

feedback to the developers. Through these efforts we hope to provide teachers and students with access to a wide variety of data applicable to problems in Earth science, along with the ability to easily display and analyze multiple data types thus providing all users with access to state-of-the-art information.

URL: <http://atlas.geo.cornell.edu/education/>

## ED71C-12 1135h

### The U.S. Educational Seismology Network (USESN)

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A new national science outreach initiative, the U.S. Educational Seismology Network (USESN), has been initiated under the auspices of the IRIS Consortium. The mission of the USESN is to promote the use of seismographs and seismic data for science education. This project has emerged out of several independent educational seismology initiatives, whose collective efforts to develop a national school seismograph network include: (1) the Princeton Earth Physics Project (PEPP), which links ten university-based regional networks, currently serving 80 schools nationwide; (2) Michseis/Ohioseis, which has built a network of 18 school and college-based stations in Michigan, Indiana, and Ohio; (3) the South Carolina Earth Physics Project (SCEPP), which is in the process of developing a 50-station education-al seismic network in South Carolina; (4) the Los Angeles Physics Teachers Alliance Group (LAPTAG), a network of eight stations in the Los Angeles area, (5) IRIS 'Seismographs in Schools' program, (6) the Public Seismic Network (PSN) an informal coalition of amateur seismologists, which includes stations at a number of schools, and (7) a number of smaller local-area educational seismic networks that are developing across the country. The USESN effort will include support for a full range of educational seismograph options, from display-oriented, stand-alone systems to networked broadband instruments. USESN seeks to provide an organizational structure for the coordination of the numerous educational seismology activities that are developing across the country. The primary goals of the USESN initiative are to: (1) promote the installation and operation of educational seismographs and effective use of seismic data; (2) disseminate high-quality curricular materials and educational services that promote the use of seismology in science education; and (3) provide an organizational framework for coordination and advocacy of educational seismology across the country.

URL: <http://www.indiana.edu/~usesn>

## ED71C-13 1150h

### Retrospective on the PEPP Experience

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The Princeton Earth Physics Project (PEPP) has installed research-quality, broadband, digital seismographs at over 70 educational institutions across the country. PEPP was envisioned to forge a marriage between seismology research and science education and outreach. Each PEPP school participates as a member of a regional group sponsored by an IRIS University, which provides training workshops and technical support needed to keep schools active. The PEPP network relies on the internet for data and information exchange. Stations are intended to provide high quality data for the limited broadband range .03 to 10 Hz, permitting the recording of both local and teleseismic events. Notice of approximately 30-40 global events each year is sent to schools, which are then asked to upload waveforms to the PEPP website. PEPP provided a baseline of online curriculum material about seismology, and initial training workshops were used to provide teachers with hands-on experience working with seismic data.

The pedagogical aims of PEPP were to (1) involve students and teachers in a networked data-collection effort, (2) to provide an experience in the research applications of seismic data, (3) to illustrate the interdisciplinary nature of seismology/geophysics by incorporating exercises in earth science, physics, and computers, and (4) to improve connections between the research and education communities. As a network of seismometers, PEPP started as a "one size fits all" standard model for a school seismic station. As an educational enterprise, each school evolved its own idiosyncratic approach, determined by the factors which

shape all schooling at the local level: mandated curriculum, staffing levels and background, administrative attitudes, and, the heavy workload of the science teachers. There are two distinct uses of the PEPP instruments: a short-term use in the context of a seismology component in earth science or physics classroom; and a long-term use to engage motivated students in inquiry-based scientific research. As a result, only a few schools routinely manage data flow for the full year; many take up the program only during specific subject periods. The major evolution in internet technology in the past 8 years has greatly enhanced the connectivity and data flow in PEPP, while it has also put many practical obstacles in the way of schools, particularly installation of firewalls and increased controls on installation of software on PEPP computers. The most successful schools have implemented an informal club-like program, by which a few interested students in each class can continue through the school year with station operations. The most successful outcomes take the form of projects which may be presented locally or statewide in science fair programs. [An example would be the annual student research symposium held by the Indiana PEPP group].

Major shortcomings in this educational model have been identified. They are almost all institutional factors revolving around how teachers do their work, and how their university mentors participate in the program. Most participants are already overcommitted for time, and not funded at even the most rudimentary level (beyond the PEPP startup funding). Although the model attempts to implement the principles of hands-on, inquiry-based science teaching as widely promulgated in the National Science Education Standards, the great increase in standardized testing and top-down curriculum prescription, has pushed teachers toward a management-driven program, dominated by standardized testing. Also well-known are the frequent lack of adequate teacher preparation for science teaching, and the low value accorded this kind of outreach by universities.

## ED72A MCC: 135 Sunday 1545h

### Improving Diversity in the Earth and Space Sciences: Programs That Work II (joint with B, OS, P, S, SA, SH, SM, T, V, PA)

**Presiding:** F R Hall, University of New Orleans; K Grove, San Francisco State University

## ED72A-01 1545h

### Enhancing Diversity in the Geosciences through National Dissemination of the AMS Online Weather Studies Distance Learning Course

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Our nation faces a serious challenge in attracting young people to science and science-related careers (including teaching). This is particularly true for members of groups underrepresented in science, mathematics, engineering, and technology and is especially acute in the number of minority college students majoring in the geosciences. A formidable obstacle in attracting undergraduates to the geosciences is lack of access, that is, no opportunity to enroll in an introductory geoscience course simply because none is offered at their college or university. Often introductory or survey courses are a student's first exposure to the geosciences. To help alleviate this problem, the American Meteorological Society (AMS) through its Education Program developed and implemented nationally an introductory weather and climate course, Online Weather Studies, which can be added to an institution's menu of general education course offerings. This highly successful

course will be offered at 130 colleges and universities nationwide, including 30 minority-serving institutions, 20 of which have joined the AMS Online Weather Studies Diversity Program during 2002. The AMS encourages course adoption by more institutions serving large numbers of minority students through support from the National Science Foundation (NSF) Opportunities for Enhancing Diversity in the Geosciences (OEDG) and Course, Curriculum and Laboratory Improvement-National Dissemination (CCLI-ND) programs. Online Weather Studies is an innovative, 12- to 15-week introductory college-level, online distance-learning course on the fundamentals of atmospheric science. Learner-formatted current weather data are delivered via the Internet and coordinated with investigations keyed to the day's weather. The principal innovation of Online Weather Studies is that students learn about weather as it happens in near real-time-a highly motivational learning experience. The AMS Education Program designed and services this course and makes it available to colleges and universities as a user-friendly turnkey package with electronic and printed components.

The AMS Diversity Program, in cooperation with the National Weather Service (NWS) facilitates institutional participation in Online Weather Studies. Prior to an instructor's initial offering of the course, he or she is invited to attend a one-week course implementation workshop at the NWS Training Center at Kansas City, MO. Participants then join an interactive network to share best practices ideas in science content and teaching strategies related to their offering of Online Weather Studies. They participate in a mentoring program that networks students with professional meteorologists and provides opportunities for internships, summer research, and career counseling. Meteorologists-in-Charge at NWS Weather Forecast Offices across the nation have volunteered their time to help make these opportunities possible. Also, participants are invited to attend the Educational Symposium of the AMS Annual Meeting where they will attend a special Diversity Session and are encouraged to present a paper or poster.

URL: <http://www.ametsoc.org/amsedu/online/info/diversity.html>

## ED72A-02 1600h

### Significant Opportunities in Atmospheric Research and Science (SOARS)

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Science education is rapidly changing. It is becoming more exciting and challenging, and also more accessible. Little more than a decade ago, the dreams of students from historically underrepresented groups to successfully pursue careers in science were admirable, but mostly elusive. Today, while African Americans, Chicano/Hispanic/Latino Americans, and Native Americans make up 25% of the U.S.A. population, these groups combined constitute fewer than 7% of scientists and engineers in the labor force and approximately 3% of the current AMS membership. Achieving the goal of a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well prepared citizens calls for different educational goals and strategies. In 1995 UCAR teamed up with NSF and established a program, SOARS, that extends science education and encourages university students from diverse backgrounds to sustain interests, develop skills, and create paths that lead them to careers in the atmospheric and related sciences. SOARS combines research opportunities with a comprehensive mentoring component and a number of other proven learning strategies to create a student (protégé) centered learning community. To date, seventy-two protégés have traveled this pathway. Thirteen protégés have completed their masters degrees and are SOARS alumni; Ten have entered the professional scientific workforce; four are enrolled in Ph.D. programs; and two are Ph.D. candidates. Twenty-four protégés are enrolled in graduate programs: Three are AMS graduate fellows; one an NSF graduate fellow. Forty-two protégés have completed bachelors degrees; three have completed associates degrees and are now enrolled in a four-year research university. SOARS sponsorship has expanded to include DOE, NASA, and NOAA. Though SOARS continues to learn from the experiences of its community of protégés and mentors, results to date suggest that it is a successful model.

## ED72A-03 1615h

### Using a modified Learning Potential Assessment Device and Mediated Learning Experiences to Assess Minority Student Progress and Program Goals in an Undergraduate Research Based Geoscience Program Serving American Indians

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During the initiation of a new program at the University of North Dakota designed to promote American Indians to engage in geoscience research and complete geoscience related degrees, an evaluation procedure utilizing a modified Learning Potential Assessment Device (LPAD) and Mediated Learning Experiences (MLE) to assess minority student progress was implemented. The program, called Indians Into Geosciences (INGEOS), utilized a modified form of the Learning Potential Assessment Device first to assess cultural factors, determination, and other baseline information, and second, utilized a series of Mediated Learning Experiences to enhance minority students' opportunities in a culturally appropriate, culturally diverse, and scientifically challenging manner in an effort to prepare students for competitive research careers in the geosciences. All of the LPADs and MLEs corresponded directly to the three goals or eight objectives of INGEOS. The three goals of the INGEOS program are: 1) increasing the number of American Indians earning degrees at all levels, 2) engaging American Indians in challenging and technically based scientific research, and 3) preparing American Indians for successful geoscience careers through multicultural community involvement. The eight objectives of the INGEOS program, called the Eight Points of Success, are: 1) spiritual health, 2) social health, 3) physical health, 4) mental health, 5) financial management, 6) research involvement, 7) technical exposure, and 8) multicultural community education. The INGEOS program goals were evaluated strictly quantitatively utilizing a variety of data sources such as grade point averages, number of credits earned, research project information, and developed products. The INGEOS program goals reflected a combined quantitative score of all participants, whereas the objectives reflected qualitative measures and are specific for each INGEOS participant. Initial results indicate that those participants which show progress through Mediated Learning Experiences within all of the Eight Points of Success, have a higher likelihood of contributing to all three of the INGEOS programs goals.

## ED72A-04 1630h INVITED

### The Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) Geoscience Initiative

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The Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) focuses on encouraging undergraduate and graduate minority students to pursue higher degrees. For over 29 years, SACNAS has provided strong national leadership in improving science and math education, as well as expanding opportunities for minorities in the scientific workforce and academia. SACNAS Annual National Conference and Teacher Workshops, summer research opportunities, E-mentoring program, and online internship/job placement resources are tools that help a diverse community of students, professors, administrators, and K-12 educators achieve expertise within their disciplines.

The SACNAS Annual National Conference is the centerpiece of our programs. The conferences feature career advancement workshops, scientific symposia, exhibits, student presentations and guest speakers designed to provide the resources Chicano/Latino, Native American, and other postdoctoral, graduate and undergraduate science and engineering students need to pursue an advanced degrees in the sciences. Guest speakers are chosen for their excellence in scientific research and

their ability to convey the wonder and importance of science through the presentation of their research results.

SACNAS has recently included a geological science emphasis to its existing programs to address the need to diversify the field. This talk will outline our approach, and outline how SACNAS has been able to grow over the past 30 years.

## ED72A-05 1645h INVITED

### Increasing Diversity in the Geosciences: A Bridging Program from Middle School to College

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A bridging program to increase the diversity in the geosciences was created at Hampton University to address the underrepresentation of certain groups across the geosciences. The primary goal of this program is to expand the opportunities and awareness of these groups in geoscience education and research so they may be inspired to pursue an educational path that advances them towards careers in the geosciences. The approach used to achieve this goal is to develop activities from middle school to college that expands the pipeline of diverse students entering advanced education and careers in the geosciences.

Activities target formal and informal K-14 education outreach and university education and research. Informal K-14 activities include an after school geoscience club, a middle school geoscience summer enrichment camp, and a research/mentorship program for high school students. These activities will inspire a diverse population of middle and high school students, outside of the classroom, to develop a continued interest in the geosciences. Formal K-14 activities include a professional development workshop that fills the need for geoscience curriculum content requested of science teachers and administrators who work primarily with underrepresented middle school populations. University education and research activities include continued development of the Hampton University geoscience curriculum, establishment of a distance-learning program, and enhancing the research facilities including development of a weather station and cloud/aerosol lidar. All three areas of activity provide opportunities and participation of underrepresented groups in the geosciences and bridge those activities from middle school through college and into careers.

The first year of the program proved to be successful in all of the major objectives of the program. The middle school summer enrichment camp, high school mentorship program, and teacher workshop were well attended and feedback obtained from the participants highlight the success of the activities in meeting the program objectives. A space and geosciences minor is in development and will represent an increase in the number and breadth of the undergraduate course offerings in the geosciences at Hampton University. The distance-learning program, weather station, and cloud/aerosol lidar are under early development.

### ED11A MCC: Hall D Monday 0830h

#### Geophysics Data in the Classroom II Posters (*joint with NG, OS, S, T, PA*)

**Presiding:** M Hamburger, Indiana

University; J Virieux, Université Nice

Sophia Antipolis/Centre National de la

Recherche Scientifique, UMR

Geosciences Azur

## ED11A-0025 0830h POSTER

#### Education and Outreach at the USGS Albuquerque Seismological Laboratory

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The Education and Outreach effort at the USGS Albuquerque Seismological Laboratory (ASL) over the past decade has evolved into an exciting program that

provides many new educational opportunities in seismology and related science, engineering, and mathematics. Our target audience includes K-12, post-secondary, undergraduate, graduate, continuing education and the general public. With an emphasis on reaching young people, our major goal is to provide to the local community an increased understanding, awareness and appreciation of the relevance of Earth science and technology in daily life. A broadened base of public support for science helps enable us to stimulate the intrinsic curiosity of youngsters who may find science and technology exciting and challenging. Our programs capitalize on the natural interests of young students in earthquakes, volcanoes, magnetism and other scientific fields. Our hands-on interactive presentations foster a students sense of inquiry and increase their knowledge of science. We see an increased amount of confidence displayed by young students as they begin to understand basic scientific principles. We attempt to increase scientific literacy within the community and help create a new generation of students with a greater understanding of the opportunities in Earth science.

We outline recent Earth science and Career Day presentations we have made at numerous elementary schools. Many of these presentations are made both in English and Spanish. Also featured are other cooperative bilingual projects that have been coordinated with the New Mexico Museum of Natural History, the National Atomic Museum and the New Mexico State Fair.

## ED11A-0026 0830h POSTER

#### The Promotion of the use of Seismic Data via the IRIS Education and Outreach Program

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The Incorporated Research Institutions for Seismology (IRIS) recognizes the potential for coordinated Education and Outreach activities in seismology to contribute significantly to the advancement of national awareness, interest, and understanding of science and mathematics. IRIS E&O activities are targeted at audiences ranging from K-16 students to the general public, and are focused on areas where IRIS is well-positioned to make substantive contributions stemming from its strong research and data resources. Program goals are advanced by the E&O staff in close collaboration with diverse allies, including IRIS members, K-12 teachers, undergraduate institutions, the media, and science museums. IRIS also works closely with other national and regional Earth science organizations to maximize effectiveness and reduce redundancy.

Leveraging IRIS resources to produce nationally significant results requires substantial and sustained outreach to the wider education community. Important efforts in this direction include a range of K-16 teacher workshops, a new Educational Affiliate membership for undergraduate institutions, and widely distributed teaching modules and associated tools. Students can access global seismic data from the IRIS Data Management System in near real time as well as by selecting events from the online archives. Earthquake locations and information are available via a new interactive map (the Seismic Monitor). Students can also collect their own seismic data using a stand-alone, relatively inexpensive seismograph (the AS1), or with research-quality broadband instruments with continuous network connections. Consortium members are currently developing new visualization tools and classroom activities using seismic data. Outreach to the general public includes a distinguished lecture program, museum exhibits with real-time displays of earthquake locations and ground motion, access to and use of seismic data via our website, and other informational materials.

URL: <http://www.iris.washington.edu/EandO/>

## ED11A-0027 0830h POSTER

#### Teaching with Real-Time Seismic Data

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Anne Ortiz<sup>2</sup>