The Structure of the Summer

The 2014 Geophysical Fluid Dynamics Summer Study Program started on June 16th, with the topic of Climate Physics and Dynamics. The topic proved very timely and attracted an unprecedented number of applications from brilliant students. Professors Kerry Emanuel (MIT) and Geoff Vallis (Exeter) gave the principal lectures. They began with the simplest energy balance models and then included adjustment of the vertical profiles by convection (dry and moist). Kerry delved more deeply into convection and the processes found in “cloud-permitting” models, including island effects and the spontaneous formation of clusters surrounded by dry regions. Geoff discussed the larger-scale dynamics of the atmosphere and oceans, including the transports by eddies and the thermohaline circulation. This year, we web-cast the principal lectures, with order 50 connections per day from viewers at many universities worldwide. Antonello Provenzale, Raffaele Ferrari, and Glenn Flierl co-directed the summer and invited a large number of top researchers in the dynamics of climate, so that we had a broad critical view on the status of modelling and theory. As usual, the visitors presented new ideas and approaches to geophysical dynamics, and the visitors, staff, and fellows engaged in intense discussions on the porch and in the lecture room. The long-term staff members ensured that the fellows never lacked for guidance; many of them explored unfamiliar topics but were still able to develop new insights. Anne Doucette, Julie Hildebrandt, and Janet Fields made sure that the administrative side of the program ran with admirable efficiency. Matt Barton ensured the webcast was high quality. We continue to be indebted to WHOI for their support and to the Academic Programs Office, who once more (with the cooperation of the weather!) provided a perfect atmosphere.

Schedule of Principal Lectures

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<th>Speaker</th>
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<td>Monday, June 16 (KE)</td>
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<td>Elements of Radiative Transfer</td>
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<td>Energy Balance Models and Simple Radiative Convective Equilibria (RCE)</td>
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<td>RCE and Tropopause Height</td>
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<td>RCE states and Interaction with Large Scale Flows</td>
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<td>Global Instability of the RCE State</td>
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<td>Wednesday, June 25 (GV)</td>
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<td>Surface Winds: Why they matter and how they are produced</td>
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<td>Thursday, June 26 (GV)</td>
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<td>Theory of the Oceanic Deep Circulation</td>
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<td>Friday, June 27 (GV)</td>
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<td>Deep Circulation (continued) and the Thermocline</td>
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Our Principal Lecturers: Geoff Vallis and Kerry Emanuel

Self-aggregation in simulation of rotating, moist, radiative-convective equilibrium

A Summer at Walsh

In addition to enjoying many lively scientific discussions, the staff and fellows enjoyed the opening barbecue (with Charlie Doering’s new grill!), “pizza night” in which they discussed possible projects, and the closing party at George Veronis’. This year, the fellows ate lunch with the lecturer, giving them a chance to ask more questions and explore other topics. Andy Ingersoll organized bike rides, and Brian Von Herzen (Climate Foundation) not only provided low cost housing for some staff and visitors, but also opportunities for sailing.

As usual, GFD fielded a softball team; their fraction of losses, \( \frac{7}{8} \), was less than one; therefore it’s a small parameter! They showed promise in the beginning with close games, collapsed in the middle as the summer got more intense, but eked out a victory in the last game of the regular season. The fellows beat the staff 9 to 6 in four innings on the last Thursday of the program, despite the very experienced pitcher and catcher (average age = 89.5 years).

Fellows’ Projects

Jörn Callies, MIT/WHOI Joint Program in Oceanography
   The role of mixed layer instabilities in submesoscale turbulence
Joseph Fitzgerald, Harvard University
   Understanding eddy saturation in the Southern Ocean using mean field theory
Shineng Hu, Yale University
   Models for tropopause height and radiative-convective equilibrium
Alexis Kaminski, University of Cambridge
   An experimental investigation of the Rossby two-slit problem
Paige Martin, University of Michigan
   A study of heat transport and the runaway greenhouse effect using an idealized model
Daniel Mukiibi, University of Hamburg
   A numerical study of the downstream development of baroclinic instability
Ashley Payne, University of California, Irvine
   The role of the lapse rate feedback in Arctic amplification
Erica Rosenblum, University of California, San Diego
   Thermobaric effects on double-diffusive staircases
Geoff Stanley, University of Oxford
   The most minimal seed for the onset of shear turbulence
Jim Thomas, New York University
   Vortex filament dynamics in two dimensions

Knobska point with fellows.
Callies, Fitzgerald, Hu, Kaminski, Martin, Mukiibi, Payne, Rosenblum, Stanley, Thomas

The GFD Website

The lectures notes and reports are available online at gfd.whoi.edu. The GFD website also contains:

- lecture and seminar schedules
- electronic versions of proceedings and newsletters
- lists of alumni and visitors
- application materials
- picture galleries of life at GFD
- useful information and links.
The GFD Faculty

The GFD Faculty handles the scientific and administrative duties of the school. This group is made up of members of the scientific community, across several disciplines, united by their interest in GFD. These are the faces to be seen regularly at GFD over future summers, and their research interests help to define the scientific direction and flavor of the Program.

Neil Balmforth University of British Columbia
Oliver Buhler New York University
Colm-cille Caulfield University of Cambridge
Claudia Cenedese WHOI
Eric Chassignet Florida State University
Steve Childress New York University
Charles Doering University of Michigan
Glenn Flierl MIT
Pascale Garaud UC Santa Cruz
Karl Helfrich WHOI
Miranda Holmes-Cerfon New York University
Lou Howard MIT and Duke University
Joseph B. Keller Stanford University
Norman Lebovitz University of Chicago
Stefan Llewellyn Smith UC San Diego
Willem Malkus MIT
Philip Morrison University of Texas at Austin
Joseph Pedlosky WHOI
Antonello Provenzale ISAC-CNR, Torino
Tiffany Shaw Columbia University
Edward Spiegel Columbia University
Jean-Luc Thiffeault University of Wisconsin
George Veronis Yale University
John Wetlaufer University of Oxford
Jack Whitehead WHOI

The Sears Public Lecture

In 2014, the Sears Public Lecture was delivered by Professor Cecilia Bitz, University of Washington, who discussed “The Future of Arctic and Antarctic Sea Ice.” She noted that both the Arctic and Antarctic have experienced record sea ice coverage in the last decade. The Arctic has experienced record losses, especially in summer, while the Antarctic has had expanding sea ice. She considers how this is possible in an era of global climate change, and what we can expect in the future. Cecilia overcame problems with the microphone and engaged the audience both in answering question and in discussions at the reception and refreshments following the talk.

Contributions

The GFD program has established an endowment fund to help support the program in the future and for a specially funded position intended to help finance the extended visit of a key participant, such as the summer’s Principal Lecturer. The fund is administered by WHOI, under the guidance of George Veronis. If you would like to contribute, please send your check (made payable to WHOI) to

Woods Hole Oceanographic Institution
GFD Fund, MS 40
Woods Hole, MA 02543

Donations can also be made by credit card by calling the Development office at 508-289-4895.

Please send comments or suggestions about this newsletter or the GFD Program to sgls@ucsd.edu, echassignet@fsu.edu or ccenedese@whoi.edu.

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