

## GFD Newsletter 2014

### Faculty of Walsh College



*The 2014 GFD Photograph.*

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.

### *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

### *Schedule of Principal Lectures*

Monday, June 16 (KE): *Elements of Radiative Transfer*

Tuesday, June 17 (GV): *Energy Balance Models and Simple Radiative Convective Equilibria (RCE)*

Wednesday, June 18 (GV): *RCE and Tropopause Height*

Thursday, June 19 (KE): *Convective Heat Transfer I*

Friday, June 20 (KE): *Convective Heat Transfer II*

Monday, June 23 (KE): *RCE states and Interaction with Large Scale Flows*

Tuesday, June 24 (KE): *Global Instability of the RCE State*

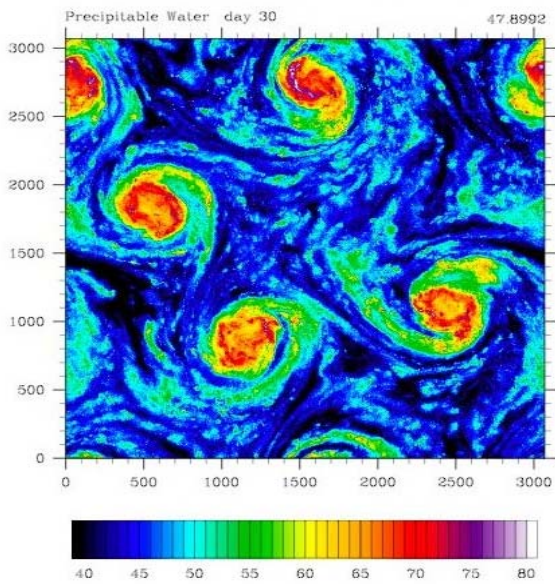
Wednesday, June 25 (GV): *Surface Winds: Why they matter and how they are produced*

Thursday, June 26 (GV): *Theory of the Oceanic Deep Circulation*

Friday, June 27 (GV): *Deep Circulation (continued) and the Thermocline*



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

## 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*

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).



Knobska point with fellows.



*The  
2014  
GFD  
Fellows*

Callies, Fitzgerald, Hu, Kaminski, Martin, Mukiibi, Payne, Rosenblum, Stanley, Thomas

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### *The GFD Website*

The lectures notes and reports are available online at [gfd.whoi.edu](http://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.

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## 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 Wettlaufer *University of Oxford*  
 Jack Whitehead *WHOI*

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## 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

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## 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.

Professor Cecilia Bitz  
 University of  
 Washington

2014 Sears Public Lecture  
 Geophysical Fluid Dynamics Program

The Future of Arctic  
 and  
 Antarctic Sea Ice

Wednesday, August 6, 5:00 pm  
 Redfield Auditorium, W.H.O.I.  
 Reception to follow

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. How is this possible in an era of global climate change, and what can we expect in the future? Cecilia will address these and other important questions about the sea ice cover on our planet.

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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](mailto:sgls@ucsd.edu), [echassignet@fsu.edu](mailto:echassignet@fsu.edu) or [ccenedese@whoi.edu](mailto:ccenedese@whoi.edu).

The GFD Program is funded by the National Science Foundation and the Office of Naval Research.