



New Study Reveals Increased River Discharge to Arctic Ocean Finding Could Mean Big Changes to Global Climate

Researchers from the Marine Biological Laboratory's Ecosystems Center along with an international team of hydrologists and oceanographers have documented that the flow of freshwater from Arctic rivers into the Arctic Ocean has increased significantly over recent decades. If the trend continues, some scientists predict that this could impact the global climate, perhaps leading to the cooling of Northern Europe.

Ecosystems Center researchers Bruce Peterson, Robert (Max) Holmes, and James McClelland led the team of scientists from the United States, Russia, and Germany. They analyzed discharge data from the six largest Eurasian rivers that drain into the Arctic Ocean.

These rivers, all located in Russia, account for more than 40% of total riverine freshwater inputs to the Arctic Ocean.



Peterson and his colleagues found that combined annual discharge from the Russian rivers increased by 7% from 1936 to 1999. They contend that this

measured increase in runoff is an observed confirmation of what climatologists have been saying for years—that freshwater inputs to the Arctic Ocean and North Atlantic will increase with global warming. “If the observed positive relationship between global temperature and river discharge continues into the future, Arctic river discharge may increase to levels that impact Atlantic Ocean circulation and climate within the 21st century,” says Peterson.

A significant increase of freshwater flow to the Arctic Ocean could slow down or shut off the North Atlantic Deep Water formation, the driving factor behind the great underwater “conveyor belt” current known as thermohaline circulation. Thermohaline circulation is responsible for moving great amounts of thermal energy around the globe, influencing the planet's climate. One of the potential effects could be cooling of Northern Europe.

Data analyzed in this study, published in the December 13, 2002, issue of *Science* magazine (Peterson, B.J., R.M. Holmes, J.W. McClelland, C.J. Vörösmarty, I.A. Shiklomanov, A.I. Shiklomanov, R.B. Lammers, S. Rahmstorf. 2002. Increasing River Discharge to the Arctic Ocean. *Science* 298:2171-2173), is important because it represents net precipitation (precipitation minus evapotranspiration) over a vast area, in contrast to point measurements of precipitation and evapotranspiration which are difficult to extrapolate to a large area. “This data is a unique measure of an environmental trend both in terms of how long the time series is and in that it integrates over a vast area rather than just measuring a precipitation trend at a few locations,” says co-author Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research.

Project scientists are hopeful that this study, which links the work of hydrologists and oceanographers, will stimulate the two fields of science to better communicate their scientific findings with each other. The group will focus their future work on the links between the atmospheric, continental, and oceanic components of the Arctic hydrologic cycle and on the biogeochemical tracers that allow scientists to follow the circulation of riverine freshwater throughout the northern oceans. This research is needed to better understand the current functioning of the linked land-ocean-atmosphere hydrologic system and improve confidence in predictions of the future behavior of the system.

This project was funded by the Arctic System Science Program of the National Science Foundation.

Science News

From The Ecosystems Center...

Publications

Melillo, J.M., P. A. Steudler, J.D. Aber, K. Newkirk, H. Lux, F.P. Bowles, C. Catricala, A. Magill, T. Ahrens, and S. Morrisseau. 2002 Soil Warming and Carbon-Cycle Feedbacks to the Climate System. *Science* 298:2173-2176.

Peterson, B.J., R.M. Holmes, J.W. McClelland, C.J. Vörösmarty, I.A. Shiklomanov, A.I. Shiklomanov, R.B. Lammers, S. Rahmstorf. 2002. Increasing River Discharge to the Arctic Ocean. *Science* 298:2171-2173

From the Boston University Marine Program...

The Laboratory of Les Kaufman welcomed Jean-Francois Bertrand as a new graduate student. “JF,” as he is known, is studying plasticity in the larval and transition juvenile life history of coral reef fishes. JF is taking over from William Ojwang as Lab Manager.

William “Oweke” Ojwang of Kenya Marine Fisheries Research Institute is going home, to the shores of Lake Victoria to conduct the first phase of his doctoral field work. William is studying the sourcing of carbon and nitrogen to the Lake Victoria fish community, with a focus on stable isotopic signals. He will be looking at the dynamics that support the very important fishery for the introduced Nile perch, and scores of highly endangered indigenous species. Last year's doctoral graduate Jesse Schwartz constructed a mass balance model, which predicted that fishery and conservation objectives could be simultaneously optimized in Lake Victoria. William will see if the numbers actually work in the real world.

Jesse, in the meantime, has succeeded in his bid to develop a nearshore monitoring protocol for rockfishes in the Monterey area, and is busily collecting stable isotope samples for his reconstruction of the food web dynamics and how they are influenced by fishing pressure.

Les Kaufman attended the 2002 Mote International Symposium in Fisheries Ecology, a symposium on “Confronting Trade-offs in the Ecosystem Approach to Fisheries Management.” He presented a paper titled “Transition From Information

Continued...

The Ecosystems Center Announces New MBL course for Summer 2003 — *Arctic Ecology and Modeling: A Study Trip to Alaska*

Arctic Ecology and Modeling: A Study Trip to Alaska, has been organized by The Ecosystems Center. The course is intended to educate advanced undergraduate students and graduate students about the Arctic environment and to demonstrate the interplay between data collection and quantitative modeling. It will consist of a 10-day tour of the 400-mile northern half of the Dalton Highway from Fairbanks to Prudhoe Bay.

The new field course is designed to take advantage of a research project on BioComplexity (Land-water Interaction at the Catchment Scale: Linking Biogeochemistry and Hydrology), funded by the National Science Foundation at the Toolik Field Station (TFS) of the University of Alaska Fairbanks (see www.uaf.edu/toolik). The project is based at the TFS because of the wealth of scientific data and understanding built up on the streams, lakes, and tundra near Toolik Lake since 1975. Much of the research has been carried out in conjunction with the Arctic Long Term Ecological Research project (LTER) now in its 15th year.

The Arctic environment section of the course will consist of lectures and field demonstrations at the University of Alaska Fairbanks, then a drive north along the Dalton Highway across the Yukon River to Coldfoot. After one or two days there, course participants will be driven across the Brooks Range to the TFS where they will spend four or five days. One day will be spent crossing the Arctic Coastal Plain to Prudhoe Bay, at the Arctic Ocean.

Lectures and demonstrations will be given by John Hobbie (course director) and Gus Shaver of the MBL, Donald Walker and David McGuire from the University of Alaska, George Kling from the University of Michigan, and Joshua Schimel from the University of California at Santa Barbara. Topics will include the vegetation and ecology of the boreal forest, vegetation of the tundra, interactions of northern ecosystems with permafrost, the ecology of northern streams and lakes, nutrient cycling, hydrology, and biogeochemistry. At the end of this section of the course, students will have enough information about Arctic ecology to understand the goals, methods, and models of the BioComplexity project.

The second section of the course, the demonstration of the planning, implementation, data collection, and modeling of the project, will take place at the TFS under the direction of Marc Stieglitz of the Lamont Earth Observatory of Columbia University. Dr. Stieglitz will demonstrate the completed hydrology model of the site as well as the “under construction” soil chemistry and terrestrial ecosystem model. Students will gain an appreciation of how field data can be converted to process description and rates and of how processes and environmental information can be linked into a simulation model.

An important part of the course will be hikes in the Brooks Range and foothills to visit different landscapes and investigate the diversity of Arctic habitats.

For more information, see the web site at courses.mbl.edu/ (Other Programs) or contact Debbie Scanlon, course coordinator, at dscanlon@mbl.edu. The course is limited to 10 students.



MBL/WHOI Library News

The staff of the MBL/WHOI Library thanks everyone who commented on the proposed list of journal changes for 2003. The result will be a much more efficient use of Library funds and the addition of some highly requested resources, including WEB of SCIENCE—the web version of Science Citation Index. This subject-searchable database offers cited reference searching by author and by links from an article's cited references.

With your input and that of the Joint Library Advisory Committee, the staff of the MBL/WHOI Library continues to build a unique and significant collection that supports current research conducted by the Woods Hole scientific community. The Library is also migrating journal titles from print to online so it can best serve the scientific community and provide onsite and remote access to scientific information 24 hours per day/7 days a week. When new titles are requested, the Library seeks to license online journals rather than purchase print versions (except in the few cases where images/micrographs and maps render the online version inadequate for scientific need). The Library is also working with vendors to link its scientific databases directly to the full-text of these subscriptions to facilitate information discovery and seamless access to articles.

Science News continued

Rags to Riches in the Management of Fishery Impacts” detailing the science necessary to support ecosystem-based management, and early results from a statewide experimental design in California created to achieve the necessary level of information flow.

From the Laboratory of Jennifer Wernegreen...

Publication:

Wernegreen, Jennifer J. 2002. Genome evolution in bacterial endosymbionts of insects. *Nature Reviews Genetics*. Nov. 3(11):850-61.

From the Laboratory of Lionel Jaffe...

MBL Senior Scientist Lionel Jaffe and Robbert Creton of Brown University are in the process of creating a glowing (aequorinated) mouse with which they expect to test a new calcium-based theory of the origin of cancer. This research is being conducted at Brown University.

A Message from the Equal Employment Opportunity Coordinator

Ten Resolutions for the New Year from the EEO Office

1. Be tolerant of other people and their ideas no matter how different they are from your own.
2. Be positive in your daily outlook and create a pleasant work environment.
3. Be kind to a co-worker and do a good deed for him/her that you don't tell anyone about.
4. Be observant of individuals with disabilities who might need assistance and help them in a respectful way.
5. Be mindful of behavior that could be interpreted as sexually harassing.
6. Be quick to report any signs of harassment or discrimination to the EEO Coordinator at x7378 or eeo@mbledu.
7. Be friendly and seek out someone at the MBL you don't know.
8. Be sure to contact MBL's Employee Assistance Program at 1-800-649-8115 if you or a co-worker or a family member are having trouble with drugs or alcohol.
9. Be social and participate in an MBL activity to make yourself a part of the community.
10. Be thankful that you are employed at the best marine lab in the world!

—Jane MacNeil, eeo@mbledu



Recent Gifts and Grants

The G. Unger Vetlesen Foundation renewed its grant of \$350,000 in support of the Josephine Bay Paul Center for Comparative Molecular Biology and Evolution, for the program to develop the Marine Resources Program in Biomedical Models, and to support veterinary services at the MBL.

The Cox Foundation, Inc. made a contribution in the amount of \$53,500 to the MBL unrestricted fund.

The Seth Sprague Educational and Charitable Foundation contributed \$10,000 to the MBL unrestricted fund.

The Worthington Family Foundation, Inc. has provided a grant in the amount of \$9,500 to help underwrite the Ecosystems Center's *Semester in Environmental Science*.

NASA awarded \$667,541 (over three years) for "Key Connections in Amazonian Stream Corridors." Linda Deegan and Christopher Neill are the principal investigators.

The National Institutes of Health (NIH) awarded the following grants:

- \$1,395,000 (over five years) for "Erythroid Transporter Function in Hemoglobin Synthesis." Orfan Shirihai is the principal investigator.
- \$574,620 (over three years) for "Lipid Signal Transduction and Oscillatory Insulin Secretion." Peter Smith, Orfan Shirihai, and Stefan McDonough are the principal investigators.

The National Science Foundation (NSF) awarded the following grants:

- \$206,663 for "BIOCOMPLEXITY: Feedbacks between Ecosystems and the Climate System." Jerry Melillo is the principal investigator.
- \$124,900 for "Harvard Forest LTER Program." Jerry Melillo, Knute Nadelhoffer, and Paul Steudler are the principal investigators.
- \$115,384 for "IRCEB: Nitrate Uptake and Retention in Streams: Mechanisms and Effects of Human Disturbances from Stream Reaches to Landscapes." Bruce Peterson is the principal investigator.

Employee News

Please welcome the following new employees:

Robert Sabatini, Assistant Scientist, Bay Paul Center
Ruth Coburn, Laboratory Admin. Coordinator, Furie Lab
Barbara Keeler, Research Assistant Ecosystems Center

Emergency Storm Closings

In the rare case that the MBL has to delay or cancel work before 8 AM due to weather conditions, the following radio stations will be notified by the MBL at approximately 5:30 AM:

WCIB 101.9 FM WMVY 92.7 FM.

We have no control over the actual announcement schedule, but expect the first announcements to be made at approximately 6 AM. Lab closings or delays in openings will usually be based on the anticipated weather conditions for 8 AM in Woods Hole and the condition of the MBL parking lots specifically. For information about MBL Operations Status, call (508) 289-7MBL.

Weather in your area may differ considerably. Therefore, on days when the MBL is open, but weather conditions are questionable, you must gauge your own safety risk based on these conditions. If you believe that conditions warrant no travel, you may exercise the MBL's liberal leave policy. All employees are required to notify their supervisor or the Human Resources Office if they are unable to report for work on a storm day.

Under the liberal leave policy, employees unable to get to work safely may take leave without pay or a vacation day (if the employee has sufficient accrued vacation time). MBL personnel are expected to report to work if conditions allow. All "Essential Personnel Category 1: Winter Storm Conditions" are expected to report for snow removal and clean-up.

January 2003 Calendar

Wednesday, January 1

Happy New Year!

MBL Closed

Friday, January 10

Falmouth Forum Presentation

“Experiences of an American
Ambassador to Iceland”

Ambassador Day O. Mount

Former U. S. Ambassador to Iceland,
1996 - 1999.

A buffet dinner will be held before the presentation in the MBL's Swope Center at 6:00 PM. Dinner tickets are \$15 and must be purchased in advance at Eight Cousins Children's Books, Falmouth or at the MBL Communications Office. Seats are limited. No dinner seats will be sold after Tuesday, January 7. For more information, please call the MBL Communications Office at (508) 289-7423. Admission to the lecture is free.
Lillie Auditorium, 7:30 PM

Tuesday, January 7

The Ecosystems Center Seminar

TBA

Michael Neubert, WHOI

Whitman Auditorium, 12:15 PM

Monday, January 13

BUMP Research Discussion

Jennifer Bowen, Ph.D. Candidate

TBA

Loeb 32, Noon

Tuesday, January 14

The Ecosystems Center Seminar

“Detritus fuels ecosystem metabolism but not metazoan foodwebs in San Francisco estuary's freshwater delta”

William V. Sobczak, College of the Holy Cross

Whitman Auditorium, 12:15 PM

Monday, January 20

BUMP Research Discussion

Carolyn Miller, Ph.D. Candidate

TBA

Loeb 32, Noon

Tuesday, January 21

The Ecosystems Center Seminar

“Linking plant communities to soil microbial communities and processes in old-fields”

Laura Broughton, MBL

Whitman Auditorium, 12:15 PM

Monday, January 27

BUMP Research Discussion

Gregory Skomal, Ph.D. Candidate

TBA

Loeb 32, Noon

Tuesday, January 28

The Ecosystems Center Seminar

“Nitrogen limitation in a tropical secondary forest”

Eric Davidson, Woods Hole Research Center

Whitman Auditorium, 12:15 PM

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Please direct questions and comments to the

MBL Communications Office,

7 MBL Street, Woods Hole, MA 02543
(508) 289-7423; comm@mbl.edu

