you want both sides, we would have to have somebody in here screaming a conniption fit on the red end, because you are hearing a very optimistic side," Alley told the committee. "We wish Dr. Michaels and Dr. Lindzen were correct against the obsessed central value" of the chart.

"It's getting warmer," Alley summarized. "We keep hoping that we have overstated the impacts, that it will be better than that," he said. "But if you plot all of the unknowns, it could be a little better, a little worse, or a lot worse."

—RANDY SHOWSTACK, Staff Writer

MEETINGS

Understanding Trace Element and Isotope Cycling in the Arctic Ocean

U.S. Arctic GEOTRACES Planning Workshop; Washington, D. C., 29 September to 1 October 2010

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GEOTRACES is an international research program focused on understanding the cycling of trace elements and isotopes (TEIs) in the oceans. Since the inception of this program, there has been strong interest in carrying out studies in the Arctic Ocean. The Arctic Ocean is at the epicenter of climate change, and warming climate will likely have a profound impact on the carbon budget, geochemical cycles, and ecosystem of the Arctic. Furthermore, these changes will ultimately be felt globally, through feedbacks related, for example, to melting ice and release of carbon from permafrost.

This interest has led to several discussions, including a planning meeting held in Germany in June 2009 (http://www.ldeo.columbia.edu/res/pi/geotraces/documents/ArcticWorkshopReportNov09B.pdf). Participants at the 2009 workshop outlined important scientific issues and constructed a map of proposed GEOTRACES Arctic Ocean sections but did not formulate plans for implementation. Because of the logistical requirements and costs of working in the Arctic, participants recognized the need for international collaboration to make future GEOTRACES efforts viable in this region.

To focus these discussions and to generate an action plan for future GEOTRACES activities, a group of approximately 40 U.S. investigators, key international partners, and students met to discuss future Arctic collaborative undertakings. Although the meeting (funded by the U.S. National Science Foundation) was centered on a U.S. perspective, discussions were developed within an international framework to facilitate planning and sharing of infrastructure. During the first day, invited speakers presented an overview of existing, relevant U.S. and international programs and activities with an eye toward constructing large-scale international geochemical surveys of the Arctic. The complexity of such an undertaking indicates that a time frame for implementation would be of the order of 3–5 years and would ideally encompass an international, multi-icebreaker approach. It was agreed that planning discussions would be ongoing, and possible future international meetings were discussed.

This overview was followed by short advocacy talks by meeting participants suggesting TEI measurements suitable for application to Arctic geochemical processes. This led in the following 2 days to discussion of scientific issues that could be addressed within GEOTRACES; it was demonstrated that TEIs are tools that can provide insight into the current processes and interconnectivity of the Arctic system and the future trajectory of Arctic change, while providing important data to test model predictions. For example, as sea ice conditions evolve over the coming decades, the partitioning of chemical species such as micronutrients (e.g., iron) and anthropogenic contaminants (e.g., mercury and lead) between the ice and ocean will change, affecting the structure of the Arctic ecosystem and its relationship to surrounding human communities. Radionuclides deposited from the atmosphere (e.g., beryllium-7 and lead-210) can trace the pathways of atmospherically delivered species, particle reactive TEIs (e.g., thorium-234, lead-210, and polonium-210) can be used to assess changes in the biological pump, and assessment of the release of biologically required TEIs (such as iron and zinc) during the melting of sea ice in seasonally ice-covered areas can reveal possible ecosystem changes in the following decades. It was also recognized that relatively new approaches involving, for example, iron, lead, hafnium, uranium, radium, and silicon isotopes had the potential to identify the role of ice rafting in Arctic geochemistry and the contribution of river and groundwater sources to the Arctic Basin.

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Teachers Explore Earth Science in South America

Rain, Rocks, and Climate: A Geophysical Information for Teachers Workshop; Foz do Iguaçu, Brazil, 8–9 August 2010

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Classroom teachers and university professors from two continents joined to learn about "rocks, rain, and climate" in the Geophysical Information for Teachers (GIFT) workshop at the AGU Meeting of the Americas held in Brazil. This was the first GIFT workshop in South America. GIFT workshops have long been part of AGU Fall Meetings in San Francisco, European Geosciences Union Spring Meetings in Vienna, and other AGU conferences. Two Brazilian geoscience professors, Celso Dal Ré Carneiro of State University of Campinas and Nisia Krusche of Federal University of Rio Grande, organized the program, together with a high-school teacher from the United States, Michael J. Passow of Dwight Morrow High School, Englewood, N. J. Joining the presenters were 15 Brazilian teachers and another teacher from New Jersey.

GIFT workshops aim at enhancing the subject knowledge of middle- and high-school teachers through combinations of lectures by research scientists and examples of curriculum applications by master teachers. In this GIFT program, scientific topics presented in Portuguese and English included background overviews of South America's geology, geography, weather, and climate; weathering of rocks and the carbon cycle; satellite-based sensing technologies; and modeling climate change. Educational themes included challenges of teaching climate change; helping students and teachers understand remote sensing; and initiatives of the Brazilian Ministry of Education to promote distance learning and educational technologies that will increase access for students everywhere in the country. Archived versions of the slide shows and other resources (mostly in Portuguese, with some in English) are available at http://www.earth2class.org/brazil/GIFT%20Program.pdf and other Web sites. A bilingual paper from the workshop (Passow, M. J., Tropical Rainfall Measuring Mission: Bringing remote sensing of precipitation into your classroom, *Terræ Didatica, 6*, 3–8, 2010) is available at http://www.ige.unicamp.br/terraedidatica/.

The 2-day program provided a model for future teacher-professor-researcher