

**ED22C MCC: Level 2 Tuesday 1330h**

**The GLOBE Program: What Has and Has Not Worked Well in the Past and Where Should It Go in the Future II**  
Posters (joint with OS, C, PA)

**Presiding:** E Geary, Colorado State University; J D Fellows, University Corporation of Atmospheric Research

**ED22C-1242 1330h POSTER**

**The GLOBE Soil Moisture Campaign and SMEX03: Making it Real for Teachers**

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The GLOBE Soil Moisture Campaign (SMC) (<http://www.hwr.arizona.edu/globe/sci/SM/SMC>) is an effort to mobilize students worldwide to collect near-surface (i.e. 0-5 cm and 8-12 cm deep) gravimetric soil moisture data twice a year: once during World Space Week/U.S. Earth Science Week (early October) and again during Earth Day Week (mid-April). As part of our teacher-training and recruitment strategy, the SMC actively seeks event-oriented scientific campaigns, with which to collaborate and make the science relevant and "real" for the teachers and, subsequently, their students. One specific success has been the SMC collaboration with the Soil Moisture Experiment 2003 (SMEX03) that took place in June-July in Georgia and Alabama. SMEX03 was a soil moisture data collection campaign whose objectives were to collect soil moisture in a large-scale field experiment that used ground, aircraft and spacecraft observations over multiple field sites during the summer of 2003. The GLOBE SMC participated in SMEX03 by collaborating with a GLOBE soils training workshop in Huntsville, AL that was scheduled for dates and locations that overlapped with SMEX03. Fifty teachers were trained in the SMC soil moisture protocol, and were asked to collect soil moisture samples at or near their homes in the communities surrounding Huntsville. Of the fifty teachers, 41 returned with soil samples that were ultimately submitted for use in the SMEX03 campaign. The training workshop's collaboration with SMEX03 proved a successful means of hands-on training with an immediate connection between schools and scientists. An analysis of the teacher-collected soil moisture data used in SMEX03 will be presented, along with a discussion of the specific successes of the SMC involvement.

**ED22C-1243 1330h POSTER**

**The GLOBE ONE campaign: a learning community approach for integrated science investigations**

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The GLOBE program has long faced three interrelated challenges. First, incomplete records, uncertainties in quality assurance and quality control, and failures to enter measurements occur too frequently in the GLOBE data system. Second, while many GLOBE protocols exist with which to characterize elements of the Earth system, most schools implement only one or a few protocols. Third, due to the previous two challenges, the number of peer-reviewed publications resulting from GLOBE measurements does not appear to be commensurate with agency funding support. To address these issues, GLOBE is currently developing a new approach based on the learning community concept. This campaign, termed GLOBE ONE, will focus on: (1) addressing a specific scientific question in a small area; (2) intensive involvement by GLOBE principal investigators; and (3) integration of the local community in measurement and support of the campaign. The campaign, to begin in Spring 2004 and conclude September 2005, will take place in Black Hawk County, Iowa. Science questions will focus on land

cover and land use influences on Earth system processes within agricultural, urban, remnant prairie, and restored prairie ecosystems. A wide community consisting of local academic institutions, extension agencies, educators, industry, and naturalists will work together to ensure collection and quality assurance of the multiple required datasets. Organizational, logistical, scientific, and educational challenges and solutions are discussed.

**ED22C-1244 1330h POSTER**

**Atmospheric Aerosols Project: A GLOBE Student-Teacher-Scientist Partnership**

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The National Science Education Standards (NSES) emphasize that students should learn science through inquiry and should understand the concepts and processes that shape our natural world. One method of accomplishing these goals is to provide students and teachers with opportunities to participate in scientists' ongoing research. The GLOBE program has done this to an extent through the involvement of students in taking environmental observations and reporting them in a useful way. However, in this project we move the teachers and students beyond the collection of data, to engage them in an interesting scientific question that they have formulated on their own, perhaps with the help of a teacher and a participating scientist. In collaboration with a scientist and their teacher, the students address their question by collecting the necessary data, performing an analysis of the data, drawing conclusions, and reporting the results. In this way, the ideal of real scientific inquiry is pursued through more formal relationships among scientists, teachers and students. David Brooks, a GLOBE Science PI, has been conducting research to learn more about how the concentration of atmospheric aerosols varies in time and space, and how those variations may be related to other changes on the planet. Students can support Dr. Brooks' research while engaging in a research project of their own. A description of the project provided for teachers and students can be found at the following url [http://essn.terc.edu/projects/proj\\_brooks01/ovrvw\\_01.cfm](http://essn.terc.edu/projects/proj_brooks01/ovrvw_01.cfm). In this presentation we will describe our activities from the 2002-2003 school year during which we involved three schools (two in New Jersey and one in North Carolina) in the atmospheric aerosols research project; and our plans for the 2003-2004 school year with possibly more than six schools.

URL: [http://essn.terc.edu/projects/proj\\_brooks01/ovrvw\\_01.cfm](http://essn.terc.edu/projects/proj_brooks01/ovrvw_01.cfm)

**ED22C-1245 1330h POSTER**

**The GLOBE Soil Protocol: Teaching the Importance of Soils in the Earth System**

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Protocols being introduced in the GLOBE Soil Investigation have been challenging for teachers and students to implement in the classroom for a number of reasons. Soil Science has not traditionally been taught as part of the curriculum in most parts of the world, and thus, concepts related to soil science and its important role in the Earth system are often unfamiliar and difficult for teachers to understand or explain. In addition, data collection requires exposing, describing, and sampling a soil profile which may require resources not easily available to most teachers. In order to facilitate the GLOBE soil protocol to be understood and performed, a number of resources and activities have been introduced. These include the development of inexpensive educational materials to assist with learning skills and concepts, and the introduction of a modeling tool in which students use GLOBE data and apply different scenarios to produce inquiry based results that identify important linkages and feedbacks within the Earth system. These materials and model have been used in

GLOBE schools worldwide, and have been shown to be an effective way to teach both the concepts and the methods required to understand the important role of the soil.

**ED22C-1246 1330h POSTER**

**Validating the MODIS snow product with GLOBE student observations**

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For this project, we validated the Moderate Resolution Imaging Spectroradiometer (MODIS) snow product and cloud masking algorithms using GLOBE student, SATELLITES (a K-12 program developed at the University of Toledo) and National Weather Service (NWS) Cooperative Extension observations. The study area is the lower Great Lakes region that includes the lake effect snowbelt areas to the east of Lakes Michigan and Erie. Student observations were taken during intense field campaigns with the winter of 2001-2002 having very little snow and 2000-2001 and 2002-2003 having significant snow cover. The student observers are able to gather data over a large spatial area that would be difficult to obtain through other means. In addition, the students collected snow as well as cloud data near the satellite overpass time as well as snow water equivalent that is an improvement over the NWS cooperative station data that is just snow depth. Quantitative analysis of the Version 4 MODIS snow algorithm produced an accuracy of 94 percent when compared to student observations. The largest errors were associated with partly cloudy conditions. A qualitative study was performed by a tenth grade student and her teacher at St. Ursula's Academy in Toledo found that the snow product produces errors when there are different levels of clouds in the images.

URL: <http://remotesensing.utoledo.edu/edu/SATEL.html>

**ED22C-1247 1330h POSTER**

**What's a Nice Hummingbird Like You Doing at an AGU Meeting Like This? (or, Operation RubyThroat Meets The GLOBE Program)**

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"Operation RubyThroat: The Hummingbird Project" is an international cross-disciplinary initiative that uses Ruby-throated Hummingbirds (*Archilochus colubris*) as a hook to excite K-12 students (and adults) about science learning. In 2002, Operation RubyThroat affiliated with The GLOBE Program as the first GLOBE protocol that involves animal behavior. Through Operation RubyThroat, students make observations about hummingbird phenology, behavior, and ecology and correlate their data against traditional GLOBE observations of atmosphere, climate, land cover, soils, hydrology, and phenology. Although Ruby-throated Hummingbirds (RTHUs) breed throughout the eastern half of the United States and southern Canada and may be the most common and most widely distributed of all 338 hummingbird species, little is known about how abiotic environmental factors affect their migration, nesting activities, and everyday behavior. Operation RubyThroat participants in the U.S. and Canada log early arrival dates of RTHUs during spring migration, note their presence throughout the breeding season, and report the last date RTHUs are seen in autumn. Conversely, participants in Mexico and all seven Central American countries (the region in which RTHUs spend their non-breeding months) watch for early arrivals in fall and late departures in spring. Participants also attempt to estimate numbers of RTHUs in local populations by counting the number of visits hummingbirds make to feeders and/or flowers in a 45-minute time block. Optional activities include observations of RTHU nesting behaviors and determining RTHU preferences for various species of native and exotic nectar sources. Participating schools are encouraged to establish Schoolyard Hummingbird Habitats in which to make their observations, but data may be collected in backyards or at local parks, nature centers, botanical gardens, and other sites where RTHUs occur. Adults not affiliated with K-12 schools are invited to become certified in the hummingbird protocols and to submit Operation RubyThroat data

to GLOBE. Participants report sightings of any RTHUs that are banded and color-marked with dye or that have unusual plumage (albinistic, leucistic, etc.). Participants in the eastern U.S. and Canada also report the occurrence of "winter vagrant" hummingbirds, i.e., species from the western U. S. and Mexico that from August through March seem to be wandering more frequently into the region. These unusual movements by western hummingbird species, as well as migration timing and winter occurrences of RTHUs, are correlated against GLOBE data to determine possible effects of atmosphere, climate, and land use, including the impact of global warming. As a new GLOBE protocol, Operation RubyThroat is just beginning to generate data for analysis. Operation RubyThroat's collaboration with GLOBE is funded by a grant from the National Science Foundation. Support for other aspects of the project comes from, among others, Agilent Technologies, ConocoPhillips (through National Fish and Wildlife Foundation), The Christensen Fund, and individual donors. Operation RubyThroat is an education, research, and conservation initiative of Hilton Pond Center for Piedmont Natural History ([www.hiltonpond.org](http://www.hiltonpond.org)) in York, South Carolina USA. URL: <http://www.rubythroat.org>

#### ED22C-1248 1330h POSTER

##### Idaho GLOBE- Implementing the Science Standards Through Preservice Teacher Education

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Integrating GLOBE into preservice teacher education is one strategy for improving science literacy, scientific inquiry skills, and teacher understanding of the nature of science. Elementary teachers typically receive minimal science as part of their preparation. This preparation often includes 2-3 introductory science courses. Introductory courses are often taught in large lecture formats with separate labs. GLOBE can be a mechanism for designing a field-based science course that prepares students to conduct long-term scientific inquiry projects and provide the appropriate experiences that can be replicated or transferred to the K-12 classroom. This also provides universities a mechanism to teach science that is aligned with the K-12 teaching, content, and assessment standards

#### ED22C-1249 1330h POSTER

##### Integrating GLOBE Into NASA Earth Science Satellite Missions Through Education and Public Outreach

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Both the Landsat 7 and EOS Aura missions have supported and utilized GLOBE science protocols as a major component of their Education and Public Outreach (EPO) programs. The Landsat 7 program adopted MultiSpec and the GLOBE MultiSpec tutorials as a basis for several web-based education products as well as for teacher professional development workshops. We have also introduced GLOBE Land Cover protocols as well as change detection activities in the Grow Smart website ([growsmart.gsfc.nasa.gov](http://growsmart.gsfc.nasa.gov)) and in workshops. The education effort for EOS Aura includes partnerships with the GLOBE Surface Ozone and Aerosols Investigations. The EPO program has also funded the development of a UV meter and the implementation of a GLOBE special measurement for UVA. In addition, Aura has hosted an Atmospheric Monitoring workshop for teachers and has introduced GLOBE Atmosphere Investigations to new audiences through partnerships with the American Chemistry Society and the Smithsonian Institution's National Museum of Natural History. We will provide a brief overview of these EPO efforts and focus on the GLOBE program in NASA EPO, and the evolution of our programs as a result of lessons learned through the implementation of both the Landsat 7 and the EOS Aura EPO programs.

#### ED22C-1250 1330h POSTER

##### Implementing GLOBE in Wisconsin

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GLOBE has had a mixed record in Wisconsin since the inception of the program. University of Wisconsin-Madison became a GLOBE partner in 1999, after over one hundred teachers had already been trained in GLOBE. Since then approximately additional one hundred or more teachers have been trained in one or more GLOBE protocols by us through a dozen workshops at various sites in Wisconsin. In order to improve the reporting of data by the GLOBE schools, we have undertaken directed efforts to help schools. The experience and success has been mixed perhaps due to changing school/teacher priorities and budgetary pressures. For GLOBE to become a true scientist-educator partnership and achieve its global potential much work lies ahead.

URL: <http://tellus.ssec.wisc.edu/outreach>

#### ED22D MCC: Level 2 Tuesday 1330h

##### Fixing the Holes in the Leaky Pipeline Posters (joint with OS, C)

Presiding: R E Bell, Lamont-Doherty Earth Observatory; C O'Riordan, AGU

#### ED22D-1251 1330h POSTER

##### Meeting the Challenges for Gender Diversity in the Geosciences

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Women are now routinely chief scientists on major cruises, lead field parties to all continents, and have risen to leadership positions in professional organizations, academic departments and government agencies including major funding agencies. They teach at all levels, advise research students, make research discoveries and receive honors in recognition of their achievements. Despite these advances, women continue to be under-represented in the earth, ocean, and atmospheric sciences. As of 1997 women received only 29% of the doctorates in the earth, atmospheric, and oceanographic sciences and accounted for only 13% of employed Ph.D.s in these fields. Women's salaries also lag; the median annual salary for all Ph.D. geoscientists was \$60,000; for women the figure is \$47,000. Solving the problem of gender imbalance in the geosciences requires understanding of the particular obstacles women face in our field. The problem of under-representation of women requires that earth science departments, universities and research centers, funding agencies, and professional organizations like AGU take constructive action to recognize the root causes of the evident imbalance, and enact corrective policies. We have identified opportunities and challenges for each of these groups. A systematic study of the flux of women at Columbia University enabled a targeted strategy towards improving gender diversity based on the observed trends. The challenge for academic institutions is to document the flux of scientists and develop an appropriate strategy to balance the geoscience demographics. Based on the MIT study, an additional challenge faces universities and research centers. To enhance gender diversity these institutions need to develop transparency in promotion processes and open distribution of institutional resources. The challenge for granting agencies is to implement policies that ease the burden of extensive fieldwork on parents. Many fields of science require long work hours but the geosciences are unique in their requirement of extended fieldwork in remote locations, which raises issues for parents, and may be one reason geosciences lags behind other science disciplines in gender diversity. AGU and AGI have both conducted comprehensive and important studies on the status of women in science at all levels. Conducting flux studies and identifying the decision points in the advancement of scientists will provide fundamental data for designing successful programs to enhance diversity in the geosciences. Professional organizations such as AGU and the Geological Society of America

should develop projects to monitor the career patterns of scientists, both men and women, beyond graduate school and the first job.

#### ED22D-1252 1330h INVITED POSTER

##### The ADVANCE Program: Targeting the Increase in the Participation and Advancement of Women in Academic Science and Engineering Careers

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The goal of NSF's ADVANCE Program is to help increase the participation of women in the scientific and engineering workforce through the increased representation and advancement of women in academic science and engineering careers. The Program tries to address this under representation by focusing on support for men and women with three approaches: institutional (Institutional Transformation), grass-root (Leadership), and individual (Fellows) support. The ADVANCE Program alternates with a round of Institutional and Leadership awards in one year and a Fellows competition the next. Since its inception in 2001, NSF has had two competitive rounds for each of the three award types and will have spent approximately 75 M\$ by the end of the next fiscal year (2004). The first and second ADVANCE Institutional Transformation competitions (FY 2001 and 2003) received over 70 proposals each. These awards are for multi-year support in the amount of 3-4M\$ each. Details and access to the websites for the ADVANCE programs of each institution can be found in NSF's ADVANCE webpage at <http://nsf.gov/home/crssprgm/advance/itwebsites.htm>. The number of proposals submitted for the Leadership awards competition dropped from 35 in 2001 to 26 in 2003, despite an increase in the allowed award size for the second round. In terms of projected goals, this part of ADVANCE is perhaps the most eclectic. Some Leadership awards were made to professional societies to work specifically with their respective scientific communities in identifying needs that might be peculiar to a field of science. In the first round of the Leadership awards, PI Mary-Anne Holmes of the University of Nebraska-Lincoln and collaborators received a grant to work with the Association of Women Geoscientists to determine the current status of women geoscientists in the US. These grantees hope to disseminate the information gathered under this award broadly in order to educate women students and faculty on strategies to overcome barriers, and to encourage women to pursue academic geoscience careers as well as teach administrators how to recruit and retain qualified women in geoscience. The ADVANCE Fellows competition includes eligibility for women in three broad categories: early-career; career interruption; and trailing spouse. The first Fellows competition took place in 2002 and received over 150 applications throughout the Foundation. The Directorate of Geosciences (GEO) received 26 proposals, approximately 18% of the total number, and second only to the Directorate of Biological Sciences (BIO). Of the 26 proposals, 5 were in Atmospheric Sciences (ATM), 9 in Earth Sciences (EAR), and 12 in Ocean Sciences (OCE). Proposal pressure in the Fellows competition was roughly correlated with the number of women in the respective fields. In GEO, the number of proposals reflected broadly the representation of women as PIs in the various Divisions, where OCE has the largest number of female PIs, followed by EAR and ATM, respectively. Of the pool of applicants in 2002 and 2004, approximately 50% were PIs that applied in the early-career (post-doctoral) category, with the other 50% composed of about half for each of the two other categories (spouse relocation and career interruption). Over the next two years, NSF hopes to have a significant portfolio of awards to start deriving some information on successful models for promoting the increase in the representation of women at higher levels of the academic career. Feedback to the members of the ADVANCE Implementation Committee is strongly encouraged as we continue to try to improve this program to better answer the needs of women in academia.

#### ED22D-1253 1330h INVITED POSTER

##### Mentoring, Women in Engineering and Related Sciences, and MentorNet

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Mentoring is a frequently employed strategy for retention of women in engineering and science. The power of mentoring is sometimes poorly understood,