, statistics and regional geology at Stockholm University. Taught geophysics at the University of Iceland (25h, lectures and fieldwork) and at the University of Technology, Tallinn, Estonia (30h, lectures). Produced study material, compendium and excursion guides. Participated in field studies (exceeding 20 weeks). Led field and laboratory based exercises (exceeding 150 hours) in general geology.

Administrative experiences:

Member of the faculty board in science at Stockholm University 1986-87.
Treasurer in the Geological Society of Sweden during the spring 1989, substitute for Risto Kumpulainen.

Puplications (see publication list at: <http://www.raunvis.hi.is/~sturkell/ES-ritskra.html>)

Referee assignments:

I am an active referee and have reviewed articles for the following scientific journals;
Deep-Sea Research II
Meteoritics & Planetary Science
Impacts in Precambrian Shields (Book from Springer Verlag)
Geophysical Journal International
GSA special paper
Pure and Applied Geophysics

Curriculum vitae for Senior researchers indirectly linked with Nordvulk

Ármann Höskuldsson

Origin

Born:
30-06-1960, Reykjavik, Iceland.
Nationality:
Icelandic
Address:
Lindarsmári 3, 201 Kópavogur, Iceland
E-mail: armh@hi.is

Academic Carrier:

1993-1995: Postdoctoral research fellow at the University of Bristol, England.
1992: Docteur de l'Université Blaise Pascal, Clermont-Ferrand, France. Project: "Le Complexe Volcanique Pico de Orizaba-Sierra Negra-Cerro las Cumbres (Sud Est Mexicain) : Structure, Dynamismes Éruptifs et Évaluation des Aléas
1989: Diplôme d'Etudes Approfondies de Geochemistry, Petrology and Volcanology. University Blaise Pascal, Clermont-Ferrand, France. Project: "Contribution to the geology of Cantal Occidental."
1986: One year graduate studies at the University of Iceland. Project: "Porosity and alteration in the Tjörnes sequence, North East Iceland."

1985: Bsc. degree in geology from the University of Iceland.

Professional positions

2005-: Senior research scientist at the Institute of Earth Sciences, University of Iceland.

2004-5: Research scientist at the Institute of Earth Sciences, University of Iceland.

2003-: Director of Icelandic Research inc.

2002-: President of the Icelandic geoscience's society

2002-2004: Supervisor of a doctoral student from the University of Stockholm

2001-: Board of directors of the Vestmannaeyjar investment corporation

1999-2004: Member of the council of University of Iceland.

2000-2002: Honorary consul for France in Vestmannaeyjar.

2001 and 2002: Elected member at the Icelandic Parliament.

2000-2001: Supervisor of a master student from the University of Stockholm.

1999-2003: Teaching physical volcanology and petrology at University of Iceland.

1996- 2002: Director of the South Iceland Institute of Natural History, Vestmannaeyjar, Iceland.

1997: Supervisor of two students, from the University of Madrid studying volcanic hazards in Iceland. From the University of Bristol, studying volcanic volatiles in pillow basalts in Iceland.

1995-1996: Research assistant at the Nordic Volcanological institute, Reykjavik, Iceland.

1995: Supervisor of a DEA student at Clermont Ferrand, France. Project concerning melting of ice by pyroclastic flows.

1993: Geological map processing by GIS on a Hewlet Packard Mainframe computer, at the Nordic Volcanological Institute, Reykjavik, Iceland.

1992: Fieldwork on the Island of Reunion. Working area Piton de la Fournaise, studying the upper crustal structure by means of TEM-soundings.

1991: Field work in Mexico during 3 months. Working area the Eastern Trans Mexican Volcanic Belt. Volcanoes studied, Pico De Orizaba and Sierra Negra.

1990: Field work in Mexico during 4 months. Working area the Eastern Trans Mexican Volcanic Belt. Volcanoes studied, Pico De Orizaba and Cerro Las Cumbres.

1987-1989: Fieldwork supervisor at the Nordic Volcanological Institute, Iceland, during June to September each year. Working areas Northern and Central Iceland.

1987-1988: Teaching Geology, Physics and Statistics at the Fjölbrautarskólinn í Breiðholti (College), Samvinnuskólinn (College) and Rítarskólinn (Private College), all in Reykjavik Iceland.

Teaching experience:

Teaching at the faculty of science, University of Iceland since 2000, undergraduate courses in volcanology, petrology and introduction to geology.

First supervisor of dr. Hannes Mattson during his preparation for a PhD at the University of Stockholm.

During the years 1999 to 2004, I have co-supervised students at Stockholm University, University of Iceland, University of Bristol, University of Trier and University of Paris.

Fellows:

2003-4: Visiting professor at the Institute de Physique de Globe Paris.

2000: Visiting Professor at University of Camerino, Italy.

1993-1995: Marie-Curie post-doctoral fellow, University of Bristol, Bristol, U.K.

1986-1987: Fellow at the Nordic Volcanological Institute Iceland.

Puplications (see publication list at: <http://www.raunvis.hi.is/~armh/AH-ritskra.html>)

Professional memberships

The Geoscience Society of Iceland, AGU

Geological society of France , American geological society

Páll Einarsson - Curriculum Vitae

Origin

Born: March 27, 1947, in Reykjavík, Iceland.

Nationality: Icelandic.

Spouse: Ingibjörg Briem.

Children: Einar Pálsson (b. 1967), [Jóel Pálsson](#) (b. 1972), Magnús Pálsson (b. 1992).

Education

[Reykjavík Senior High School](#) 1963-67.

[Reykjavík College of Music](#) 1957-67. Majors: Cello and composition.

[University of Göttingen](#), Germany, 1967-70. Major in physics, minors in mathematics and chemistry. Vordiplom in physics 1970.

[Columbia University](#), New York, 1970-75. Major in seismology, minors in general geology, physics and structural geology. M.Phil. degree in 1974, Ph.D. degree in 1975.

Professional positions

Graduate research assistant, [Lamont-Doherty Geological Observatory](#), 1970-75.

Teaching assistant, Columbia University, 1974-75.

Research scientist, [Science Institute](#), [University of Iceland](#), 1975-77.

Senior research scientist, Science Institute, University of Iceland, 1977-1994 and 1997-98.

Head of the Geophysics division and member of the Board of Directors of the [Science Institute](#) 1983-87.

Member of the University Senate, [University of Iceland](#), 1986-90.

Lecturer in the Department of Natural Sciences, [University of Iceland](#), 1975-94 and 1997-98, teaching courses in geophysics, physics, seismology, tectonics and volcanology.

Professor of geophysics, [University of Iceland](#), 1994-97 and since 1999.

Puplications (see publication list at: <http://www.raunvis.hi.is/~palli/PE-ritskra.html>)

Professional memberships

[Jarðfræðafélag Íslands](#)

Vísindafélag Íslendinga

[Eðlisfræðifélag Íslands](#)

[Jöklarannsóknafélag Íslands](#)

[American Geophysical Union](#)

[Seismological Society of America](#)

Sigurður Reynir Gíslason - Curriculum Vitae

February 2006

Origin

Icelandic, born October 9, 1957

Education

Johns Hopkins University, USA, 1980-1985.

Ph.D. in Geochemistry 1985.

University of Iceland, 1977-1980. B.Sc. in Geology 1980.

Gymnasium "Menntaskólinn við Tjörnina", 1973-1977

Ph.D: Meteoric water-basalt interactions: A field and laboratory study.

Present position

Research professor at the Science Institute, University of Iceland

Puplications (see publication list at: <http://www.raunvis.hi.is/~sigrg/SRG-ritskra.html>)

Professional memberships

The Geochemical Society

The European Association for Geochemistry

Jarðfræðafélag Íslands

Vísindafélag Íslendinga

Magnús Tumi Guðmundsson - Curriculum Vitae

Professor of Geophysics,

Institute of Earth Sciences,

University of Iceland

Askja, Sturlugata 7, 101 Reykjavík, Iceland

June 2008

Origin

Born on 8 May 1961 in Reykjavík.

Spouse: [Anna Líndal](#), artist.

Children: Rögnvaldur (b. 1989) and Katla Sigríður (b. 1993).

Education

1986-1990 [University College London](#), graduate studies in geophysics. Ph.D. in geophysics 1992. Title of thesis: Crustal structure of the subglacial Grímsvötn volcano, Vatnajökull, Iceland, from multiparameter geophysical surveys.
1982-1986 [University of Iceland](#) - B.S. in geophysics.

Employment

2008- Professor of Geophysics at the Department of Earth Sciences, University of Iceland.
2002-2007 Professor of Geophysics at the Department of Physics, University of Iceland.
1995-2001 Associate Professor of Geophysics at the Department of Physics, University of Iceland.
1991-1994 Research associate at the [Science Institute University of Iceland](#).
1985-1986 Research assistant at the [Science Institute University of Iceland](#).
1985-1986 Research assistant at the National Energy Authority, Iceland.

Publications (see publication list at: <http://www.raunvis.hi.is/~mtg/MTG-ritskra.htm>)

Summary:

1. Author and coauthor of about 50 reviewed papers in scientific journals and books.
2. Author and coauthor of about 30 lightly or non-reviewed popular articles on scientific matters.
3. Author and coauthor of about 30 scientific reports.
4. Author of text in four photographic books on Iceland.

Administration

2007-2008 Institute of Earth Sciences, Executive Committee
2005-2007 Department Chair, Department of Physics, University of Iceland
2004-present Leader, Physical geology, geography and geophysics group, Institute of Earth Sciences, University of Iceland
1996-present Science Advisory Board, Civil Protection Department of the National Commissioner of the Icelandic Police
1998-present President, Iceland Glaciological Society
2008 Chair, joint IAVCEI and IACS Commission on Volcano-Ice Interactions
2006-2007 IAVCEI Working Group on Volcano-Ice Interactions. 2007: Vice-Chair; 2006: Secretary

Editorial experience

1. Journal of Glaciology, Scientific Editor, 2007 - present
2. Annals of Glaciology, 48, 2008. Associate Editor.
3. Journal of Geodynamics, 43 (1), 2007. Special Issue: Hotspot Iceland. (with W. Jacoby).
4. Hættumat vegna eldgosa og hlaupa frá vestanverðum Mýrdalsjökli og Eyjafjallajökli (in Icelandic: Eruptions in the western part of Mýrdalsjökull and Eyjafjallajökull: a risk assessment)(with Á.G. Gylfason). The Icelandic Police Commissioner and the University of Iceland Press. 210 pages. 2005.

Professional societies

[Iceland Glaciological Society](#)
[American Geophysical Union \(AGU\)](#)
[European Geosciences Union \(EGU\)](#)
[Geoscience Society of Iceland](#)
[International Association of Volcanism and Chemistry of the Earth's Interior \(IAVCEI\)](#)
[International Glaciological Society \(IGS\)](#)
Societas Scientarium Islandica

President of the [Iceland Glaciological Society](#) 1998-.
Member of the board of the Iceland Glaciological Society 1996-1998.
Member of the board of the [Geoscience Society of Iceland](#) 1994-1998.

Bryndís Brandsdóttir - Curriculum Vitae

Born in Reykjavík, September 27th, 1953

Education

[University of Iceland](#) 1974-1978 B.Sc. Geology, 1978. B.Hn. Geophysics, 1978.

[Oregon State University](#), 1984-1986. M.Sc. Geophysics, 1986.

Supervisor: William H. Menke.

Thesis: Measurements of coda buildup and decay rates of Western Pacific P, Po and So phases and their relevance to lithospheric scattering. *J. Geophys. Res.*, 93, 10.541-10.559, 1988.

Appointments

1976-1978 Research assistant, Science Institute, University of Iceland.
1978-2000 Research scientist, Science Institute, University of Iceland, on leave 1984-1986.
2000- Senior Research Scientist, Science Institute, University of Iceland.
Sept. 2001-Feb. 2002. Visiting professor, Hokkaido University, Sapporo, Japan.
2006 Courtesy Research Associate, University of Oregon, USA.

Publications (see publication list at: <http://www.raunvis.hi.is/~bryndis/BBpublications.html>)

Professional activities

2006-2009 Chairman of the board of the Science Institute, University of Iceland
2003-2006 Science Institute, University of Iceland, vicechairman.

2004-2005 Boardmember of the Institute of Earth Sciences, University of Iceland.
 2003-2004 Division chair of Geophysics, Science Institute, University of Iceland
 1997-2004 A member of the University Science Committee and Research Fund, representing Faculty of Science.
 2004- ECORD Science support and advisory committee (ESSAC) member, representing Iceland.
 2001 Coconvenor, with E.E.E. Hooft & S. Solomon. Symposium on the Icelandic Plume and Crust, Svartsengi, Iceland.
 1990- Editor of Jökull, Journal of the Glaciological and Geological Societies of Iceland.

Research Interests

Crustal accretion processes; the seismic structure and evolution of oceanic crust; size, depth, and physical properties of magma chambers; nature of mantle flow beneath mid-ocean ridges and relationship to ridge segmentation and axial topography. Volcanic activity and monitoring methods. Seismic hazards. Environmental protection.

Advisor

1987 Alvaro Nieto, Colombia, Nordic Volcanological Institute.
 1989-1990 Anne Birgitte Lassen, Nordic Volcanological Institute
 1990-1992 Erik Sturkell, Nordic Volcanological Institute
 1998-1999 Malou Blomstrand-Stinesen, M.Sc. University of Lund, Sweden.

Principal advisor

1996-2001 Nicholas Weir, Ph.D. Univ. of Cambridge.
 1998-2003 Raimon Alfaro, Ph.D. Univ. of Cambridge, UK

Cruise experience as chief scientist or co-chief scientist

1996 Reykjanes-Iceland Seismic Experiment, *Coast Guard Cutter Ægir*
 2000 Kolbeinsey Ridge Iceland Seismic Experiment, KRISE2000, *Rs. Hakon Mosby, CGC Ægir*
 2001 Tjörnes Fracture Zone, *Rs. Bjarni Sæmundsson*
 2002 Tjörnes Fracture Zone and Kolbeinsey Ridge, *Rs. Árni Friðriksson*
 2003 Tjörnes Fracture Zone, *Rs. Bjarni Sæmundsson, Rs. Baldur*
 2004 Tjörnes Fracture Zone and Kolbeinsey Ridge, *Rs. Árni Friðriksson, Rs. Baldur*

Recent Collaborators:

Emilie E.E. Hooft ([Univeristy of Oregon](#)); Robert Detrick ([WHOI/MIT](#)); Neal Driscoll ([USCD-SIO](#)); Larry Mayer ([CCOM-UNH](#)); Rolf Mjelde ([Univ. Bergen](#)); Hideki Shimamura ([Univ. Hokkaido](#)); Colin Devey ([Geomar](#)); Carsten Riedel ([Univ. Hamburg](#)); Robert S. White ([Univ. Cambridge](#)); William Menke ([LDEO](#)); Roger Buck ([LDEO](#)); Jeff Karson ([Duke](#)); Guðrún Helgadóttir and Einar Kjartansson ([Iceland Marine Research Institute](#)); Bjarni Richter and Kristján Sæmundsson ([Iceland GeoSurvey](#)), Robert Dziak and Dave Mellinger, [OSU/NOAA](#).

Gudrún Larsen - Curriculum Vitae

Institute of Earth Sciences,
Science Institute, University of Iceland
Askja, Sturlugata 7, IS-101 REYKJAVÍK
Tel.: +354 525 4396, Fax: +354 525 4499

Origin:

Born on November 1, 1945, Akureyri, Iceland
Married, 2 children, 4 grandchildren

Education:

Akureyri Senior High School 1960-1964
1975 B.Sc. in geology, University of Iceland, Reykjavík.
1978 B.Sc.hons. in geology, University of Iceland, Reykjavík.

Professional positions:

1976-1979: Stipendiat at the Nordic Volcanological Institute.
1979-1990: Research Associate at the Nordic Volcanological Institute.
1988-2005: Part-time lecturer, University of Iceland
1990-present: Research Scientist at the Science Institute, University of Iceland.

Puplications (see publication list at: <http://www.raunvis.hi.is/~glare/GL-ritskra.html>)

Professional memberships

Geoscience Society of Iceland
Societas Scientarium Islandica

Appendix 2: Nordvulk publications 2004-2008

Role of Nordvulk researchers in the following publication list is indicated in the following manner:

Nordvulk research fellows, past and present: **bold font**
Senior researchers directly linked with Nordvulk: ***bold + italics***
Senior researchers indirectly linked with Nordvulk: *italics*
Nordvulk researchers with “soft money” funding: **Green bold font**
Technicians and other staff related to Nordvulk: **Blue bold font**

Articles

Submitted:

Halldorsson, S.A., N. Oskarsson, K. Gronvold, G. Sigurdsson, G. Sverrisdottir and *S. Steinthorsson*: Isotopic-heterogeneity of the Thjorsa lava - implications for mantle sources and crustal processes within the Eastern Rift Zone, Iceland, 2007. Chemical Geology, in press.

Hooper, A., 2008. A Multi-Temporal InSAR Method Incorporating Both Persistent Scatterer and Small Baseline Approaches. Submitted to Geophys. Res. Letters.

Jakobsen, J.K., Tegner, C. Brooks, C.K., Kent, A.J.K. , Leshner, C.E., Nielsen, T.F.D. and Wiedenbeck, M., 2007. Parental magma of the Skaergaard intrusion: constraints from melt inclusions in primitive troctolite autoliths and FG-1 dykes. Submitted to Contributions to Mineralogy and Petrology.

Jenness, M.H., **Clifton, A.E.**, 2008. Controls on the geometry of a Holocene crater row: a field study from SW Iceland. Submitted to Bulletin of Volcanology, in review.

Lindström, M., Ormö, J., & **Sturkell, E.**, 2008. Water-blow and resurge breccias at the Lockne marine-target impact structure. Submitted to GSA special paper.

Mansfeld, J., **Sturkell, E.F.F.** & Broman, C. 2008. Gullgruvan - an epigenetic sulphide mineralization in the northernmost part of the southern Svecofennian volcanic province, Jamtland, Sweden. Submitted to GFF.

Mattsson, H.B., Hode Vuorinen, J., Emplacement, cooling and inflation of natrocarbonatitic lava flows during the March-April 2006 eruption of Oldoinyo Lengai, Tanzania. Submitted to Bulletin of Volcanology.

Sturkell, E., Sigmundsson, F., Geirsson, H., **Ólafsson, H.**, & Theodórsson, T., Post-

rifting deformation processes 1989-2005 at Krafla volcano, Iceland: Constraints from local levelling, tilt and GPS observations. Submitted to Journal of Volcanology and Geothermal Research.

Sturkell, E., & Roberts, M.J., Fatal volcanic eruptions in Iceland, Submitted to Natural Hazards.

Sturkell, E., Einarsson, P., Roberts, M.J., Geirsson, H., Gudmundsson, M.T., **Sigmundsson, F.**, Pinel, V., Guðmundsson, G.B., **Ólafsson, H.**, & Stefánsson, R., Seismic and geodetic insights into magma accumulation at Katla subglacial volcano, Iceland: 1999 to 2005, Submitted to Journal of Geophysical Research.

Sturkell, E., Jakobsson M., & Gyllencreutz, R., How true are geological maps? An exercise in geological mapping. Submitted to Journal of Geoscience Education.

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Appendix 3: Statistics on NordVulks fellowship programme and the profession of former Nordvulk fellows

(prepared by Ólafur Guðmundsson)

The NordVulk fellowship programme was started in 1974 immediately after Nordvulk was established. All 95 NordVulk fellows are listed in Table A1 in an appendix to this short summary. Figure 1 shows a graph of the number of fellows as a function of time. After the first few years the number of fellows has been about 5 on average with short periods of exception (1992-93 and 1997). Variations from the average have been of short duration and are caused by individual fellows arriving or leaving NordVulk slightly sooner or later than planned. The fellows are generally granted a fellowship for one year at the time from June 1st until May 31st the following year. When a fellow has not used up his/her entire year, shorter fellowships have been granted to use up the allocated resource. It is interesting to note that the variations have reduced with time. This can be explained by the fact that in the eighties more fellows left early because of job offers. Therefore, resources were often available to offer shorter fellowships (3-6 months) during that period.

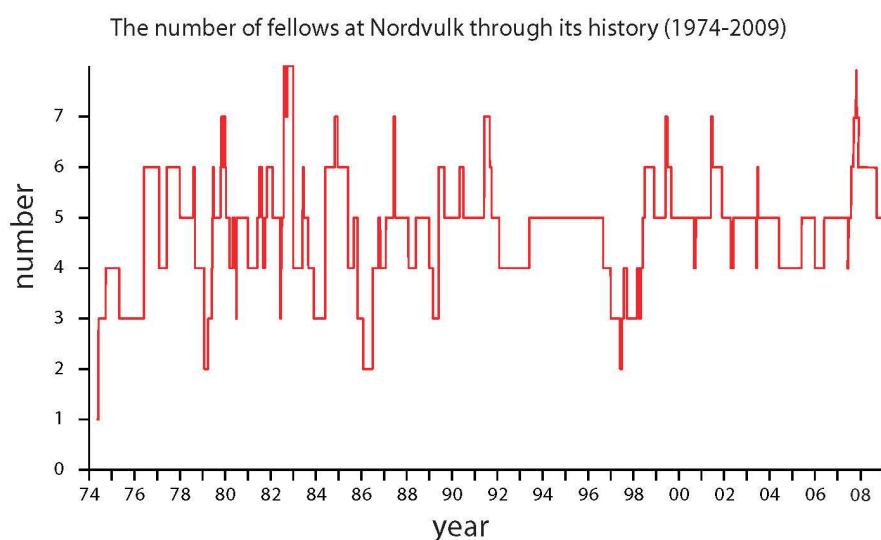


Figure 1. The number of NorVulk fellows as a function of time from the beginning of NordVulk's fellowship programme in 1974.

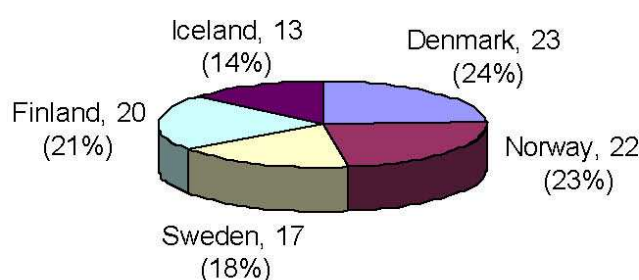
The division of NordVulk fellows between the Nordic countries has been relatively even. This is summarized in Table 1, both in terms of the numbers of fellowships and the total number of fellowship months for each country. Most fellowships have been awarded to Danes and Norwegians (23 and 22) and the fewest have gone to Icelanders (13). This is also summarized in Figure 2. Approximately one third of the fellowships have gone to women (see Table 1 and Figure 3). The numbers of fellowships granted to women has increased significantly with time although women have always been a part of the

programme. This increase reflects the general increase of the numbers of women in the earth sciences. The differences between the five countries lies more in the women participation than in the participation of men in the fellowship programme. A third of the fellowships to women have gone to Danish women and more than 40% of the women fellowship months are accounted for by Danish women.

COUNTRY	MEN	MONTHS	WOMEN	MONTHS	TOTAL	MONTHS
Denmark	14	270¼	9	264	23	534¼
Finland	14	242	6	131½	20	373½
Iceland	11	236½	2	63	13	299½
Norway	16	299¾	6	102½	22	402¼
Sweden	13	282½	4	65	17	347½
Total	68	1331	27	626	95	1957

Table 1. The numbers of NordVulk fellows and fellowship months broken down by country and sex and (1974 – 2009).

a) Number of fellows at NordVulk by nationality



b) Number of fellowship months of NordVulk fellows by nationality

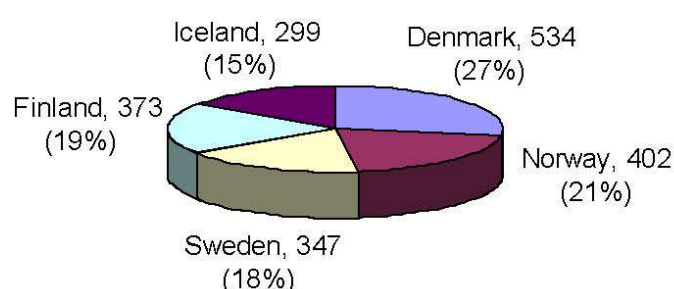
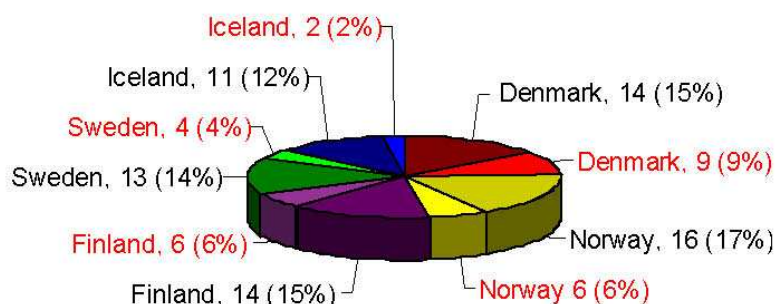


Figure 2. The numbers of NordVulk fellows (a) and fellowship months (b) broken down by country.

It is clear from Figure 2 that Danish and Icelandic fellows have tended to stay at NordVulk a bit longer than their colleagues from Norway, Finland and Sweden

(their fellowship-months percentile is higher than the number-of-fellowships percentile).

a) Number of fellows at NordVulk by nationality and sex



b) Number of fellowship months at NordVulk by nationality and sex

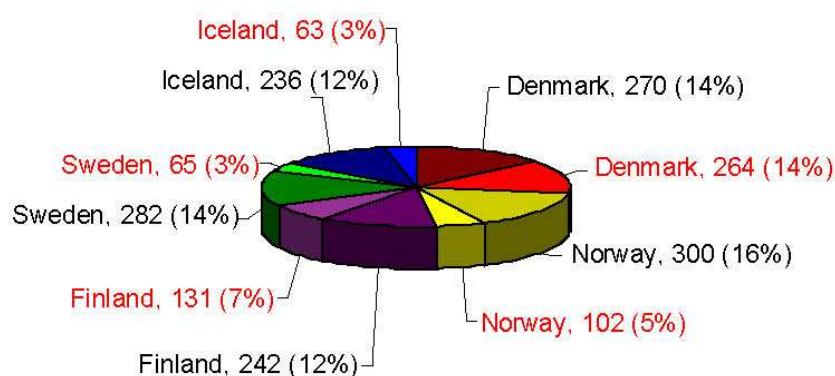


Figure 3. Number of NordVulk fellows (a) and fellowship months (b) broken down by nationality and sex. Each of the Nordic countries is assigned a base colour in the pie diagrams with a dark slice representing male statistics and a light slice representing female statistics. The female slices are denoted with red legends.

In Table A1 we list the current employer of all but two of NordVulk's fellows (we were not able to track those two). We divide the fellows employment into seven categories. Those include: 1) University teaching and research; 2) Government research agencies (Denmarks Geological Survey [GEUS], Finish Geological Survey [FGU], Swedish Geological Survey [SGU], Norwegian Geological Survey [NGU], Iceland Geosurvey [ISOR]); 3) Research students; 4) Private company consulting within the field of geology; 5) Junior College teaching; 6) Other (not earth sciences). The information about the employment of fellows is current or very recent (less than two years old). The employment statistics are summarized in Table 2 and Figure 4.

JOB CATEGORY	NUMBER	PERCENTILE
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Academic research	33	34.7
Government research agencies	15	15.8
Research students	11	11.6
Private company consultancy	20	21.0
Junior college teachers	3	3.2
Other	11	11.6
Unknown	2	2.1
Total	95	100

Table 2. The numbers (and percentiles) of former and current NordVulk fellows in seven different categories of employment as defined in text.

Over one third of the NordVulk fellows are employed at universities in teaching and research positions. (Of those about one third work at universities outside of the Nordic countries [Germany, Switzerland, UK, Estonia, USA]). Over another third is employed by government research agencies and private companies engaged in the earth sciences (mining, oil, energy, environment etc.). Just under one sixth are currently pursuing a PhD degree, either as fellows or have left their fellowship for a PhD study. Three percent work as teachers at junior colleges engaged in earth science teaching. Just over one tenth are not engaged in the earth sciences.

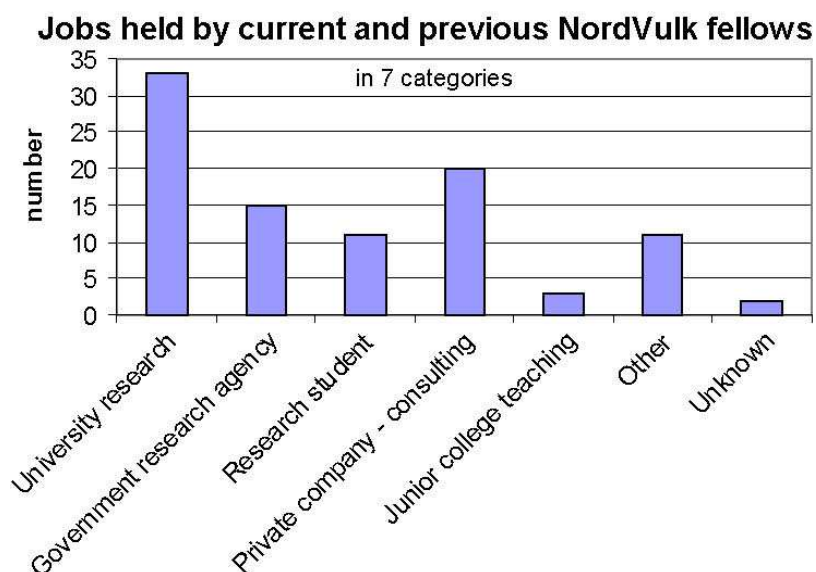


Figure 4. Jobs held by former and current NordVulk fellows divided into seven categories.

The fact that almost 90% of NordVulk's fellows work within the earth sciences proves that they are competent researchers and that their stay at NordVulk has enforced their engagement in earth science research. One tenth of those are working with research outside of the Nordic countries. This can be seen with negative eyes as a brain drain from the Nordic countries, but with positive eyes

would be regarded as a measure of research strength in the region with a significant contribution from NordVulk.

More than 20% of the NordVulk fellows are employed in private companies within their field of expertise in the earth sciences. This is proof that NordVulk has also contributed significantly to the private sector in the Nordic countries. The study of active processes in Iceland can be useful for the education and training of e.g. mining geologists and oil geologists working with ancient products of passified geological processes in older and geologically stable Fennoscandia.

NordVulk's fellowship programme has adapted to a changing research and educational environment. Earlier in the programme most of the fellows had completed a Cand. Mag. degree and did not continue their education as a part of the fellowship or following it. In recent years the proportion of fellows continuing for further education (PhD) has increased as has the proportion of fellows already with a PhD degree working at NordVulk as postdoctoral fellows. Currently, two of the six NordVulk fellows are postdocs, three are engaged in PhD studies either at the University of Iceland, in collaboration with the University of Iceland or at another Nordic University, and one has followed up on his MSc at the University of Iceland and is leaving for PhD studies at a world leading University. It has also become more common for the fellow's funding being partially NordVulk and partially another external source. Thus, NordVulk's fellowship programme contributes to the integration of research within the Nordic countries and produces funding solutions for research education in the Nordic educational environment at large.

Appendix

Table A1. Information about individual NordVulk fellows throughout the NordVulk fellowship programme from 1974 to the end of 2008. Nationality is indicated by the countries initial. The column on the right is incomplete.

Country	Name	Period(s) @ Nordvulk	Months	Employment	Deg.
N	Tore Prestvik	01/06/74-30/04/75	10½	Professor, NTNU, Trondheim	
I	Páll Imsland	01/06/74-31/01/77 01/09/80-31/12/80	36	Teacher, Junior College	PhD
N	Ellen M.O. Sigmond	01/05/74-31/01/77	33	Geologist, NGU, Trondheim	
D	Jørgen G. Larsen	24/09/74-31/07/77	28	Hador Topsøe Catalyst and Technology	
I	Guðrún Larsen	01/06/76-31/01/79	32	Senior Researcher, ESI, UI	BSc
F	Heikki T. Mäkipää	01/06/76-31/05/79 01/05/80-30/06/80 01/01/82-31/01/82	39	Direktor, Finish Institut in Japan	PhD
S	Jan O.H. Swantesson	01/06/76-31/05/77	12	Lektorer, Karlstad Universitet	PhD
D	Karl A. Jørgensen	01/06/77-31/07/79 01/07/80-31/08/80	28	DHI Water & Environment	
N	Per Olav Mørkeseth	01/06/77-31/08/78	15	Geolog, Statoil	
S	Peter Torssander	01/06/77-31/01/79 01/08/79-30/11/79 01/02/87-31/01/88	36	Professor, Stockholm University	
N	Elen Roaldset	01/08/78-31/08/78 01/04/79-30/06/79	4	Direktor, Naturhistorisk Museum, UIO	PhD
F	Krister Söderholm	01/06/79-31/12/79	7	Adviser, Finlands Ministerium for Industri og Handel	
D	Peter Thy	01/06/79-31/05/82	36	Professor, UC Davis	PhD
S	Ulf Sundquist	10/06/79-10/03/80 01/07/80-31/08/80 01/07/81-15/08/81 01/08/82-31/08/82	12½	Geologist, Aqualog AB	
N	Mai Britt Mørk	18/06/79-31/05/80	11½	Professor, NTNU, Trondheim	
I	Magnús Ólafsson	01/12/79-31/05/82	30	Geologist, ISOR	
F	Kaj J. Västi	01/11/79-31/12/81	14	Geologist, FGU	
D	Finn Ulf Møller	17/10/79-15/01/80	3	Researcher, Syddansk Universitet	
I	Einar Kjartansson	01/09/80-31/08/81 01/11/81-31/05/82	19	Marine Institute, Iceland	PhD
F	Jouko Parviainen	01/09/81-31/08/83	24	Josek Ltd, ecotourism	
D	Ole Stecher	01/10/81-31/05/82	8	Geologist, RUC, Denmark	MSc
D	Jens Konnerup Madsen	01/06/81-31/08/81	3	Lecturer, Copenhagen University	
F	Meri Liisa Airo	01/06/82-31/12/82	6	Geologist, FGU	PhD
F	Juhani Airo	01/06/82-31/12/82	6	Helsinki Environmental labs	
F	Carl Ehlers	01/08/82-31/12/82 01/08/83-31/08/83	6	Professor, Åbo Akademi	PhD
D	Jakob W. Høj	01/10/82-30/11/83	14	Lecturer, DTU	
N	Ole Lutro	15/06/82-15/06/83 01/11/84-15/12/84	13½	Geologist, NGU, Trondheim	
S	Runo Löfvendahl	01/07/82-31/12/82	6	Riksanantikvarieämbetet	
I	Guðrún Sverrisdóttir	01/06/83-31/10/85 01/05/90-30/06/90	31	Researcher, ESI, UI	BSc
F	Helmi Risku-Norja	01/06/83-31/01/86	32	MTT Agrifood Research	
I	Grétar Ívarsson	01/09/83-31/10/85	26	Geologist, Reykjavík Energy	PhD
N	Steffen Bergh	01/06/84-31/05/85	12	Professor, Tromsø Universitet	
S	Magnus Nilsson (Randén)	01/06/84-31/05/85	12	Bra Böcker (publisher), Malmö	
S	Kristian Annertz	01/06/84-31/05/85	12	Geologist, Swedish Railways	MSc
N	Reidar G. Trønnes	01/06/85-31/10/86	17	Curator, Oslo Univ.	PhD
I	Ágúst Guðmundsson	01/09/85-30/06/87	22	Professor, Göttingen	PhD
F	Kari Strand	01/07/86-30/06/87	12	Direktor, Professor, Oulu Univ.	PhD
F	Ritva Karhunen	01/07/86-31/12/88	30	Research secretary, Kuopio Univ	
I	Ármann Höskuldsson	01/10/86-31/05/87	8	Senior Researcher, ESI, UI	PhD
F	Hilkka Leino	01/06/87-31/05/88	12		
N	Håvard Gautneb	01/06/87-31/05/89	24	Geologist, NGU, Trondheim	

N	John A. Opheim	01/06/87-31/05/88	12	Geologist, Skaland Graphite AS	
D	Ellen Habekost	01/06/88-31/05/91	36	Teacher, Odense Katedralskole	
S	Kristin Bäckström	01/06/88-28/02/89	9		
I	Þorvaldur Þórðarson	01/06/88-31/08/89	15	Lecturer, U Edinborough	PhD
D	Ann Birgitte Lassen	01/06/89-31/05/91	24	Homopat	
F	Lauri Wirén	01/06/89-31/05/91	24	Geologist, Geotek OY	
N	Thor Hansteen	01/06/89-31/08/91	27	Researcher, Geomar, Kiel	
N	Trond Forslund	01/06/89-31/01/92	32	Geologist, Norsk Hydro	
D	Henrik Schiellerup	01/06/91-31/05/93	24	Researcher, NTNU, Trondheim	
F	Kenneth Fjäder	01/06/91-31/05/92	12	Geologist, Nordkalk	
I	Kristján Jónasson	01/06/91-31/05/94	36	Geologist, Iceland Natural museum	C.Sci
S	Erik Sturkell	01/06/91-31/05/93 01/07/98-30/06/99	36	Senior Researcher, ESI, UI	PhD
F	Risto Kumpulainen	01/06/9130/09/91	4	Researcher, Stockholm University	PhD
F	Bo Olof Långbacka	01/06/92-31/05/93	12	Geologist, Golder Ass. OY	MSc
S	Johan Camitz	01/06/93-31/05/94	12	Geologist, ScanMining AB	
D	Henriette Hansen	01/06/93-31/05/95	24	Researcher, GEUS	
F	Matti Rossi	01/06/93-31/05/96	36	Finish Science Centre	PhD
D	Martin B. Klausen	01/06/93-31/05/95	24	Postdoc, U Witvaterstrand	PhD
S	Lisbeth Hildebrand	01/06/94-31/05/96 01/09/98-30/11/98	27	Geologist, SGU, Malå	
N	Finn S.D. Karlsen	01/06/94-31/05/95	12	Teacher	
F	Vesa Nykänen	01/06/95-31/05/97	24	Geologist, FGU	Ph.Lis
N	Rinn Rolfsen	01/06/95-31/12/96	19	Geologist, ESSO Norge	
D	Kresten Breddam Dupont	01/06/95-31/05/97	24	Danish radiation Institute	PhD
D	Karen Bollingberg Sørensen	01/06/96-31/05/97	12	Teacher	
N	Rune S. Selbekk	01/06/96-31/08/96 01/06/02-31/05/03	15	Professor, AL Univ, Freiburg	PhD
N	Helge Reginiussen	01/07/97-31/05/99	23	Geologist, SGU, Malå	PhD
N	Astri J. Kvassnes	01/08/97-31/03/98	8	PhD student MIT	
S	Daniel Larsson	01/06/97-31/08/99 01/10/00-30/06/01	36	PhD student, Lund	
I	Sigurjón Jónsson	01/06/97-15/09/97	3½	Postdoc, ETH Zürich	PhD
Fr	Christophe Dubégnny	01/01/98-30/04/98	4		
S	Malou Blomstrand-Stinessen	01/03/98-31/08/98	6	Sales person	
I	Guðmundur H Guðfinnsson	01/05/98-31/08/00	27	Senior Researcher, Bayreuth	PhD
N	Pål A. Jensen	01/06/98-31/05/00	24	Taxi driver	PhD
S	Paul Christian Frogner	01/06/99-31/05/01	24	Swedish Geotechnical Institut	PhD
N	Tor Sigvald Johansen	01/06/99-30/11/01	30	PhD student, GEOMAR	
F	Iikka Juhani Ylander	01/06/99-31/07/00	14	Hydrologist, Turku Region Water Ltd	
D	Rikke Pedersen	01/06/00-31/05/03	36	Postdoc, JH	PhD
D	Peter Momme	01/08/00-15/04/02	20	Lecturer, Ålborg Univ.	PhD
F	Heidi E. Soosalu	01/06/01-31/05/04	36	Tallin University	PhD
D	Anette K. Mortensen	01/06/01-31/05/04	36	Geologist, ISOR	MSc
S	Hannes Mattsson	01/06/01-30/06/03 01/06/05-31/05/06	37	Postdoc, ETH Zürich	PhD
D	Dorthe Hegnet Holm	01/06/03-31/05/05	24	Housewife, Iceland	MSc
S	Fredrik Holm	16/06/03-31/05/05	23½	Photographer, Iceland	MSc
S	Lillemor Claesson	23/06/03-31/05/05	23	PhD student, Stockholm	MSc
N	Heidi Elisabet Hansen	01/06/04-31/12/05	18	PhD student, Bergen	MSc
D	Marie Keiding	01/06/05-31/05/09	48	PhD student, ESI, UI	MSc
D	Tanja Grandvuiet	01/06/05-31/05/07	24	Mining geologist, Gexco, Norge	MSc
N	Therese Flaathen	01/06/05-30/09/07	28	PhD student, UI & Toulouse	MSc
D	Erik Vest Sørensen	01/06/06-31/08/07	14¾	PhD student, Copenhagen	MSc
N	Tore Dolvik	01/06/06-31/07/07	13¾	Unemployed	MSc
D	Anders Schomaker	01/08/07-31/05/09	22	Postdoc, ESI, UI	PhD
D	Jakob Kløve Jakobsen	20/08/07-31/05/09	21½	Postdoc, ESI, UI	PhD
F	Hanna Kaasalainen	11/06/07-31/05/09	23½	PhD student, Helsinki & UI	MSc
S	Per Erikson	08/06/07-31/05/09	23½	PhD student, Luleå	MSc
I	Sæmundur A Halldórsson	01/07/07-31/08/08	14	PhD student, Scripps	MSc

Appendix 4: NORDVULK Summer Schools

Nordvulk has through its collaborative partners organized a series of international summer schools in volcanology. Each summer school has centred around a debated theme in the geosciences of international and Nordic interest, with lectures by world authorities on the respective subject. The schools are a venue for graduate students and post-docs to meet with an international group of researchers and study the theme the school. They give Nordic geoscience students an opportunity to present a poster of their current research and it enables them to discuss their work with invited lecturers and fellow students from Europe and the United States. Typically about 50 persons attend. The schools are a mixture of talks by invited speakers, presentation by participants, and field trips to relevant geological localities in Iceland. The summer schools extend for 10-12 days in a remote location which is chosen to provide an opportunity to demonstrate the theme of the school in the field.

Nordvulk has contributed to the schools by carrying out extensive preparation of the summer schools by internal funding, as well as covering the costs of Nordvulks personnel. Nordvulk has furthermore sought international collaboration for the schools, so each school has been organized by an international organizing committee. The direct costs of participants have been covered by various sources, but each participant (or his/her institute) has only been required to pay a low registration fee. Nordvulk staff has made extensive efforts to seek funding to cover the costs of the summer schools, primarily the costs of invited speakers and the bulk of the costs for participants (partial travel, accommodation, field trips). Nordic participation has been sponsored by Nordforsk (The Nordic Research Board of the Nordic Council of Ministers) and the former Nordic Academy for Advanced Study (NorFA). European funding has been received through the European programme for Training and Mobility of Researchers (TMR). Funding for US participants has been received from the US National Science Foundation (NSF), the US Ridge programme, and the US Geological Survey.

Information about summer schools in 2003 and 2007 is found at:

2007: Summer school on Geodynamics and magmatic processes

http://www2.norvol.hi.is/page/nordvulk_summerschool%202007

2003: Tectonic-Magmatic Interaction

http://www.norvol.hi.is/~thora/summer2003/summerschool_2003.html

and some information for earlier summer schools is found below:



NorFA Summer school 2002

ICELAND

28/08-06/09 2002

ICELANDIC INSTITUTE OF NATURAL HISTORY

Hlemmur 3, 105
Reykjavík Iceland_



NORDIC VOLCANOLOGICAL INSTITUTE

Grensásvegur 50, 108 Reykjavík
Iceland

Environmental effects of large volcanic eruptions on the Northern Hemisphere

Location:

[Skaftafell](#) on the south coast of Iceland.

[Map](#) of Iceland and fieldtrips

[Preliminary field guides](#)

Course objective and content:

The summer school will focus on the four main themes:

1. Frequency of large eruptions in the Northern Hemisphere. Studies on different eruptions and the Greenland ice-core records will be discussed. The difference between large silicic and basaltic eruptions will be addressed.
2. Physical volcanology of large-scale eruptions. Time the eruptions last, altitude of eruption plumes, eruption rates and methods used to approach these parameters in prehistoric eruptions. Impact of large eruptions to the atmospheric and to the oceans.
3. Volatile emission in different eruptions and methods used to approach this information. Dilution models for volcanic gas and ash in the atmosphere and the ocean. Physics controlling the atmosphere and the ocean and theoretical models for major alterations.
4. Archaeological and historical studies on volcanic impact to past time societies. Future scenarios of large eruptions and predictions of atmospheric and marine pollution effects.

The summer school will be on the form of alteration between courses and field trips.

5. **Preliminary program:**

August 28: arrival to Iceland and welcome dinner in Rvík.

August 29: field trip across the highlands to Skaftafell

August 30: course, opening by professor **Alan Robock, Sigfus Johnsen**, frequency of large eruptions in the NH

August 31: field trip to Laki 1783 eruption side

September 1: course, Physical volcanology, opening by **Gerald Ernst, Clive Oppenheimer**,

September 2: field trip to Öraefajökull 1362 eruption side

September 3: course, Volatile emission, opening by **Niels Óskarsson, Sigrún Karlsdóttir**

September 4: field trip to the Eldgjá and Laki lava fields

September 5: course Archaeological and historical studies on volcanic impact, opening by **John Grattan, Áslaug Geirsdóttir, Peter Baxter**

September 6: field trip back to Reykjavík along the south coast

September 7: departure from Iceland

Course leaders/contact persons:

Dr. Armann Hoskuldsson	Dr. Karl Grönvold
Icelandic Institute of Natural History Hlemmur 3, 105 Reykjavík Ísland	Nordic Volcanological Institute Grensásvegur 50 108 Reykjavík Ísland.

Summer School

Plume-Ridge Interactions

20-30 August 2000

Mývatn, Iceland

Convenors

Bob Detrick, Woods Hole Oceanographic Institution

Karl Grönvold, Nordic Volcanological Institute
Freysteinn Sigmundsson, Nordic Volcanological Institute
John Sinton, University of Hawaii

Background

The Nordic Volcanological Institute and the U.S. RIDGE Program will be conducting a summer school for graduate students and young researchers around the theme of Plume-Ridge Interactions. This school is intended to provide a comprehensive and up-to-date treatment of the physical and chemical consequences of the interaction of mantle plumes with mid-ocean ridges. The school is primarily intended for graduate students and young researchers (<5 years since their PhD) interested in the theme of the school.

Format

The summer school will consist of a mixture of formal lectures, poster presentations and field trips. Lectures and field trips will be given by a range of international experts. School participants will be expected to make a poster presentation on a topic relevant to the Plume-Ridge Interaction theme of the school.

Sponsorship

Nordic participation will be sponsored by the Nordic Academy for Advanced Study (NorFa) and the Icelandic Research Council (Rannís) through the Nordic Volcanological Institute. U.S. participation will be sponsored by the National Science Foundation through the U.S. RIDGE Program. Participants will be expected to pay US\$250 for registration. Other expenses, including airfare to and from Iceland, meals, lodging, and transportation costs within Iceland will be covered by the sponsoring agencies.

In 2006 and 2008 Nordvulk has instead of organizing summer schools contributed to the organization of the international “2006 George Walker meeting” in Reykholt, western Iceland, and in 2008 Nordvulk is contributing to the IAVCEI meeting in Iceland.

An outcome of the summer schools has been a number of collaborative projects, that have originated by informal discussions at the summer schools.

1998 summer school:

Greenland Ice Cores and North Atlantic Climate

Wealth of new data and ideas on the history of climate and other environmental parameters have come available in recent years. This research is very much problem driven and a multidisciplinary approach is essential. The issues are of special significance as the past may prove to be a key to the future. Fruitful interaction and communication between workers engaged in the different fields of study is already in place and continues to increase. The aim of the summer school is to review in some depth and discuss the present knowledge of the records available from ice cores, marine and terrestrial sediments. Both to see what is available and what the quality is and the precision that can be obtained. There will also obviously be great emphasis on how the different records compare and relate.

Participants will be invited lectures and young researchers principally at the post doctoral and post graduate level. The sponsors will provide most of the travel and subsistence cost, which limits potential applicants to the Nordic countries, members of the European Union and USA.

The format will be formal lectures by the invited speakers followed by informal discussions. The other participants will be required to present posters that will be standing during the whole summer school and to give short presentation. This is to ensure active participation and at the same time gives the more established researchers opportunity to get acquainted with ongoing research outside their main interest. In addition there will be field excursions to sites of geological interest and possible relevance and to give participants opportunity for informal mixing.

The final list of invited lectures is not ready but the following have agreed to attend:

André Berger, Université de Louvain
Svante Björck, University of Copenhagen
Gerard C. Bond, Lamont-Doherty Earth Observatory
Jean-Claude Duplessy, Laboratoire mixte CNRS-CEA, Gif-sur-Yvette
Henry Hooghiemstra, University of Amsterdam
Nalan Koc, University of Bergen
Nick Shackleton, University of Cambridge
Bernhard Stauffer, University of Bern
Thomas Stocker, University of Bern
Árný Erla Sveinbjörndóttir, University of Iceland

The convenors are:

Karl Grönvold, Nordic Volcanological Institute, Reykjavík
Sigfús Johnsen, Niels Bohr Institute, University of Copenhagen
Thompson Webb III, Department of Geological Sciences, Brown University

Appendix 5: Institute of Earth Sciences: Finances, staff and facilities

(prepared by Stefán Arnórsson)

1. Financial matters

The Institute of Earth Sciences (IES) is part of the Science Institute of the University of Iceland. In 2007 the overall budget of IES was 403 million Icelandic kr (Ikr, about 25 m. Dkr). It was divided as follows: 57 m. Ikr from the Nordic Council of Ministers, 155 m. Ikr from the Science Institute of which 57 m. Ikr was earmarked to the Nordic Volcanological Center. Other income was 191 m. Ikr. Most from research funds for research project and purchase of new instruments but also from companies, in particular from the large energy companies in Iceland, Reykjavík Energy and the National Power Company.

The University of Iceland supports IES financially very much although this does not appear in the accounting of the Science Institute. The University thus covers salary expenses for professors in geosciences (eight in all), provides housing and covers expenses for daily cleaning and maintenance. University of Iceland additionally supports scientists to attend scientific meetings abroad. For the year 2006 the total support from the University of Iceland has been evaluated as 197 m. Ikr of which 17 m. Ikr was for purchase of new instruments and is included under “other income” of the Science Institute in the paragraph above. A final figure for financial support from the University of Iceland for 2007 is not available but it is around 210 m. Ikr in addition of teaching expenses of some 50 m. Ikr.

The financial turnover of geosciences at the University of Iceland and the Science Institute is thus 663 m. Ikr.

2. Staff

In 2007 the academic staff of IES was 16 in addition to 8 professors who have research facilities at IES. There is position for 1 Nordic senior researcher and for 5 Nordic research fellows. A total of 10 experts involved in research were employed using “soft money”. Technicians and office staff totalled 8. Ph.D. students were 14 and Msc. Students 11. Accordingly, the total IES staff was 48 in 2007, including the 5 Nordic research fellows. Graduate students were 25.

Of the staff of IES in 2007, 4 research scientists were employees of the former Nordic Volcanological Institute, 5 of the technical and office staff members and 2 scientists paid by soft money in addition to the Nordic senior researcher and the 5 Nordic research fellows.

3. Facilities

When the geosciences of the University of Iceland moved into the new building of Askja in late 2003, together with the Nordic Volcanological Institute, the University of Iceland decided to support substantial purchase of new instruments and replacement of older instruments. Thus, in 2007, 63 m. Ikr were spent on new instruments. The support came from Icelandic funds and Reykjavík Energy. The total value to replace all scientific instruments, both in laboratories and used for field work is estimated as 300 m. Ikr.

The major instruments at IES include (shown in bold are instruments in the possession of the Nordic Volcanological Institute prior to merging with the University of Iceland):

- (1) Mass spectrometer for light isotopes (H, C and O), mostly for studies of natural waters and ice in glaciers – renewed in 2007
- (2) **ICP-mass spectrometer for heavy isotopes, largely for various petrochemical studies**
- (3) **Electron microprobe – extensively renewed in 2007**
- (4) ICP-AES spectrometer, renewed in 2006
- (5) Three ion chromatographs, one for anions, one for cations and one for trace elements
- (6) Gas chromatograph (renewed in 2003)
- (7) **X-ray diffractometer**
- (8) Carbon analyzer for soils
- (9) Infrared spectrophotometer
- (10) Instrument for high pressure and high temperature petrochemical studies
- (11) UV-VIS optical spectrophotometer
- (12) Three bombs for hydrothermal experiments
- (13) **Various minor chemical instruments**
- (14) Malvern grain size analyzer
- (15) Radio echo sounding instrument for measuring the thickness of glaciers
- (16) Drills for drilling through glaciers
- (17) **GPS instruments for geodetic measurements**
- (18) **Facilities for InSAR analysis of satellite images**
- (19) **Portable seismometers**
- (20) **2 four wheel drive trucks**
- (21) 1 four wheel drive truck
- (22) 1 snow-scooter