GPC Newsletter
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IN THIS ISSUE

APS TOPICAL GROUP ON THE PHYSICS OF CLIMATE

Message from the Editor

This is the seventeenth GPC Newsletter, published twice per year. 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.

Message from the GPC Chair

William I. Newman, UCLA

The current calendar year is proving to be a remarkable one as it continues to unfold. As I write this message, Los Angeles has undergone a 10-day heat wave with record breaking temperatures sometimes exceeding 40°C resulting in the possibility of brown outs or even black outs, lest Angelenos curtail their power usage between 4 and 9 p.m., and part of the UCLA campus was closed. Northern California, meanwhile, is also experiencing record breaking temperatures and drought conditions, with resulting forest fires relatively early in the season already consuming nearly 10^5 hectares while last year's total approached one million hectares. Extraordinary rainfall with accompanying downpours and flooding have impacted many other areas in the United States. Overseas, approximately 30% of Pakistan is underwater as a result of flooding.

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2023 APS March Meeting

The 2023 March Meeting will take place in Las Vegas, NV March 5-9. The meeting will be in-person with virtual components. GPC is planning two Focus Sessions, described below, each with three invited presentations.

Contributed abstract submission deadline is October 22, 2022. It is emphasized that although abstracts consistent with the Focus Session topics are certainly desired, *any climate physics related contribution will be welcomed.*

GPC Organized Tutorial (Sunday, March 5): THE PHYSICS OF CLIMATE AND CLIMATE CHANGE

Physics provides the foundation to climate science. Last year's March meeting of the APS began with a "Nobel special session," which celebrated the prize-winning contributions of climate scientists Syukuro Manabe and Klauss Hasselmann to our understanding of the climate system.

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ARTICLE: Recollections from the 2022 Boulder Summer School: Hydrodynamics Across Scales

Peter Weichman, BAE Systems FAST Labs, and Brad Marston, Brown University

Your two authors had the honor of organizing and hosting, along with Leo Radzihovsky, Jeff Weiss, Julia Yeomans, and Royce Zia, a remarkable event during the month of July 2022. The Boulder Summer School for Condensed Matter Physics and Materials Science, which tends to alternate year-by-year between hard and soft topics in condensed matter physics, went all wet this year with a program on hydrodynamics across scales. The main audience consisted of approximately sixty advanced graduate students and early postdocs, plus one senior professor (Alan Dorsey) testing the waters for something new to think about. In addition to the lectures, the students presented posters on their research and self-organized other group activities on the school's Slack channel.

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Message from the GPC Chair –

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Meanwhile, 72% of Americans believe that "global warming" is happening and 57% believe that it is caused by human activity (Yale Climate Opinion Maps for 2021). Public opinion relating to climate warming has been confirmed by many investigations, notably showing that the first decade of the 21st century is the hottest one during human history.

Concerns in the physics community relating to emergent climate change surfaced in that decade and resulted in two proposals in 2010 to establish a Topical Group on the Physics of Climate (GPC). The first was presented by APS Fellow Roger Cohen in a petition to the APS Council signed by 200 APS members and then by an initiative chaired by APS President Curtis Callan. Taken together, the petitions sought to establish a topical group that focused on the physics of "climate and the environment" without engaging in "matters of policy, legislation and regulation." Further, they sought to provide a "mechanism for physicists … to learn about and exchange views on the science, and to generally advance the physical understanding of terrestrial climate." Much more work went into refining the emergent proposal and the election in the summer of 2012 of its Executive Committee Officers, beginning with Chair James G. Brasseur, Chair-Elect Robert P. Behringer, Vice Chair John S. Wettlaufer, and Secretary/Treasurer Kenneth R. Minschwaner and the issuance of a vision statement for GPC. The first meeting of the Executive Committee took place in August 2012 and GPC went forward with four 2013 APS March meeting sessions including, notably, an invited (speakers) session, a focus session on the "physics of climate," and a regular session on "climate physics" shared with the Division of Fluid Mechanics ('instabilities and turbulence'). Thus, calendar year 2022 marks the end of the first decade of activity by the Group on the Physics of Climate. Not long thereafter, in 2014, the Intergovernmental Panel on Climate Change (IPCC) issued its Fifth Summary Assessment, following its Fourth Assessment in 2007, which had an influential role at that time in motivating the APS leadership in its statement on climate change.

In real terms, 2022 was the tenth year of GPC activity—the pace of activity elsewhere accelerated dramatically—the Nobel Prize in Physics for 2021 was awarded to three scientists, including two pioneers in arenas relating to investigating climate change—the IPCC issued its Sixth Summary Assessment. Furthermore, the globe continued to be struggling to cope with the SARS-CoV-2 coronavirus. The 2020 meeting was canceled, literally on the eve of its inauguration. The 2021 meeting was conducted virtually via Zoom. The viral threat had subsided sufficiently for our 2022 meeting to be held with strict public health controls and vaccination protocols in place using a combination of in-person—albeit socially distanced and masked—and virtual modes.

In keeping with APS tradition, the March meeting including a "special session" to honor the two climate physics laureates, Syukuro Manabe (Princeton) and Klaus Hasselmann (Max Planck, Hamburg) "for the physical modelling of Earth's climate, quantifying variability and reliably predicting global warming." I chaired the special session associated with the physics of climate and climate change. Owing to their advanced age and their inability to participate directly, their contributions were described by Raymond Pierrehumbert (Oxford), and William (Bill) Collins (UC Berkeley and Lawrence-Berkeley National Laboratory) surveyed some of the essential outcomes of the IPCC Sixth Summary Assessment. As a concluding segment for that special session, Morgan O'Neill (Stanford, and former GPC executive committee student member) spoke on the physics of hurricanes and other extreme phenomena and reached out to early-career physicists to consider the potential for innovation and discovery in climate physics research. During the course of the Nobel special session, it became evident that many physicists from other subdisciplines had a strong interest in the physics of climate but little applicable training—during our Executive and Business Meetings, this became a topic for intense discussion and spawned new activities within our group that will be discussed below.

The APS March meeting held in Chicago was also noteworthy since it initiated a return to the traditional mode of in-person meetings, but also allowed virtual real-time or recorded presentations via Zoom, in both the Nobel special session and our now standard pair of focus sessions. The first, on "rare events, tipping points, and abrupt changes to the climate system," Hussein Aluie (our current Chair-Elect) and I co-chaired a session which included three invited speakers and five contributed speakers. The second, on "nonlinear and statistical physics" was co-sponsored by the Group on Nonlinear and Statistical Physics (GNSP) and chaired by Mary Silber and Justin Burton. It also included three invited lectures and five contributed ones. In planning for the future, it became clear to the APS Executive, since relatively effective vaccines and countermeasures were available, the continuing endemic nature of the coronavirus variants would necessitate having both in-person and virtual components looking ahead to 2023. However, the associated cost of blending the two modes in a large meeting with, as we saw in March, 7,000 in-person attendees and 6,000 virtual attendees, became prohibitive and resulted in a major loss to our parent society. So, 2023 will have *separate* in-person and virtual meetings, with the latter convened at a later date.

As mentioned earlier, it became clear from the Q&A segment of the Nobel special session that we needed to develop a mechanism to help educate our general membership in the fundamental physics arising from climate as well as bring our members up-to-date on the most current developments in this rapidly evolving field. On the Sunday afternoon immediately prior to next year's March meeting, namely March 5, 2023, GPC will offer a 3-hour tutorial addressing radiation balance, large-scale and global circulation, small-scale atmospheric dynamics, and conclude by exploring future prospects and impacts. The speakers will include Nadir Jeevanjee (GFDL, Princeton), Tiffany Shaw (Chicago), Allison Wing (Florida State U), and Michael Mann (U. Pennsylvania). The GPC will seek to defray the $75 tutorial fee for graduate student and postdoctoral attendees. Further, in order to disseminate the latest information on climate change investigations, the Topical Group on the Physics of Climate has already initiated a monthly seminar organized by Pedram Hassanzadeh, Ching-Yao Lai, Albion Lawrence, and Tiffany Shaw. More information relating to our tutorial session and monthly seminar series may be obtained via the APS Engage platform.

Finally, looking ahead to our March 2023 meeting which will be held in Las Vegas, NV, we will again convene our two focus sessions described earlier. The first, which I will chair with Tiffany Shaw, addresses "rare and extreme events, tipping points,

and abrupt changes to the climate system" and will feature invited lectures by Yi Zhang (Berkeley), Alex Robel (Georgia Tech.), and Ian Eisenman (UC San Diego). The second, chaired by Hussein Aluie and Mara Freilich, addresses in conjunction with GNSP on "nonlinear and statistical physics" and will feature invited lectures by Lynne Talley (UC San Diego), Luc Deike (Princeton), and Sam Stechmann (UW-Madison). Further details can be found elsewhere in this Newsletter.

Ten years have now passed since the Topical Group on the Physics of Climate was established. We now have in excess of 600 members and two robust well-established annual focus sessions. Moreover, we have observed a growing interest by APS members in general of the physical phenomena involved in climate as well as a thirst for the latest available insights arising from observations, modeling, statistical analysis, and the application of machine learning. The creation of a tutorial session and of a monthly seminar series attest to the intellectual vitality and interest that our colleagues have in this extraordinarily important topic.

2023 APS March Meeting – *continued from p. 1*

It also summarized the consensus on anthropogenic climate change in the long-awaited Sixth Summary Assessment from the Intergovernmental Panel on Climate Change. Earth's climate embraces a dizzying array of physical processes, which are often hard to parse. The radiative energy received at the Earth's surface is profoundly influenced by its reflectivity or albedo which varies dramatically due to the heterogeneous nature of the surfaces encountered (deserts and mountains, marshes and wetlands, forests and vegetation covered), ranging from different kinds of landforms to atmosphere, ocean, and ice. In general, however, radiative processes are driven by the need to balance (net) incoming solar radiation with outgoing thermal radiation, the latter emitted primarily from the atmosphere by greenhouse gasses. Radiative energy balance is achieved via three main pathways: vertical energy transport via infrared radiation, vertical energy transport via atmospheric convection (e.g., thunderstorms), and poleward energy transport via large-scale atmospheric and oceanic circulation. Moreover, relatively small-scale variability contributes to destructive phenomena including hurricanes, tornadoes, ice-sheet melting, sea-level change, and flooding. This tutorial will review the basics of these intersecting phenomena as a system, emphasizing fundamental physical principles, and will also touch on climate impacts and areas for future research relevant for physicists.

The tutorial is intended for graduate students, postdocs, and researchers who are interested in climate as a possible subject of research, as well as those simply interested in learning about the basic physics of climate. GPC intends to cover the registration costs for ~50 students.

Topics:

- Radiation Balance
- Large-Scale and Global Circulation
- Small-Scale Atmospheric Dynamics
- Future Prospects and Impacts

Instructors:

Dr. Nadir Jeevanjee, NOAA Geophysical Fluid Dynamics Laboratory, Princeton

Prof. Tiffany A. Shaw, University of Chicago

Prof. Allison Wing, Florida State University

Prof. Michael Mann, University of Pennsylvania

GPC Focus Session #1 (Tentatively on Monday March 6): Rare Events, Tipping Points, and Abrupt Changes in the Climate System

Invited Speakers: Alexander Robel (GaTech), Ian Eisenman (UCSD), Yi Zhang (UC Berkeley)

GPC Focus Session #2 (Tentatively on Monday March 6): Statistical and Nonlinear Physics of Earth and Its Climate

Invited Speakers: Lynne Talley (UCSD), Luc Deike (Princeton), Sam Stechmann (U. Wisconsin-Madison)

We look forward to your contributions and interacting you in March!

ARTICLE: Recollections from the 2022 Boulder Summer School: Hydrodynamics Across Scales – *continued from p. 1*

From a physics point of view, the hydrodynamic approach encompasses a broad set of models that describe dynamical systems on "macroscopic" length and time scales. The models replace the full microscopic, even quantum mechanical, description with a much simpler set of flow equations for the basic conserved quantities such as mass, momentum and energy. Contact with microscopic physics is made through the assumption of local equilibrium, allowing one to close the set of equations using basic thermodynamic principles, such as sound wave propagation, diffusion, and heat conduction. The methods find use in a vast array of physical phenomena, from strongly correlated Fermi and Bose systems (e.g., notions of conventional and quantum Hall viscosities, exotic superconductor, and superfluid behaviors), to populations of living systems (e.g., bacterial and flocking dynamics), to geophysical and planetary phenomena (e.g., Earth climate, Jupiter's Great Red Spot), to the very largest scales (e.g., star formation, solar system dynamics, cosmic rays, and beyond). The 2022 Boulder Summer School explored recent observational, experimental, and theoretical results covering aspects of all these areas.

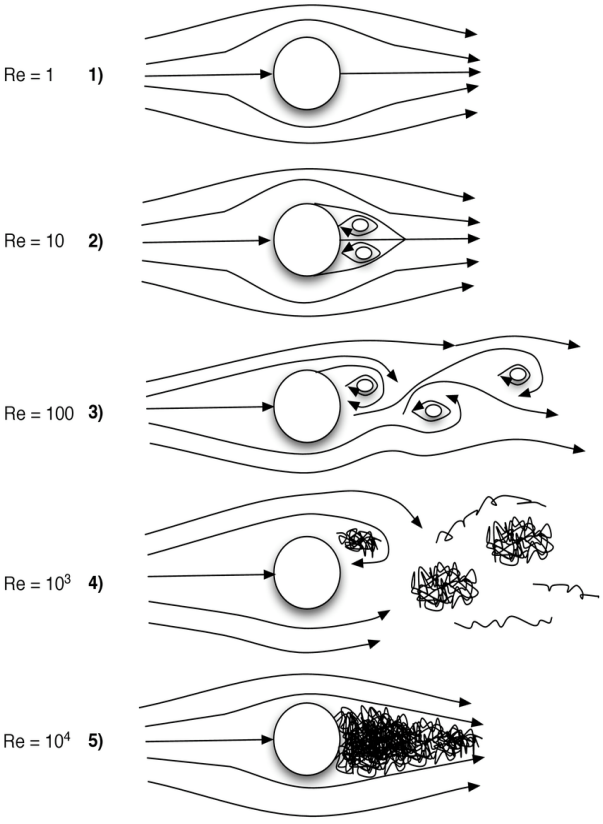
One of the major themes, for obvious reasons, was Earth's climate, how we know what we know, how we know what is coming on decadal, and even century, time scales, and what we can do about it given present and near-future expected technological advances. Our school was unique in its attempt to introduce a new generation of researchers to these important, even life-changing, problems, allowing them to directly interact with each other and with leaders in these fields, and even initiate future research collaborations.

The fifteen lecturers ranged tremendously in background and expertise. Their systems ranged in size from nanometers to

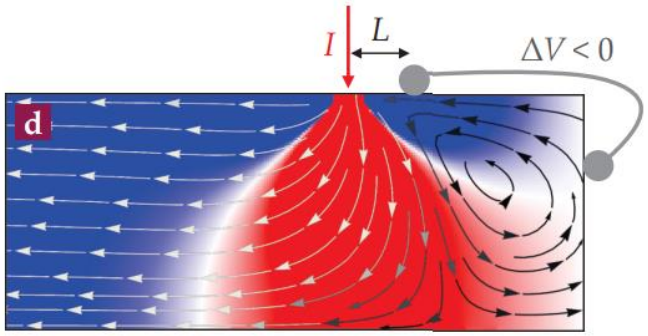
Grisha gave out copies of his textbook to a select few judged to have asked the most interesting questions!

light years, and from intensely quantum to conservatively classical. We present here a few interesting highlights that piqued our own (clearly biased) personal interests. For a complete view we invite you to visit the YouTube channel where you can view all the recorded lectures.

Gregory (Grisha) Falkovich positioned himself somewhere in between the micro and macro realms, lending insights into some classic fluid flow problems from ideas that mainly originated in quantum mechanics. Consider, for example, the problem of a sphere falling under gravity through a perfect fluid. The accelerating motion of the surrounding fluid adds to the inertia of the combined fluid-particle system, creating a "quasi-particle" with "quasi-momentum." Such concepts are quite common in quantum systems, giving rise, for example, to exotic excitations with fractional charge and fractional statistics.



Ideal flow past a cylinder: Transition to turbulence [S. Banerjee, Ph.D. Thesis (2014), Figure 4.1]



Simulation of electron flow vortices in graphene [Physics Today 73 (6), p. 28 (2020)]

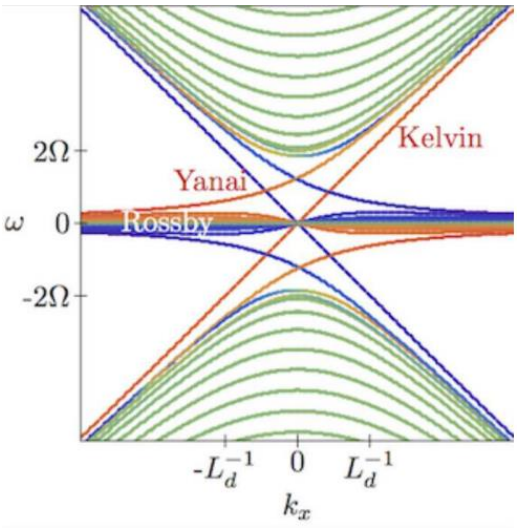
The onset of turbulence, in the wake behind a fixed cylinder, provides an example of an "anomaly" where an arbitrarily small value of the fluid viscosity nevertheless generates a huge change in behavior. Thus, at low velocities the flow around and past the sphere is perfectly Newtonian, with vanishing dissipation. Beyond a critical velocity, however, a circulating vortex is formed and trapped behind the sphere, and as the velocity increases further, vorticity is shed and swept downstream. The resulting turbulent is flow suddenly strongly dissipative. This is a type of phase transition whose origin lies in an infinitesimally thin boundary layer on the sphere surface that suddenly detaches. The anomalous behavior is reminiscent of a number of condensed matter systems, in which a phase transition breaks an underlying symmetry.

Sid Nagel described a remarkable series of table-top experiments that lend insight into basic hydrodynamic concepts even at much smaller and larger scales, such as the quark-gluon plasma and the formation of clusters of galaxies. He emphasized the importance of being open to unexpected results when conducting experiments – they are not only about testing theories. Jeff Oishi, one of the lead developers of the Dedalus project, taught us about pseudospectral algorithms for simulating nonlinear partial differential equations.

At nanometer scales, Andy Lucas described how difficult it is to get electrons to flow like a viscous fluid. The problem is that a dense fluid of electrons is actually very weakly interacting – a feature that that permits many systems to be described by elementary, textbook noninteracting fermion models. Creating conditions where interactions are sufficiently strong to generate viscous and other classical fluid dynamics effects is very difficult, and conclusive experimental evidence remains elusive.

Antoine Venaille shed new topological light on an old problem. Traveling wave excitations on a rotating planet can be trapped in the neighborhood of the equator. There are several different excitation modes (Rossby, Kelvin and Yanai waves) that emerge in this equatorial channel, and the new insight is that they are intimately tied together by the mathematics of topology.

A three dimensional parameter space labels these modes, and at the center of this space is a singularity that acts very much like a magnetic monopole. The Berry flux from the monopole integrates up to 2 rather than 1, a number known as the first



Chern number. Breaking an additional symmetry causes the singularity to separate into a pair of unit monopoles. Chern numbers in physics originally emerged in quantum systems, such as current loops influenced by a threading magnetic field. Here by a principle known as bulk-interface correspondence it predicts the existence of waves along the equator which is the interface between the two hemispheres. This reasoning demonstrates that ocean and atmospheric waves share fundamental properties with topological insulators, and that topology plays an unexpected role in the Earth climate system. Although oceanographers will note that the waves predicted from topology here are ones that they already know about, insights gained could drive a search for new types of waves in other settings.

Yuhai Tu explained how advection effects can allow bird flocks to escape the constraints of the Mermin-Wagner theorem, enhancing their ability to fly in a shared direction rather than chaotically disperse. The theorem relates to the ability of thermally fluctuating spins to magnetically align at sufficiently low temperature. In two-dimensional systems, fluctuations are too strong to allow alignment at any positive temperature. In two-dimensional flocking models the aligning force is governed by an advection term which encourages nearby birds to "flow" together. This alignment turns out to be significantly stronger than magnetic-type interactions, perhaps because of the longer-ranged influence of the mixing process that occurs when birds stray into each other's space while still trying to maintain their distance.

Earth's changing climate was obviously a central theme, with Tiffany Shaw, Freddy Bouchet, and Baylor Fox-Kemper covering different aspects of the Earth's ocean-atmosphere-sea ice system. A central message is that very simple model abstractions, with a very few free parameters, suffice to strongly constrain a remarkably complex system. That is, after study of complex processes in dedicated and computationally expensive models, one can often work out simple but accurate approximations and crucial measurements to diagnose. It is from such analyses that remarkably robust predictions regarding long-term climate trends can be made. The latest UN IPCC Report, for example, now treats the dominant human contribution to global warming as a scientific fact, not as a still uncertain, though highly probable, inference.

Much of the uncertainty in climate modeling stems from errors introduced by unresolved processes such as turbulence. Hussein Aluie taught us about tools used to think about the statistical modeling of

such subgrid-scale physics. In a related vein Steve Tobias lectured on the direct statistical simulation of large-scale turbulent flows. Subgrid modeling and direct statistical simulation offer the prospect of extending the reach and accuracy of numerical simulation of high Reynolds number fluid flows.

All the scientific fields discussed during the school are witnessing remarkable advances including novel and precise experimental measurements and vast observational data accumulation, opening unprecedented challenges for experiments, computational studies, and theoretical understanding. Younger scholars have sensed this excitement but often wonder how to engage in such research as physicists, given the broad spread of these fields over numerous academic departments and disciplines. There are many conferences and workshops throughout the world that focus on each field individually, but the Boulder summer school was unique, we believe, in exposing young researchers to broad array of such topics at reasonably introductory level, allowing them to see where physicists can and are making singular contributions, and hopefully illuminate possible new future paths of scientific exploration.

2022 APS Fluid Dynamics Meeting

The 75th Annual Meeting of the APS Division of Fluid Dynamics meeting will take place November 20-22, 2022 in Indianapolis. The DFD meeting features a broad range of topics related to fluid mechanics, including several sessions devoted to geophysical fluid mechanics. These sessions include atmospheric and oceanic flows, sediment transport, glacial dynamics, turbulent flows, and microphysical process at the air-sea interface. As such, the GPC has made a sustained effort in the last 5 years to support and maintain a presence at the APS Division of Fluid Dynamics (DFD) annual meeting.

In 2020, the GPC co-sponsored a mini-symposium on the topic of Fluid Dynamics of Atmospheric Clouds, which was co-organized by former GPC treasurer and DFD fellow, Raymond Shaw. In 2021 and 2022, GPC members-at-large Justin Burton, Ching-Yao Lai, and Hussein Aluie helped sort all abstracts related to geophysical fluid dynamics. Lai and Burton

also organized a special focus session, Planetary Flows in Climate, featuring a diverse array of talks specifically focused on the effects of climate change. GPC also co-sponsored an invited mini-symposium titled "Fluids Next: Environmental Turbulent Flows Under the Effect of Climate Change" featuring five invited speakers.

Of particular note is a new tradition, started in 2021 by Hussein Aluie, of an informal get-together on Monday evening during the DFD for all geophysical-interested conference participants. Nearly 50 people enjoyed refreshing libations at a local pub in 2021, and the GPC plans to continue this tradition in 2022!

For the 2022 DFD Meeting, the list of geophysical fluid dynamics sessions include:

Geophysical Fluid Dynamics: Clouds and Fog

Geophysical Fluid Dynamics: General

Geophysical Fluid Dynamics: Sediment Transport

Geophysical Fluid Dynamics: Stratified Flows I & II

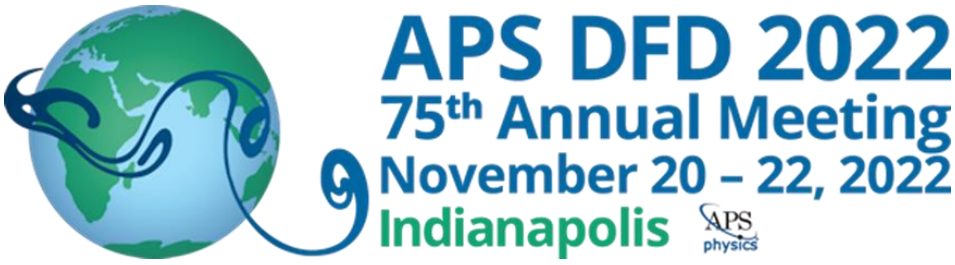
Geophysical Fluid Dynamics: Atmosphere

Geophysical Fluid Dynamics: Oceanography I & II

Geophysical Fluid Dynamics: Rotating Flows

Geophysical Fluid Dynamics: Atmospheric Boundary Layers

Geophysical Fluid Dynamics: Air-Sea Interactions



GPC Elections

The upcoming GPC election features openings for Vice Chair and two regular Members-at-Large. The election is to be held in late November and elected candidates would begin their terms in January 1, 2023. We strongly encourage you to help shape your GPC by voting.

The nominating committee is headed by Mary Silber (GPC Past Chair). Prospective candidates will be considered for their scientific standing and activity, their history of involvement with GPC and the APS, their perspective on the activities of the Group, and their likelihood of service to GPC if elected. Diversity in the GPC leads to vitality and innovation.

The position of the Vice Chair of GPC (currently held by Valerio Lucarini) is a four-year commitment: after a year as vice chair the officer becomes in successive years the chair-elect (currently Hussein Aluie), chair (currently William Newman), and then past chair (currently Mary Silber) – each with distinct duties. The chair officers play a crucial role in providing leadership in organizing the scientific content of the March Meeting and other meetings and in representing climate physics within the American Physical Society.

The members-at-large (Juston Burton and Albion Lawrence) serve a three-year term; they constitute the fellowship committee, help select the invited symposia and invited talks for the March Meeting and provide advice on issues important to the GPC.

Identifying excellent candidates who can provide a broad view of the diverse field that is climate physics is key to maintaining the vitality of GPC.

GPC Seminar Series

Hussein Aluie

Several members of the GPC felt the need to better connect with the physics community beyond the annual March meeting. One idea was to organize a virtual seminar series on climate physics. I had the pleasure to work with Pedram Hassanzadeh and Tiffany Shaw with input from the GPC executive committee to brainstorm on the format and focus of these proposed talks. An *ad hoc* GPC seminar series committee was subsequently established, comprised of Pedram Hassanzadeh as chair, alongside Tiffany Shaw, Ching-Yao Lai, and Albion Lawrence. We did not want to duplicate similar efforts by other professional groups who were already organizing virtual seminars within the climate and geoscience communities. We decided that it is valuable to host seminars that cater to physicists, including those in their early careers, who are interested in climate but who are not necessarily experienced in the subject. Therefore, having sufficient introductory materials in the talks, and discussions of the open unanswered problems physicists can contribute to, would be just as important as surveying new results and discoveries. We were also aware that many have become "Zoom'd out" during the pandemic and having yet another online talk platform may not be very appealing to many. Yet, the logistical ease and low cost of the virtual format has proven to be potent, especially since talks can be recorded and watched on demand at any future time. We decided that a sustainable cadence for the virtual seminars, at least initially as we gauge interest, was to hold 1-hour talks once a month. The inaugural speaker for our series in July was Tapio Schneider (Caltech), who spoke about the physics of turbulence and its relevance and application to our climate. His talk garnered almost 200 attendees, underscoring the hunger to learn about climate physics within the community. Upcoming speakers for our series include Laure Zanna (NYU) on September 21 and Tiffany Shaw (U. Chicago) on October 19.

The seminar schedule is online at (https://engage.aps.org/gpc/resources/seminar-series), where you can also access recordings of past talks. You can also sign up for the GPC seminar mailing list, to receive communication regarding the seminars.

GPC Students and Early Career Investigators Awards

Three years ago, GPC created a scholarship for young GPC members to attend the APS March Meetings and participate in the GPC sessions. For the upcoming 2023 APS March Meeting, GPC is offering two $1,000 awards. The first award will be "The GPC Student Prize" and will be given to a graduate student member of the APS who is pursuing work related to the GPC mission. The second award will be "The GPC Early Career Investigators Award" and will be given to an early career investigator (less than 5 years out of Ph.D.) who is a member of the APS GPC. Both awards will help defray the costs of attending and participating in a GPC related session at the March Meeting.

To apply for the awards, applicants should submit a single pdf file: containing (1) a maximum one-page statement that includes a brief description of the applicant's research, how participation would benefit them, and how their work fits with the GPC mission, (2) a CV, (3) an abstract submitted to the upcoming APS March meeting. Please send an email with the heading: "APS GPC Scholarship Application 2021" with the pdf file attached to the GPC Vice Chair, Valerio Lucarini v.lucarini@reading.ac.uk.

Deadline for applications: December 11, 2022.

American Journal of Physics and *The Physics Teacher* Call for Papers

The editors of the *American Journal of Physics* and *The Physics Teacher* are joining to issue a call for papers for special collections on the physics of the environment, sustainability, and climate change.

Submissions across the range of instructional materials are encouraged. Examples include introductions to new physics applications impacting on sustainability or understanding climate, demonstrations, laboratory experiments, short units, homework problems, course outlines, and curricular sequences. If you choose to submit a paper, please focus on how your work can be useful to colleagues and students, rather than merely on how successful your implementation was.

Of the two journals, *The Physics Teacher* focuses on physics instruction at the introductory level, in secondary schools as well as colleges and universities, and on teaching physics concepts as part of general education courses; the benchmark length for a TPT article is 2000 words.
The *American Journal of Physics* focuses primarily on physics instruction beyond the introductory level, mostly at the undergraduate level but also including graduate-level instruction when the topic is of high interest or broad usefulness. Both journals publish some papers on history and philosophy of physics and on outreach to the general public. Authors are encouraged to contact the guest editors for these special issues to determine which journal is more appropriate and which topics are suitable for this special collection. More information on editorial policies is found on the two journals' web pages.

As with all TPT and AJP manuscripts, these new submissions will be peer-reviewed by a variety of folks with expertise in the areas of physics teaching and issues the environment, climate, and sustainability. While the published articles in this collection will still undergo the peer-review process that ensures both journals' high quality, we expect that authors will be able to address "big picture" issues regarding physics teaching and the environment more emphatically than one usually sees in TPT or AJP articles—especially because we are encouraging notable members of the physics community like yourself to think big in addressing the topics of environment, sustainability, and climate.

If you do not have an idea for a manuscript, please consider forwarding this request to a colleague who might have something important to contribute. Please make submissions using our online submission system, Editorial Express, by November 30, 2022. When prompted, choose the "special issue paper" category as the type of submission, and feel free to contact either journal's editorial office if you have any questions.

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Other News Links of Interest and Upcoming Events Calendar

1. UN Climate Change Conference 2022 (UNFCCC COP 27), November 7-18, 2022, Sharm El-Sheikh, South Sinai, Egypt.
2. AGU Fall meeting, Dec. 12-16, 2022, New Orleans, LA.
3. 103rd American Meteorological Society Annual Meeting, Houston, TX, January 8-12, 2023.
4. European Geosciences Union General Assembly 2023, April 23-28, 2023, Vienna, Austria & Online.
5. ASLO Aquatic Sciences Meeting 2023, *Resilience and Recovery in Aquatic Systems*, June 4-9, Palma de Mallorca, Spain. The AGU Ocean Sciences Meeting has been held since 1984.The conference scientific program committee for each meeting, which includes representatives from all three societies (AGU, ASLO, TOS), will discuss how to prioritize the Decade at each conference between 2022-2030 and consider what partners or what focus would enhance collaboration and knowledge-sharing on sustainable oceans with a focus on the ocean we want for the future. Additional goals of these events are to highlight the ocean's importance to society and to support the Decade of Ocean science vision to develop scientific knowledge, build infrastructure and foster relationships for a sustainable and healthy ocean.

6. Aspen workshop "Geometric and Field Theoretic Methods for Astro-, Geo-, and Bio-physical Fluids," May 28-June 11, 2023, organized by Albion Lawrence, Helen Burgess, James Cho, and Jane Wang.
7. 2024 Ocean Sciences Meeting, February 18-23, 2024, New Orleans, LA.