

GFD Newsletter 2007

Faculty of Walsh College



The 2007 GFD Photograph.

A Sketch of the Summer

The 2007 Geophysical Fluid Dynamics Summer Study Program started on June 18th and the topic this year was *Boundary Layers*. Professor Joe Pedlosky (WHOI) was the principal lecturer and Steve Lentz (WHOI) gave one lecture at the beginning of the second week on "Observations of the bottom boundary layer". Joe's lectures taught us about "linear" boundary layers starting with insightful examples and applications, then he illustrated how boundary layers work on a shelf, and then we learned about the Sverdrup, Munk and Stommel boundary layers. The lectures finished with the ocean ventilation problem and equatorial boundary layers. As usual, after the principal lectures the summer schedule was filled by seminars on a variety of topics. During the 4th week we held a Mini-Symposium on "Ocean bottom and surface boundary layers" where we learned how the ocean boundary layers are observed and the challenges given by waves, wave-breaking, and bubbles, to mention a few, in measuring and understanding the dynamics in the oceanic boundary layers. At the beginning of August we held the 2007 GFD Public Lecture given by Professor Kerry Emanuel of the Massachusetts Institute of Technology. We learned how hurricanes are generated, named, and that they obey a Carnot cycle, just like a steam engine. The talk took place at the Quissett campus and afterwards we relaxed and enjoyed mingling at the reception. Jack Whitehead and Claudia Cenedese directed the summer program, and with the help of the faculty and two long-term visitors (Professors Steve Thorpe and Ted Johnson) took on the supervision of the fellows. Jeanne Fleming, Penny Foster, and Janet Fields also contributed to the smooth running of the program. Eric Chassignet helped with the computers during the first few weeks, and Keith Bradley worked his usual magic in the Lab. We continue to be indebted to W.H.O.I. Education, who once more provided a perfect atmosphere.

Schedule of Principal Lectures

Week 1:

Monday, June 18: Boundary layers in density stratified fluids.

Tuesday, June 19: Control of interior.

Wednesday, June 20: An experimental application.

Thursday, June 21: An extremely simple model for later use.

Friday, June 22: Bottom boundary layer on shelf. The problem of the bottom velocity.

Week 2:

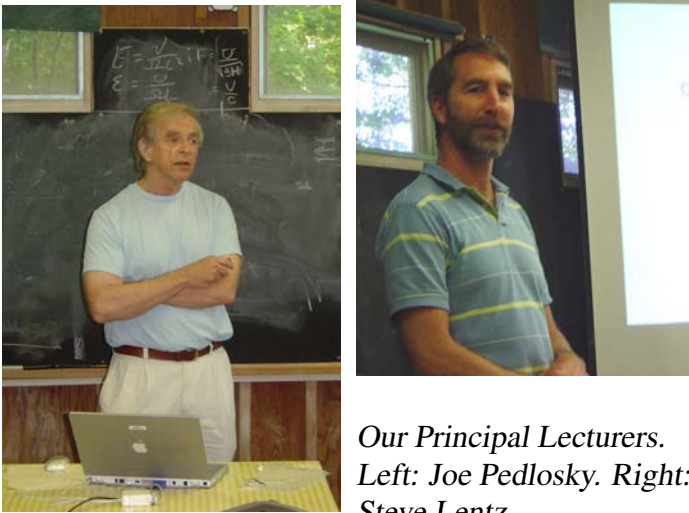
Monday, June 25: Observations of the bottom boundary layer. (Steven Lentz)

Tuesday, June 26: Sverdrup theory and Munk, Stommel boundary layers.

Wednesday, June 27: Inertial boundary layers.

Thursday, June 28: Inertial "runaway" and its repair.

Friday, June 29: The thermocline and its boundary layer structure.



*Our Principal Lecturers.
Left: Joe Pedlosky. Right:
Steve Lentz.*



*Presentation of the fellows. Clockwise from top left,
above: Basile, Iva, Miranda and Henrik; below: Angel,
Rebecca, Fred and Jan.*

Fellows' Reports

Andrew Wells, University of Cambridge
Skinny dipping in Woods Hole: Investigating near surface variations in sea temperature

Jeroen Hazewinkel, Amsterdam University
Internal wave radiation by gravity currents down a slope

Jan Zika, University of New South Wales
The stability of cascading flows

Frederic Laliberte, New York University
Double diffusive effects in a dam break experiment

Henrik van Lengerich, Cornell University
Convection of a van der Waals Fluid near the critical point

Basile Gallet, Ecole Normale Superieure
Instability theory of swirling flows with suction

Rebecca Dell, MIT/WHOI Joint Program
Nonlinear modifications to the Ekman Layer by an advecting geostrophic flow

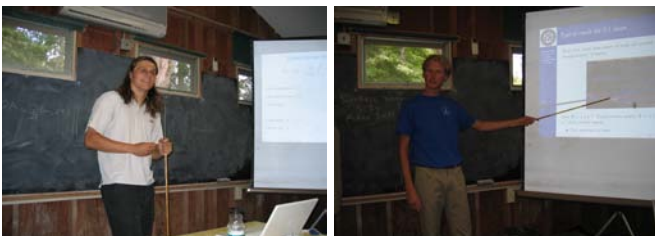
Iva Kavcic, University of Zagreb
Circular internal hydraulic jump

Miranda Holmes, Courant Institute of Mathematical Science
Length and shape of a lava tube

Angel Ruiz-Angulo, Caltech
Differential diffusion paradox for turbulent flow



*Jeroen and Andy during their GFD Field Trip (above)
and during their presentations (left).*



Softball Report



The GFD softball teams. Claudia's strategic position is hiding the fellows' score of 13 runs in the first inning!

For various reasons the GFD softball team this year was short of experienced players. The result was that Charlie and George supplemented by Joe, who played in the majority of the games, had to provide the expertise. The collective age of these experienced players was over 210 years so they didn't provide blinding speed. The inexperienced fellows were eager to play and showed up with enthusiasm all summer long, but the GFD team was not able to post a single victory until the last game of the summer when one of the two GFD teams (fellows vs staff) would prevail. Still, the softball games provided an opportunity for the fellows to bond and to have some fun together. Jan developed into a competent shortstop, although a line drive to his forehead caused him to field the ball tentatively in the games that followed. Fred developed an elaborate set of motions in the field, but he had terrific speed on the bases and turned into our go-to guy when we needed a runner. Basile surprised everybody by becoming our strongest hitter and he fielded well, too. Andrew roamed left field effectively and batted well during batting practice. Angel was a great help at third base, a position that requires a good strong arm. Jeroen was our second baseman and his height provided opposing pitchers with a big target over the plate. The biggest surprise turned out to be Iva, who was stunned that we would ask anyone to chase a softball around the field. But she was determined to play and ended up as a very competent catcher, who even caught fast throws from the outfield to put out runners trying to score. Our game on the final Thursday turned into a rout. The fellows scored 13 runs in the first inning to ice the game after which the two teams played pretty evenly before we retired to Crooked Pond for some water activity followed by food and drinks.



Iva batting (left) and Andy showing off his cricket skills (right).

The GFD Website

The lecture notes and reports are available online at gfd.who.i.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 Sears Public Lecture

Professor Kerry A. Emanuel of the Massachusetts Institute of Technology gave the 2007 Sears Public Lecture "Divine Wind: The History and Science of Hurricanes". Professor Emanuel is a noted authority on hurricanes. He has been highlighted in numerous books on hurricanes and climate change and recently received the Carl Gustaf Rossby Research Medal, which is the highest medal awarded by the American Meteorological Society. Discussion of climate and hurricane issues by Professor Emanuel can be found on the Society website and on his MIT website.

Divine Wind: the History and Sciences of Hurricanes

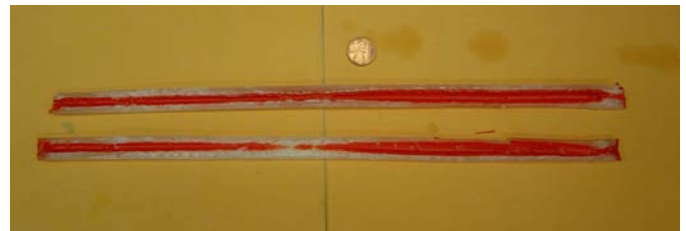
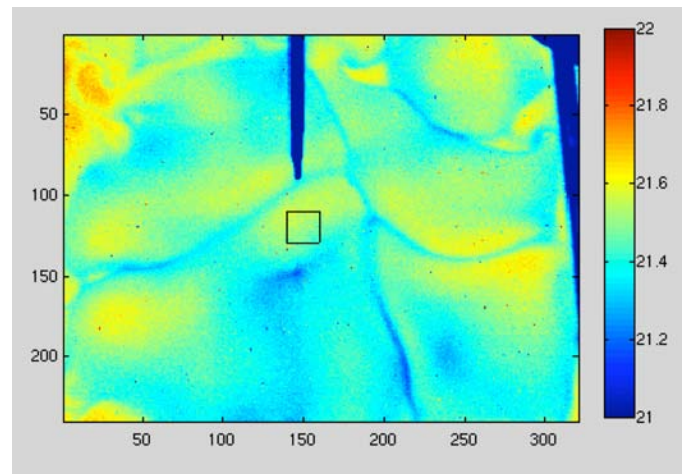
Professor Kerry Emanuel
Department of Earth, Atmospheric, and Planetary Sciences
M.I.T.

August 6, 3:00 pm
Sears Lecture
Geophysical Fluid Dynamics Program
Clark 507, W.H.O.I.
Reception to follow

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 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*
 Claudia Cenedese *W. H. O. I.*
 Eric Chassignet *University of Miami*
 Steve Childress *New York University*
 Charles Doering *University of Michigan*
 Glenn Flierl *M. I. T.*
 Karl Helfrich *W. H. O. I.*
 Lou Howard *M. I. T. and Florida State University*
 Joseph Keller *Stanford University*
 Norman Lebovitz *University of Chicago*
 Stefan Llewellyn Smith *U. of California, San Diego*
 Willem Malkus *M. I. T.*
 Philip Morrison *University of Texas at Austin*
 Michael Proctor *University of Cambridge*
 Antonello Provenzale *ISAC-CNR, Torino*
 Edward Spiegel *Columbia University*
 Jean-Luc Thiffeault *U. of Wisconsin, Madison*
 George Veronis *Yale University*
 John Wettlaufer *Yale University*
 Jack Whitehead *W. H. O. I.*
 William Young *Scripps Institution of Oceanography*



Top: Free surface temperature seen by an infra-red camera during a free convection experiment by Andy.
 Bottom: Miranda's laboratory wax model of a lava tube (split open). The white wax was solid inside a metal tube, and the red wax flowed through as liquid.

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.



Left: Walsh Cottage early in the morning. Right: Is Ed Spiegel trying out for first base?

Please send comments to ccenedese@whoi.edu and njb@math.ubc.ca if you have any suggestions regarding this newsletter or the GFD Program.

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