GPC Newsletter

February 2015

APS TOPICAL GROUP ON THE PHYSICS OF CLIMATE

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Message from the Editor

This is the third GPC Newsletter, timed like the first two with the APS March Meeting. We would like to increase the frequency of the Newsletter to at least twice per year, and this is where you, the GPC membership, can be of enormous value. We invite comments, event notices, letters, and especially specific suggestions for content. Any of the above, addressed to GPCnews@aps.org, will be gratefully acknowledged in a timely fashion.

Welcome from the GPC Chair, *John Wettlaufer, Yale University*

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As we approach the third March Meeting with GPC presence, it seems prudent to reflect a little and project a little as our fledgling organization steers its course amongst the more traditional organizations within the APS. First, I would like to reflect on the core goals and approaches that underlie the GPC's foundation and modus operandi. It has now been said in many places within the GPC's web-sphere that despite the evidently politically charged environment in which the science of climate exists, our goal is to "spread the science" and to invite broad participation from within and without the APS in embracing the scientific challenges that pepper climate science. Our organization is often conflated with the APS Panel on Public Affairs (POPA), one of whose duties is to draft the APS statement on climate change. Public affairs are outside the purview of the GPC mandate and hence GPC and POPA play distinct roles. Second, we are successfully, but slowly, drawing in new interests within the APS and matching some common interests between traditional climate science practitioners and APS Divisions, such as the Division of Fluid Dynamics, with whom we organized an Invited Session on Dynamical Cores in climate models. Indeed, because of the nature and union of the activities of the Topical Group on Statistical and Nonlinear Physics, it is natural and timely to initiate similar cooperation with their membership.

Projecting into the future we see collaborative activity within the APS as a central goal. There is no debate about the fact that the Earth's climate is a complex nonlinear dynamical system, whose intrinsic processes range over enormous spans of time and space.

UCAR's role in climate science: Connecting a worldwide community

Continued on p. 2

Thomas J. Bogdan, President, UCAR

The University Corporation for Atmospheric Research (UCAR) is a national and international hub for scientific research, education, and advanced technology development. Its roots go back to the late 1950's, when scientists on the faculty of fourteen U.S. universities created the nonprofit organization. In partnership with the National Science Foundation (NSF), they established the National Center for Atmospheric Research (NCAR) in 1960 as a federally funded research and development center that allows the community to carry out complex, long-term scientific programs beyond the reach of individual universities.

Since its inception, NCAR has been managed by UCAR on behalf of NSF to address pressing scientific and societal needs involving the atmosphere and its interactions with the oceans, ice, land, and Sun—the multidisciplinary field known as Earth system science. As the need for additional services arose, the organization added several UCAR Community Programs in support of the community's education and research goals. Today, the UCAR consortium includes more than 100 North American colleges and universities with programs focused on research and training in our multidisciplinary field.

Welcome from the GPC Chair –

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Importantly, however, is the fact that similar challenges are embraced by many other scientific enterprises that have traditionally been under the umbrella of the APS. For example, consider the issues recently brought up in the Planck/Bicep/Keck analyses of the polarization (the so-called B-mode) of the cosmic microwave background radiation or sifting through the enormous data sets generated at the LHC at CERN or RHIC and the NSLS-II at BNL. The expertise in extracting signal from noise with a wide swath of our core community most certainly can play a role in examining the data sets of the Earth system. From the theoretical perspective, the methods of statistical physics are general for a reason—they are based on inviolable processes describing the elemental structure of macroscopic systems. Physicists have been successfully attacking problems, from biology to engineering using the toolboxes of statistical mechanics and, perhaps more importantly, many of these "applications" have led to the invention of entirely new approaches. So too is the case with climate science—it offers a swath of exciting opportunities for those of us trained in one of the many core disciplines of physics and the GPC is hopefully demonstrating these opportunities through education and discussion. We are under no illusion concerning the activation barriers towards progress. For example, although some key early advances in molecular biology were made by physicists, or using methods from physics, many decades later we have an APS Division of Biological Physics. However, a young physicist who is taken in by the challenges of the biological sciences needs to take on an important task—learning some biology! For physicists hoping to make an impact in biology a key starting point is to do something that is of interest to biologists. The point is that by replacing "biological science" with "climate science" in this example we are inviting the membership to the table, where they will meet a vast range of challenges, from the theory of turbulence and computational physics to the zoology of geochemical proxies and the complexity of geophysical data. New ideas will emerge from perspectives that come from the range of approaches used across the APS membership.

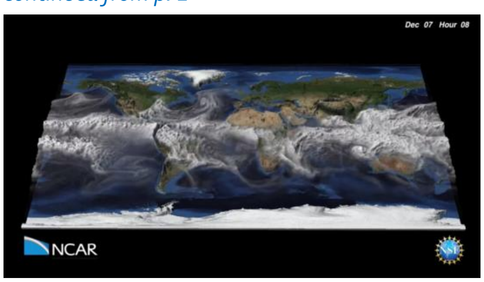
As a means to reduce some of the activation barriers we have organized a Tutorial to launch the March Meeting, during which we are very fortunate to have four leading researchers collectively giving a short course on key aspects of the physics of climate. We then have two Focus sessions and an Invited session that delve into more technical aspects of a range of processes, perhaps particularly relevant to other areas of physics is the latter session on Stochastic Effects in Atmospheric and Oceanic Dynamics. In this session it is hoped that the membership will see that fundamental approaches used are immediately relevant to a myriad of other fields. These sessions are described in more detail below.

Such a span of approaches has been playing out in Woods Hole Massachusetts for more than half a century at the Geophysical Fluid Dynamics (GFD) Summer Program. Having been affiliated with the program for some time now, and having a good understanding of its history and its mode of operation, I believe it to be of interest to the APS membership broadly, as it reflects in large part the challenges described above. To quote from the program profile "The GFD Program began in 1959 at the Woods Hole Oceanographic Institution with the aim of introducing a then relatively new topic in mathematical physics, geophysical fluid dynamics, to graduate students in physical sciences. It has been held each summer since and promotes an exchange of ideas among the many distinct fields that share a common interest in the nonlinear dynamics of rotating, stratified fluids. These fields include classical fluid dynamics, physical oceanography, meteorology, astrophysics, planetary atmospheres, geological fluid dynamics, hydromagnetics, and applied mathematics." It is a melting pot of disciplines held together by a common passion for mathematics and physics, and I invite you and your students look into it on the web.

Finally, in addition to my other colleagues on the GPC Executive Committee, and Peter Weichman editing the Newsletter, I would like to thank Bob Behringer, the Past Chair of the GPC, who has done so much in the last few months that I wonder if next year is going to be more challenging than this one has been already?

UCAR's role in climate science –

continued from p. 1



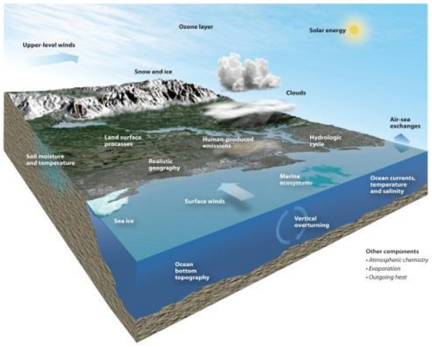
Advancing climate science

From NCAR's earliest days, scientists in its Climate & Global Dynamics group have played major roles in advancing our understanding of the key physical processes in Earth's climate system and how they interact. Representation of those interactions within a climate model builds on the same set of equations first posited by Norwegian meteorologist Vilhelm Bjerknes in the early 20th century to describe atmospheric motion. In 1964, Warren Washington and Akira Kasahara began with those equations to develop NCAR's first general circulation model of the atmosphere.

Today, the NCAR-based Community Earth System Model, which is freely available for use by the national and international research community, enables simulations of the Earth's past, present, and future climate states. The CESM fully couples the major components of the Earth system, including oceans, land surface, sea ice, and atmosphere, along with an increasing number of processes that influence climate behavior. Its development is made possible by NSF and the Department of Energy, with additional support from NASA.

Hundreds of researchers and model developers at NCAR and their colleagues at universities and laboratories around the world collaborate to continually refine and extend each component of CESM. The

model's twelve working groups reflect the scope necessary to encompass the complexity of atmosphere-Earth interactions. Iterations of the CESM (previously known as the Community Climate Model and then the Community Climate System Model) have been used to create many of the simulations that underpin the research assessments of the Intergovernmental Panel on Climate Change in each of its major reports (see, for example Climate Change 2013, the Physical Science Basis, IPCC/AR5/WG1, 2013).



The collaborative hub model pioneered by our organization also serves the climate research community with a variety of related activities:

• The Climate Data Guide is an NCAR-based community portal combining data discovery, metadata, and figures for more than 170 data sets with expert commentary on the strengths, limitations and applications of those data sets.

• The Regional Integrated Science Collective within NCAR's Institute for the Study of Mathematics Applied to the Geosciences focuses on generating regional-scale information about climate change for use in impacts and adaptation studies.

• NCAR's Climate Science and Applications Program focuses on multidisciplinary activities that connect an active group of physical and social scientists to explore the interconnections between society and the climate system.

• NCAR's Earth Observing Laboratory supplies engineering, research expertise, and collaborative opportunities that lead to major advancements in observing technology to better understand climate. The lab provides observing facilities, from mobile ground units to research aircraft, along with support for multiagency field campaigns and the research and data services needed to advance the scientific understanding of weather, water, climate, chemistry, and other aspects of the Earth system.

Delivering climate services

The need by planners and decision makers for regional information about climate change impacts has spurred development of new initiatives in climate services. At UCAR and NCAR, as well as our partners in the university community, climate services include data visualization and delivery, training and education, and decision support services, as well as the activities outlined above. Much of this work is coordinated through UCAR's new Climate Services initiative.

For example, UCAR's Unidata program provides data analysis tools, fosters a collaborative user community, and streams a wealth of observational data in real time into thousands of classrooms and research labs across the United States and around the world.

To further build our collaborative networks, we are developing a Climate Services Directory featuring the diverse expertise of our university consortium. Our education materials include climate teaching boxes for K-12 teachers and training modules for geoscience professionals and university students.

The UCAR Climate Services Evaluation program is a key ingredient in delivering climate knowledge developed by NCAR and our university partners to decision makers.

A voice for science

The activities outlined above are but a small sample of our efforts to advance climate science. We keep the research community, decision makers, and the public informed through our AtmosNews website and e-newsletter. Many of our collaborative activities across NCAR and UCAR are highlighted on our Opportunities pages, which include visitor programs, internships, fellowships, and workshops focused on climate.

A lesser-known yet vital role we play on behalf of climate and Earth system science takes place in the meeting rooms and hallways of our national and state capitals. The 104 colleges and universities in our consortium have charged UCAR with providing nonpartisan information and advocacy for science-based policies. We serve the atmospheric and related Earth system sciences community by

• highlighting the importance and impact of our science on policy and legislative issues of the day;

• identifying and advocating for research priorities critical to our nation and planet;

• acting as a neutral, fact-based voice on weather, climate and research policies;

• helping atmospheric scientists effectively engage in the policy process;

• building consensus for initiatives that enhance the community's success and standing in Washington, D.C.

We report on these activities through the UCAR Washington Update, which is available online and by email subscription.

In 2013 we began a collaboration with the United Nations Foundation to connect experts in climate science with local communities across the country. The Climate Voices speaker network is helping increase public understanding of what we know, our levels of confidence in our knowledge, and the areas we are still exploring to bring the best information possible to bear on one of the crucial scientific and societal challenges of our era.

As we look to the future, we will be guided by the mission, vision, and goals outlined in UCAR's next strategic plan (draft available on my website) to continue our efforts across these and many newly emerging fronts in climate research, education, and services. If this article has inspired you to become more involved, I invite you to contact me (president@ucar.edu).

GPC 2015 Executive

Chair (through 2015):

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GPC Executive Committee Members-at-Large and Newsletter Editor:

Left to right: Judith Curry (12/2015), Dan Rothman (12/2015), Sharon Sessions (12/2016), Morgan O'Neill (Student Member, 12/2016), Peter Weichman (Newsletter Editor, 12/2015).

GPC Program Committee

Left to right: Juan Resptrepo, (Chair), John Wettlaufer, Robert Behringer

The role of the Program Committee is to work with the Executive Officers in scheduling contributed papers within areas of interest to the GPC and in arranging symposia and sessions of invited papers sponsored by the GPC at Society meetings. From time to time the Program Committee may also organize special GPC meetings and workshops, some with and some without the participation of other organizations.

GPC Nominating Committee

Left to right: Robert Behringer (Chair), Sharon Sessions, James Brasseur, and Warren Warren

The role of the Nominating Committee is to prepare a slate of candidates for the open elected positions each year. The Nominating Committee shall also respond with appropriate names to the Society's call for nomination for senior Society positions.

2015 APS March Meeting Events

GPC Tutorial: The Physics of Climate Change

Sunday, March 1, 2015

1:30 p.m. - 5:30 p.m.

Organizers: Prof. Robert Behringer, Duke University and John Wettlaufer, Yale University

Instructors:

- **Kerry Emanuel, MIT**
- **Daniel Rothman, MIT**
- **Sam Stechmann, University of Wisconsin-Madison**
- **Mary-Louise Timmermans, Yale University**

Topics :

- **Pedagogical overview**
- **Review of the state of the art**
- **Questions of current research interest**
- **Research and funding opportunities**

The Tutorial on Climate Physics has two goals and several overlapping target audiences. The first goal is to present the state of contemporary climate research in order to provide researchers at all levels a greater knowledge of the real issues, and to provide a stepping stone for those who are interested in entering the field of climate science. The tutorial will begin by providing a pedagogical overview of the core physics principles at play in climate science and how they impinge on the key open questions in the field.

The second goal is a more detailed examination of open questions, and is taken up with an emphasis on connections between physics principles and methods. As such, the tutorial can provide guidance for researchers at all levels who want to apply their expertise in allied disciplines to the field of climate science.

The tutorial may be of particular interest to researchers who work in the areas of dynamical systems, fluids mechanics, or statistical and nonlinear physics and their allied sub-disciplines, as they impact directly or indirectly on climate physics. These areas are represented in the APS structure by the Topical Group on Statistical and Nonlinear Physics, the Division of Fluid Dynamics, and by the Topical Group on the Physics of Climate (the March Meeting is the annual meeting for GSNP and GPC).

Young researchers at the student or postdoctoral level are of particular interest, as are established researchers with either a general interest in the topic or a motivation to tackle problems that parallel their skills and inclinations. A more extended list of subfields underlying climate research includes fluid dynamics, nonlinear and complex systems, gas, condensed and interfacial phase behavior, radiation/heat transfer, phase transitions, measurement science, computational physics, statistics, biophysics, chemical physics, and geophysics.

Recent experience at the last two March Meetings suggests that the target audience for the tutorial is large: the GPC invited and focus sessions at the past two March Meetings have attracted substantial audiences.

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GPC Invited Session: Stochastic Effects in Atmospheric and Oceanic Dynamics (Session G20, 11:15 am – 2:15 pm, Tuesday, March 3)

Despite understanding many fundamental physical principles underlying geophysical flows and the complex nonlinear interactions that determine the weather and, on longer space and time scales, Earth's climate, the predictive power of theory and computation is inevitably limited by uncertainties associated with unresolved dynamical processes. Small-scale turbulence and mesoscale chaos in the ocean and atmosphere act on macroscopic motion of the climate in much the same qualitative manner as molecular collisions act on a Brownian particle. For example, one longstanding challenge for physical meteorology and oceanography is to understand the quantitative influence of high frequency – perhaps white noise – forcing. Realistically modeling such phenomena, and then reliably analyzing the resulting models, requires understanding both the power and limitations of stochastic dynamical descriptions of complex multi-scale systems. Moreover, understanding the essential physical processes in much simpler, but experimentally testable systems such as turbulent thermal convection, provide crucial insight for complex geophysical systems. The five distinguished scientists presenting at this symposium will explain modern methods and examples from the theory of stochastic processes that advance our understanding of probabilistic models and predictability of geophysical dynamics and its influence on the Earth's climate from equatorial to polar regions.

OLIVER BÜHLER
Professor of Mathematics and Atmosphere Ocean Science Courant Institute of Mathematical Sciences New York University

Title: Big science with little data: separating random waves from vortices in atmosphere and ocean fluid dynamics

Synopsis: How to extract physical and conceptual meaning from limited data sets has been a perennial problem in atmosphere ocean science. Dynamics aliasing refers to the situation when physically different processes project into the same data stream. Indeed, it is well known in atmosphere ocean science that random waves and vortices overlap and intermingle in a complex wave-turbulence jig-saw puzzle, which we need to solve! This talk describes recent progress on this problem, which led to a new method to decompose one-dimensional data into its wave and vortex constituents. Applications to oceanic data sets and to the famous Gage –Nastrom spectrum in the atmosphere are presented, with surprising results.

CHARLES R. DOERING
Professor of Physics, Mathematics, and Complex Systems
U. Michigan

Title: Convection, Stability, and Turbulence

Synopsis: Buoyancy-driven flows play a major role in geophysical fluid mechanical processes and their transport properties and are central to climate dynamics. The simplest setting to study this phenomena is so-called Rayleigh-Bénard convection, the buoyancy driven flow in a horizontal layer of fluid heated from below and cooled from above. This seminal problem has received tremendous attention over the last century but many riddles remain, especially regarding strongly nonlinear turbulent convection. In this presentation I will describe some recent results that mathematical analysis has contributed to our understanding of turbulent heat transport.

BALU NADIGA
Scientist
Los Alamos National Laboratory

Title: A look at two disparate limits of the climate system: oceanic sub-mesoscales and global energy balance

Synopsis: A common theme underlying this journey across scales is that of energy balance. The first topic considers scales from a few tens of meters to a few tens of kilometers and grapples with a fundamental question that concerns energetics of ocean circulation: how does ocean circulation equilibrate in the presence of continuous large-scale forcing and a tendency of geostrophic turbulence to confine energy to large and intermediate scales. In particular, interior instabilities are shown to provide an energy pathway between the largely-balanced, energetic oceanic mesoscales and smaller unbalanced scales The second topic zooms out to the global scale and considers global warming from an energy balance perspective. With the global ocean sequestering in excess of 90% of recent warming due to energy imbalance at the top of the atmosphere, sensitivity and depth of penetration of warming are characterized in a probabilistic fashion.

SAMUEL STECHMANN
Assistant Professor
Dept. of Mathematics
University of Wisconsin – Madison

Title: Stochastic models for tropical convection and extreme rainfall events

Synopsis: In the Tropics, storms and convection occur intermittently and have a major impact on weather and climate. In recent years, tropical rainfall statistics have been shown to conform to paradigms of critical phenomena and statistical physics. This talk presents simple stochastic models for the statistics of precipitation events and water vapor dynamics. Through exact solutions and simple numerics, a suite of observed rainfall statistics is reproduced by the model, including power-law distributions and long-range correlations. The key ingredients of the model are the dynamics of column water vapor, governed by a combination of Gaussian stochastic forcing and nonlinearity provided via a threshold and/or stochastic trigger.

JEFFREY B. WEISS
Associate Professor
Department of Atmospheric and Oceanic Sciences
University of Colorado, Boulder

Title: Climate Variability and Nonequilibrium Steady-States

Synopsis: The climate system is forced by incoming solar radiation and damped by outgoing long-wave radiation. As a result, the climate system is not in thermodynamic equilibrium but is residing in a nonequilibrium statistically steady-state. Nonequilibrium steady-states have internal fluctuations which appear as natural variability of the climate system. Additionally, the phase space has nonzero probability current loops which are manifested as preferred patterns of natural climate variability. Simple stochastic models have been applied to a variety of climate phenomena including El-Niño, the North Atlantic Gulf Stream, surface temperature patterns, ocean heat content, and atmospheric Storm Tracks. In their simplest form, these models describe a stable steady-state with linear nonconservative damping perturbed by additive Gaussian white noise and thus fall into the class of models capturing nonequilibrium steady-states where previous results from Langevin models apply, while the climate context motivates additional new questions

GPC Focus Sessions

Climate and Weather dynamics refer to the same geophysical fluid dynamical system on different spatio-temporal scales. The role played by the different elements that go into the momentum, mass, and energy balances is different in weather and climate, leading to remarkably different types of behavior. Research in these two regimes also lends itself to different analytical, computational and observational strategies. Our invited speakers in the two focus sessions will explore key questions regarding the role of multiple time and space scales in dynamic and thermodynamic processes controlling climatological phenomena.

GPC Focus Session I: The Physics of Climate I (Session B33, 11:15 am – 2:15 pm, Monday, March 2)

Invited talk:

KERRY EMANUEL
Professor
Department of Atmospheric Sciences
MIT

Title: Thermodynamics of Hurricanes

Recent publications: N. Lin, P. Lane, K. A. Emanuel, R. M., Sullivan, and J. P. Donnelly, "Heightened hurricane surge risk in northwest Florida revealed from climatological-hydrodynamic modeling and paleorecord reconstruction," J. Geophys. Res. Atmos. **119**, 8606–8623 (2014).

J. P. Kossin, K. A. Emanuel, and G. A. Vecchi, "The poleward migration of the location of tropical cyclone maximum intensity," Nature, 509, 349-352 (2014).

D. R. Chavas and K. A. Emanuel, "Equilibrium tropical cyclone size in an idealized state of axisymmetric radiative–convective equilibrium," J. Atmos. Sci. **71**, 1663-1680 (2014).

S.B. Sieron, F. Zhang, and K. A. Emanuel, "Feasibility of tropical cyclone intensity estimation using satellite-borne radiometer measurements: An observing system simulation experiment," Geophys. Res. Lett. **40**, 5332–5336 (2013).

S. Strazzo, J. B. Elsner, J.C. Trapnier, and K. A. Emanuel, "Frequency, intensity, and sensitivity to sea surface temperature of North Atlantic tropical cyclones in best-track and simulated data," J. Adv. Model. Earth Sys. **5** (2013).

K.A. Emanuel, "Downscaling CMIP5 climate models shows increased tropical cyclone activity over the 21st century," Proc. Nat. Acad. Sci. **110** (2013).

K. Emanuel and A. Sobel, "Response of tropical sea surface temperature, precipitation, and tropical cyclone-related variables to changes in global and local forcing.,"J. Adv. Model. Earth Sys. **5** (2013).

K. Emanuel, S. Solomon, S., D. Folini, S. Davis, and C. Cagnazzo, "Influence of tropical tropopause layer cooling on Atlantic hurricane activity," J. Clim. **26**, 2288-2301 (2013).

B. Tang and K. Emanuel, "A ventilation index for tropical cyclones," Bull. Amer. Meteor. Soc. **93**, 1901-1912 (2012).

N. Lin, K. Emanuel, M. Oppenheimer, and E. Vanmarcke, "Physically based assessment of hurricane surge threat under climate change," Nature Clim. Change (2012) doi:10.1038/nclimate1389.

R. Mendelsohn, K. Emanuel, S. Chonabayashi, and L. Bakkensen, "The impact of climate change on global tropical cyclone damage," Nature Clim. Change (2012), doi:10.1038/nclimate1357.

Contributed talks:

James Otto, James Roberts	A Test for Periodic and Quasi-Periodic Fluctuations in Past Climate Change Data
Juan Restrepo	Nonlinear/Non-Gaussian Data Assimilation
Sharon Sessions, Stipo Sentic, Michael Herman, David Raymond	The Role of Radiation in Organizing Tropical Convection
Robert Ecke, Philippe Odier	Stratified shear flow instability: Application to oceanic overflows
R. Tao	Eliminating Major Tornadoes in Tornado Alley
Henri-Philippe Degueldre, Jakob J. Metzger, Ragnar Fleischmann, Theo Geisel	Random Focusing of Tsunami Waves
Bruce Rodenborn, Daniel Kiefer, Hepeng Zhang, Harry L. Swinney	Energy Dissipation when Internal Wave Beams Reflect from a Slope
Kenneth Minschwaner, Gloria Manney, Luis Torres	Lamination in Atmospheric Ozone: A Diagnostic for Tracer Transport Mechanisms

GPC Focus Session II: The Physics of Climate II (Session D33, 2:30 pm – 5:00 pm, Monday, March 2)

MARY-LOUISE TIMMERMANS
Assistant Professor
Department of Geology & Geophysics
Yale University

Title: Polar Oceanography, Arctic Sea Ice and Climate

Synopsis: Intensive sampling from oceanographic moorings, shipboard measurements, and drifting autonomous buoy systems has brought new understanding to Arctic freshwater dynamics, ocean heat and mixing processes, circulation and eddies, and atmosphere-ice-ocean interactions. Observations indicate apparently rapid changes in the basin-scale freshwater distribution that have marked effects on

Arctic stratification. Recent measurements support the idea that a strengthened stratification limits the vertical flux of deep-ocean heat. All ocean layers exhibit a rich mesoscale eddy field; eddies, with scales comparable to the Rossby Deformation Radius [O(10km)], transport water and heat over long distances and enhance ocean mixing. Measurements further reveal an active submesoscale flow field in the ocean surface layer. These upper-ocean features, having length scales of a few kilometers or less, are dynamically important in that they can impede surface-layer deepening and modify heat, salt, and momentum fluxes between the surface ocean and adjacent sea-ice cover. This talk will review highlights of recent Arctic Ocean observational studies across a range of temporal and spatial scales, and outline advances in our understanding of ocean drivers of sea ice and climate change.

Solomon Bililign, Sujeeta Singh, Marc Fiddler, Damon Smith	Scattering and Absorption of E\&M radiation by small particles- applications to study impact of biomass aerosols on climate
William Collins, Daniel Feldman, Jonathan Gero, Margaret Torn, Eli Mlawer, Timothy Shippert	Observations Determination of Surface Radiative Forcing by CO_2 and CH_4
Yingdi Liu, Sanwu Wang	Interaction between carbon dioxide and coal: atomic-scale characteristics and electronic structures
Austin Berry, Rudra Aryal	Study of Aerosol Chemical Composition Based on Aerosol Optical Properties

GPC Communications Committee

Left to right: Peter Weichman (Chair), Barbara Levi, Michael Ritzwoller

The role of the Communications Committee is to have oversight of the Newsletter and any other publications that may be established by the GPC. The Communications Committee shall also be responsible for keeping the physics community and other interested communities informed about climate physics issues, activities, and accomplishments through the Newsletter, GPC website and email messages.

Upcoming Events and Other Links of Interest

APS Climate Change Statement Review, including links to a number of relevant documents.
See also the perhaps unusually colorful January 2015 POPA report:
Report from the FPS Representative on the Panel on Public Affairs of the APS, which provides links to some interesting public discussion, including:
Climate Science Is Not Settled, September 19, 2014 Wall Street Journal editorial by Steven Koonin (then APS Climate Statement Review Subcommittee Chair), and forceful rebuttal:
Climate Science Is Settled Enough, October 1, 2014 Slate.com article by Raymond Pierrehumbert.

The National Research Council reports on Climate Intervention (more popularly known as climate engineering) were recently released, in two parts: Carbon Dioxide Removal and Reliable Sequestration and Reflecting Sunlight to Cool Earth.

Abstract: *Climate intervention is no substitute for reductions in carbon dioxide emissions and adaptation efforts aimed at reducing the negative consequences of climate change. However, as our planet enters a period of changing climate never before experienced in recorded human history, interest is growing in the potential for deliberate intervention in the climate system to counter climate change. This study assesses the potential impacts, benefits, and costs of two different proposed classes of climate intervention: (1) carbon dioxide removal and (2) albedo modification (reflecting sunlight). Carbon dioxide removal strategies address a key driver of climate change, but research is needed to fully assess if any of these technologies could be appropriate for large-scale deployment. Albedo modification strategies could rapidly cool the planet's surface but pose environmental and other risks that are not well understood and therefore should not be deployed at climate-altering scales; more research is needed to determine if albedo modification approaches could be viable in the future.*

Raymond Pierrehumbert is one of the report authors, and has posted a more personal view in the form of a February 10, 2015 Slate.com article: Climate Hacking is Barking Mad.

The American Geophysical Union (AGU) conference list, especially the Fall Meeting, San Francisco, CA, Dec. 14-18, 2015.

The American Meteorological Society (AMS) conference list.

Theoretical Advances in Planetary Flows and Climate Dynamics, Les Houches (France), March 2-6 (2015).

20th Conference on Atmospheric and Oceanic Fluid Dynamics, Minneapolis, MN June 15-19, 2015

Third International Conference: Energy & Meterology, Boulder, CO, June 22-26, 2015.

68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA, November 22-24, 2016

Graphics credits

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