LETTER FROM THE EDITOR

Greetings! As you can tell, we’ve been getting Near-Surface Views out bimonthly. By doing so, time-sensitive information should be available in a more appropriate fashion. Additionally, your newsletter should become a more familiar reference for meetings, calls-for-papers, short courses, etc. We’re also working hard to shift the posting date to be more in line with the issue date (i.e., in the future we will post the Jan/Feb issue in January rather than February!).

This is the second issue available electronically, and the response thus far has been very positive. We are attempting to work with our advertisers and SEG to see if the advertisements could be posted on the NSG web site, so we could offer our regular newsletter as well as an advertisement-free newsletter that would be significantly faster to download. We’ll keep you posted!

[Continued on next page]

Travel Grants from the NSG

Due: March 7, 2001

Purpose
The purposes of the NSG travel grant are to encourage and support graduate students, seeking a career in environmental, ground water, and engineering geophysics, to attend the Annual Meeting of the SEG. Each year up to three travel grants may be awarded. The maximum amount of a travel grant will not exceed 500 USD.

Eligibility
Students eligible for a travel grant are graduate students, with research projects in environmental, ground water, and engineering geophysics. Preference will be given to students presenting oral or poster papers at the Annual Meeting. The recipients will be expected to attend the NSG annual meeting during the SEG convention.

Applications
Applications should be submitted by the deadline for submittal of abstracts to the SEG Annual Meeting, set each year by the SEG. The applications are to be submitted to the Secretary of the NSG by electronic mail or hard copy. The information to be provided in the application shall as a minimum contain:

1. Name, address, telephone number, e-mail
2. Affiliation (college or university, department, academic advisor)
3. One page resume, listing course work in geophysics, synopsis of planned career.
5. Letter of reference of academic advisor.

Selection
The NSG shall appoint a committee of three members, one of which shall be on the NSG Executive Committee to review the applications and recommend awards. The committee shall notify the NSG Executive Committee one month after the deadline for applications of their recommendations for awards. The Treasurer of the NSG will subsequently notify the recipients of the awards.

Payment
Recipients of the travel grants shall submit a request for payment to the Treasurer of the NSG. The request for payments shall be documented by receipts. Eligible expenses include registration, travel, lodging and up to $ 30 per day for meals. The Treasurer shall reimburse the recipient within 14 days of receipt of invoice.
LETTER FROM THE EDITOR

[Continued from previous page]

The NSG thrives when there is input from all members. Here are some items you can sink your teeth into.

- Submit your suggestions for nominations for the Frank Frischknecht and Hal Mooney awards to Roger Young (ryoung@ou.edu).
- Submit your suggestions about technical sessions topics for the San Antonio meeting to Mary Poulton (mpoulton@u.arizona.edu).
- Submit suggestions for nominations for the 2002 Executive committee to Roger Young (ryoung@ou.edu)
- Write letters to the Editor of the NSG newsletter (Greg Baker; gbaker@geology.buffalo.edu) about topics impacting us all.

Hope 2001 is finding you well!

GSB

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Advertisements can be placed in the Near-Surface Views. For advertising information contact the Editor or Sue LoBianco SEG [Phone: 918 497 5574 Fax 918 497 5557].

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CALENDAR OF EVENTS

2001

5-6 Jan  The 2001 Pan-American Conference on Research on Fluid Inclusions (PACROFI) will be held at the Macey Center located on the campus of the New Mexico Institute of Mining and Technology, Socorro, New Mexico, U.S. Web site: http://www.nmt.edu/~quadlab/.

6 Jan  HGS Field Trip: 100 Year Anniversary of Spindletop, with Spindletop Historian Michel T. Halbouty. For more information, contact the HGS Office. Web site: http://hgs.org/cour0101.htm


23 Jan  IAGC E-Commerce for the Geophysical Industry - A Roadmap for the Future, Houston, Texas, U.S. Email: iagc@wt.net

24-26 Jan  5th SEGJ International Symposium - Imaging Technology, Tokyo, Japan. Web site: http://segjsvc.geosys.t.u-tokyo.ac.jp/segj/meeting/


18-20 Feb  2nd Wave Inversion Technology Workshop on Seismic True Amplitudes, Karlsruhe, Germany

20 Feb  IAGC Environmental Commitment in the Geophysical Industry: What Does That Mean?, Houston, Texas, U.S. Email: iagc@wt.net

20-21 Feb  International Seminar on Seismics for Enhanced Reservoir Characterization, Abu Dhabi. Email: enquieris@energylogistics.co.uk

4-7 Mar  SAGEEP 2001, Doubletree Hotel, Denver, Colorado, U.S.

6 Mar  IAGC Multi-Component Seismic: The Next Technological Revolution. Are You Ready?, Houston, Texas, U.S. Email: iagc@wt.net

17-20 Mar  MEOS 2001: the 12th Middle East Oil Show and Conference, Bahrain International Exhibition Centre. Email: pmckean@montnet.com

20 Mar  IAGC annual general meeting, Houston, Texas, U.S. Email: iagc@wt.net

27-29 Mar  Hydro 2001, The Hydrographic Society's 12th biennial conference, Univ. of East Anglia, Norwich, U.K. Email:hydro2001@haleys.globalnet.co.uk

30 Apr-3 May  33rd Annual Offshore Technology Conference, Astrodome, Houston, Texas, U.S. Email: LindaJ.Zimmerman@exxon.sprint.com


1 May  2001 IEEE Radar Conference, Atlanta, Georgia, United States. Email: radar2001@seal.gtri.gatech.edu

DO YOU LIKE THE DIGITAL FORMAT?

The past two executive committees have strongly supported the move from a paper to a digital newsletter format. How is it working out for you?

Near-Surface Views, created by the Near-Surface Geophysics Section of the Society of Exploration Geophysicists, is primarily for you, the membership. During the past two annual gatherings of the NSG section, it was decided to move our newsletter into the digital world. We are still sending paper copies upon request, but hope in the near future to be completely digital.

The money saved by going digital will allow us as a section to spend instead on scholarships, travel grants, guest speakers, etc., rather than on stamps and paper.

We hope you like it! We also understand that this will be a growing period, and need your comments to continue to smooth this transition.

Please send comments to Pieter Hoekstra at pieterhoek@aol.com

CALENDAR OF EVENTS

2001 (continued)

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<th>Date</th>
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<td>24-29 Jun</td>
<td>SEG Development and Production Forum, Taos, New Mexico, U.S.</td>
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<tr>
<td>15-18 Jul</td>
<td>AAGP Regional International Conference (AAGP/VNIIGRI/SEG/EAGE): Exploration and Production - Operations in Difficult and Sensitive Areas, St. Petersburg, Russia. Email: <a href="mailto:blemmon@mail.aapg.org">blemmon@mail.aapg.org</a>.</td>
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<tr>
<td>5-8 Aug</td>
<td>ASEG 2001 Geophysical Odyssey 15th Geophysical Conference and Exposition, Brisbane, Australia. Email: <a href="mailto:jenny.bauer@upstream.originem.energy.com.au">jenny.bauer@upstream.originem.energy.com.au</a>.</td>
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<td>2-6 Sep</td>
<td>EEGS Annual Meeting, Birmingham, England, U.K. Email: <a href="mailto:helen.wilson@geolsoc.org.uk">helen.wilson@geolsoc.org.uk</a></td>
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<tr>
<td>9-12 Oct</td>
<td>South African Geophysical Association (SAGA/SEG/EAGE) Biennial Conference &amp; Exhibition, in the Drakensberg Mountains, South Africa. Email: <a href="mailto:mcomb@scientia.up.ac.za">mcomb@scientia.up.ac.za</a></td>
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<td>28 Oct-1 Nov</td>
<td>7th International Congress of the Brazilian Geophysical Society (SBG/SEG/EAGE/ULG), Bahia Convention Center, Salvador, Brazil. Web site: <a href="http://www.sbgf.org.br">http://www.sbgf.org.br</a></td>
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<td>5-7 Nov</td>
<td>ASCOPE 2001 Exhibition and Conference, Putra World Trade Centre, Kuala Lumpur. Email: <a href="mailto:pmckean@montnet.com">pmckean@montnet.com</a></td>
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2002

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<tr>
<td>7-9 Jan</td>
<td>4th Conference and Exposition of the Society of Petroleum Geophysicists, India (SPG/SEG).</td>
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<td>11-13 Mar</td>
<td>GEO 2002, Bahrain International Exhibition Centre</td>
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<td>27-30 May</td>
<td>EAGE 2002, Florence, Italy. Email: <a href="mailto:AG@EAGE.NL">AG@EAGE.NL</a></td>
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<tr>
<td>6-11 Oct</td>
<td>SEG International Exposition &amp; 72nd Annual Meeting, Salt Lake City, Utah, U.S.</td>
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CALL FOR PAPERS:

Ground Penetrating Radar (GPR) in Sediments: Applications and Interpretation

Ground Penetrating Radar (GPR) is seeing increasing application in the fields of sedimentology and geomorphology. This international conference will be the first to bring together geologists, geomorphologists, geophysicists and engineers with an interest in the application and interpretation of GPR in sediments and sedimentary rocks. Contributions including case studies of sedimentary environments, sedimentary architecture, sandbody geometry, shallow subsurface stratigraphy and engineering applications are invited. Abstracts of not more than 350 words should be sent to the conference convenors by April 30th 2001, authors are requested to express a preference for poster or oral presentations. Poster presentations are encouraged and there will be a half day devoted to poster presentations to be followed by the conference dinner in an adjacent room. The conference aims to bring together interdisciplinary scientists from around the world and will be held at The Geological Society in London and University College London, England. Refereed papers will be published.

Location: London, England  Date: August 20 & 21, 2001
Papers Due: August 20/21 (at conference)
Co-Chairs:
Dr Charlie Bristow  Dr Harry Jol
Birbeck College  University of Wisconsin-Eau Claire
e-mail: c.bristow@ucl.ac.uk  email: jolhm@uwec.edu

Hosted by: The Geological Society of London and University College London
Sponsored by: British Sedimentology Research Group
Abstracts of 350 words should be submitted within the body of an e-mail to either Charlie Bristow or Harry Jol (not as an attachment).

SHORT COURSE:

Geometrics offers a short course on capacitively-coupled resistivity surveying and the OhmMapper TR1/TR2.

Geometrics, Inc. of San Jose, California is offering a 2-day short course on the use of the OhmMapper TR1/TR2 for capacitively-coupled resistivity (CCR) surveys. The course will concentrate on practical field applications and techniques, CCR theory, instrument operation, and data processing- including inversion of data and contour mapping.

The course will be offered April 26 and 27 at the Geometrics facilities in San Jose, CA. A nominal course fee of $275 will be charged.

To register for the course or for additional information contact Douglas Groom at doug@mail.geometrics.com or phone 408-954-0522.
SHORT COURSE:

Near-Surface Seismic Reflection Processing Workshop, Jackson Hole, WY

PASSCAL will sponsor a one-day workshop on June 6, 2001 in conjunction with the IRIS Workshop at Jackson Hole, WY. The course will be given by Dr. Gregory Baker from the University at Buffalo. The purpose of the workshop is to provide an introduction to the theory and practice of near-surface seismic reflection data acquisition and processing. The initial part of the course will introduce the basic concepts of seismic reflection data acquisition and some of the specific problems associated with near-surface data acquisition. The processing portion will cover basic processing theory and practical aspects of processing utilizing the SPW package from Parallel Geosciences.

This course is geared for someone who has a basic knowledge of seismology, but no specific training in reflection seismology. Attendance will be limited and available on a first-come, first-serve basis. To apply, go to the registration form on the PASSCAL web page http://www.iris.edu. The SPW processing package is available to IRIS members for a very reasonable cost.

For more information on SPW see http://www.parallelgeo.com. All attendees will receive one night's lodging, breakfast and lunch on the 6th and a copy of "Processing Near-Surface Seismic-Reflection Data: A Primer" by Gregory S. Baker.

Registration requests should be submitted by filling in the Registration Form (www.passcal.nmt.edu/iris/passcal/course.form.html). Priority will be given to faculty and research staff. However, any remaining slots will be open to students who have applied.

Questions should be addressed to Jim Fowler jim@iris.edu.

Course Outline

Morning Schedule: ACQUISITION

Introductions; Basic concepts of seismic reflection data acquisition, focusing on issues specific to near-surface data collection; Acquisition pitfalls and Case Studies

Afternoon Schedule: PROCESSING

Introduction to CMP processing, focusing on differences between exploration seismic and near-surface seismic data; Discussion of theory of major processing steps, including filtering, scaling, statics corrections, velocity analysis & NMO corrections, sorting, and stacking; Initial hands-on processing walkthrough; Discussion of major processing pitfalls and Case Studies; Continued hands-on data processing with additional datasets

NEW!! Research Profile

The purpose of this section is to give a particular industry group, government group, or academic institution a chance to describe recent past, current, or future research to the NSG community. The goal is three-fold: (1) to facilitate discussion or collaboration among groups working in similar areas; (2) give students interested in employment or graduate school an additional source for information; and (3) learn a little bit more about the people and groups in our Section.

We would like to hear from research groups in industry as well as government and academia—and it’s free advertising for all!

This issue— The U.S. Geological Survey…
GEOPHYSICS IN THE US GEOLOGICAL SURVEY

by

Jeff Wynn
US Geological Survey
Reston, VA 20192

This article provides a limited overview of geophysical activities in the US Geological Survey (USGS). At the outset, it should be stated that I have deliberately emphasized certain components of the USGS at the expense of other parts in order to focus on the geophysics part. This has been necessary in part to keep this article to a manageable length. It has also been done this way to give readers in the Near-Surface Geophysics Section of the SEG an idea of the breadth of work found in these particular elements of the USGS, and how geophysics can fit into often-times very non-geophysical-sounding program sub-tasks. This article cannot give justice to the huge range of activities within the USGS, which encompasses extensive biologic, geologic, hydrologic, and mapping efforts. For more detailed information, the reader is encouraged to investigate and to pursue their interests further through the USGS web-site: www.usgs.gov

In order to understand the role geophysics plays within the USGS, it is appropriate to first place things in context. I will do this by describing where the USGS is located, and how it is organized. Keep in mind that the USGS is a dynamic, evolving organization, and as this is being written its internal structure and organization are changing. In fact, the official motto of the USGS is “Science for a Changing World.” The photo below shows the US Geological Survey National Center, located in Reston, VA. The main facility is so large it has its own Zip Code (20192); it has over 1 million square feet of space, over 150 labs, and accommodates between 2,500 and 3,000 employees. There are also two other facilities on the huge National Center property, including a Physics Lab and an Advanced Systems Center that processes satellite imagery. The USGS has at least one district office or field
office in each of the 50 states, and there are major Regional Centers in the Central Region (Denver, CO) and the Western Region (Menlo Park, CA). In addition, there is an on-going USGS presence in Saudi Arabia that dates from 1963, with now-disbanded resident missions having existed in many other countries including Brazil, Bolivia, Pakistan, Indonesia, Costa Rica, and Venezuela.

The USGS is currently structured at the top level, below its current Director (Dr. Charles “Chip” Groat) into Disciplines (Formerly called Divisions: Geologic, Water Resources, National Mapping, Biologic Resources, and Operations) in a conscious effort to encourage multi-regional, cross-specialty cooperation. At present, the USGS internal structure is still evolving, with current line-management based around regional assistant directors, with Associate Directors managing 5-year Science Plans for geology, hydrology, etc. Within the Geologic Discipline there are regional geologists who supervise chief scientists who supervise scientists (line authority), with the funding being provided through national program managers such as Energy, Mineral Resources, etc. (fiscal authority).
Geophysicists in the US Geological Survey

Historically there have been pure geophysics Branches within the USGS. However, with a Reduction in Force and simultaneous massive reorganization of the Geologic Division in 1995-96 most of these Branches were eliminated, and geophysicists now find themselves working under many different programs - sometimes receiving funding from more than one program at a time. The USGS employs geophysics to address problems in a wide range of applications and in many different internal programs. While there are geophysicists in most of the programs and most of the administrative levels (the former and current Directors, and the past and current Associate Director for Geology all have geophysics backgrounds), geophysicists are mainly concentrated in the Water Resources Division (about 25 in a single branch in Connecticut, with some individuals scattered around in various district offices) and in the Geologic Division (with many hundreds of individuals scattered over all of the major national centers). Within the Geologic Division, geophysical activities are primarily concentrated in the Mineral Resources, Earthquake Hazards, and Volcano Hazards programs, but there are a number of geophysicists employed also in the Coastal and Marine, Earth Surface Dynamics, and Energy Resources programs.

It is actually quite difficult to estimate the total number of geophysicists working in the USGS (geophysicists may find themselves listed under job classifications such as "geophysicist," "geologist," "physical scientist," "hydrologist," etc.), but there are probably at least 700 people doing some sort of geophysics in at least part of their work. This is a surprisingly large percentage of USGS employees, who number about 10,000. I will broadly describe the major elements of geophysics within these two divisions, subdivided as much as possible by programs. My intent here is to give the reader a broad overview of just part of what the USGS does, primarily centered around where most of the geophysics activities can be found. I will therefor narrow my focus to geology and hydrology, as geophysicist
readers in the NSGS will probably be less interested in National Mapping Division or Biologic Division activities.

THE GEOLOGIC DIVISION:

THE MINERAL RESOURCES PROGRAM

The USGS Mineral Resources Program is the only Federal research effort focused on mineral issues that integrates environmental, resource, and economic factors. Program emphasis leans heavily on partnering, database accessibility for decision-making, mineral environmental studies, assessments of industrial minerals, applied deposit research, and geochemical backgrounds and baselines. With the 1996 demise of the US Bureau of Mines, the USGS absorbed and now hosts its extensive national and international minerals information functions, with responsibilities for collecting, assessing, and analyzing the production, consumption, and materials flow of over 100 commodities from 190 countries. The program now has comprehensive capabilities and activities that cover almost all aspects of the mineral cycle from deposit discovery to mineral recycling. The Mineral Resources program addresses three major

Figure 3. Magnetic map of the Portland, Oregon area, showing fault interpretations.

Figure 4. 3-D view of terrain showing the Portland Hills Fault, inferred from the geophysical data.
types of mineral issues facing the Nation today:

1. Sustainability and Societal Need
2. Economy and Public Policy
3. Environment and Public Health

It’s somewhat difficult to see how a square geophysics peg could possibly fit within this round programmatic hole, but somehow it does. In addition to these three major sub-tasks, there is also another sub-task, Technology and Information Dissemination, whereby significant geophysical information is released to the general public.

Confusing the geophysics categorization or compartmentalization issue even further, line authority within the Mineral Resources program falls under the following Teams, each headed by a Chief Scientist, all but one having a major geophysical component:

1. Central Region Mineral Resources
2. Crustal Imaging & Characterization
3. Eastern Region Mineral Resources
4. Minerals Information
5. Western Region Mineral Resources

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Figure 5. A mineral map derived from classifying airborne AVIRIS spectral imagery, Leadville, CO.
The Team Chief Scientists do not report to the Mineral Resources Program Coordinator - but instead to their own Regional Geologist. However, most of the funding for scientists within these Teams comes from one or more Program Coordinators, requiring close coordination between the Program Coordinators and the Chief Scientists to keep scientists adequately funded and focused in a meaningful way. Individual scientists can be classified as either “research” or “operations”, depending on the nature of their work, and these classifications for a given individual can change over time as organizational needs and focus evolve.

Within all these Teams (with the exception of Minerals Information), there are geophysicists who specialize in potential fields, electromagnetics, resistivity/IP, radiometrics, refraction/reflection seismics, remote sensing, and borehole geophysics. As far as I know the USGS doesn’t have any atmospheric geophysicists, but there are several who do what might be called space geophysics, including meteorite and impact specialists scattered over several centers and a large Astrogeology facility exists in

**Figure 6.** A marine induced-polarization system developed within the USGS and now being commercialized. It is designed to drag along the ocean floor, mapping titanium-bearing placers and metallic objects.

**Figure 7.** An example of marine IP data, Mississippi Sound, Gulf of Mexico.
Flagstaff, AZ funded mainly by NASA. There are so many Programs and Teams that I’m sure I’ve overlooked at least several additional geophysical specialties. While most are specialists in one field or another, there are some geophysicists (including the author) who could be classified as "omni-geophysicists", that is, they use many different kinds of geophysical methods to address a particular geological or environmental problem or mapping issue. The USGS in particular excels in gathering large, regional-scale data sets (mainly potential fields) and combining and analyzing them to draw conclusions about the regional geologic framework that hosts known and as-yet-undiscovered mineral deposits. The interested reader can view and access these huge datasets at the following URL: http://crustal.usgs.gov/crustal/geophysics/index.html. Geophysicists are actively involved in parameter-characterization efforts in deposit model studies, and heavily involved in assisting in regional geologic mapping and toxic waste mapping efforts.

THE EARTHQUAKE HAZARDS PROGRAM

The Earthquake Hazards program is mostly made up of geophysicists, but in most cases these are a very different kind of geophysicist from those found in the mineral resources or any of the other programs - these geophysicists are exclusively interested in earthquake records and seismic propagation. The Earthquake Hazards program provides and applies relevant earthquake science information and knowledge towards reducing deaths, injuries, and property damage from earthquakes. This is done through studying their characteristics and effects, and by providing the information and knowledge needed to mitigate these losses.
The USGS Earthquake Hazards Program is also part of the National Earthquake Hazards Reduction Program (NEHRP) lead by the Federal Emergency Management Agency (FEMA). The USGS role in NEHRP is to provide Earth sciences information and products for earthquake loss reduction. Specific sub-tasks include:

1. Improve earthquake hazard identification and risk assessment methods and their use,
2. Maintain and improve comprehensive earthquake monitoring in the United States with focus on "real-time" systems in urban areas, and
3. Improve the understanding of earthquakes occurrence and their effects and consequences.

The Earthquake Hazards program also supports an External Research Program, which funds external cooperators and awards external grants through a competitive, peer-reviewed proposal process. Participants in the Earthquake External Research Program include State and local government, the academic community, and the private sector. Priorities for both the internal and external programs are guided by the Earthquake Hazards Program's Five Year Plan. Virtually all USGS programs are guided by a long-term (5- or 10-year) plan.

Earthquake geophysics efforts can broadly be subdivided into earthquake research and seismic networks. Research activities are coordinated through sixteen different research projects. These projects are either regionally or topically based and include a suite of scientific activities across an array of different earth science disciplines. They include:

1. Earthquake Information
2. Seismograph Networks
3. Pacific Northwest Earthquake Hazard Studies
4. Earthquake Loss Reduction Products, Cascadia
5. Northern California Seismic Network
6. San Francisco Bay Area Earthquake Hazards Project
7. Southern California Earthquake Project
8. The FOCUS project on Quaternary Stratigraphy in the Los Angeles Region
9. Earthquake Loss Reduction in the Central and Eastern U.S.
10. U.S. National Strong Motion Program
11. National Seismic Hazard Maps
12. Earthquake Probabilities And Occurrence
13. The Physics of Earthquakes
14. Research on Earthquake Effects
15. Earthquake Effects
16. Deformation

Seismic Networks involve external, even international cooperators. The USGS has the assigned Federal responsibility to monitor seismic activity in the United States; it also monitors seismicity internationally, in cooperation with the Incorporated Research Institutes for Seismology (IRIS). The USGS thus operates a number of different networks designed to monitor earthquake activity at the global, national, and regional level. Networks send recordings of seismic activity to the National Earthquake Information Center (NEIC) in Golden, Colorado, where earthquake data are collected, processed, reported, and archived. Regional networks also have their own earthquake Centers and are responsible for reporting earthquake activity in their respective regions. To better meet the Nation's monitoring requirements, the USGS is planning an upgrade to seismic monitoring systems in the US. The Advanced National Seismic System will re-organize, modernize, and standardize seismic monitoring in the US.
THE VOLCANO HAZARDS PROGRAM

The Volcano Hazards Program operates four volcano observatories, and collaborates with Federal, State, and local government agencies, universities, and the private sector to reduce the risk from volcanic activity. These observatories are:

1. The Alaska Volcano Observatory (AVO), a cooperative effort of the USGS Volcano Hazards Program, University of Alaska Fairbanks Geophysical Institute (UAFGI), and State of Alaska Division of Geological and Geophysical Surveys (ADGGS). AVO monitors about half of the 42 historically active volcanoes of Alaska, which not only threaten local populations but also aircraft and travelers using major air routes across the North Pacific. AVO also disseminates warnings and information on dangerous eruptions and ash clouds from Kamchatkan volcanoes in the Russian Far East.

2. The Hawaiian Volcano Observatory (HVO), which conducts an intensive program of seismic, gas, ground deformation, and observational monitoring of the frequently active volcanoes of the Island of Hawaii.

3. The Cascades Volcano Observatory (CVO) in Vancouver, Washington, which monitors and assesses hazards from the volcanoes of the Cascade Range of Washington, Oregon, and California. Seismic monitoring is shared with the USGS center in Menlo Park, California, (for northern California)
and the Geophysics Program of the University of Washington in Seattle (for Washington and Oregon). CVO also is home to the Volcano Disaster Assistance Program.

4. The Long Valley Observatory (LVO) in Menlo Park, California, which conducts seismic, deformation, hydrologic, and geochemical monitoring and research to interpret the recent unrest and assess the hazard from this large and potentially dangerous caldera system.

![Figure 10. Volcano monitoring methodologies - sketch.](image)

Volcano monitoring methods (see diagram) cover a wide range of geophysical and quasi-geophysical technologies, including seismics to detect magma movement, acoustic flow monitors to detect lahars, tiltmeters to detect inflation, and remote sensing for eruption plume tracking. These methods are all geared one way or another to detect and measure changes in the state of a volcano caused by magma movement beneath the volcano. Rising magma typically will (1) trigger swarms of earthquakes and other types of seismic events; (2) cause swelling or subsidence of a volcano's summit or flanks; and (3) lead to the release of volcanic gases from the ground and vents. By monitoring these phenomena, scientists are sometimes able to anticipate an eruption days to weeks ahead of time and to detect remotely the occurrence of certain volcanic events like explosive eruptions and lahars.
THE WATER RESOURCES DIVISION

The USGS Office of Ground Water is a subdivision of the Water Resources Division. It includes within it a Branch of Geophysical Applications and Support, centered in Connecticut. This group performs research on the use of geophysical methods in hydrogeologic investigations, and provides active support for the use of geophysical methods within the Water Resources Division of the USGS.

Within the Branch of Geophysical Applications there is a small but energetic research effort, focusing mainly on fractured rock investigations. Work covers a range of topics (some of which are done in cooperation with geologists and geophysicists in the USGS Geologic Division):

2. Borehole-radar,
3. 2-D Resistivity studies,
4. Ground-penetrating radar (GPR),
5. Azimuthal square-array DC-resistivity, and
6. Integration of surface geophysical methods for fracture detection.
7. Tracer experiments to investigate fluid movement in fractured rock (borehole radar).

Figure 11. An example of borehole geophysics research being carried out by USGS hydrologists.
In addition to fractured rock investigations, there are on-going studies in:

8. Time-lapse attenuation-difference radar tomography,
9. Borehole radar methods for characterizing unconsolidated sediments,
10. Use of geophysical methods to detect in-filled scour holes and assess bridge foundations,
11. Nuclear magnetic resonance for determining the grain size and "free water" content of subsurface units,
12. Multi-channel shallow water (less then 10 ft.) seismic-reflection surveys and interpretation,
13. Three-dimensional (3-D) visualization of borehole-radar and surface radar (GPR) data,
14. Direct-current (DC) resistivity, low-frequency electromagnetic, and radar tomographic techniques, contaminant detection with GPR, and thin aperture fracture experiments and modeling.

SUMMARY

I hope with this brief summary that I’ve at least roughly conveyed the breadth of the geophysics efforts conducted within the US Geological Survey. People who consider themselves geophysicists in the USGS include mineral-exploration specialists, hazards-mapping experts, oceanographers, environmental geophysicists, hydrologists, astrogeologists, and remote sensors. I’ve worked for 25 years within the USGS, yet in compiling this information, I have been amazed to discover some work I had been previously unaware of – such is the wide diversity of geophysical work carried out within the USGS. The interested reader can follow this up in far greater detail by going to the USGS web-site (www.usgs.gov) and burrowing down to areas of interest.

And we like to cooperate! USGS geophysicists are actively involved in cooperative work with a number of different international, national, regional, and state-level organizations, and there is a long history of close cooperation with many major universities. There are formal regulations in place that allow USGS scientists to develop Cooperative Research And Development Agreements with both
universities and private industry. The author has recently set up a CRADA with a private ocean-engineering firm to commercialize some USGS-developed technology in order to move it into the public domain. Ultimately we are all very cognizant of both the old USGS motto: “Science in the Public Interest” and also of our new motto: “Science for a Changing World”. The USGS is evolving to meet ever-changing needs, and while change can sometimes be painful, it can also be exhilarating. Geophysicists in the USGS are very much in the forefront of this change, heavily involved in developing new technology and new ways to address problems the nation faces.
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