Volume 9, Issue 1 October 2006

THE *Ithacation*

Cornell Chapter of the American Meteorological Society Newsletter

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September Weather In Review by Erik Thorgersen '08

If you are like me and based what to bring with you as you packed to come to Cornell this August on last year's weather, it was a mistake to leave that cool weather jacket behind until after Fall Break. Overall, this September's high temperatures averaged nearly eight degrees cooler than last year's. The September 2005 average high was 75.6°F, while the September 2006 average high was a much cooler 67.8°F. The climatological average is 70.9°F. Only once during this September did the temperatures reach 80°F. (It happened eight times in 2005.) This September, high temperatures in the sixties arrived before September itself, while the first sixty degree day of 2005 was not until September 17. The fifties did not show up in 2005 until after the first week in October while 56°F was the high on September 29 this year. Ironically, the average low temperature for September 2006 was 49.8°F, while the average low temperature for September 2005 was actually a slightly cooler 49.0°F.

Part of that flip-flop would seem to be due to the lack of clouds and precipitation in 2005. 1.54" was the 2005 total precipitation compared to 2.68" in 2006. Both years were below the climatological average of 3.84". Days of precipitation greater than a trace favored 2006 fifteen to nine.

Stratocumulus clouds over Collegetown.
Photo by Dean Fogarasi '09

Overall, September 2006 in Ithaca felt much more like fall than September of last year did, when the effects of summer lingered throughout the month and into the first week of October. 60s were rare anywhere in the country until the final third of September 2005. The cold fronts of 2005 seemed to bring little precipitation and brief cool downs into the 70s. In contrast, this year we've experienced rainy fronts followed by cool, Canadian high pressures. The moral of the story: next year, don't wait until after Fall Break to bring the sweaters from home!

Internship at Indiana University by Robert Gottlieb '09

Last summer I worked as a research assistant for a group of atmospheric scientists –led by Drs. HaPe Schmid and Danilo Dragoni, PhD '03, - at Indiana University in Bloomington, Indiana. Although I was far younger and less experienced than everyone else, I still managed to be helpful. The group was somewhat short-staffed during the summer, because most of the students left Indiana during the break from school. Since I was returning to my hometown for the summer, I was in a better position to be useful.

This research team examines gas exchange between the boundary layer of the atmosphere and the canopy of Morgan-Monroe State Forest, which is located about 20 miles north of Bloomington. We had to perform weekly and monthly maintenance at our area in the forest, and I often helped with this. Weekly maintenance included walking to five below canopy sites, cleaning and leveling their sensors, taking soil samples, collecting readings from two data loggers by using a PDA, and a few other tasks. Every two weeks, two people recorded the leaf area index for the forest. Since this can only be done at sunrise or sunset, I had to wake up at 4:30 a.m. twice, but that didn't bother me too much. The job also included doing work in the lab, which consisted of permanently recording data from that I had done in the forest that week.

A major part of the project is a 150 ft. tower in the forest. Each week, somebody also has to climb the tower to check instruments, replace filters, and take pictures, among other things. I did this twice, and it was my favorite part of the job. The tower has an internal ladder to climb, and it's really quite safe. Once I started climbing I wasn't worried about the height at all. The trees prevented me from seeing how high I really was, and I think that helped. At the top I was well above the canopy, and I could see for miles in all directions. I was treated to a truly amazing view.

Surprisingly I didn't learn much about the weather or forecasting. I spent many hours coding in MATLAB, so I became much more proficient with that language. I used MATLAB to write a program for the calibration of a gas analyzer. I had to include data from other instruments at the top of the tower and at ground level for my calculations. The project took a while, and it was fairly difficult to get everything to work just how I wanted it, but I feel much better about using MATLAB now. I'm also glad that I was able to contribute something that will have a lasting benefit for the project. Working at IU was a great introduction to something that was both similar to and different from my main interest.

Internship at Gulf of Maine Research Institute by Pat Meyers '08

This past summer I worked as an intern at the Gulf of Maine Research Institute, working for former Cornell professor Dr. Andy Pershing. I worked on a project to see if there is any correlation between atmospheric variables and the number of lobster larvae that settle on the ocean floor. After lobsters hatch, they spend their first days of life drifting in the top meter beneath the water's surface. When the lobster is between fifteen and thirty days old, the young lobsters begin to dive towards the ocean floor, searching for a suitable habitat. This search could continue for several weeks until the lobster finds a location of suitable depth and ocean floor terrain. Lobsters usually choose cobble ocean floors because they provide fit hiding spaces for the lobsters to avoid predators. The lobster data set used was collected by counting lobster larvae in thirteen sample areas spanning the midcoast of Maine between 1989 and 2004. This data was correlated with atmospheric data covering New England and the Canadian Maritimes. Monthly averages of surface pressure and wind fields, and 500- and 700-mb geopotential

heights, wind fields and temperatures for three-month averages between June and October were extracted from NCEP's North American Regional Reanalysis dataset. This 32-km resolution set assimilates observed data at various levels through the atmosphere to create high resolution atmospheric profiles from 1979 to the present. The lobster data time series was correlated with the atmospheric data at each pixel.

The highest correlations were found in the 500- and 700-mb geopotential heights and surface winds and surface pressure. Years with high lobster counts had anomalously high pressure centers to the east of the New England coast, implying southerly winds along the Maine coast. These surface winds will drive southerly ocean surface currents that run perpendicular to the coast, transporting the lobster larvae towards the shore, giving them a suitable location to settle. Conversely, low settlement years are connected to anomalously low pressure over the region, producing surface winds from the north, transporting the surface water, and more importantly the lobster larvae, away from the coast. This research project opened my eyes to atmospheric forcing in the marine ecosystem. Not only is it good for Maine tourism when southerly winds bring up warm, tropical air, it also suggests there will be more lobsters to feed the tourists.

Research & Discover Program at UNH by Ginny Sawyer '07

I spent my summer close to home, at the University of New Hampshire. Their Institute for the Study of Earth, Oceans, and Space sponsors an undergraduate research and graduate fellowship program called Research & Discover, which I would recommend to anyone interested in climate change-related issues. There are relatively few meteorologists in the department as such, but the climate scientists there are involved in air quality monitoring, taking measurements from ice cores, and many other areas. I worked with Dr. Ruth Varner, an atmospheric chemist, and Dr. Doug Vandemark, an oceanographer. It took some effort to overcome differences in vocabulary between our different fields, but it was gratifying to know that my relatively limited knowledge of atmospheric science offered a new perspective for their research.

The Research & Discover program requires its interns to present their research at the end of the summer as a twelve-minute slideshow—matching American Geophysical Union guidelines—first at UNH for each other, and then at NASA Goddard Space Flight Center. The latter is because the program actually lasts two summers. Next summer, as part of the same program, I am eligible to do a similar project with an advisor at NASA. This way, I hope to be able to contrast academic research with government research as career options.

I was afraid at first that I wouldn't use much of what I had learned at Cornell to do my project. In the end, though, I learned much more about the sea breeze circulation and the planetary boundary layer, all in a project that mostly dealt with carbon dioxide readings left over from UNH's air quality campaign. I gained a slight head start on air pollution, which I'm taking this fall. There is also the chance to see other Cornell students, since UNH and Cornell jointly run the Shoals Marine Lab at Appledore Island. I didn't go there this year, except to circle it by boat, but other Research & Discover interns have taken air samples on the island.

Only juniors are eligible for Research & Discover, but I also worked in Dr. Varner's lab the summer before last. It was a great opportunity to do fieldwork on a regular basis, whereas the formal internship didn't leave much time to collect data, and I had to rely on measurements other people had already posted online.

Lamont-Doherty Intern Program at Columbia University

by Allison Wing '08

This past summer, I participated in the Lamont-Doherty Intern Program at Lamont-Doherty Earth Observatory of Columbia University, located in Palisades, NY. The Lamont-Doherty Intern program offers undergraduates the chance to experience scientific research in the Earth Sciences, including geology, geochemistry, oceanography, climatology, and meteorology. The specific areas of research available change year to year, depending on what scientists agree to serve as research advisors, but there are generally a few that are meteorology or climatology-based. The program is funded by a grant from the National Science Foundation through the Research Experience for Undergraduates program. In addition to doing work on my research project under the supervision of two Columbia-affiliated scientists, I attended special lectures, workshops and field trips designed to give a better idea of what the world scientific research entails.

I worked specifically at the International Research Institute for Climate and Society (IRI), a member of The Earth Institute at Columbia. IRI both conducts research and produces forecast products such as seasonal climate forecasts, ENSO predictions, and tropical cyclone activity predictions, as well as examining impacts on society.

My research project was titled "The relationship between actual and potential intensities of tropical cyclones on interannual time scales." Tropical cyclones, also known as hurricanes or typhoons, are undoubtedly one of the most spectacular and powerful meteorological phenomena, but are also one of the most costly, both in terms of monetary value and human life. There has therefore been a great deal of attention on tropical cyclones as part of the global warming debate. It is clear that anthropogenic climate change has the potential to affect tropical cyclone intensity, thus warranting careful studies of hurricane intensity. My research project was one such study on hurricane intensity. It was based on a thermodynamic theory for the maximum intensity of steady state tropical cyclones. Derived from Carnot's principle, the thermodynamic theory for potential intensity (PI) calculates an upper bound on the intensity of tropical cyclones given specific thermodynamic conditions. It includes only thermodynamic variables, thus making it relatively easy to calculate potential intensity from climatological data. More so, it is a physical theory, not a statistical one. If the potential intensity theory was accurate and the way in which actual storms relate to the theory is well understood, this could have significant applications in terms of intensity forecasts and predictions, as well as projections for the effect of global warming on hurricane intensity. Thus, I tested the theory and examined how it is related to the actual observations of tropical cyclones in both the Atlantic and Western North Pacific basins over the past fifty-six years. The motivation for the specifics of my study was that past analysis has indicated that wind speeds follow a uniform distribution up until their theoretical maximum (PI), indicating that a climatic change in PI would affect the intensity distribution of real storms uniformly. I sought to determine exactly how potential intensity and actual wind speeds were related, and I therefore examined if fluctuations in actual wind speeds were indeed governed by fluctuations in PI on the level of interannual variability. After comparing yearly average time series of tropical cyclone wind speed and PI, I found that the two were correlated fairly well for most breakdowns of the data, but additional results indicated that actual wind speed is varying with PI less than predicted.

Participating in the summer intern program at Lamont was an incredibly interesting and valuable experience for me. I got to work with world-renowned scientists on a topic that is very much a center of debate in the meteorological world. In addition, I learned what it was like to do research in atmospheric science, and scientific research in general. I discovered that while interesting and exciting in many ways, it was also tedious and involved sifting through large amounts of data and writing many MATLAB scripts. I also learned that in the world of academia, things move quite slowly. Nevertheless, it helped focus my interests in meteorology, and I know now that research is the direction in which I want to take after earning my degree in Atmospheric Science. Also, I'm currently working, with my two advisors from IRI, on getting our results published, and plan on presenting them at various national conferences, which is exciting! In summary, if you are at all interested in pursuing a research career or going to graduate school, I strongly suggest finding a similar program to participate in. Exploring opportunities such as this is important in figuring out your specific interests within meteorology and what direction you want to take your career.

Barclays Capital by Alyssa Pizzolanti '07

This past summer I worked with Barclays Capital, a British Investment Bank that is a powerhouse in commodity trading. Their departments are split up into power (electricity), natural gas, and oil teams. In terms of meteorology-related work, I provided the commodities team with three forecasts daily with a 15-day outlook for 12 US cities. It was a great opportunity to practice forecasting, with a lot of pressure since they relied heavily on the accuracy of the forecasts. They had me demo some fun weather products and evaluate whether or not the products would provide value-added. I taught some members of the power team how to interpret thickness maps and read MOS output. I gave a tropical meteorology seminar to the oil team. In addition, I did an analysis of the weather derivative market and proposed exotic weather structures that I deemed profitable to our group. Non-meteorological work I did for them consisted of excel spreadsheet work for our structuring team in order to quantify the value of different biofuels. I worked on a power pricing model and gave a presentation to the energy team at Barclays. I automated a few of our every-day tasks writing Visual Basic Code in Excel. I would recommend working in Investment Banking if you enjoy the financial markets, have taken at least 3 classes in Finance, and if you like a fast-paced work environment.

Lockheed Martin by Yolanda Roberts '07

At this time last year, I didn't think that I would ever work for Lockheed Martin. The thought never crossed my mind that there would be a multitude of opportunities for atmospheric science majors there, as they usually hire engineers. Thankfully, an email to Dr. Colucci from a college recruiter sealed the fate of my summer of 2006.

I was excited to learn on my first day that I would be working with a small research and development team on part of the next GOES (Geostationary Operational Environmental Satellite) satellite! My team in particular worked on developing the products that would be available from GOES-R. NASA plans on launching GOES-R in either 2012 or 2013, and Lockheed Martin is one of the companies competing for the contract. It was exciting to learn about the future capabilities of the next GOES series, and even more exciting to be a part of developing it. So what exactly did I do? When it comes down to it, I worked with C code all summer. No, I did not know how to code in C when I first started, so I had to learn myself, using Google and my computer savvy co-workers as references. That was a huge part of this internship: catching what was thrown my way then using the resources available to me to complete my task. I didn't have anyone looking over my shoulder, but I did have deadlines.

It turns out that Lockheed was seeking to fill a specific position with an atmospheric science major. However, I was impressed that they asked me at my interview last October what I would like to do during my internship, to which I responded applied computer programming, *and* that is exactly what they had me doing this summer. I was even more impressed that after I met my team (entirely composed of computer scientists) and had the opportunity to work with them for a couple weeks, my software and program leads gave me the option to switch to something more atmospheric science related. Even though I decided to stick with learning more about being a software developer, it was nice to know that if at any time I wanted something more directly related to my major, my leads were open to it.

If you are interested in learning more about what Lockheed Martin has to offer, please do not hesitate to contact me at ylr2@cornell.edu.

CBS-4 Boston by Nick Borelli '07

This past summer I interned at CBS4 Boston, where I worked with four meteorologists and two weather producers. CBS4 is rated number five out of 210 local television markets, in terms of audience size. Also, they were recently awarded the best local news broadcast in the country. Their vast resources allowed me to work with some of the most up-to-date graphics systems, and well-seasoned meteorologists. Initially having two weather producers was beneficial in learning to use the WSI graphics system. Meanwhile, each American Meteorological Society certified meteorologist that I worked with provided me with a different point of view in learning to effectively use the infamous chroma-key. Also, I saw many different points of view in making a weather forecast.

I interned with CBS4 in June, July, and August, typically working three days a week, for four to five hours a day. Throughout this time, I answered viewer e-mail and phone calls, recorded viewer weather observations, and occasionally performed computer updates to the sophisticated VIPIR radar. During the first several weeks of my internship I spent the majority of my time learning to use the WSI graphics system. I normally arrived around 8am (although sometimes much earlier to watch the thirty or more early morning on-air hits), and observed the weather producers making graphics for the noon show. Shortly after, I myself started to use the graphics system, which I learned over the course of about four weeks. The weather producers showed me the main workings of the system, while answering all of my questions along the way. Once familiar with most components of WSI, I was asked to make daily weather trivia questions, and an accompanying graphic to be used on air. I was also responsible for creating other graphics, such as wind gusts, precipitation totals, and updated weather maps. These involved using viewer observations, National Weather Service statements, and weather model output.

After observing several meteorologists going on-air many times, I was ready to use the infamous green screen. Watching four different meteorologists afforded me the advantage of seeing a number of different styles for presenting a weather forecast in front of a camera. In the beginning, I practiced for about an hour at a time, asking my colleagues for suggestions and pointers. After a few weeks of getting used to being in front of a camera, CBS4 taped one of my mock on-air forecasts, so that I could diagnose my flaws. Once done, I practiced for another few weeks; by this time I was getting very comfortable in front of the chroma-key. I then chose a day to come in and film a resume tape. First, I arrived and put together a show using the WSI producer computer. I used a combination of my own graphics and those made by the weather producers. I then taped for two hours, giving both longer and shorter forecasts. After filtering through my tape, I picked two forecasts that best represented myself, and edited them to use as a resume tape.

On several mornings throughout the summer I arrived around 3:30 AM, so that I was able to get an idea of how broadcast meteorologists prepare their weather forecasts. I noticed how many of the tools that I learned about in Synoptic Meteorology were employed for forecasting conclusions. Each meteorologist used a combination of the MOS statistical data, the FOUS actual model output, as well as several weather model runs. Current temperature trends as well as satellite and radar imagery were also used. Through the course of this observation, I feel that I gained insight in putting together an accurate forecast by using a variety of weather-related tools.

As a whole, I think that this internship was a big step in my becoming a broadcast meteorologist. Not only did it reaffirm my career choice in broadcasting, but I also learned a huge amount of information, both through my daily duties and observations. I feel that I have a good handle on using the WSI graphics system; this one of the most popular graphics systems that is used in broadcast meteorology. Furthermore, I am now comfortable in using the green screen, an achievement that could never be reached inside a classroom.

Lastly, I learned how to use many aspects of weather data that I learned about at Cornell and turn them into an accurate forecast. I feel that this internship has afforded me with the tools to reach my goal of becoming a broadcast meteorologist.

As a side note, I am staying in contact with all of the wonderful people at CBS4. They have invited me back to the weather office this winter so that I can experience the madness of a full-fledged snowstorm. Furthermore, they have invited me back for recording whenever the need arises. I therefore feel that this internship has also aided me in making good contacts and references for my future.

WTEN-Albany and Weather Routing Inc. by Erik Thorgersen '08

I was lucky enough to have two internships over the summer. One was paid, at a private meteorology company called Weather Routing, Inc. in Glens Falls, NY which specializes in ship and yacht forecasting and routing. The other was at TV station WTEN in Albany, NY, which was not a paid internship. Most importantly, they both involved forecasting, which is what I was really hoping for, and they were both close enough to home.

At Weather Routing my tasks included hanging up the weather plot maps, sorting through the models, and entering ship positions on clipboards and in the computer database. That may sound like boring stuff, but it was useful in expanding geographical knowledge, especially with world time zones, and in meteorological knowledge as well. We would receive reports directly from the ships in synoptic code which I would then interpret and plot on a map. It was interesting to receive such reports and see how events like the Indian Monsoon and tropical systems affect ships and the routes they take. Some of the more interesting and important responsibilities of mine were to write daily tropical summaries for the Atlantic and Eastern Pacific Oceans. I would summarize locations and intensities of tropical waves or lows and their likelihood for development. In addition to other tasks here and there, my other main job was to create the forecast and graphics for local cable television station TV8. This was my favorite part of the job. The Weather Routing meteorologist who would be doing the evening newscast for TV8 spent most of their day forecasting for ships. It was then up to me to create the forecast and most of the graphics on my own. The only downside to this job was starting work at 5AM!

At WTEN, my main task was also putting together the forecast and graphics for the evening newscasts. The main difference was in the graphics systems used. TV8 uses power point, while WTEN uses WSI, obviously a much more sophisticated graphics system. I also didn't get to create the forecast on my own at WTEN, but was happy to watch and learn forecasting techniques as I worked with Jeff Smith (2003 Cornell grad), the weekend meteorologist, on weekend evenings. I became comfortable working with WSI and even got to practice in front of the green screen and make a demo tape of me doing the weather.

Overall, I enjoyed both internships which gave me a look at two very different aspects in forecasting. Even if you are not interested in broadcasting, I would definitely recommend a broadcasting internship to anyone who wants something weather related to do over the summer that can't find anything more related to their interests. TV internships are not usually paid, but it is fun to see that side, and, from my experience, they are happy to have you, flexible in scheduling, and you can learn a lot about forecasting.

2006 Wettest Summer on Record in Ithaca by Allison Wing '08

On Wednesday August 30, the summer of 2006 became the wettest summer on record here in Ithaca, NY. In June, it rained a total of 7.52 inches, well above the normal monthly total of 3.87 inches. July experienced 6.77 inches of rain, compared with the normal monthly total of 3.54 inches, and August had 4.84 inches of rain, compared with the normal monthly total of 3.39 inches. The 19.13 inches of rain total over the summer made it the wettest since records began being kept in 1895. The previous record was 19.05 inches (1917). Interestingly, last summer (2005) was the third driest on record in Ithaca, with only 9.60 inches of rain recorded. In addition, there was an average of 16.86 inches of rainfall over the June, July, and August of 2006 across New York State, setting a record for greatest summer New York State precipitation average. The previous record was 16.26 inches, which occurred in the summer of 1903.

Data Source: Northeast Regional Climate Center
www.nrcc.cornell.edu

September Hurricanes by Erik Thorgersen '08

Looking outside of Ithaca, tropical systems in the month of September were down from last year by just one, but the intensity and affects of the 2006 storms were much less. Four tropical systems formed in 2006 and none posed a threat to the United States. Florence became a tropical storm on September 5 about midway between the Cape Verde Islands and the Leeward Islands before tracking northwest toward Bermuda as a hurricane. Gordon formed on September 11 to the east-northeast of the Virgin Islands and moved north, becoming a hurricane, before turning eastward and weakening. Helene formed on September 13 near the Cape Verde Islands. Helene became a hurricane three days later as it headed northwest before turning north and then northeast before reaching Bermuda. The final tropical system of September 2006 was Isaac which formed on September 28 to the southeast of Bermuda. Isaac became a hurricane as it headed north and weakened as it continued towards Newfoundland. There's quite a contrast between these four storms with the September storms of 2005. Recall that Maria, Nate, and Philippe meandered in the central Atlantic relatively harmlessly, but Ophelia threatened, and skirted, the southeast coast. Hurricane Rita formed east of the Bahamas before plowing into the Gulf of Mexico, reaching category 5 strength with winds as high as 175 mph, and low pressure of 897mb before making landfall along the Texas/Louisiana border. Quite a difference from this September!

A rainbow arches over campus after a fall rainstorm. Photo by Allison Wing '08

Ithacation–October 2007

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Call the Cornell WeatherPhone at
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Weather Trivia

Trivia Source: Extreme Weather, by Christopher C. Burt

1. What is the world's highest recorded dew point?
A. 83°F
B. 87°F
C. 91°F
D. 95°F

2. What is the world's highest recorded temperature?
A. 134°F
B. 136°F
C. 138°F
D. 140°F

3. What is the wettest city (population at least 10,000) in the U.S. by average number of days of precipitation?
A. Binghamton, NY
B. Syracuse, NY
C. Astoria, OR
D. Olympia, WA

4. What is the world's greatest 24 hour rainfall?
A. 57"
B. 64"
C. 68"
D. 73"

5. What is the world's largest 24 hour temperature change?
A. 63°F
B. 83°F
C. 103°F
D. 123°F

Answers:
1. D. 95°F is the world's highest dew point - recorded in Dhahran, Saudi Arabia.
2. B. 136°F is the world's highest temperature - recorded in Al Aziziyah, Libya.
3. C. Astoria, OR receives an average of 196 days of precipitation per year. Syracuse is tied for third and Binghamton is tied for sixth.
4. D. 73" is the world's greatest 24 hour rainfall recorded in Cilaos, Reunion Island (east of Madagascar).
5. C. 103°F is the world's largest 24 hour temperature change. In Loma, Montana over one 24 hour span the temperatures changed from -54°F to 49°F.

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