

Analysis, Integration and Modeling of the Earth System Young Scientist Network

The vulnerability and sustainability of the global human-environment system is poised on a threshold of uncertainty in the near- and long-term future. The future of the planet may at least be partly in the hands of young scientists. Because Earth system science has become increasingly integrative and the need for international communication is increasingly important, an international young scientist network was established in June 2005 as a key activity of the Analysis, Integration and Modeling of the Earth System (AIMES) project of the International Geosphere-Biosphere Programme.

The goal of this network is to facilitate communication between young scientists who work on a wide range of biophysical and chemical climate models, those who work on models that include human decision making such as land use models or economic models, and scientists who analyze the observations that test these models.

The network will promote collaboration between the natural and social sciences and the discussion of the human/natural environment system as an integral component of Earth system models. An important element of the network is to entrain participants from developing countries to contribute their expertise in quickly changing and highly vulnerable environments and to enhance the human resources in important regions of the globe that will be needed for future science projects.

As a step toward fuller integration of Earth system science, the AIMES Young Scientist Network was inaugurated at a workshop in Breckenridge, Colo., in June 2005. (The former name of the network, the International Postdoctoral Network for Earth System Science, was changed following the workshop.)

Participating in the three-day meeting were 52 young scientists from 18 countries (Argentina, Australia, Bangladesh, Brazil, Canada, France, Germany, Ghana, India, Italy, Nigeria, Poland, Portugal, Russia, Switzerland, United Kingdom, United States of America, and Zimbabwe). Conference participants reflected the broad geographic composition of the network members. While most participants are involved with the biological, chemical, and physical sciences, about one-fourth work on problems involving human decision making.

All participants presented a talk or poster on their research during the workshop. In addition, two invited senior scientists gave introductory presentations on the two workshop topics. The first topic, on "The end of nature? Human-Earth systems interactions," was introduced by John Reilly of the Massachusetts Institute of Technology (MIT), Cambridge, Mass., and the second topic, on "Is there a scenario in the class? Different views of the future (multi-scaled approaches to Earth system modeling)," was introduced by Ron Prinn of MIT.

The two workshop themes were well-reflected in participant presentations. One hot topic in the first session was how integrated assessment models were used by decision makers to understand scenarios that would achieve climate stabilization. Urbanization and urban development in the context of the global carbon cycle and climate change also were discussed. The discussions highlighted difficulties in quantifying uncertainties, particularly in the context of the human/natural environment system and the consequences to the policy and assessment communities. Participants noted that greater involvement of scientists with a background in the social sciences is needed to help deal with these important issues.

The second session was devoted to using a hierarchy of models to examine the complexities of the coupled biogeochemical-climate system at a local site, regional modeling

studies to meta-analyses of global climate change experiments. One of the foci of the session presented was the aspect of physical coupling between land, ocean, and atmosphere and the biogeochemical interactions. Discussions underlined the importance, when linking biophysical and climate system science, of applying a wide range of modeling tools, such as simple conceptual models, models of intermediate complexity, and full three-dimensional general circulation models based on primitive equations.

Overall, the presentations addressed integrative questions of a coupled human and natural science system. However, the focus of most of the presentations was on the development, improvement and application of the various models of the human and natural environmental processes themselves rather than on the coupled carbon-climate system.

Participants also discussed the future of the AIMES network and how this network should operate. Overall, there was enthusiasm for the idea of a network that would link together young scientists involved with Earth system science. Participants agreed to having future general workshop on an annual or biannual basis that would serve as a place to present recent research highlights and to discuss more general topics relevant to young scientists. Such topics could include discussions led by senior scientists about potential career paths, and how to present research to the general public.

Participants proposed that the next network workshop should be held in 2006 in the United Kingdom, jointly organized with the U.K. Natural Environment Research Council's Quantifying and Understanding the Earth System program. However, a firm decision has not yet been made.

Some participants also volunteered to organize smaller social or working meetings at existing larger conferences such as the AGU Fall Meeting or the European Geophysical Union assembly. Participants also suggested that the network organize or cosponsor tutorials on specific topics to broaden the researchers' knowledge. These topics can either address scientific questions such as the use of data assimilation in Earth Sciences or the social skills of the Young Sciences or the social skills of the young scientists such as improving communication skills.

Additionally, participants discussed how the network could reach more social scientists, for example, by advertising the network at respective conferences and meetings, such as the Open Science Conference of the International Human Dimensions Programme on Global Environmental Change. The expertise of social scientists is required in order to fully integrate the effects of humans into Earth system science.

The Advanced Study Program at the National Center for Atmospheric Research (NCAR), which cosponsored this workshop, has established a Web site to facilitate communication among the young scientists (<http://www.asp.ucar.edu/ess/>). The private part of the site includes short participant biographies and features an open forum to improve collaborations, discuss emerging topics in Earth system science, and link together on subprojects.

Workshop participants also discussed the possibility of developing formal links between this network and existing networks or institutions. A link with the Australian Earth System Science Network has since been established. Links with other institutions, such as the International Max Planck Research School on Earth System Modelling based in Hamburg, Germany, still need to be developed. The participants also discussed ways to expand the membership of the network.

Outside the formal agenda, small groups from different disciplines and even different continents formed as participants interacted through scientific discussions and social networking while hiking, biking, or sightseeing.

The inaugural workshop of the AIMES Young Scientist Network was held on 23–25 June 2005 in Breckenridge, Colo. More information is available at: <http://www.asp.ucar.edu/ess.html>. The workshop was supported by the U.S. National Science Foundation, AIMES, and the Advanced Study Program and the Societal-Environmental Research and Education Laboratory, both at NCAR, as well as by the home institutions of many of the participants.

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