



MATHEMATICS AND WEATHER AND CLIMATE RESEARCH

San Diego, California – January 9, 2013 – How does mathematics improve our understanding of weather and climate? Can mathematicians determine whether an extreme meteorological event is an anomaly or part of a general trend? Presentations touching on these questions will be given at the annual national mathematics conference in San Diego, California. New results will also be presented on the MJO (pronounced “mojo”), a tropical atmospheric wave which governs monsoons and also impacts rainfall in North America, and yet does not fit into any current computer models of the weather.

These research presentations are part of the U.S. launch of Mathematics of Planet Earth 2013 (MPE2013), an international effort by the mathematics community to make lasting contributions to the well-being of planet Earth. More than one hundred academic institutions and scholarly societies from around the world are partners in the MPE2013 effort. The U.S. launch occurs on Wednesday, January 9, at the Joint Mathematics Meetings, the world's largest annual mathematics conference. This year, the conference takes place at the San Diego Convention Center. The Simons Foundation, a major supporter of MPE2013, is sponsoring an international public lecture series—the “MPE2013 Simons Public Lectures”—at nine locations throughout the world during 2013: ranging from Melbourne, Australia, to San Francisco, and Cape Town, South Africa.

Over the course of the MPE2013 year, U.S. mathematics research institutes will host several programs that will marshal the resources of the mathematical science research community in an effort to address key issues related to planet Earth.

Long-term programs include:

- "[Materials for a sustainable energy future](#)" at the Institute for Pure and Applied Mathematics (IPAM) in Los Angeles, and
- "[Ecosystem dynamics and management](#)" at the Mathematical Biosciences Institute (MBI), based at The Ohio State University.

A summer school, "[Mathematics of seismic imaging](#)," will be held at the Mathematical Sciences Research Institute (MSRI), in Berkeley, California.

An additional 15 research workshops nationwide will address questions such as, "How do we model outbreaks of Dengue fever?"; "What role do oceans play in climate uncertainty?"; "How does climate change affect the way that species spread?"; and "How can we use earthquake data to 'see' the Earth's interior?"

Events at the San Diego mathematics conference, January 9-12:

In addition to the [MPE2013 kickoff reception](#) on Wednesday, January 9, MPE2013 events taking place at the Joint Mathematics Meetings in San Diego include:

[Mathematics and the melting polar ice caps](#)

Ken Golden, professor of mathematics at the University of Utah and recently back from Antarctica, will give the *MAA-AMS-SIAM Gerald and Judith Porter Public Lecture* at 3pm on Saturday, January 12, at the San Diego Convention Center.

In the summer of 2012, the area of the Arctic Ocean covered by sea ice reached its lowest level ever recorded, reduced to about half the extent compared to the 1980s. This lecture will describe how the latest research uses mathematical models of composite materials and statistical physics to study critical sea ice processes such as freezing and melting. The lecture will be accompanied by video from recent Antarctic expeditions. Members of the public are invited to this lecture. A preview of Ken's talk, in which he discusses his recent experience in Antarctica, is at

http://jointmathematicsm meetings.org/meetings/national/jmm2013/2141_speakers#ken

[The polar oceans and climate](#)

On Wednesday, January 9, Emily Shuckburgh, a climate scientist with the British Antarctic Survey, will deliver an AMS-MAA Invited Address. The title of her talk will be "Using Mathematics to Better Understand the Earth's Climate."

Dr. Shuckburgh is the leader of the Open Oceans research group, which is focused on the role of the polar oceans in the global climate system.

[How the atmosphere got its mojo](#)

A huge traveling wave in the atmosphere called the Madden-Julian Oscillation (MJO), pronounced "mojo," floats over the tropics and governs both short- and long-term weather patterns. The MJO extends hundreds of miles, travels 10–15 miles per hour, and takes 1–2 months to complete its cycle. The MJO tends to be more active a year before an El Niño event, and it tends to be less active during El Niño. The MJO has a major influence on monsoons in the tropics, and a somewhat lesser impact on rainfall in North America – primarily on the winter rains in the western United States.

Despite its importance, the MJO is not predicted by current weather models. Understanding the MJO presents a challenge to atmospheric modeling, but promises new insights into the complex system that is our weather.

Samuel Stechmann, mathematics professor at the University of Wisconsin, will describe a new model of the MJO at a lecture on Thursday, January 10. The talk, titled "The skeleton of the Madden-Julian oscillation: a nonlinear oscillator model," will describe joint research with Andrew Majda of the Courant Institute of Mathematical Sciences at NYU. The work will appear in the journal *Nonlinearity*.

[Was Hurricane Sandy an extreme weather event or due to a changing climate?](#)

Important climate issues, such as sea level rise, snow-cap cover estimates, glacier dynamics, greenhouse gas estimates, global temperature, and whether we are experiencing a weather event (an unusually hot summer) or a climate phenomenon (global rise in temperature), depend on the establishment of an unambiguous trend. Researchers at the University of Arizona, Juan M. Restrepo, Darin Comeau, Shankar Venkataramani, and Hermann Flaschka, address the shortcomings or inapplicability of conventional statistical methods to capture a trend in these and other geoscience problems.

On Friday, January 11, Juan M. Restrepo, group leader of the Uncertainty Quantification Group and the faculty in the Mathematics Department at The University of Arizona, will deliver the talk “How Do You Determine Whether the Earth is Warming Up?”

More about MPE2013

Mathematics of Planet Earth 2013 (mpe2013.org) is an initiative of over 120 scientific societies, research institutes, universities, and organizations all over the world. The mission of the project is to encourage research in identifying and solving fundamental questions about planet Earth, encourage educators at all levels to communicate the issues related to planet Earth, inform the public about the essential role of the mathematical sciences in facing the challenges to our planet, and to encourage young people interested in sustainability and global issues to consider mathematics as an exciting career choice. MPE2013 enjoys the patronage of UNESCO, the United Nations Educational, Scientific, and Cultural Organization. The [Simons Foundation](#) is a major supporter of MPE2013 and the sponsor of the international “MPE2013 Public Simons Lectures” at nine locations throughout the world in 2013.

For more information, please see www.mpe2013.org/newsroom or contact:

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