IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF MISSISSIPPI
SOUTHERN DIVISION

THOMAS C. AND PAMELA MCINTOSH,	)	
	)	No. 1:06-cv-1080-LTS-RHW
Plaintiffs,	)	
	)	
v.	)	
	)	
STATE FARM FIRE AND CASUALTY COMPANY, FORENSIC ANALYSIS & ENGINEERING CORP., *et al.*,	)	
Defendants.		

DEFENDANT STATE FARM FIRE AND CASUALTY COMPANY'S MOTION TO EXCLUDE TESTIMONY OF KEITH G. BLACKWELL

Defendant State Farm Fire and Casualty Company ("State Farm") moves pursuant to Federal Rules of Evidence 104, 402, 403, 702, and 703 to exclude the testimony of Plaintiffs' expert Keith G. Blackwell from the trial of this action. Dr. Blackwell's report[1] consists largely of general observations about Hurricane Katrina that are irrelevant to the issues in dispute here. And his conclusions about the McIntosh site are not reliable, and would not assist the jury, because they are based on only two sources of data, neither of which purports to measure winds

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[1] Dr. Blackwell's report in this case credits a co-author, Dr. Aaron Williams, who is a colleague of Dr. Blackwell. Dr. Blackwell testified at deposition, however, that Dr. Williams "helped me initially put together a very short overview of the storm, but essentially the report—the meat of the report is mine, the research." (Deposition of Keith Blackwell ("Blackwell Dep.") at 51.)

at (or even near) the McIntosh house, to the exclusion of all others—including those just miles from the McIntosh property. For these reasons, as discussed in detail in State Farm's memorandum in support of this motion, filed contemporaneously herewith, Dr. Blackwell's testimony should be excluded from the trial of this action pursuant to Federal Rules of Evidence 104(a), 402, 403, 702, and 703.

RESPECTFULLY SUBMITTED, this the 9th day of November, 2007.

BRYAN, NELSON, SCHROEDER, CASTIGLIOLA & BANAHAN
Post Office Drawer 1529
1103 Jackson Avenue
Pascagoula, MS 39568-1529
Telephone: (228)762-6631
JOHN A. BANAHAN, ESQ. (MSB# 1731)
HARRY BENJAMIN MULLEN, ESQ. (MSB# 9077)
MATTHEW E. PERKINS, ESQ. (MSB# 102353)

WEBB, SANDERS, & WILLIAMS, P.L.L.C.
363 NORTH BROADWAY
POST OFFICE BOX 496
TUPELO, MISSISSIPPI 38802
Telephone: (662) 844-2137
DAN W. WEBB, MSB # 7051
ROECHELLE R. MORGAN, MSB # 100621

By: /s/ Roechelle R. Morgan
ROECHELLE R. MORGAN

CERTIFICATE OF SERVICE

I, Roechelle M. Morgan, hereby certify that on November 9, 2007, I electronically filed the foregoing Defendant State Farm Fire and Casualty Company's Motion to Exclude Testimony of Keith G. Blackwell with the Clerk of the Court using the ECF system which sent notification of such filing to the following:

Sidney A. Backstrom, Esquire
Zach Scruggs, Esquire
Richard F. Scruggs, Esquire
Benjamin H. McGee, III, Esquire
THE SCRUGGS LAW FIRM, P.A.
Post Office Box 1136
Oxford, MS 38655

Harlan F. Winn, III, Esquire
BATTLE FLEENOR GREEN WINN & CLEMMER LLP
505 N. 20th Street
Suite 1150
Birmingham, AL 35203

Larry Canada, Esquire
Katherine Breard, Esquire
GALLOWAY, JOHNSON, et al.
701 Poydras Street, Suite 4040
New Orleans, LA 70139

David A. Norris, Esquire
H. Hunter Twiford, III., Esq.
Christine Lipsey, Esquire
MCGLINCHEY, STAFFORD
P.O. Drawer 22949
Jackson, MS 39225

Marshall H. Smith, Jr.
BARRETT LAW OFFICES
P.O. Box 987
Lexington, MS 39095

Dewitt M. Lovelace, Esquire
LOVELACE LAW FIRM, P.A.
36474 Emerald Coast Parkway, Suite 4202
Destin, FL 32541

Derek A. Wyatt, Esquire
NUTT & MCALISTER, PLLC
605 Crescent Blvd., Suite 200
Ridgeland, MS 39157

Mary E. McAlister, Esq.
NUTT & MCALISTER, PLLC
605 Crescent Blvd., Suite 200
Ridgeland, MS 39157

Michael C. Moore, Esquire
MIKE MOORE LAW FIRM, LLC
10 Canebrake Blvd.
Flowood, MS 39232

George Shaddock, Esquire
707 Watts Avenue
Pascagoula, MS 39567

Michael R. Smith, Esq.
William W. Taylor, III., Esq.
ZUCKERMAN, SPAEDER
1800 M Street, NW, Suite 1000
Washington, DC 20036-5802

THIS, the 9th day of November, 2007.

/s/ Roechelle R. Morgan
ROECHELLE R. MORGAN

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IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF MISSISSIPPI
SOUTHERN DIVISION

THOMAS C. & PAMELA MCINTOSH PLAINTIFFS

VERSUS 1:06-cv-1080-LTS-RHW

STATE FARM FIRE AND CASUALTY
COMPANY; and FORENSIC ANALYSIS
& ENGINEERING CORP.; and E.A.
RENFROE & CO., INC. DEFENDANTS

VIDEOTAPED DEPOSITION OF KEITH G. BLACKWELL

Taken at Scruggs Law Firm, 4836 Main Street, Moss Point, Mississippi, on Monday, October 1, 2007, beginning at 9:37 a.m.

REPORTED BY:
Elizabeth Bost Simpson, RDR, CRR, CSR 1293
Registered Realtime, Merit, and Diplomate Reporter
2100 18th Street
Gulfport, Mississippi 39501
ESimpson@SBMreporting.com

0002

APPEARANCES:

REPRESENTING THE PLAINTIFFS:
SIDNEY A. BACKSTROM, ESQUIRE
Scruggs Law Firm
120-A Courthouse Square
Oxford, MS 38655
sidbackstrom@scruggsfirm.com

REPRESENTING STATE FARM FIRE & CASUALTY CO.:
VALERIE STRONG SANDERS, ESQUIRE
Sutherland Asbill & Brennan, LLP
999 Peachtree Street, N.E.
Atlanta, GA 30309-3996
valerie.sanders@sablaw.com

REPRESENTING E.A.RENFROE:
DAVID A. NORRIS, ESQUIRE
McGlinchey Stafford, PLLC
Skytel Centre South, Suite 1100
200 South Lamar Street
Jackson, MS 39201
dnorris@mcglinchey.com

REPRESENTING FORENSIC ANALYSIS & ENGINEERING CORP.:
KATHRYN BREARD PLATT, ESQUIRE
1213 31st Avenue
Gulfport, MS 39501
kbreard@gjtbs.com

ALSO PRESENT: Jeff Conner, Videographer

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TABLE OF CONTENTS

- - -

STIPULATION

It is hereby stipulated and agreed by and between the parties hereto, through their respective attorneys of record, that this deposition may be taken at the time and place hereinbefore set forth, by Elizabeth Bost Simpson, RDR, CRR, CSR 1293, Court Reporter and Notary Public, pursuant to the Federal Rules of Civil Procedure, as amended;

That the formality of READING AND SIGNING is specifically NOT WAIVED;

That all objections, except as to the form of the questions and the responsiveness of the answers, are reserved until such time as this deposition, or any part thereof, may be used or is sought to be used in evidence.

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VIDEOGRAPHER: This is the video deposition of Dr. Keith G. Blackwell, taken in the suit styled Thomas C. and Pamela McIntosh versus State Farm Fire and Casualty Company, et al., being Number 1:06cv1080LTS-RHW in the United States District Court for the Southern District of Mississippi, Southern Division.

We are at the Scruggs Law Firm in Moss Point, Mississippi. Today's date is Monday, October 1st, 2007. The time is 9:42 a.m. The court reporter is Elizabeth Simpson of Simpson Burdine and Migues. I am Jeff Conner, the legal video specialist with Conner Reporting.

Will the attorneys please introduce themselves on audio.

MS. SANDERS: Valerie Sanders for State Farm Fire and Casualty Company.

MR. NORRIS: David Norris for E.A. Renfroe and Company.

MS. PLATT: Kathryn Platt for Forensic Analysis & Engineering Corporation.

MR. BACKSTROM: Sidney Backstrom for the plaintiffs. And with me is the witness,

0006

Dr. Keith Blackwell.

VIDEOGRAPHER: Thank you.

Swear the witness, please.

(OATH ADMINISTERED)

KEITH G. BLACKWELL,

having been produced and first duly sworn, testified as follows, to-wit:

- - -

EXAMINATION

BY MS. SANDERS:

Q. Good morning, Mr. Blackwell. My name again, as we just heard, is Valerie Sanders. I represent State Farm Fire and Casualty Company. I know you have been deposed before. We'll talk more about that in a moment, but do let me know if you don't understand one of my questions.

Please also let me know if you'd like to take a break at any time. And try to remember, if you would, even though we're on video, to give audible answers as opposed to nodding or shaking your head. That just helps everybody out.

A. Okay.

Q. Okay. So am I correct, then, that you have been deposed before?

Blackwell, and also Dr. Aaron Williams. I gather Dr. Williams is also at the University of South Alabama?

A. Yes, he is.

Q. He's a colleague of yours?

A. Yes, he is.

Q. And even though you've got a co-author, do I understand that you agree with everything in this report as supplemented?

A. As supplemented, yes.

Q. You consider the whole thing yours,

0051

notwithstanding that you have a co-author.

A. He helped me initially put together a very short overview of the storm; but essentially the report -- the meat of the report is mine, the research.

Q. Okay. Thank you. I'd like to look first at this numbered Section 1 here that begins at the first page, and it's got a numeral one and it says Storm History and Large Scale Characteristics. Am I correct in my evaluation that this section, Section Number 1, deals with your conclusions about general features of Katrina rather than conditions at any specific property at a specific time?

A. Yeah. It says Storm History and Large Scale Characteristics, so that would be just an overview of the storm in general.

Q. Great. If you would turn to page 4 for a moment. At the very top of the page it begins "over the loop current." That loop current is in the Gulf of Mexico?

A. Yes, it is.

Q. And Katrina passed over that loop current before it moved across the Mississippi Coast?

0052

A. Yes.

Q. All right. Reading further in that sentence, or I'll start again, it says, "Over the loop current, Katrina strengthened to a Category 5 hurricane on the Saffir-Simpson Scale on 28 August 2005, Figure 3, before weakening as it moved across the coast the next morning, Figure 4." Have I read that correctly?

A. Yes.

Q. And we've heard some today and we laypeople also hear on the news about categories of hurricanes. That is what's meant -- that's a reference to that Saffir-Simpson Scale?

A. That's correct.

Q. Do I understand correctly that the determining factor in assigning that category is wind speed?

A. Yes. The way it's defined presently, it's wind speed.

Q. Okay. And this weakening of Katrina that you refer to here resulted in Katrina's becoming a Category 3 hurricane, whereas it had previously been a five?

MR. BACKSTROM: Object to the form.

A. Yes, according to the Saffir-Simpson

A. No.

MR. NORRIS: I don't have anything.

- - -

EXAMINATION

BY MS. PLATT:

Q. Dr. Blackwell, my name is Kathryn Platt. I represent the engineer in this case, Forensic Analysis & Engineering Corporation.

Have you visited the McIntosh case after Katrina, or since Katrina?

A. No, I have not.

MR. BACKSTROM: You talking about the McIntosh house?

MS. PLATT: Yes.

MR. BACKSTROM: Okay.

BY MS. PLATT:

Q. Have you ever visited their property --

A. I haven't visited -- I've been all around the Mississippi Coast, but I have -- probably have not been on their property.

Q. Okay. If I understand correctly, earlier today you testified that storm surge did get into the McIntosh home.

A. That's my understanding.

Q. Do you have any knowledge of the level of water that came onshore at the McIntosh home?

MR. BACKSTROM: Objection to form.

A. I did, and at least there were estimates of the water level from -- from what I recall from the IPET report. I can't remember the exact values, but I believe the water level got a few feet deep in the house.

BY MS. PLATT:

Q. And when you say "a few feet deep in the house," do you have an estimate as to what that would be above sea level?

A. I'd have to look at the elevation of the house again. I can't recall the exact elevation of the house right off --

Q. Okay.

A. -- but have that data. I just can't -- I believe the elevation of the house was around 17 feet, but I'd have to check that.

Q. Okay. You said earlier that you are not an engineering expert; correct?

A. No.

Q. And, therefore, you have no opinion as to whether the house was, in fact, damaged by winds prior to the storm surge?

A. I have no -- could you repeat your question again?

Q. I said, therefore, you do not have any opinion as to whether or not the home was damaged by wind prior to the storm surge.

A. I know that there were strong winds there that were likely there prior to the likely arrival of the significantly -- of the very high water. What actually damaged the house, I don't know.

MS. PLATT: Okay. Thank you.

MR. BACKSTROM: I don't have any

to 140 miles per hour.

Q. And is the basis for that, again, radar imagery?

A. Well, partly.

Q. What else?

A. The basis of the presence of the downburst-like condition is based on radar imagery.

Q. Okay. And what about your conclusion about greatly enhancing the surface wind speed possibly to greater than or equal to 140 miles per hour?

A. That's based on the strength of the winds in the eye wall, where the downburst was -- downburst-like condition was being experienced.

Q. And that -- the strength of the winds in the eye wall --

0153

A. Were near cloud base.

Q. Okay.

A. They were then being brought down -- could -- likely were being brought down to the ground.

Q. Okay. And your conclusion --

A. Were down to ten meters -- or down to the level of the house.

Q. Okay. And your conclusion about what was happening in the eye wall is based on the processes we discussed earlier involving your analysis of dropsonde data and radar?

A. And radar.

Q. Okay.

A. And, to some degree, step frequency microwave radiometer.

Q. Okay. If you would turn back to the second page of this most recent supplement, I've just got one question there. It actually begins on the bottom of the first page. It says --

A. This is on the second supplement?

Q. The same supplement, yes, but turning back to the first page, at the very bottom. It says, "Replace the following sentence in Section 1 on page 6." And then the statement to be replaced

0154

says, "Calculations by the National Oceanic and Atmospheric Administration's Hurricane Research Division show that even though the storm weakened to a Category 3 at landfall, the great horizontal expansion of the wind field allowed Katrina's winds near landfall to maintain or even exceed the kinetic energy of its earlier Category 5 strength."

And you've noted, then, that that should be replaced with the following: "Powell and Reinhold, 2007, show that even though the storm weakened to a Category 3 at landfall, the great horizontal expansion of the wind field allowed Katrina's winds near landfall to maintain nearly the same kinetic energy of its earlier Category 5 strength."

What caused you to decide that that revision should be made?

A. The publication of Powell and Reinhold, 2007.

Q. Okay. And --

A. The fact that they came out with a paper stating this, that Powell had presented a paper to us at University of South Alabama -- it was either in April or March 2006 -- where he was working on

0155

the preliminary aspects of this paper that was later published; and at that time, he came forward with these calculations that showed that Katrina's winds -- that the kinetic energy of Katrina's winds actually at landfall exceeded the kinetic energy of the winds when the storm was at Category 5 strength.

But in the paper that was later published and peer-reviewed, he said that they were nearly the same, essentially they were -- and I talked to him the other day on the phone and he reiterated that, that essentially they were approximately the same. And he stated then that because of some of the, you know, potential errors, small errors in his calculation, that it could have still exceeded; but in the peer-reviewed publication, he went with, I think, roughly equal to. At least that's what he told me the other day, and what's what I seem to remember from the paper that I read. It was approximately the same.

Q. Okay. That's helpful. Thank you.

Dr. Blackwell, we have not talked today about H winds. Do you know what I mean by H winds? Or what does H winds mean to you?

0156

A. Hurricane wind. That's what it means to me.

Q. Are you familiar with an H*Wind product, maps that have been put out about Katrina winds?

A. Yes, I am.

Q. Okay. Did you use those at all -- oh, by whom are those disseminated?

A. They're disseminated by the Hurricane Research Division or NOAA, by Dr. Mark Powell in particular.

Q. The same Dr. Powell we have had occasion to discuss today?

A. That's correct.

Q. Did you use those H*Winds from the Hurricane Research Division at all in coming to the conclusions in your report for this case?

A. No. Not significantly, no.

Q. Why not?

A. Because they did not portray a double eye wall storm. That's the main reason.

Q. Okay. And what do you understand that H*Wind product or grid to report?

A. It provides -- it's my understanding that it provides an estimate of the one-minute sustained wind for marine exposure over water and

0157

for open exposure over land in the hurricane --

Q. Do you --

A. -- supposedly at a certain time. I think they were produced in three-hour intervals.

Q. Do you know what data was used to come up with those estimates?

A. It's listed on the product.

Q. And I think you said the main reason you did not use that product was because it did not show a double eye wall.

A. That was a significant factor, yes.

Q. Any other reasons come to mind?

A. The wind fields looked overly smooth. The wind fields -- the peak winds that were being observed that are shown in H*Wind, it's my recollection that they don't correlate with where the peak winds measured by dropsondes were indicated. So I just -- you know, it looks like an overly smooth product that gives you a general flavor for maybe what the wind looked like, but it doesn't give you -- I don't believe it gives you the local accuracy you need to do an evaluation like this. And it doesn't do double eye walls, which is what Katrina had at landfall.

Q. Dr. Blackwell, do you agree with the

0158

proposition that wind typically damages houses from the top down, while storm surge typically damages them from the bottom up?

MR. BACKSTROM: Object to the form. Outside the scope.

A. I don't know. I'm not a -- I'm not an engineer. I don't know. I don't do damage assessment. I don't know.

BY MS. SANDERS:

Q. Okay. Now, I understand that's not in your report, but are you unable to agree or disagree with that proposition?

MR. BACKSTROM: Same objection.

A. I'd have to study it. I don't know.

BY MS. SANDERS:

Q. Okay. So as you sit here, you can't agree or disagree.

MR. BACKSTROM: Same objection.

A. I don't know. I don't know.

BY MS. SANDERS:

Q. Okay. Have you been asked, Dr. Blackwell, to analyze any of the defendants' expert reports in this case?

MR. BACKSTROM: Let me object to the extent it calls for work product.

0159

BY MS. SANDERS:

Q. Let me ask this: Have you developed any conclusions with respect to any of the defendants' experts' reports in this case?

MR. BACKSTROM: Same objection.

BY MS. SANDERS:

Q. Well, let me ask it this way: If we -- when we are at trial, if Mr. Backstrom or one of his co-counsel were to ask you to opine on any of the defendants' expert reports in this case, what would you say?

MR. BACKSTROM: Again, same objection. I don't have a problem with you asking him about those reports; but just to ask it in that general way, in addition to invading on

Katrina had a double eye wall structure? What sorts of data did you consider in reaching that conclusion?

A. I looked at radar data. I looked at aircraft data. I looked at Doppler radar data, dropsondes from aircraft flying in Katrina.

Q. Maybe we should go ahead and spell that now.

0063

A. D-R-O-P-S-O-N-D-E-S.

Q. Thanks, Dr. Blackwell.

MS. SANDERS: You'll be hearing that again.

BY MS. SANDERS:

Q. Okay. So Doppler radar and aircraft dropsonde?

A. Step frequency microwave radiometer, microwave satellite imagery. Those are likely the main tools.

Q. Okay. And I may have some follow-up on that in a minute, but I wanted to finish up here on this point. It is your view, am I correct, that the ongoing eye wall replacement feature that you believe inhered in Hurricane Katrina resulted in a reduction of Katrina's maximum winds after landfall when compared with before landfall?

A. Well, it was reducing the winds before landfall, too.

Q. So was it always -- did it reach a maximum over water and then keep reducing, referring here to the maximum winds of the storm?

A. Yes. Figure 5A shows the storm with a single eye wall. Figure 5B shows storm with still a single eye wall but a lot of banding outside the

0064

eye wall. Figure 5C shows the early stages of an outer eye wall forming as the outer bands coalesce. Figure 6A shows the now open eye walls, both inner and outer, as they are striking the coast, but it was -- the storm was weakening at the time of Figure 5C because of the development of the coalescing of these outer bands into a almost complete ring around the storm center at that time. That was influencing the weakening of the storm. So the storm had begun to weaken before it hit the coast.

Q. Okay. And that weakening, you concluded, resulted in, among other things, a reduction of the storm's maximum winds?

A. That's correct, in the inner eye wall.

Q. Okay. And overall, do I take it?

MR. BACKSTROM: Object to the form.

BY MS. SANDERS:

Q. Well, let me read you a sentence from the caption of Figure 5C, which is on page 8 of your report, which says -- I'm actually going to begin on the 5th line down, at the end of that line: "As the outer eye wall strengthened, the inner eye wall was being starved of energy, thus this ongoing eye wall replacement was one factor

0065

aiding the reduction of Katrina's maximum winds from earlier." I understand that to refer to the maximum winds of the storm Katrina as a whole. Have I got that right?

A. Yes, because that's the maximum wind that the Hurricane Center assigns to the storm. Doesn't matter -- in their book, it doesn't matter which eye wall it's in. If the storm has two eye walls, they're only going to give you one wind speed.

Q. Okay.

A. One maximum wind, and that's going to be wherever the maximum wind is found.

Q. Okay. So do you agree or not with what I understand to have been the hurricane's conclusion that the storm's maximum wind speeds decreased as it moved over land?

MR. BACKSTROM: Object to the form. You said hurricane's conclusion. Did you mean Hurricane Center?

MS. SANDERS: Oh, Hurricane Center. I'm sorry. Yes.

BY MS. SANDERS:

Q. Do you understand the question? And thank you to Mr. Backstrom for that clarification.

0066

A. The storm was weakening before landfall, and it certainly weakened after landfall.

Q. And you agree with that much of what the -- I know that -- I sense you have a disagreement with the Hurricane Center as to the presence or absence of a double eye wall structure.

A. Yes.

Q. Okay. Notwithstanding that disagreement --

A. Although some -- some disagreement.

Q. Okay. What do you mean by -- why do you qualify it?

A. Well, because in my supplement -- first supplement I attach, the very back -- very back page, a cyclone discussion that was written by one of the forecasters at the Hurricane Center talking about the development of an outer eye wall.

Q. Okay. So -- and I take your point. To the extent the Hurricane Center concluded that there was not a double eye wall structure, you disagree with that.

MR. BACKSTROM: Object to the form.

A. I think it should have been worded stronger in their report.

0067

BY MS. SANDERS:

Q. As to the -- worded more strongly as to the possibility, likelihood, or existence of a double eye wall?

A. Yes.

Q. Okay.

A. Pretty much along those lines. There -- the -- since the report is the official word from the Hurricane Center, that's their official stance; but it doesn't necessarily agree with all the forecasters down at the Hurricane Center.

Q. I understand.

And so -- but it sounds to me as though

Q. Okay. Do you know offhand at least something that is missing?

A. Yes.

Q. What's missing?

A. Just off the top of my head here, a

0012

grant or two that was recently awarded.

Q. Okay.

A. And one of the papers that has recently been published in a journal. Here it says it was submitted for peer review. That's old.

Q. Which article is that?

A. It's the Medlin, et al., 2000 -- well, it really was -- it's the Medlin, et al., 2006 in this CV, but it really was published in 2007 --

Q. Okay.

A. -- as is indicated in my current CV. And all the technical reports are not there.

Q. Okay.

A. So it's not my current CV.

Q. Okay. Well, I want to ask you now about something that I'm quite sure hasn't changed, and that is just to go through your academic background there, with your three degrees in meteorology.

A. Okay.

Q. Let's start with the Bachelor of Science. You got that from the University of Wisconsin?

A. That's correct.

Q. Were there any courses there at the

0013

undergraduate level that you believe are particularly relevant to your qualifications to express the reviews you've given in the report in this case?

A. That's part of my formal education. Did take a course in small-scale meteorology.

Q. And what do you mean or what did you understand the course title to mean by "small-scale"?

A. Well, microscale.

Q. Is there sometimes --

A. I think. I'm trying to remember. Meso-, microscale, something along those lines.

Q. Is there a distinction sometimes made between microscale meteorology and macro meteorology?

A. Oh, yeah. Oh, yes.

Q. Okay. Is your work focus more or less in one or the other of those categories?

A. I've done work in all three.

Q. Both -- I missed the third. I've got macro, micro --

A. Synoptic. Synoptic is generally mid-range. Macroscale -- I think of macroscale as being a very large scale. Synoptic may be

0014

included in that scale --

THE REPORTER: I'm sorry. Could you repeat that? You think of what?

A. Synoptic scale as being included -- you know, as possibly included in macro scale, but it's -- macro scale is a larger scale.

BY MS. SANDERS:

Q. Okay. And so if we've got the three, macro, synoptic, and micro, is there -- can you describe that for us --

A. There's another in there, too, meso.

Q. Okay.

A. Mesoscale.

Q. Where does that fall?

A. Falls between microscale and synoptic.

Q. Can you describe for us in what I might call laypersons' terms, is macro global? Is there a -- can you give us an idea what each of those four categories, what the breadth of each would be?

A. Roughly. I would think macroscale would include, yes, planetary scale. I'd have to look at the actual definition to be sure, but it's a large scale, very large scale.

Q. And then synoptic?

0015

A. Synoptic is -- synoptic scale is generally thought of as being smaller than planetary scale.

Q. Okay. In geographic terms, would it be more regional than global or --

MR. BACKSTROM: Object to the form. You can answer if you can.

A. It would be more, maybe, regional or continental.

BY MS. SANDERS:

Q. And then mesoscale I believe you said was next?

A. Right. Mesoscale is smaller than synoptic.

Q. Is there an approximate sort of geographic range you could give us to put that in context?

A. It depends on the situation.

Q. Okay.

A. Depends on the latitude. It depends on the depth of the feature that you're looking at. There's a dynamical definition for mesoscale that essentially mesoscale starts at the -- well, where the Rossby radius of deformation defines it to be.

Q. Okay. You will be shocked to hear that

0016

I don't know what that is, so could you -- is there -- I guess what I'm getting at -- let me ask it this way. Well, first let's cover micro. How would you describe microscale meteorology?

A. Microscale is small scale.

Q. Okay. Smaller than any of the three we've discussed previously.

A. The planetary, synoptic and meso?

Q. Yes.

A. Yes.

Q. Okay. So it's the smallest of the four. Is there one of these levels that corresponds to studying -- and, again, I apologize for my layperson's understanding of this. But is there one of these that corresponds to the study of an entire storm or weather system or event, whatever moved over them. There were some observation towers along the Mississippi Coast themselves.

Q. Are you aware of one at Keesler Air Force Base?

A. Yes.

Q. Did you consult the data from that station in connection with reaching, let's say, any of the conclusions in your report?

A. I did -- it is a data source that I

looked at.

Q. Did you find it to be roughly equivalent to the numbers that you have offered in your report, or did you find a significant difference there?

A. It's -- the -- the data early on -- well, let me put it this way: The data -- the further you progressed into the storm, the more the data looked like it may be suspect, particularly in the hours prior to the equipment failing.

Q. And when you refer to the data being suspect, do you mean the data from Keesler Air Force Base?

A. Yes.

Q. Okay. What led you to the conclusion that that data appeared suspect?

A. Well, the dropsonde that was released -- before the eye wall of the storm got to the Mississippi Coast, dropsonde was released closer to Gulfport, though, that indicated that winds were 115 miles an hour, thereabouts, below 2,000 feet, some level below 2,000 feet, and that the method used to correct or to estimate winds near the surface from dropsonde -- from dropsondes

was quite a bit higher than what I was seeing with the -- with the -- some of the station data that was ground-based.

Q. And in particular the Keesler data -- Keesler data?

A. Yes.

Q. I'll ask you more about the dropsondes and the adjustments in a moment, but is it fair -- I think I understood you correctly that it was the difference between the dropsonde measurements as adjusted -- and we'll talk about that in a moment. The difference between that and the Keesler data caused you to be suspect of the Keesler data?

A. Well, the Keesler data also started having real problems.

Q. What do you mean by that?

A. Well, the pressure started rising dramatically even though the storm was still approaching, and that just is absurd.

Q. Is the pressure something else that was measured by the equipment at Keesler?

A. Yes.

Q. And do I understand correctly that that pressure measurement was rising in a way that you considered -- your word was "absurd," but that led

you to think it was inaccurate?

report, if you would, which is Exhibit 4, and I am going to pick up with the clause of the sentence that I had been reading. Actually this is still the second clause in the first sentence under Section 3. It says, "Winds likely reached at least 135 miles --"

A. Where is this?

Q. Oh, I'm sorry. It's still the first sentence under Section 3, but it's picking up after the semicolon --

A. Okay.

Q. -- with the next clause. "Winds likely reached at least 135 miles per hour later that morning around and/or after sunrise in the vicinity of the residence."

First, you talk about "likely" and "in the vicinity of." That's for the same reason that you can't tell exactly what was happening at and

0107

affecting the residence wind-wise; correct?

A. I can't see the wind at the elevation of the house, no.

Q. Okay. And you do have this number, 135 miles per hour. Is that a sustained wind number or a gust number?

A. That would be a gust number.

Q. And how do you define "gust"? Three-second?

A. The normal gust -- the normal gust is a three-second gust. The normal convention for wind gusts is three-second gusts.

Q. So if you tell --

A. So the three-second gusts likely reached 135. Now, the one- or two-second gusts likely reached much higher than that.

Q. Okay. So if there's a number in here which is identified either in your report or in your testimony today as a gust number, you would be using the three-second convention unless you tell me otherwise?

MR. BACKSTROM: Object to the form.

A. Not necessarily.

BY MS. SANDERS:

Q. So what can I make, then? It just says

0108

135 miles per hour. You've told me it's a gust number. Can you tell me if it is a three-second gust number?

A. The three-second gust was 135. The three-second gust got to at least 135.

Q. Okay.

A. The one- and two-second gusts got higher, and so higher values that you see associated with the McIntosh property are likely shorter term gusts.

Q. Okay. Well, we'll talk about those when we get to them, but let me ask you first how you came up with that 135 figure.

A. Well, I know that the McIntosh property experienced the outer eye wall of the hurricane; and based on my research into the strength of the outer high wall, the sustained wind speed in the outer eye wall was around mid Category 2 range, according to dropsonde data, and SFMR of Pascagoula tends to corroborate those speeds as well.

And knowing the -- and also the house looks like it was on the edge of the inner eye wall sometime after the -- after being in the outer eye wall, and that there were very

0109

significant winds in the inner eye wall that were stronger than the winds in the outer eye wall, at least the sustained winds, and being in -- the fact that the McIntosh house was likely in the inner eye wall, albeit the extreme eastern portions of that eye wall, along with some of the precipitation features that were moving through the eye wall over the McIntosh house, the winds likely gusted to at least 135 at their house.

Q. Okay.

A. There was radar -- radar from Slidell showed -- depicted the intensity of the inner eye wall as well as dropsondes over points closer to the radar, namely, Bay St. Louis, Pass Christian. And much of that wind velocity was likely also in the eastern eye wall that then affected the McIntosh residence, likely sometime after the inner eye wall essentially was affecting them, I believe sometime around 9:30 or a little later. The outer eye wall was affecting them much earlier.

Q. Okay. So let me back up over those -- a few things. Do I understand correctly that your conclusion that the outer eye wall and you say likely, also, the inner eye wall would have

0110

affected the McIntosh residence, is that conclusion based on your analysis of radar imagery?

MR. BACKSTROM: Object to the form.

A. Radar imagery --

MR. BACKSTROM: Object to the form. Go ahead.

A. It's based on my analysis of microwave satellite imagery, radar imagery, and the fact that GPS dropsondes portrayed eye wall wind profiles in these features --

BY MS. SANDERS:

Q. Okay.

A. -- that then swept across the McIntosh residence.

Q. Okay. But there was no dropsonde dropped on the McIntosh residence.

A. No.

Q. Okay. So you mentioned microwave -- let me take both the microwave and radar imagery. I think we've seen some samples of those in your report. Those are -- are those both taken from satellite?

A. Microwave -- the microwave satellite -- the microwave imagery is, yes.

0111

Q. And what about the radar? Where does that image originate or where is the measuring device?

technique in it.

0133

Q. It had that averaging over 150 that you talked about.

A. Right.

Q. Okay. And then I think you said that once that averaging was done, a figure was obtained -- the mean figure was obtained. And did you then apply a percentage to that? I know you mentioned 90 percent in another context. Once you obtained that mean figure over the 150, what did you do with it?

A. Well, I obtained several figures. I did several layers. One was across the 700-millibar layer. The other was across the 850-millibar layer, and the other was an average of the lowest 150 meters in the dropsonde.

Q. Does that not always -- does the lowest 150 meters not always correspond to the 150 meters above sea level?

A. No, because in the case of the Pascagoula sounding, for instance, the dropsonde stopped reporting winds within 800 feet of the surface. So it didn't actually measure surface wind.

Q. Okay. So in that case, the lowest 150 would be 800 to 950, just to take an example?

0134

A. Well, let's see. Whatever 800 feet converts to meters.

Q. Okay. I've got my metric wrong. But my point, I think you've said it better than I could, that it doesn't necessarily correlate with the absolute ground. It may have stopped measuring before that.

A. It stopped -- that Pascagoula dropsonde measured -- or stopped working -- the wind component stopped working about 800 feet above the ground.

Q. Okay. Now, you mentioned sort of three sets of averages you took around different levels, different millibar levels. Was that part of the approach suggested by Dr. Franklin?

A. It's the standard -- it's what they use operationally. When a plane is flying around, for instance, at flight level, they fly in at an 850-millibar level or the 700-millibar level. In hurricanes, generally, that's -- those are the two levels they fly in at. And they then are -- they're measuring flight-level winds as the plane goes along, high density observations. And there's -- they wanted to try and convert those -- or estimate the surface winds based on what the

0135

winds were at -- they were measuring at flight level. And, therefore, this is the technique that they've used operationally at the Hurricane Center to -- wherever the plane was, at 700 millibars, at 850 millibars, estimate the winds at the surface based on what the winds at flight level were, wherever the plane was, you know, and then also if they had dropsondes available, measuring -- taking an average of the -- a 150-meter average of the you do agree, it is your own belief, taking into view your conclusion about the double eye wall structure, that the storm's maximum winds did decrease as it moved over land. Have I got that right?

A. Yes. A storm will weaken as it moves or land.

Q. And this one did.

A. Yes, eventually --

Q. As far as you know?

A. Eventually dissipated over land.

Q. Okay. Let me ask you: You referred us

0068

to a few of the figures in your report, which are identified as being color microwave imagery. What is that? What does that measure?

A. Measures the microwave emissions from the earth and atmosphere and the areas that -- well, my figures here are not in color, but the areas represented by -- well, the areas where the eye walls are being represented. This microwave imagery generally is looking at the emissions from hydrometeors in the -- in the vicinity of pronounced convection, and the eye walls have a lot of convection.

Q. Does that mean heat?

A. It means --

Q. Energy?

A. -- storms, thunder -- not -- squalls or thunderstorm-like features, maybe not necessarily that have lightning but that have a lot of heavy rain and that extend -- that likely extend to fairly high levels in the atmosphere and where their tops are glaciated, essentially, or have a significant amount of ice or snow.

Q. Where -- well, what is the measuring device which results in this kind of an imagery?

A. It's a --

0069

MR. BACKSTROM: Talking about microwave imagery?

MS. SANDERS: Right. I'm sorry. I was gesturing. Yes. Thank you.

BY MS. SANDERS:

Q. To the picture of what you have referred to here. I'm looking at Figure 5C, Color Microwave Imagery. What sort of measuring device would create that?

A. A radiometer, a microwave radiometer on board a satellite.

Q. And I know you've told us a bit about what sorts of things the radiometer measures. I know you mentioned convection. Is there any -- more simple layman's term, does it measure water, heat, motion, anything like that, or have you really given me as specific a description as you can or as accessible for laypeople a definition as you can?

MR. BACKSTROM: Object to the form.

A. It's an indicator of where -- it's an indicator of a general region where heavy rainfall associated with deep convection, in other words, tall squalls or thunderstorms, are occurring.

BY MS. SANDERS:

Q. Okay. And is the -- is this sort of color microwave imagery the direct output of the radiometer, or does the radiometer produce some other data which can then be rendered into this kind of an image?

A. It generates raw data, which then is post-processed and an image like this is produced. The user can choose the color scheme, most likely, and this particular image is a morphed image. In other words, this is a -- well, Figure 6A is from the MIMIC system, the Morphed Integrated Microwave Imagery system, and is a composite of various microwave satellite images over time.

Q. Okay. And I see there looking at that Figure 6A a sort of logo at the bottom that says CIMSS.

A. Yes.

Q. Do you know what that stands for?

A. Stands for the Cooperative Institute for Meteorological Satellite Studies.

Q. And is that where this morphed image came from?

A. Yes. The other images earlier, Figure 5A, B, and C, are microwave images. Those are the actual images that are being post-processed at the Naval Research Lab in Monterey, California.

Q. Okay. Just one more question, I think, about that caption for 5C. I think I read that sentence that said "as the outer eye wall strengthened," and then it ends with "a reduction of Katrina's maximum winds from earlier," the same sentence we talked about a moment ago?

A. Yes.

Q. Just to put that word "earlier" in context, the image you're describing here is one from 9:27 p.m. Central time August 28?

A. That's correct.

Q. And that's before Katrina made landfall?

A. That's correct.

Q. If you would turn over to page 10 of your report. Now, this, by my count, is just at the end of that Section 1.

A. May I make a statement?

Q. Sure.

A. You were talking earlier about storms weakening at landfall.

Q. Uh-huh.

A. They will weaken. Ultimately they will weaken at landfall. Some storms, though, actually continue to strengthen over land for a short period of time --

Q. Okay.

A. -- after making landfall.

Q. Do you consider Katrina to have been one of those?

A. It may have been.

Q. You can't say for sure?

A. Can't say for sure.

Q. Do you have an opinion whether it was

Hurricane force: Is that 74 miles per hour still? Is that what that phrase means to you?

A. Thereabouts, yes.

Q. Okay. You say the conclusion is based on radar. Would that be the same kind of radar we discussed earlier? You talked about how to use radar and dropsondes in doing your work. That's the same radar?

A. Uh-huh.

Q. Okay. A Doppler radar?

A. A Doppler radar, yes.

Q. Okay. It's true, though, isn't it, that because of ground clutter and the curvature of the

0102

earth, that WSR-88D radar can't see the ground outside the immediate vicinity of the radar; right?

MR. BACKSTROM: Object to the form.

A. That's correct. It cannot see the ground because of the earth's curvature, and also the beam is elevated slightly upward.

BY MS. SANDERS:

Q. Okay.

A. So once you get a -- once you get several miles away from the radar, you can no longer see the ground under normal circumstances.

Q. Okay. And would you agree that when it comes to wind damage, it's the wind speeds which occur at the ground that count?

A. Not at the ground itself, no.

Q. Where?

A. Wherever the damage is occurring.

Q. Okay. So if -- Okay. Well, let's look at your testimony again. Could you pull that out? That was Exhibit 4.

A. Five.

MR. BACKSTROM: Congressional testimony?

MS. SANDERS: Yes. The Congressional testimony. Thank you.

0103

BY MS. SANDERS:

Q. Let's look at the fourth page of that. Okay. There's a couple of bullet-numbered lists, but I'm looking under the heading Much More Storm Intensity Research Needed.

A. Right.

Q. The fourth bullet point says, "Some storms bring their strong winds to the ground and others don't. We cannot predict this." And then it says, "When it comes to wind damage and effects of the wind on the storm surge, it is the wind speeds which occur at the ground that count."

So would you agree with me that with a structure like a residence, one, two, three stories, it is the wind speeds which occur at the ground that count?

A. The wind speeds that occur at the residence, whatever height the residence is, because the wind is always zero at the ground itself. So that was a miss -- you know, this was not a statement to scientists, so that would not have passed peer review because it would have residence.

Q. I think you said a moment ago principal among those features would be heavy precipitation?

A. Yes.

Q. And you told me a moment ago that radar, because of its inherent limitations, cannot measure wind near the ground in the sense of at a structure the size of the McIntosh residence?

MR. BACKSTROM: Object to the form.

A. At the distance that the McIntosh residence was from the radar, it was impossible to get wind measurement direct -- a wind measurement from the radar at the elevation of the McIntosh residence.

BY MS. SANDERS:

Q. Thank you. Is that all --

A. But knowing that these features -- knowing that these eye walls extended around close -- to regions closer to the radar, you could see what kind of winds were contained in the eye wall at lower elevations closer to the radar and also see what kind of winds were contained in the eye walls where dropsondes had penetrated, and then make the -- and then assess likely similar winds in the vicinity of the McIntosh residence under certain conditions.

Q. Okay. And is what you just said with respect to wind conditions at the McIntosh residence equally true with respect to precipitation conditions at the McIntosh residence?

A. Well, you can't actually see the precipitation hitting the house on the radar, no, because the radar cannot see the McIntosh house because the beam is at too high an elevation; but since the precipitation is forming at altitudes higher than the house and then falling toward the ground, it stands to reason that when you have heavy precipitation occurring -- say, for instance, the closest radar was the Mobile radar. You had heavy precipitation occurring at the lowest elevation indicated by the radar over the McIntosh residence, and that that precipitation had at least some prior history of being in existence before reaching the McIntosh residence, that this precipitation would likely -- likely that -- that's a close approximation of the intensity of precipitation that was occurring at the house level.

Q. Okay. And you referred there to the lowest elevation indicated by the radar. What is that? Do you know what height that is?

A. I'd have to actually look at the radar image itself to get the exact height. The -- it would be within -- likely be within a couple of thousand feet of the ground.

Q. Okay.

A. But I would have to look to recall the actual value.

Q. Thanks. I appreciate that.

Okay. Let's turn to the next paragraph

and then to gust?

A. Well, that value came from both Doppler assessments and dropsonde assessments.

Q. Okay. So dealing first with Doppler, do you recall or does it appear in your report what the raw Doppler number was that led to your conclusion about the 135?

MR. BACKSTROM: Object to the form.

BY MS. SANDERS:

Q. Is it in your report anywhere, let me ask you that, the raw Doppler data on which that's based?

A. No, because the -- the raw Doppler data over the house itself was not -- was not available.

0119

Q. Because of the low altitude?

A. Because of the direction the wind was blowing.

Q. Okay. So when you say that the raw data from the Doppler was not available over the house, do you mean at any altitude over the house?

A. No. It was -- I'm trying to remember -- we know that this is wind that's within the eye wall, and the eye wall passed over their house. We know these winds were within the eye wall, and the eye wall is a fairly continuous feature.

Q. Okay. So you developed conclusions about the nature of the eye wall. You also believe those features to be fairly consistent such that you could extrapolate, for lack of a better word, that those conditions or something similar to them would have existed over the McIntosh residence.

MR. BACKSTROM: Object to the form.

A. We looked at the strength of the winds in the eye wall based on where we could assess the wind strength from Doppler radar and where we had dropsondes in the eye wall, and then were able to infer the strength of the eye wall within a certain arc of the storm and then came up with a

0120

conversion to near ground level.

BY MS. SANDERS:

Q. Okay. So do I gather that first you did some calculation involving raw Doppler data and raw dropsonde data?

A. First we did a calculation using dropsonde data. I found the -- this is in a paper I presented, Hurricane Conference in New Orleans back in March of 2007. It's probably in my --

Q. It is. Well, it isn't, but I'm aware of it, so yes.

A. And we found that the -- we derived a sustained wind, or I derived a sustained wind from both the Pascagoula and Pearlington dropsondes. These dropsondes were both within the outer eye wall, were very consistent in the wind speeds, maximum wind speeds indicated in the eye wall. One of them was in -- near the Louisiana border, near the Mississippi Coast near the Louisiana border. The other was near -- was near the Mississippi Coast near the Alabama border, both in of the wind is very important with the ability of the wind to be able to pile water up against the coastline. And if the wind is blowing parallel to the beach, it's going to be very difficult for the water to pile up significantly on the beach while the water is blowing along the beach and not over the beach.

BY MS. SANDERS:

Q. Okay. But you have not engaged -- you have not developed, say, a time line of storm surge at the McIntosh residence.

A. No. I've looked at the -- I've looked at other estimates.

0148

Q. But you have not performed one.

A. No.

Q. Okay. Would you turn over to page 13 of your report? I'm going to go down to the fourth paragraph, then, that begins "the McIntosh residence." And it says, "The McIntosh residence was subjected to the effects of several swirling vortices embedded in the hurricane's strong wind field, some of which were probably tornadoes." Is that -- what data is that observation based on?

A. Based on radar data primarily.

Q. Okay. And so, then, where you say "the McIntosh residence was subjected," I believe you testified earlier that radar imagery can't answer that precise question, although you believe it can help you offer opinions on that question.

MR. BACKSTROM: Object to the characterization.

A. Radar can tell you -- can show you where there's -- where the air -- where -- if a particular storm appears to be rotating or not.

BY MS. SANDERS:

Q. Okay. But it doesn't take a picture of the McIntosh residence and show you what was happening precisely there.

0149

A. Not at house level, no.

Q. And when you say there at the end of that sentence, "some of which were probably tornadoes," is that because radar images cannot establish definitively whether or where tornadoes were present?

A. Radar data can give you an indication of where a tornado may be, and -- but the hurricane environment is -- with the very strong wind shear near the ground, is very prone to developing vortices; and there were vortices that moved over the McIntosh residence. Radar shows that. And, therefore, they were subjected to swirling vortices. They were likely subjected to swirling vortices embedded within these rapidly moving storms, and these vortices were likely producing strong wind gusts.

Now, as to, you know, actually showing you the funnel and saying, yes, this is a tornado, you rarely get that opportunity in Doppler imagery.

Q. Okay. And it is not your opinion that there is Doppler imagery that would allow you to actually see the funnel in this case.

A. I could not -- no, I did not -- the

0150

distance from the radar and other factors did not allow me to actually see a funnel, but it did allow me to see an area that was -- that likely contained a vortex.

Q. Okay. I want to go now to the last sentence in the paragraph we've been looking at, which begins "downburst conditions." And it says, "Downburst conditions were probable over or near the McIntosh residence." Let's stop right there. What is the -- what data is the basis for that conclusion?

A. These would be areas of heavy rain embedded. The ones that would be significant would be -- that would have very strong winds associated with them of the level that we're talking about here, those would be in the eye wall of the hurricane.

Q. Okay. And is that something you determined based on your review of radar images or some other data?

A. These came primarily from radar.

Q. Okay.

A. And they are -- these are downburst-like conditions, and I think I amended my report. Let's see what I did with that. It may be in the

0151

second supplement of my report, which I don't think I have. There we go.

Q. Actually, let's go ahead and mark that. I have got one question on that, so -- well, at least one.

MR. BACKSTROM: I was going to hold you to it.

MS. SANDERS: Yeah. Could we go ahead and mark this? I don't have a -- yeah. Is that a clean copy?

MR. BACKSTROM: I think so.

MS. SANDERS: Okay. Let's go ahead and mark that one as -- what number are we up to?

- - -

(Exhibit Number 6 marked)

BY MS. SANDERS:

Q. Dr. Blackwell, you've just been handed what's been marked as Exhibit 6, which is the September 30th, 2007, supplement to your report, which I think you just referred to in connection with downbursts; correct?

A. Right.

Q. And were you referring to the Figures 26, 27, 28?

A. No. I was -- yes. On -- well, Section

0152

3, first paragraph. That's going to be on page 12. I talk about downburst-like features.

Q. Uh-huh.

A. And in Section 3, fifth paragraph, on the second supplement, I talk about downburst-like conditions were probable over or near the McIntosh residence, which would have greatly enhanced the surface wind speed possibly to greater than/equal and we tried to relate various meteorological features to areas that we saw that were damaged.

Q. I understand. Thank you.

I'm going to turn back to your report a minute. It's actually that same sentence we were sort of deconstructing before the break, and the

0092

clause I had been interested in says, "Hurricane-force winds reached the Mississippi Coast before the peak of the storm surge arrived." I want to refer to the phrase "peak of the storm surge." First of all, did you come up with a specific numeric figure, a height, for that?

A. For the storm surge, you mean?

Q. For the peak of the storm surge, yes.

A. Well, I didn't do any modeling of the storm surge, no. I looked at the Corps of Engineers' -- I looked at the Corps of Engineers' high watermarks and things of that sort. Can't remember exactly what they were at this point, but --

Q. Okay. But is it safe to say, then, that the basis of your assertions here about the peak of the storm surge are -- or at least the height of it are based on what you gleaned from the Corps of Engineers' high watermarks?

A. Well, we went down to that area, like I said, after the storm and saw for ourselves how high the water had gotten in certain places from just debris matted in trees and, you know, things of that sort. So we know that ultimately there was a massive storm surge that came into the

0093

Mississippi Coast. Now, as far as the timing of it goes, there's a -- there was a model hindcast done of Katrina storm surge by CNMOC at the Stennis Space Center.

Q. Could you spell that acronym out for me, please?

A. CNMOC.

Q. I'm going to guess it's Coastal at the beginning. No? What does that stand for; do you know?

A. Something Command, but I don't know anything else.

Q. Okay.

A. Probably Navy something Command.

Q. Okay.

A. But I don't know what the acronym stands for.

Q. And are you looking at a particular part of your report as you tell me about that?

A. Yes. Looking at the final page of the initial report.

Q. Before the references?

A. No, in the references.

Q. Oh, okay.

A. Just above my signature, Part J. Or is

0094

that I? Can't tell.

Q. "I" would be Preliminary Model Hindcast?

A. Yes. That's it.

Q. Okay. Okay. And I think you said you

A. The inner eye wall at the McIntosh residence arrived, I want to say, around 9:30. I believe that's -- I'd have to check my radar to see exactly when, but it was around 9:30, radar microwave -- microwave imagery.

Storm surge -- that would have been associated with winds that were now blowing onshore from the south or a significant southerly component, and I would think the peak storm surge would have occurred likely within an hour or so of the time that they first entered the -- the inner eye wall.

Q. Within an hour on either side?

A. No. An hour later.

Q. But I think you told us you didn't actually do any storm surge modeling yourself.

A. No, I did not. I'm just looking at the -- you know, the fact that your highest surge is going to occur when the wind is blowing -- at least in the eastern part of the storm, when the wind is blowing onshore with a -- and that would mean that the center of the storm would have to make landfall. Center of the storm did not actually cross the Louisiana/Mississippi border

0146

area until around 9:45 a.m. So your maximum storm surge is going to occur probably slightly after that time. And that's just a subjective estimate on my part, but I did not do any modeling of the surge.

Q. Okay.

A. And with the outer eye wall, the outer eye wall having hit the coastline earlier, the winds would have been more out of an easterly direction and therefore would have been more paralleling the beach. So they would have had strong winds impacting the McIntosh residence in the outer eye wall, but the water would not have been blowing onshore. It would have been blowing along the shore. And, therefore, the water levels would be significantly lower than later. So at the outer eye wall they were getting the strong winds, most likely without the high water.

Q. And that is based on your -- I think you called it a subjective estimate based on your opinions about the storm structure as opposed to any observations at the McIntosh house itself.

MR. BACKSTROM: Object to the form. Characterization of testimony.

MS. SANDERS: I think that's a quote.

0147

We can read it back.

BY MS. SANDERS:

Q. But I think you referred to your last -- something previously as a subjective estimate, which I took to mean you know a lot about storms, you're applying your knowledge of storms to this situation and coming up with an estimate, as opposed to an observation of the McIntosh residence itself. Have I got that right?

MR. BACKSTROM: Same objection.

A. The storm surge is a -- you know, is primarily a wind-driven event; but the direction the existence of a tornado?

MR. ZACHARY SCRUGGS: Object to the form, mischaracterizes his prior testimony and asked and answered.

Q. (Mr. Bonds) It's a question. Would you like to have it back?

A. I can't say with 100 percent certainty where a tornado occurred; I can just say with a high confidence there were tornadoes. But I've never tried to state whether a tornado occurred in a particular region or not, generally speaking unless I found some evidence, which is really hard to do in this situation, when you have the water moving everything around that a tornado could occur on a particular property. I certainly have suspicions, very strong suspicions, very high confidence there were

tornadoes.

Q. Somewhere?

A. Probably quite a few areas.

Q. Now, am I correct in understanding that the National Weather Service did not confirm the existence of any tornadoes along the Mississippi Gulf Coast?

A. In their opinion and their field surveys that was their conclusion.

Q. Okay. Now, you also say in -- at that same place, I believe on page four, that satellite shows mesovortices on the inner edge of the eyewall capable of extreme wind damage similar to the damage caused by mesovortices in Hurricane Andrew. Do you see that? It's really in the same sentence we were talking about before.

A. I'm familiar with the statement. I don't know where it is on here.

Q. All right. Do I understand your view correctly to be that these are images that are consistent with the existence of conditions that could cause this kind of damage but not that you are able as a scientist to say that any particular image is an image of something that, in fact, did cause such damage?

MR. ZACHARY SCRUGGS: Object to the form, asked and answered.

THE WITNESS: Can you restate in a shorter

sentence?

Q. (Mr. Bonds) Yes. As I was asking that question I was anticipating you might respond that way. The radar -- I'm sorry, the satellite images that you noted are images of conditions that you believe are consistent with the existence of severe wind damage, correct?

A. Well, we saw a mesovortex in Katrina offshore in the satellite photo. You can see it in the NASA

HURRICANE KATRINA OPINIONS for
McIntosh Residence
2558 South Shore Drive
Biloxi, MS 39532

Dr. Keith G. Blackwell
and
Dr. Aaron Williams

Coastal Weather Research Center
University of South Alabama

In our opinion, Hurricane Katrina was an exceptional storm in several respects: (1) The storm was extremely intense in the central Gulf of Mexico; (2) The development of two eyewalls produced a dramatic outward expansion of hurricane-force winds; (3) Winds of hurricane force reached coastal Mississippi well before the peak of the storm surge arrived; (4) Numerous rotating storms, along with tornadic supercells, raced across the Mississippi coast beginning well in advance of the eye reaching Mississippi; and (5) The high water that inundated the Mississippi Coast was a direct result of the wind-driven storm surge and not rain-induced flooding.

1) Storm History and Large-Scale Characteristics

Katrina formed in the western Atlantic fairly close to the United States and made landfall nearly a week later along the northern Gulf Coast after a relatively short track across South Florida and the Gulf of Mexico. Katrina's lifetime was less than half as long as that of Hurricane Ivan the previous year which formed over the far eastern Atlantic and eventually struck the Alabama coast 2 weeks later.

During Katrina's short lifetime, the extremely rapid intensification to a category 5 hurricane and the dramatic expansion of the storm's size with the development of an outer eyewall over the northern Gulf were of historic significance for a storm in this area. Katrina's rapid intensification was greatly aided by a very favorable atmospheric environment and a prolonged track across a deep warm layer of water known as the Gulf Loop Current.

Katrina formed over the Bahamas on 23 August 2005 and reached hurricane status just prior to moving across extreme southern Florida (Figure 1). The storm stayed well organized during its short 6-7 hour trek across the narrow tip of southern Florida and began immediately strengthening once it emerged in the southeastern Gulf of Mexico.

Once in the Gulf, Katrina moved into an ideal environment for rapid strengthening. Several favorable environmental factors are listed below:

(1) Katrina moved into a region of very light vertical wind shear, allowing the storm to stay well organized.
(2) The storm was surrounded by a warm moist air mass, providing a necessary ingredient for thunderstorm formation.

(3) Katrina's inflowing cyclonic (i.e., counter-clockwise) winds near the surface were situated beneath a massive region of out-flowing clockwise-directed winds in the upper atmosphere; thus, the warm moist air flowing into the storm's core near the surface was allowed to rise, generate clouds with heavy rain, and release great quantities of heat energy, before being very efficiently evacuated away from the storm at upper-levels. This release of heat energy in the clouds of Katrina and the efficient evacuation of air away from the storm in the upper atmosphere allowed the pressure to fall in the eye, the winds to increase, and the storm to intensify.

(4) A very important 4th element also contributed to a massively intense hurricane; Katrina moved down the length of the Gulf of Mexico Loop Current for two days (Figure 2).

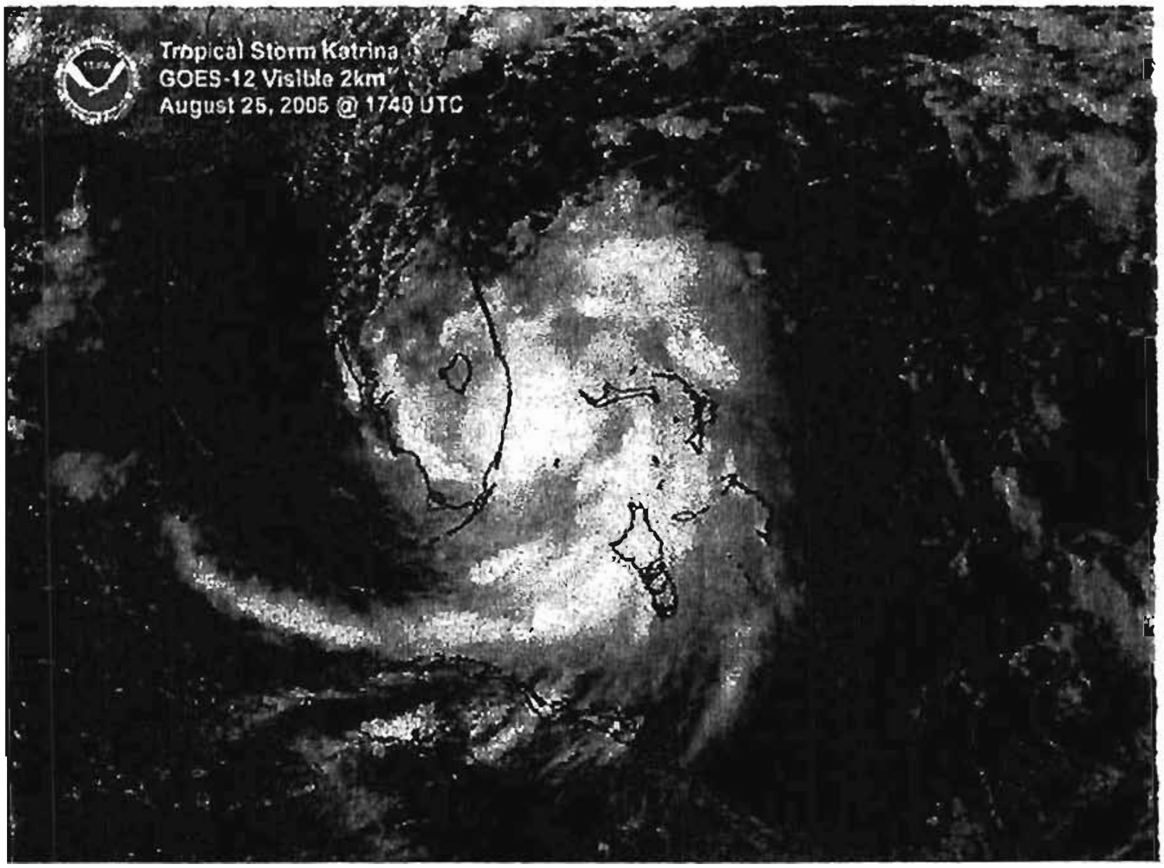


Figure 1. Tropical Storm Katrina approaching hurricane strength near the Florida east coast, as captured in a visible image from a GOES geostationary satellite at 12:40 pm CDT, 25 August 2005 (Image courtesy of NOAA).

The Gulf of Mexico Loop Current is a region where the warm waters of the Gulf of Mexico extend down to much deeper depths than in other areas outside this loop current. This loop current contains some of the greatest oceanic heat content in the Western Hemisphere. In the right atmospheric setting, a storm moving over this loop current can become "supercharged" and develop extreme intensity; this is exactly what happened with Katrina.

As hurricane forecasters and researchers for the Coastal Weather Research Center at the University of South Alabama (USA), we were aware of the atmospheric and oceanic conditions at the time of Katrina's track across the Gulf. This information was vital to each forecast run of the Blackwell Over-surface Hurricane Wind (BLOHW) Model. In addition, research on the Gulf Loop Current for Coastal Weather Research Center's Hurricane Katrina DVD revealed the impact the Loop Current had on the intensity of the hurricane.

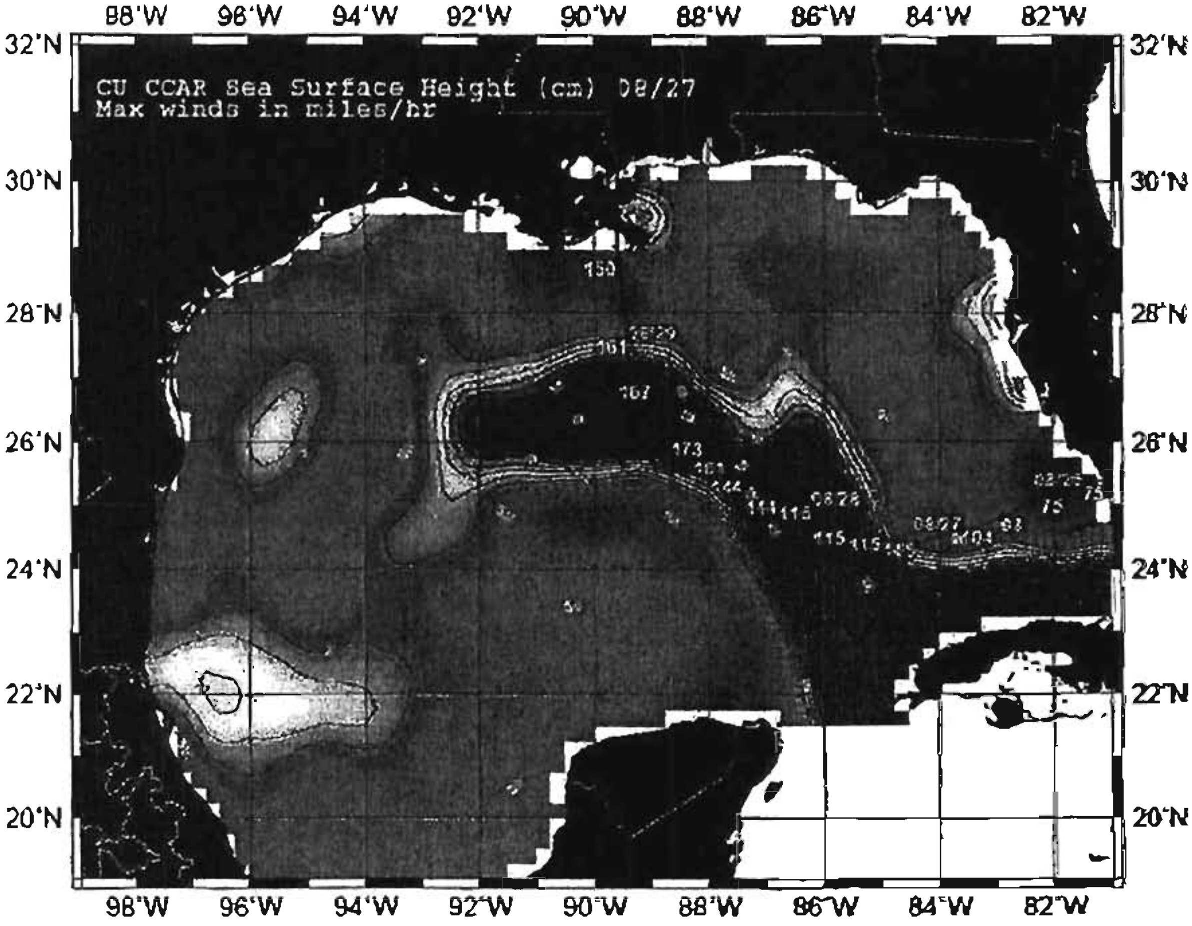


Figure 2. The Gulf of Mexico Loop current (red shading) on 27 August 2005 as depicted by satellite-derived altimetry of the sea surface. The loop current is a region of exceptionally high oceanic heat content and represents a tremendous source of energy for a hurricane. Hurricane Katrina's path is represented by the solid black curved line stretching from southern Florida to the Louisiana/Mississippi coast. Maximum sustained winds (mph) are posted below and to the left of the track while dates are posted above and to the right. (Image courtesy of the Colorado Center for Astrodynamics Research at the University of Colorado and NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML)).

Over the loop current, Katrina strengthened to a category 5 hurricane on the Saffir-Simpson Scale on 28 August 2005 (Figure 3), before weakening as it moved across the coast the next morning (Figure 4). During the period of rapid strengthening over the central Gulf, the storm contained one very intense eyewall (Figure 5a). As the storm moved closer to the northern Gulf coast, the structure of Katrina changed dramatically when the storm began an eyewall replacement cycle. During this cycle, a developing outer eyewall began to encircle the inner eyewall (Figures 5b and 5c) and Katrina became a concentric two eyewall storm. This multiple eyewall configuration in Katrina is documented by Hawkins et al. (2006) and Blackwell et al. (2007). The development of an outer eyewall greatly aided the dramatic increase in the size of Katrina as it approached the coast and allowed hurricane force winds to expand to a distance greater than 100 statute miles from the center.

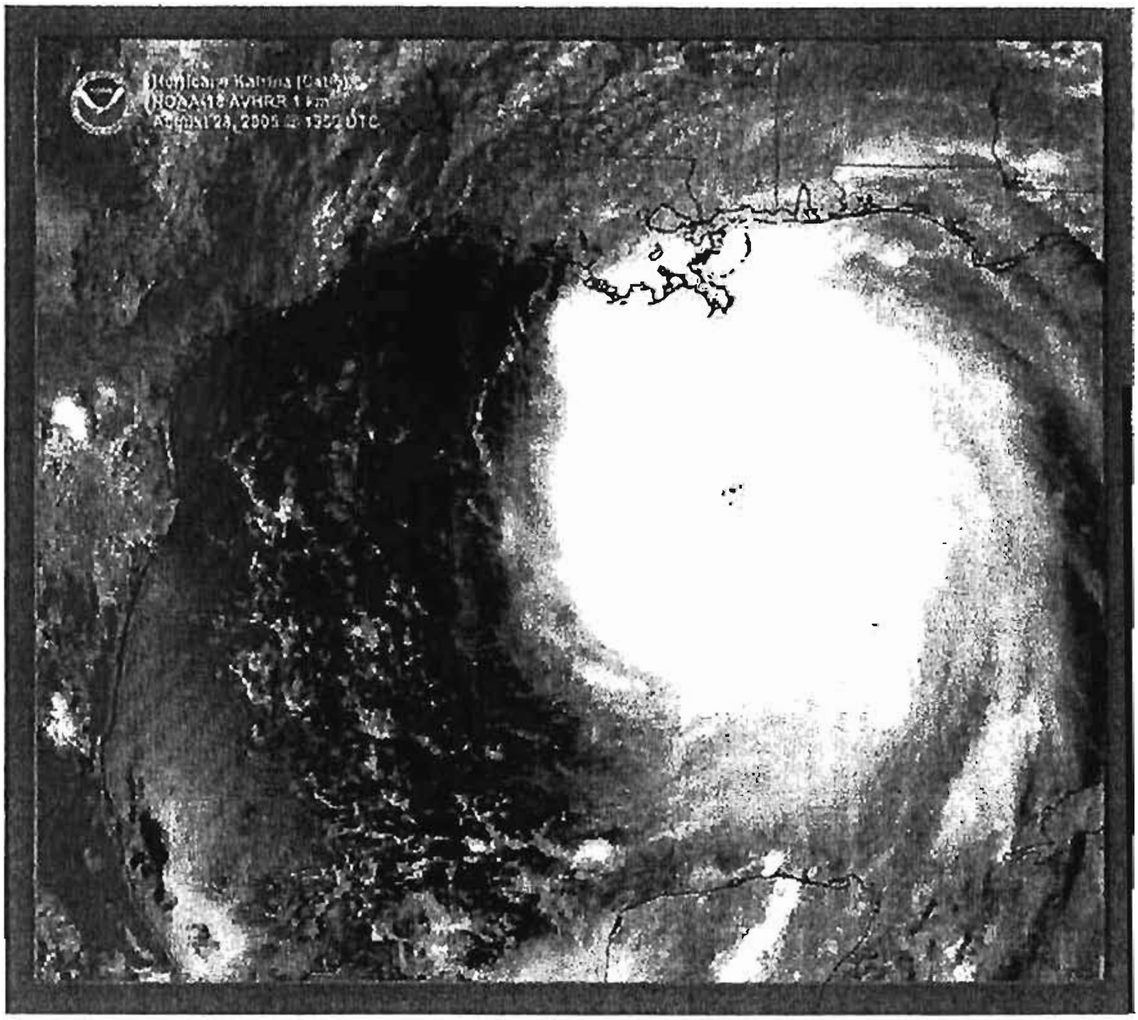
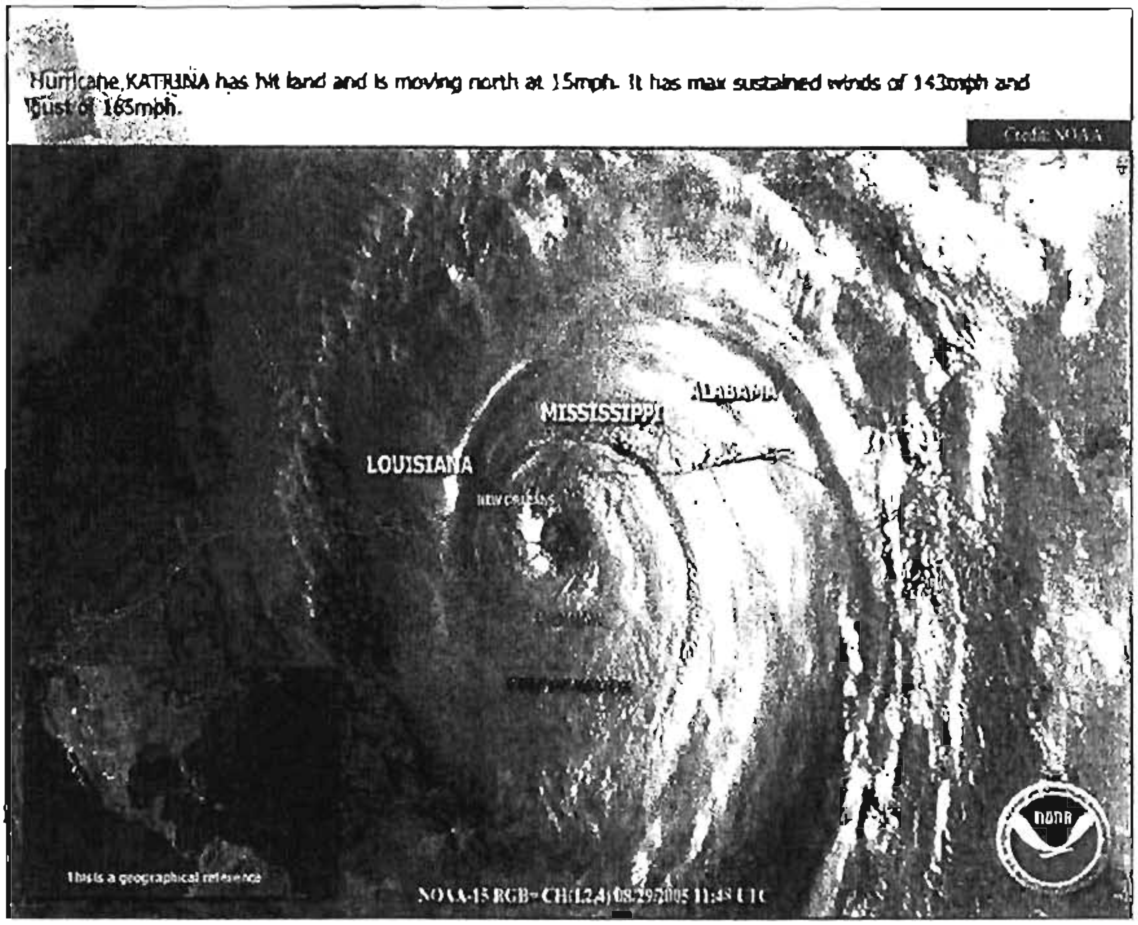


Figure 3. Hurricane Katrina at category 5 strength in the central Gulf, as captured in visible imagery from a GOES geostationary satellite at 2:50 pm CDT, 28 August 2005 (Image courtesy of NOAA).



Hurricane KATRINA has hit land and is moving north at 15mph. It has max sustained winds of 143mph and gust of 165mph.

Figure 4. Hurricane Katrina making landfall along the Louisiana and Mississippi coasts, as captured in visible imagery from the NOAA-15 satellite at 6:48 am CDT, 29 August 2005 (Image courtesy of NOAA).

Hurricane Katrina made landfall on the Mississippi coast with two eyewalls (Figures 6a and 6b). Nearly the entire Mississippi coast was affected by at least one eyewall of Katrina, with some places suffering the impact of two eyewalls.

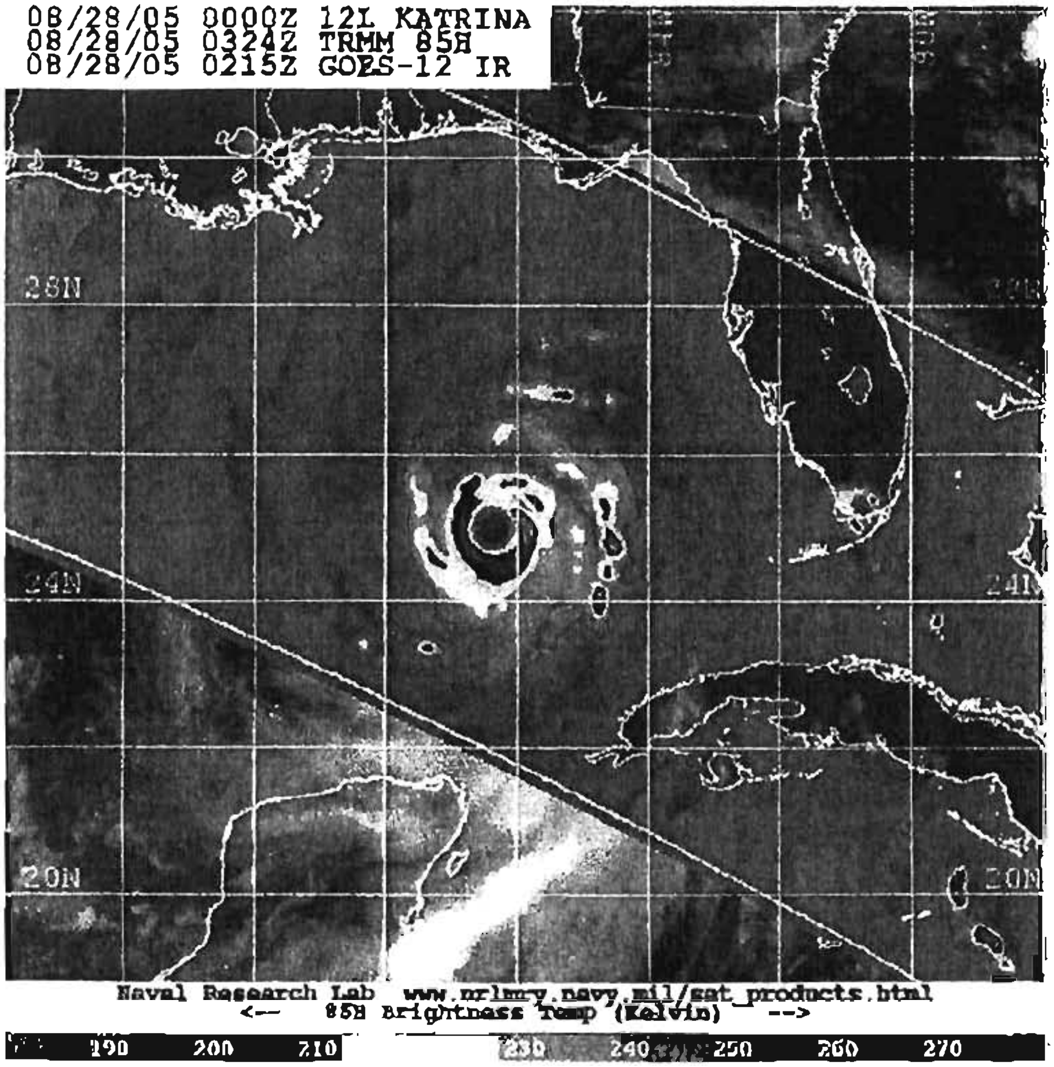


Figure 5a. Color microwave imagery of Hurricane Katrina at 10:24 pm CDT, 27 August 2005 from the TRMM satellite overlaid on a black and white infrared image from the GOES-12 satellite. The color microwave imagery displays Katrina with an intense single eyewall. The storm was rapidly strengthening over the Gulf Loop Current at this time. (Image courtesy of the Naval Research Laboratory's Tropical Cyclone Satellite Branch.)

Katrina made landfall on the Gulf Coast with the 3rd lowest central pressure of any landfalling hurricane in United States history, but the pressure had been much lower before landfall. As Katrina went through the eyewall replacement cycle, the peak category 5 winds in the inner eyewall began to decrease as winds in the outer eyewall strengthened. During this transition phase of a weakening inner eyewall and a strengthening outer eyewall, Katrina officially slipped to a category 3 hurricane at landfall, but the storm surge that was created by its massive wind field reached the coast equivalent to a category 5 hurricane. Calculations by the National Oceanic and Atmospheric Administration's (NOAA's) Hurricane Research Division (HRD) show that even though the storm weakened to a category 3 at landfall, the great horizontal expansion of the wind field allowed Katrina's winds near landfall to maintain or even exceed the kinetic energy of its earlier category 5 strength. Reconnaissance data during the storm and NOAA post storm reports all indicate that Katrina was an extraordinary tropical cyclone in both size and intensity.

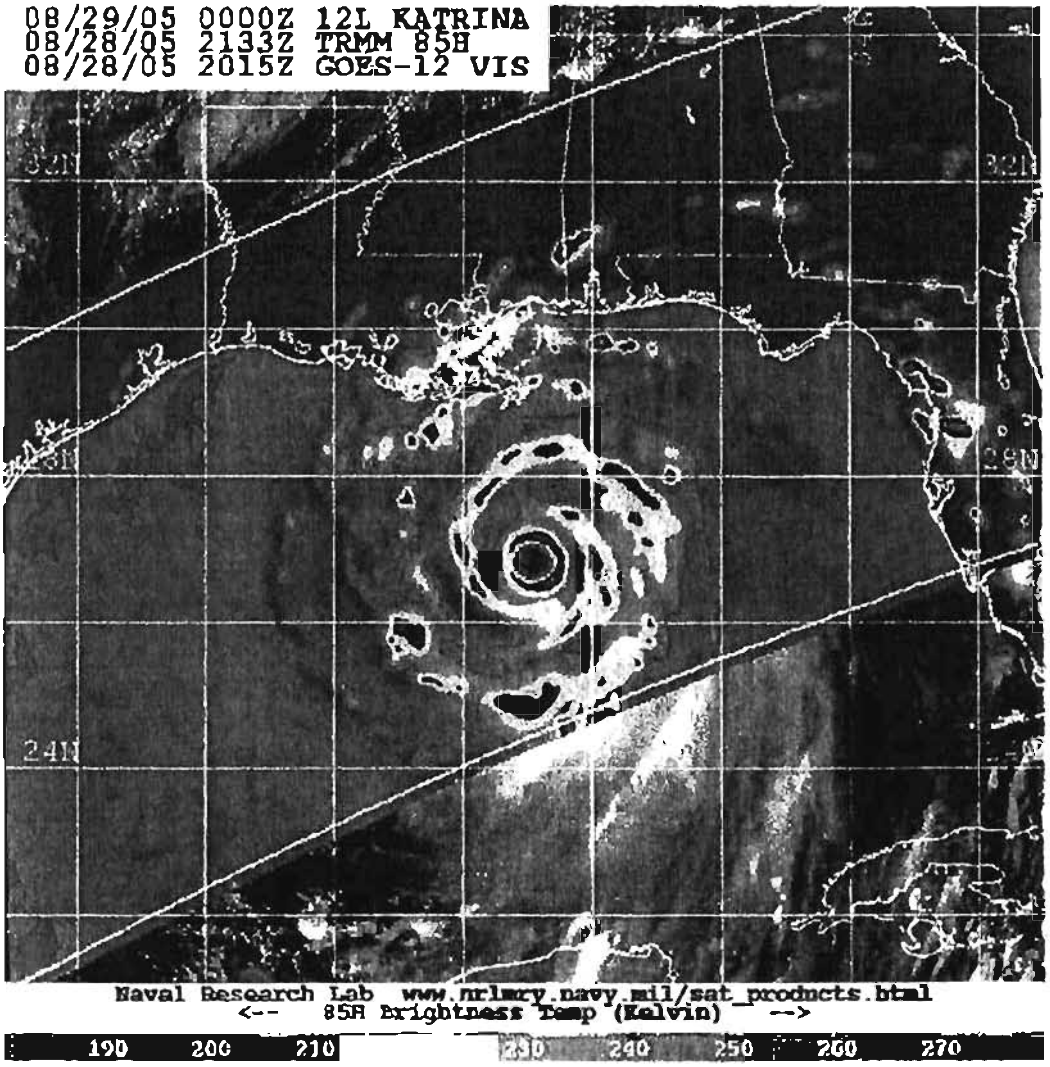


Figure 5b. Color microwave imagery of Hurricane Katrina at 4:33 pm CDT, 28 August 2005 from the TRMM satellite overlaid on a black and white infrared image from the GOES-12 satellite. The color microwave imagery indicates that Katrina has begun an eyewall replacement cycle as spiral bands begin to coalesce into an outer eyewall which encircles the inner eyewall. (Image courtesy of the Naval Research Laboratory's Tropical Cyclone Satellite Branch.)

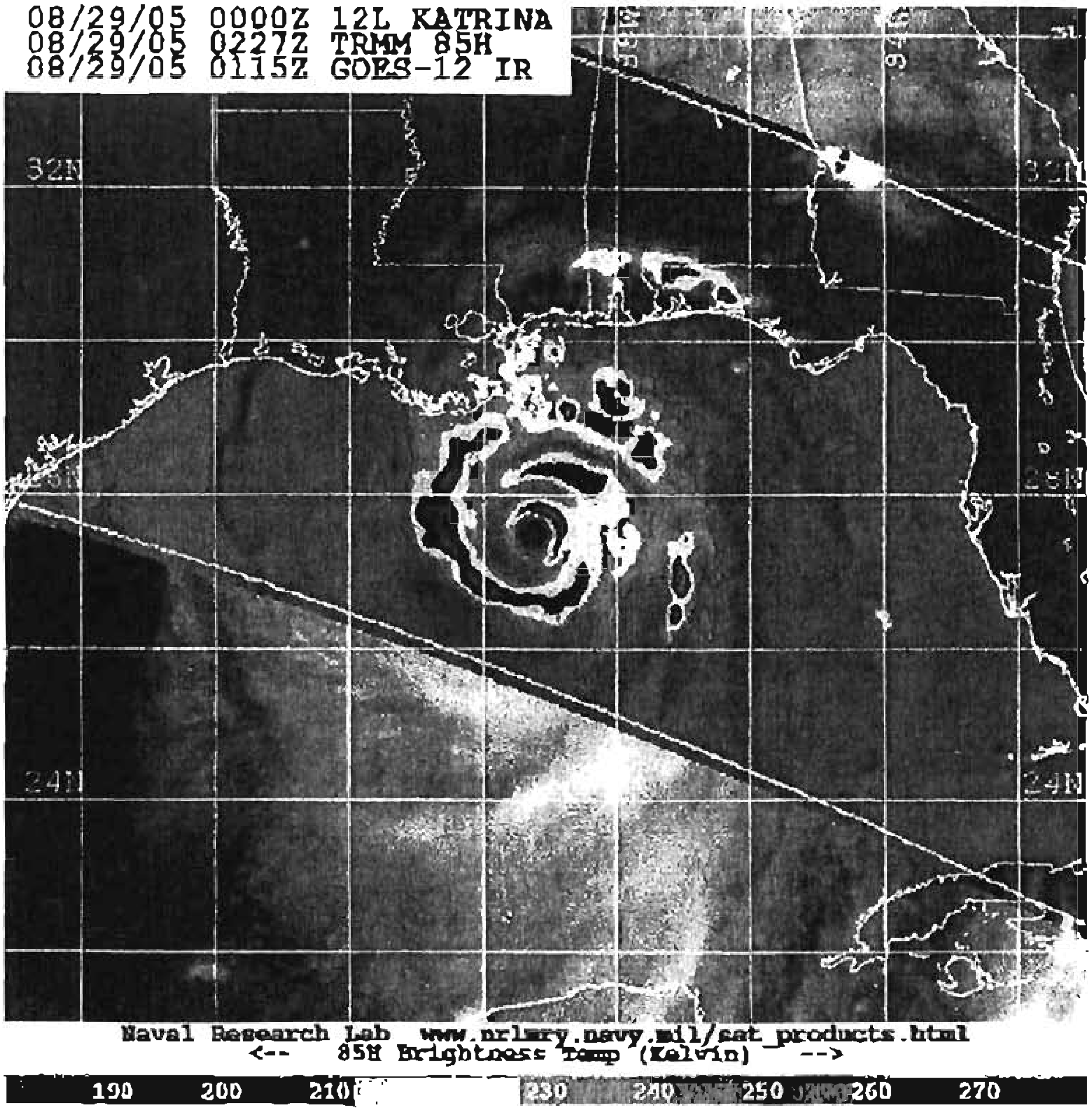


Figure 5c. Color microwave imagery of Hurricane Katrina at 9:27 pm CDT, 28 August 2005 from the TRMM satellite overlaid on a black and white infrared image from the GOES-12 satellite. The color microwave imagery continues to indicate the development of an outer eyewall in Katrina which almost completely encircles the inner eyewall. Katrina became a double eyewall storm as it approached the northern Gulf Coast. As the outer eyewall strengthened, the inner eyewall was being starved of energy; thus, this ongoing eyewall replacement was one factor aiding the reduction of Katrina's maximum winds from earlier. However, the development of this outer eyewall greatly increased both the size of the storm and the extent of hurricane winds. (Image courtesy of the Naval Research Laboratory's Tropical Cyclone Satellite Branch.)

The existence of this outer eyewall greatly increased the area of damaging winds surrounding the storm. Also, the combination of inner and outer outer eyewalls ultimately produced a much more extensive storm surge than that of a single eyewall storm. Katrina's eyewall replacement cycle was observed during an analysis of satellite imagery and aircraft data in research performed by USA faculty. Other well respected hurricane researchers have also indicated the existence of these eyewall cycles in Katrina.

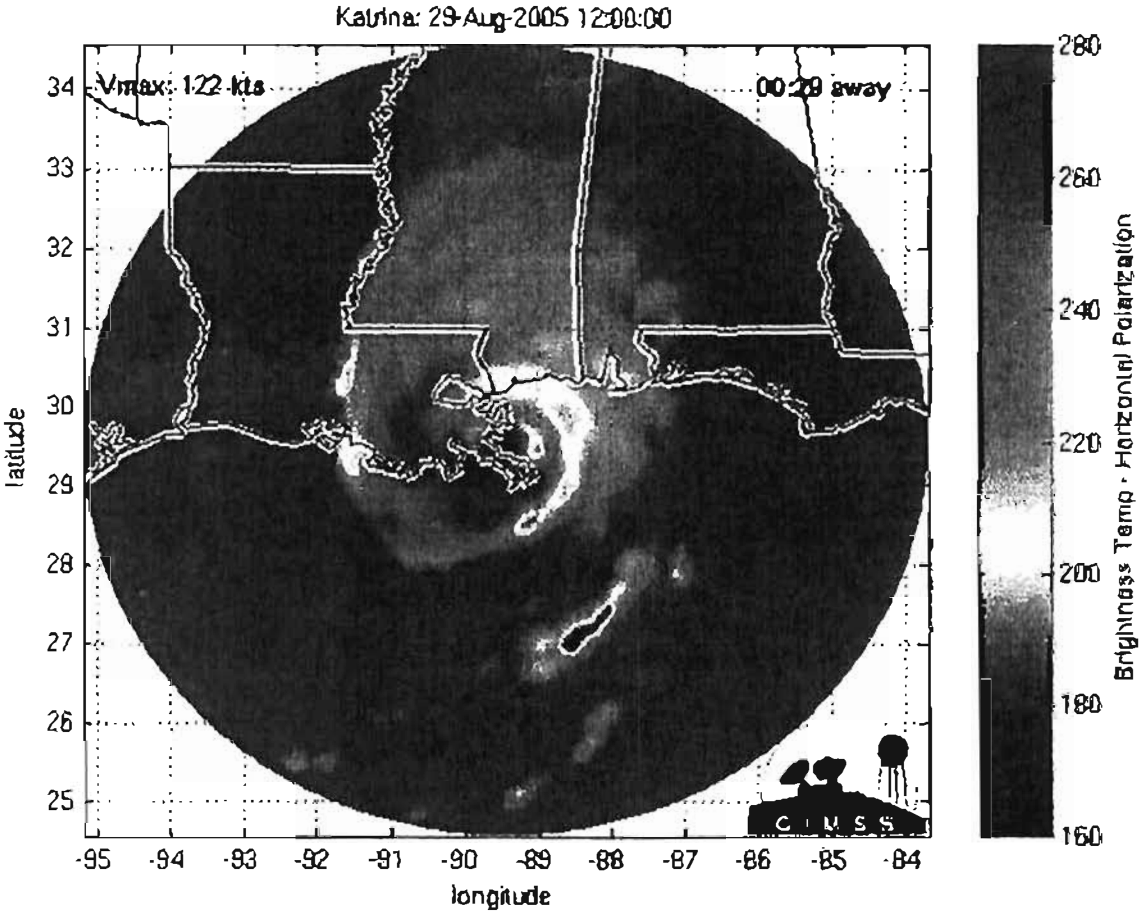


Figure 6a. Color morphed microwave imagery of Hurricane Katrina at 7:00 am CDT, 29 August 2005 from the MIMIC (Morphed Integrated Microwave Imagery at CIMSS) system showing the double eyewall structure of Katrina as it makes landfall along the northern Gulf Coast. Northern portions of the outer eyewall are already making landfall along portions of the Mississippi coast around 3 hours prior to the official landfall of the eye. Erosion of the inner and outer eyewalls over the southwestern semi-circle of the storm is likely due to upper-level wind shear and dry air entrainment. The entrainment of dry air into the "open" eyewalls likely enhances the potential for very strong downbursts there. Image courtesy of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison.

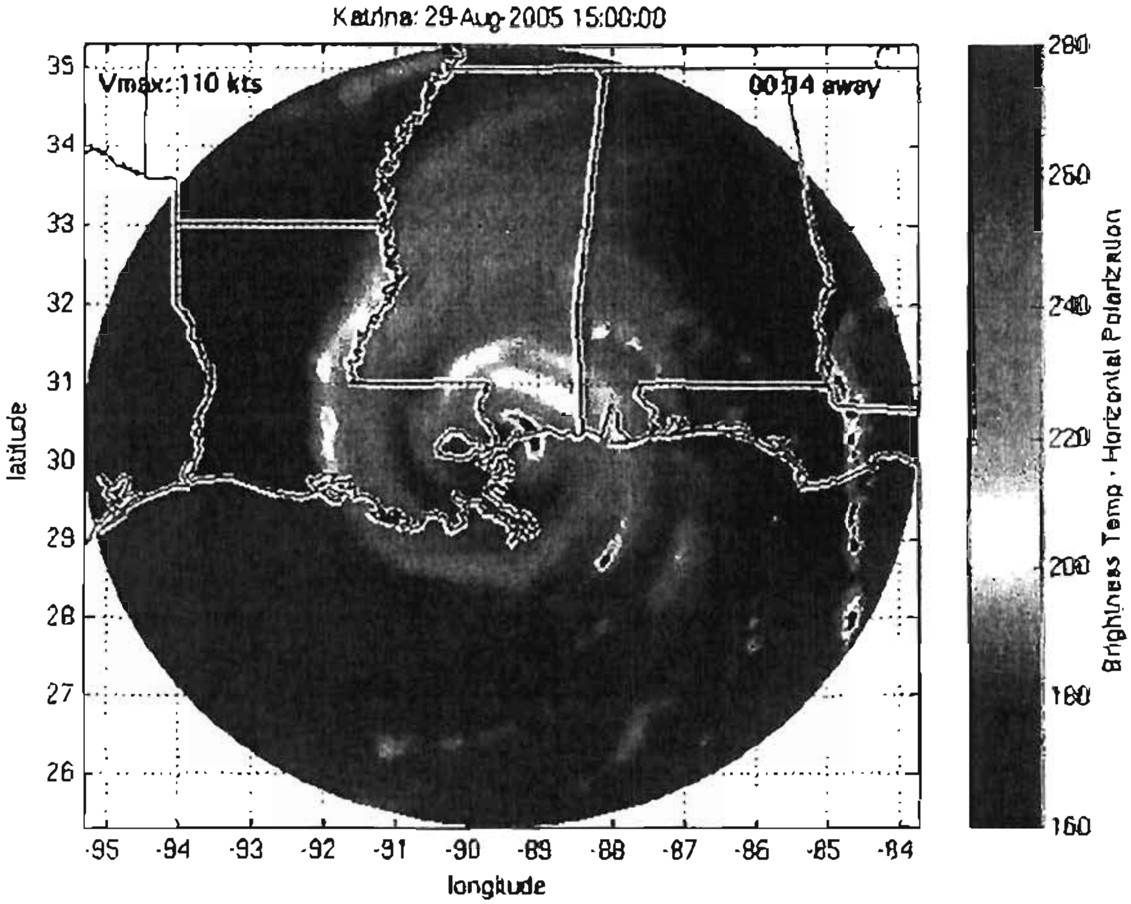


Figure 6b. Color morphed microwave imagery of Hurricane Katrina at10:00 am CDT. 29 August 2005 from the MIMIC (Morphed Integrated Microwave Imagery at CIMSS) system showing continued evidence of an "open" double eyewall structure of Katrina as the inner eyewall crosses the Mississippi coast. Image courtesy of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison.

Because of 1) the outer eyewall, 2) the existence of a vast northern and eastern semi-circle of hurricane winds and 3) a series of squalls and discrete thunderstorms to the north, northeast, and east of the eye, hurricane force winds reached the Mississippi coast before the peak of the storm surge arrived. Radar analyses of Hurricane Katrina revealed numerous rotating features in squalls, including supercell thunderstorms, many of which contain high winds, and probable tornadoes or tornado-like vortices. Many of these severe features occurred in outer spiral bands of squalls well in advance of the arrival of Katrina's eye on the Mississippi Coast. These squalls also contained other mechanisms for producing strong, damaging winds, as did the eyewalls themselves.

2) Some Features Associated with Extreme Wind Gusts in Hurricanes

Holmes et al. (2006) state that hurricanes produce strong winds at landfall, particularly within their eyewalls. Over the last several years, GPS dropsonde data and coastal Doppler radars have observed low-level wind maxima, often extending down to elevations at or below 500 meters above ground level (AGL). In hurricanes, convective 3-s wind gusts may approach values twice that of the sustained wind (Powell et al., 2003). Fujita, Parrish et al., (1982) and Powell et al., (1991) suggest that many of these extreme convective winds in hurricanes are associated with thunderstorm downdrafts. Also, Powell and Houston (1996) indicate that strong horizontal shear along the lateral edge of the downdraft as it spreads along the ground may develop small vortices and extreme winds in hurricanes.

Collapsing cores of heavy precipitation appear to be prevalent in many tropical cyclones. Indeed, preliminary investigation of radar data indicate that "open-eyewall" storms repeatedly display large intense elevated cores of precipitation within their eyewalls which subsequently collapse toward the surface. Doswell (1985) (see Figure 7) shows that collapsing precipitation cores are often associated with downbursts (Fujita, 1985). Elmore and McCarthy (1992) show that the maximum outflow velocity in microbursts (i.e., small downbursts) occurs at approximately 250 feet AGL. These downburst winds, when superimposed on the already strong hurricane wind field, can produce localized regions of extreme winds and damage. Willoughby and Black (1996) indicate that heavy convective rain within a hurricane can generate precipitation-induced downdrafts which inject high-velocity air from the free atmosphere into the frictional boundary layer and that the surface wind accelerates even more as the "downburst" spreads along the ground. In Hurricane Andrew, they indicate that the most severe damage lay in streaks along the downwind of the convective cells' trajectories around the eye where the downbursts may have caused 20 m/s surges in wind speed on a >60 m/s basic flow (Wakimoto and Black, 1994). These collapsing cores are indicative of downbursts and are likely associated with enhanced wind gusts in landfalling hurricane eyewalls.

Even in the absence of strong thunderstorm activity, the large wind shear above the ground in landfalling hurricanes produces other features which can enhance surface winds: horizontal rolls and tornadoes. Horizontal rolls in the lowest portions of the atmosphere can act to transfer high-velocity air near the top of the roll downward toward the ground, thus producing significant wind gusts near the surface from faster-flowing air aloft. National Weather Service Doppler radars (WSR-88D) indicate that Katrina was full of these horizontal roll features. The prolific number of horizontal rolls in the boundary layer of a hurricane provides an unusually favorable environment for tornadoes or tornado-like vortex production. Unlike their Great Plains cousins, however, tornadoes in hurricanes often form in much smaller storms and squalls, thus making their detection by radar more difficult. Also, rapidly moving vortices in hurricane circulations may produce tornado-like winds without ever being identified as a true tornado.

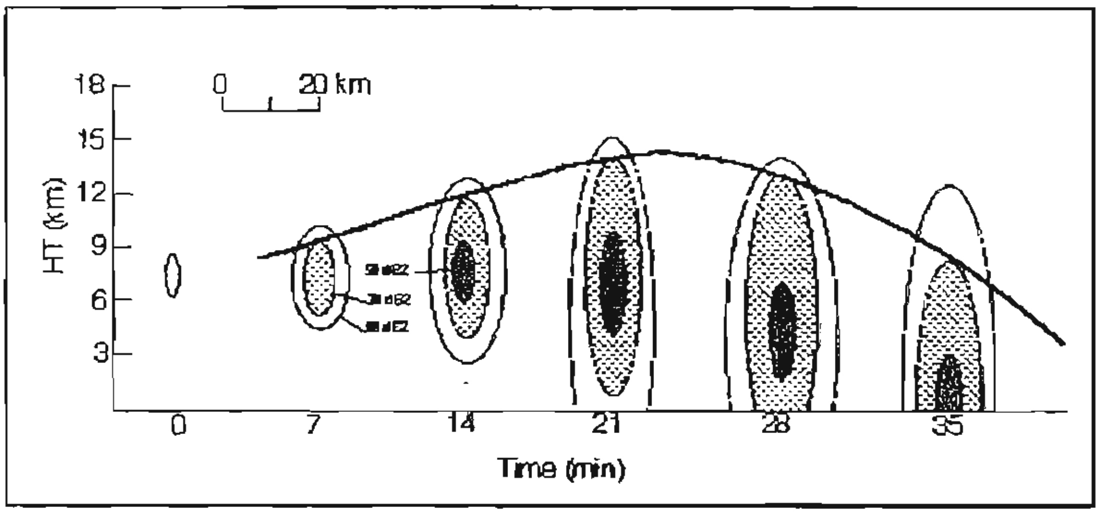


Figure 7. Time sequence of elevated precipitation reflectivity within a storm which then collapses toward the surface in the form of a downburst (from Doswell, 1985).

3) Severe Winds at the McIntosh Residence in Biloxi

The WSR-88D radar from the National Weather Service Office in Slidell LA indicates that hurricane-force winds began over the McIntosh Residence at 2558 South Shore Drive in Biloxi around midnight on the evening of 28 August or morning of 29 August 2005; winds likely reached at least 135 mph later that morning around and/or after sunrise in the vicinity of the residence. Blackwell (2000) and others have documented some of the limitations of wind measurements in hurricanes from Doppler radar, whereby stronger winds than what the radar can actually detect often exist in the hurricane. Also, the WSR-88D radar only samples the atmosphere once approximately every 6 minutes; therefore, more severe winds within the hurricane may occur between radar scan times, particularly with small-scale phenomena such as tornado-like vortices and downbursts.

In addition to these Doppler radar observations, winds of 140 mph or greater are also depicted in dropsonde data released from aircraft within the boundary layer of both the outer and inner eyewalls of Katrina near and along the Mississippi coast prior to the official landfall of the storm center near the Mississippi/Louisiana border at 9:45 am CDT. These strong winds, observed in the boundary layer of each eyewall, indicate the high potential for near-surface wind gusts ≥135 mph associated with heavy precipitation and collapsing cores (i.e., strong downdrafts and/or downbursts); thus a high potential for such winds existed for any coastal Mississippi location which experienced convective downbursts in either eyewall. One dropsonde released in Katrina's inner eyewall recorded winds of 153-155 mph within the near-surface boundary layer over the beach of Pass Christian MS before crashing to the surface farther inland (Henning 2006). In this paper, Henning, a meteorologist with the U.S. Air Force and an on-board weather officer with the "Hurricane Hunters", states that this dropsonde was not released in the heavier thunderstorm activity of the eyewall where much stronger surface winds likely would have been found. Blackwell et al., 2007 show that winds of 142 and 143 mph were recorded by dropsondes in the near-surface boundary layer in the outer eyewall adjacent to the coasts of Pascagoula and Pearlington MS, respectively. Per procedures from Franklin et al., 2003, both of these dropsonde wind profiles produced surface (33 ft) 1-minute sustained wind estimates of at least mid-to-upper category 2 intensity within Katrina's outer eyewall. These wind speeds are also substantiated in Stepped Frequency Microwave Radiometer (SFMR) data from NOAA aircraft near Pascagoula close to the time of dropsonde release there.

In addition to downburst winds, shallow vortices likely developed along the edges of downbursts which would be very difficult for remotely-located Doppler radars to correctly detect, and likely would not be identified by the more stringent vortex/tornado identification algorithms resident in the WSR-88D radars[1]. The McIntosh residence experienced at least one, and possibly two, eyewalls of Katrina as the storm struck the Mississippi coast. Mechanisms were in place which probably produced extremely strong eyewall winds of ≥ 135 mph at the McIntosh residence.

WSR-88D Doppler radars from both Mobile and Slidell National Weather Service Offices indicate the existence of hundreds of swirling vortices within the circulation of Katrina, many of which were likely tornadoes or tornado-like vortices. Indeed numerous tornado warnings were issued by the National Weather Service during Katrina's landfall. Biloxi was officially placed under a tornado warning at 3:59 am CDT for Doppler-observed vortices within spiral bands of thunderstorms well ahead of the outer eyewall which arrived after 6:00 am CDT. Biloxi was again placed under nearly continuous tornado warnings from 7:25 am until 11:45 am CDT as the eyewalls of Hurricane Katrina moved inland.

The McIntosh residence was subjected to the effects of several swirling vortices embedded in the hurricane's strong wind field, some of which were probably tornadoes. With the rapid motion of the vortices within the hurricane circulation and the strong winds already present in the Biloxi area, much stronger localized gusts were likely with many of these vortices. Over a period of several hours, the McIntosh residence experienced at least one eyewall of Katrina containing severe hurricane-force winds well in excess of 100 mph. Downburst conditions were probable over or near the McIntosh residence, which would have greatly enhanced the surface wind speed. Wind gusts near the ground likely exceeded the winds measured by radar in these features.

4) General Comments on Wind and Storm Surge timing at the McIntosh Residence

Due to the exceptionally large expanse of hurricane-force winds in the northern and eastern semi-circles of Katrina, strong hurricane-force winds began affecting the McIntosh Residence many hours before the center of the storm arrived. Furthermore, the double eyewall structure resulted in the storm's outer eyewall arriving in Biloxi well before the inner eye wall and maximum storm surge. In addition, the cyclonic flow of wind around the hurricane initially came from the northeast (generally offshore and/or along-shore) direction before shifting to a more southerly (generally onshore) direction. The highest storm surge levels would not occur until the wind shifted to a southerly (onshore) direction.

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[1] Doppler radar vortex/tornado detection algorithms were developed using severe thunderstorms in the Great Plains. Vortices/tornadoes associated with hurricanes are often much shallower and are more easily missed or incorrectly labeled by the WSR-88D vortex detection algorithms.

The high water that inundated the Mississippi Coast before and during landfall was a direct result of the wind driven storm surge. The storm surge is a major and deadly component of hurricanes and is defined by NOAA's Hurricane Research Division as "the onrush of sea or lake water caused by high winds associated with a landfalling cyclone and secondarily by the low pressure of the storm." Thus the storm surge and high winds are inseparable. As a storm's maximum wind velocity increases, the storm surge potential increases as well. Of course, other variables such as the storm track, wave setup, and the configuration of the coast contribute to the overall magnitude of the surge.

5) Rainfall vs Storm Surge

Rainfall also can be a major contributor to hurricane damage when the flooding results from excessive runoff (flash flooding) and stream overflow. NOAA defines a flood as "an overflow of water onto normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream or drainage ditch. Ponding of water at or near the point where the rain fell." However, rainfall was not a significant factor in Hurricane Katrina. A review of post storm reports and radar estimates indicates that rainfall totals for the storm were not excessive for a landfalling tropical system of this size and intensity. Thus the high water on the Mississippi Coast was not a result of rain-induced flooding but a result of the wind-driven storm surge.

6) References

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7) Additional Data Sources
   a. National Weather Service WSR-88D Doppler Radar Archive Level II and Level III data.
   b. National Weather Service Warnings
   c. National Hurricane Center's Post Storm Report on Hurricane Katrina
   d. NOAA's Hurricane Research Division data archives.
   e. NOAA and USAF Hurricane Reconnaissance Data

f. NOAA satellite imagery, post-processed by various agencies as the Naval Research Laboratory and NESDIS.
g. MIMIC Microwave Satellite Imagery from CIMSS
h. Land-based surface observations from government and private sources.
i. Preliminary Model Hindcast of Hurricane Katrina Storm Surge (CNMOC, Stennis Space Center, MS).
j. Buoy reports from the National Data Buoy Center
k. U.S. Army Corps of Engineers Interagency Performance Evaluation Task Force (IPET) Report.

Keith G Blackwell 3/26/07 Aaron Williams 3/26/07

Dr. Keith G. Blackwell Dr. Aaron Williams

CURRICULUM VITAE KEITH G. BLACKWELL, Ph.D.

Associate Professor of Meteorology
Department of Earth Sciences
Coastal Weather Research Center
Mitchell Center, Room 1623
University of South Alabama
Mobile Alabama 36688
E-mail: kblackwell@usouthal.edu
Web Site: http://www.southalabama.edu/meteorology/faculty.html
Phone: (251) 460-6302
Fax: (251) 460-7886

Home Address:
16411 County Road 34
Summerdale, AL 36580
Phone: (251) 988-1843
E-mail: kgbmab@gulftel.com

ACADEMIC DEGREES

B. S. Meteorology - University of Wisconsin - Madison, June 1980

M. S. Meteorology - Texas A&M University - College Station, December 1987
Thesis Title: Synoptic-Scale Sensitivity of TIROS-N Moisture Channels in the Tropics

Ph. D. Meteorology - Texas A&M University - College Station, December 1990
Dissertation Title: Transient Synoptic Forcing of Tropical Plumes in a Barotropic Model with a Realistic Basic State

ACADEMIC/PROFESSIONAL EXPERIENCE

September 2001 - Present: Associate Professor of Meteorology, Department of Earth Sciences, University of South Alabama, Mobile AL

September 1996 – August 2001: Assistant Professor of Meteorology, Department of Earth Sciences, University of South Alabama, Mobile AL

August 2000 – December 2004: Adjunct Professor of Meteorology, Graduate Faculty, Department of Atmospheric Sciences, Texas A&M University, College Station, TX

September 1996 - Present: Consultant, Forecaster and Hurricane Analyst, Coastal Weather Research Center, University of South Alabama, Mobile AL

August 1998 – June 2005: Chief Scientist (Lieutenant Colonel, USAF Reserves) - Weather Forecast Model Applications, Centralized Weather Forecast Center, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL.

October 1993 - August 1996: Director of Meteorology and Assistant Professor of Meteorology, Department of Economics and Geography, United States Air Force Academy CO

August 1994 - June 1996: Director - Cadet Summer Research Program, Dean of Faculty, United States Air Force Academy CO

December 1994 - June 1996: Secretary - Weather Career Field Selection Board, Dean of Faculty, United States Air Force Academy CO

August 1995 - June 1996: Associate Air Officer Commanding for Academics, Dean of Faculty, United States Air Force Academy CO

October 1990 - September 1993: Lead Scientist and Team Chief - Regional Numerical Models Team, Meteorological Models Section, Software Development Division, Air Force Global Weather Central, Offutt Air Force Base NE

August 1992 - August 1993: Lecturer, Department of Geography, University of Nebraska-Omaha, Omaha NE

September 1991 - May 1992: Lecturer, Embry Riddle Aeronautical University, Offutt Air Force Base NE

August 1987 - August 1990: Ph. D. Graduate Student, Department of Meteorology, Texas A&M University, College Station TX

August 1985 - August 1987: M. S. Graduate Student, Department of Meteorology, Texas A&M University, College Station TX

August 1983 - August 1985: Weather Forecaster and Wing Weather Officer, Detachment 20, 17th Weather Squadron, Little Rock Air Force Base AR

May 1983 - August 1983: Officer Trainee, Flight 6, Squadron 12, U.S. Air Force Officer Training School, Medina Annex, Lackland Air Force Base, San Antonio TX

July 1981 - November 1982: Meteorological Consultant, Forecaster, and Broadcast Meteorologist, Capitol Weather Service, Mobile AL

June 1980 - July 1981: Air Pollution Meteorologist, Air Pollution Control, Department of Environmental Health, Jefferson County Health Department, Birmingham AL

September 1979 - May 1980: Weather Lab Technician (part-time), Department of Meteorology, University of Wisconsin-Madison, Madison WI

June - August 1979: Meteorology Student Intern, National Weather Service Forecast Office, Birmingham AL

TEACHING EXPERIENCE

Courses Developed and/or Taught at the University of South Alabama

GEO 243/MET 353	General Meteorology and Laboratory (*Major Revision*)
GEO 344/MET 354	Dynamic Meteorology I (*New*)
GEO 345/MET 355	Dynamic Meteorology II (*New*)
GEO 346	Physical Meteorology (*New*)
GEO 444/MET 454	Synoptic Meteorology I and Laboratory (*New*)
GEO 445/MET 455	Synoptic Meteorology II and Laboratory (*New*)
MET 456	Applied Climatology (W) (*New)*
MET 492	Seminar: Satellite Meteorology (New)
MET 492	Seminar: Air Pollution Meteorology and Dispersion *(New)*
MET 494	Directed Studies (Tornadic thunderstorm-related topics)
MET 494	Directed Studies (Tropical cyclone-related topics)
MET 494	Directed Studies (Numerical weather prediction-related topics)
MET 494	Directed Studies (Techniques in map analysis)
MET 494	Directed Studies (Aviation Meteorology)
MET 496	Internship in Meteorology

Courses Taught at the Dauphin Island Sea Lab

Geography 441	Coastal Climatology
Meteorology 492	Hurricanes of the Gulf Coast (*New*)

Courses Developed and Taught at the U. S. Air Force Academy, Colorado Springs

Meteorology 352	Climatology (*New*)
Meteorology 452	Mesoscale Meteorology and Laboratory (*New*)
Meteorology 499	Tropical Cyclones (*New*)

Courses Taught at the University of Nebraska - Omaha

Geography 3510	Introduction to Meteorology

Courses Taught at Embry-Riddle Aeronautical University

Aeronautical Science 201	Meteorology
Masters-Level Aeronautical Science 517	Advanced Meteorology

SCHOLARLY ACTIVITIES

Research Proposals and Grants

Submitted: *Assessing Wind Damage due to Hurricane Katrina.*, National Science Foundation-Alabama EPSCoR., Co-PI with USA team lead by Dr. John Steadman (Engineering).
Results: **Awarded $100,000, November 2005.**

Submitted: *Modernization of Aerographer's Mate and Marine Forecaster Course for the U.S. Navy,* Navy Technical Training Unit, U.S. Navy, PI.
Results: **Awarded $28,822, September 2002.**

Submitted: *Comparing Numerical Weather Model Data of Hurricane Danny (1997) to real Doppler radar observations. Part II: The Radar Observations,* 2002, University Committee on Undergraduate Research (UCUR) 2002 Undergraduate Summer Research Fellowships, PI.
Results: **Awarded $2,300, March 2002.**

Submitted: *"Black Box" Recording of Extreme Wind Events,* 2002, National Oceanic and Atmospheric Administration/HPCC, Co-PI with M.D. Powell.
Results: **Declined**

Submitted: *Modernization of Aerographer's Mate and Marine Forecaster Course for the U.S. Navy,* Navy Technical Training Unit, U.S. Navy, PI.
Results: **Awarded $50,000, January 2002.**

Submitted: *Regional Atmospheric and Land Surface Modeling,* 2000, NASA: National Space Science and Technology Center (NSSTC), $900,000, Co-PI.
Results: **Declined**

Submitted: *Computational Modeling of Hurricane Strikes on the Gulf Coast,* 2000, Sun Microsystems Computer Corporation, PI.
Results: **Awarded $45,000, July 2000.**

Submitted: *University of South Alabama Satellite Center for Meteorological Modeling and Remote Sensing (MMARS),* 1999, NASA: Global Hydrology and Climate Center. $871,600. Co-PI with M. Carpenter.
Results: **Declined, March 2000.**

Submitted: *Holocene sedimentary history of Weeks Bay, AL: Human and natural impacts on deposition in a Gulf Coast estuary.* 1998, Alabama EPSCoR - Alabama Center for Estuarine Studies, Co-PI with D. Haywick.
Results: **Awarded $145,222, October 1998**

Submitted: *Justification for student helper in the meteorology program.* 1998, College of Arts and Sciences, PI.
Results: **Awarded $2,500,, September 1998**

U.S. Senate Expert Oral and Written Testimony

Blackwell, K.G., 2005: A Review of Hurricane Forecasting in the Wake of Hurricane Katrina: The Current Status of Hurricane Prediction and What Can Be Done to Make Predictions Better in the Future. *United States Senate's Commerce, Science and Transportation Committee's Disaster Prevention and Prediction Subcommittee.* Room 562, Dirksen Senate Office Building, U.S. Capitol, Washington D.C., 3:00 -5:00 pm EDT, Tuesday, 20 September 2005.

Publications

Published Peer-reviewed Journal Articles

Medlin, J. M., S. K. Kimball, and **Blackwell, K.G.**, 2006: Radar and Rain Gauge Analysis of the Rainfall during Hurricane Danny's (1997) Landfall. Accepted 7 August 2006 for publication in *Monthly Weather Review* (American Meteorological Society).

Blackwell, K.G., 2000: The evolution of Hurricane Danny (1997) at landfall: Doppler-observed eyewall replacement, vortex contraction/intensification, and low-level wind maxima. *Monthly Weather Review* (American Meteorological Society), **128**, 4002-4016.

Blackwell, K.G., 2000: Tropical plumes in a barotropic model: A product of Rossby wave generation in the tropical upper troposphere. *Monthly Weather Review* (American Meteorological Society), **128**, 2288-2302.

Blackwell, K.G., and J. P. McGuirk, 1996: Tropical upper tropospheric dry regions from TOVS and Rawinsondes. *Journal of Applied Meteorology* (American Meteorological Society), **35**, 464-481

Technical Reports

Blackwell, K.G., 2005: "*Quantitative Evaluation of Surface Wind Forecast Accuracy from the ETA, MM5, and GFS Weather Prediction Models*". Technical Report 5, 15th

Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL (https://15ows-public.scott.af.mil/)

Blackwell, K.G., 2004: *A Quantitative Comparison of Convective Forecast Accuracy by the MM5, ETA, GFS, and NOGAPS Numerical Weather Prediction Models.* Technical Report 4, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL (https://15ows-public.scott.af.mil/)

Blackwell, K.G., 2002: *East Coast Cold Air Damming: A Study of AFWA MM5 Forecast Performance.* Technical Report 3, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL (https://15ows-public.scott.af.mil/)

Blackwell, K.G., 2001: Operational Numerical Weather Prediction Model Verification Study for the Central and Eastern United States and Adjacent Portions of Southern Canada: Part II, 24-hour Forecasts of Cyclone and Anticyclone Positions and Intensities from the MM5, AVN, ETA, and NGM Models. Technical Report 2, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL (https://15ows-public.scott.af.mil/)

Blackwell, K.G., 2000: Operational Numerical Weather Prediction Model Verification Study for the Central and Eastern United States and Adjacent Portions of Southern Canada: Part I, 24-hour Forecasts of Cyclone and Anticyclone Positions and Intensities from the MM5, AVN, ETA, and NGM Models. Technical Report 1, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL (https://15ows-public.scott.af.mil/)

Technical Reviews

Blackwell, K.G., 2002: The Dover AFB Convective Wind Event of 13 May 2002. *Technical Review, 15th Operational Weather Squadron*, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL

Conference Papers/Presentations

Holmes, J., **Blackwell, K.G.**, R. A. Wade, and S.K. Kimball, 2006: Collapsing precipitation cores in open-eyewall hurricanes at landfall: Are these cores actually downbursts associated with extreme surface wind gusts? *American Meteorological Society's 27th Conference on Hurricanes and Tropical Meteorology*, 24-28 April 2006, Monterey CA, Paper # 7B.7

Holmes, J., S.K. Kimball, and **Blackwell, K.G.**, 2006: The University of South Alabama Mesonet and data collected during the 2005 Hurricane Season. *American Meteorological Society's 27th Conference on Hurricanes and Tropical Meteorology*, 24-28 April 2006, Monterey CA, Paper # P7.6

Blackwell, K.G.,, 2006: The Hurricanes of 2004-2005: A devastating period for the Southeastern United States; *U.S. Coast Guard Annual Hurricane Conference and Training (Eighth District)*, 5 April 2006, Hale Boggs Federal Building, 500 Poydras Street, New Orleans, LA 70130. (*Invited Presentation*)

Blackwell, K.G., J. Holmes, R. A. Wade, and S.K. Kimball, 2006: Collapsing precipitation cores in hurricanes at landfall: Possible downbursts and extreme surface wind gusts *U.S. Government Interdepartmental Hurricane Conference*, U.S. Government Office of the Federal Coordinator for Meteorology, Mobile, Alabama, 20-24 March 2006.

Blackwell, K.G.: The Four Florida Hurricanes of 2004: Have there been previous seasons with this type of concentrated activity in the United States?"", *Alabama Geological Society & Southwest Geological Society*, University of South Alabama Brookley Campus, 11 November 2004 (*Invited Presentation*)

Blackwell, K.G., S.K. Kimball, and A. Montoya, 2004: Doppler-observed and model-simulated low-level wind surges in Hurricane Danny's (1997) eye wall. Keith G. Blackwell, S. K. Kimball and A. Montoya. *American Meteorological Society's 26th Conference on Hurricanes and Tropical Meteorology*, 3-7 May 2004, Miami, FL, Paper # P1.65

Blackwell K.G. and A. Montoya, 2003: Doppler-Observed Low-Level Wind Surges in Hurricane Danny's Eyewall. *99th Annual Meeting of the Association of American Geographers*, 5-8 March 2003, New Orleans, LA.

Conlee, D.T., Schrieber-Abshire, W., Miles, C.B., **Blackwell, K.G.**, Lee, T.F., Carroll, A.G., Williams, D.E., Moreau, D.R., 2003: Revolutionizing Navy Meteorology Training, *12th Symposium on Education, 83rd Annual Meeting of the American Meteorological Society*, Long Beach, CA, January 2003.

Blackwell K.G., 2002: Coastal and Inland Flooding Associated with Hurricanes Danny and Georges: The Event and Forecast Challenges. *U.S. Government Interdepartmental Hurricane Conference*, U.S. Government Office of the Federal Coordinator for Meteorology, New Orleans, LA, 13 March 2002. (*Invited Presentation*)

Blackwell K.G., 2002: Two slow-moving hurricanes produce diverse structure and impacts in the Mississippi/Alabama coastal area. *Southeast U.S. Severe Storms Symposium*, Mississippi State University, East Mississippi Chapter of the American Meteorological Society and National Weather Association, Starkville, MS, 15-17 February 2003 (*Invited Presentation*)

Kimball, S.K, and **K.G. Blackwell**, 2001: A modeling study of Hurricane Danny (1997) at landfall. *Symposium on Precipitation Extremes: Prediction, Impacts, and Responses*. 81st Annual Meeting of the American Meteorological Society, Albuquerque NM, 14-19 January 2001, 322-323.

Blackwell, K.G., 2000: Numerical Weather Prediction Models and Their Performance: How to Utilize These Tools More Effectively. *2000 Air Mobility Command Weather Conference*, Headquarters - Air Mobility Command, USAF, Scott Air Force Base IL, 10-14 April 2000 (http://amc.scott.af.mil/do/dow/workshop.html) (*Invited Presentation*)

Blackwell, K.G., 2000: Operational Numerical Weather Prediction Model Verification Study for the Central and Eastern United States and Adjacent Portions of Southern Canada. Part I: 24 hour Forecasts of Cyclone and Anticyclone Positions and Intensities from MM5, AVN, ETA, and NGM Models, *Air Mobility Command Weather Conference*, Headquarters - Air Mobility Command, USAF, Scott Air Force Base IL, 10-14 April 2000 (http://amc.scott.af.mil/do/dow/workshop.html) (*Invited Presentation*)

Blackwell, K.G., and W.E. Calhoun III, 1999: Refinery's inland-most levees likely received Hurricane Georges' Highest Storm Surge. *3rd Conference on Coastal Atmospheric and Oceanic Prediction and Processes*. New Orleans, LA, American Meteorological Society, 3-5 November 1999, pp. 344-347.

Blackwell, K.G., 1999: Mainland side of Gulf Coast refinery receives maximum surge heights in Hurricane Georges. *13th Annual Alabama Water Resources Conference and Symposium*. Gulf Shores, AL, American Water Resources Association, 8-10 September 1999, paper 14 in Tract III.

Blackwell, K.G., and W.E. Calhoun III, 1999: Coastline configuration maximizes Hurricane Georges' storm surge height over inland portions of Pascagoula refinery. *The Impact of Hurricane Camille: A Storm Impact Symposium to Mark the 30th Anniversary*. New Orleans, LA, University of New Orleans, 17-18 August 1999, p. 12.

Blackwell, K.G., and J.M. Medlin, 1999: Doppler-observed eyewall replacement cycles in Hurricane Danny near the Alabama coast and corresponding fluctuations in storm intensity, organization, and precipitation. *23rd Conference on Hurricanes and Tropical Meteorology*, Dallas, TX, American Meteorological Society, 10-15 January 1999, pp. 196-199.

Medlin, J.M., and **K.G. Blackwell**, 1999: A persistent supercell associated with prolonged excessive rainfall within Hurricane Danny's eyewall over Mobile Bay. *23rd Conference on Hurricanes and Tropical Meteorology*, Dallas, TX, American Meteorological Society, 10-15 January 1999), pp. 196-199, pp. 321-324.

Haywick, D.W., M.L. Grace, **K.G. Blackwell**, and D.T. Allison, 1998: Fair-weather and storm-influenced sedimentation within a marginal marine embayment along the Alabama Gulf Coast. Canadian Society of Petroleum Geologists Triad Conference, Calgary, CN, 16-19 June 1998

Butts, D.A. Jr. and **K.G. Blackwell**, 1998: North Alabama tornado family evolving near the apex of a bow echo. *Alabama Academy of Sciences Annual Conference: Section III - Earth Science*, University of South Alabama, Mobile, AL

Blackwell, K.G., 1998: The effect of atmospheric conditions on Alabama beach erosion. Proceedings: *1st Annual Coastal Issues Symposium: Beach Erosion*, Dauphin Island, AL, Alabama Department of Economic and Community Affairs/Dauphin Island Foundation/Dauphin Island Sea Lab/Alabama Coastal Foundation, 3-5. *(Invited presentation).*

Blackwell, K.G. and J.M. Medlin, 1998: Hurricane Danny's transition from a symmetric to asymmetric hurricane in Mobile Bay and its flash flood implications. Preprints: *16th Conference on Weather Analysis and Forecasting*, Phoenix AZ, American Meteorological Society, 19-21.

Butts, D.A. Jr., and **K.G. Blackwell**, 1997: Rapid evolution of a tornadic supercell along the leading edge of a bow echo. Preprints, *28th Conference on Radar Meteorology*, Austin, TX, American Meteorological Society, 475-476.

Blackwell, K.G., and B.E. Heckman, 1996: Integration of interactive multimedia into the curriculum of the United States Air Force Academy Meteorology Track: Year two assessment and future directions. *Fifth Symposium on Education*, Atlanta GA, American Meteorological Society, J13-J16.

Koehler, T.L, **K.G. Blackwell**, D.J. Knipp, and B.E. Heckman, 1995: New meteorology program at the U.S. Air Force Academy integrates COMET multimedia and computer weather lab into undergraduate curriculum. Preprints, *Fourth Symposium on Education*, Dallas TX, American Meteorological Society, 23-24.

Lanicci, J.M, R.B. Kiess, N.H. Mandy, **K.G. Blackwell**, and K.B. Monk, 1993: Use of a workstation for model quality control and development. Preprints, *Ninth International*

Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology, Anaheim CA, American Meteorological Society, 91-95.

Blackwell, K.G., J.P. McGuirk, and Y. Zhang, 1991: Tropical plumes in a barotropic model. Preprints, *Eighth Conference on Atmospheric and Oceanic Waves and Stability*, Denver CO, American Meteorological Society, 416-417.

Blackwell, K.G., J.P. McGuirk, and A.H. Thompson, 1988: Temporal and spatial variability and contamination of 6.7 and 7.3 micrometer water vapor radiances. Preprints, *Third Conference on Satellite Meteorology and Oceanography*, American Meteorological Society, 115-120.

Thompson, A.H., J.P. McGuirk, and **K.G. Blackwell**, 1987: Synoptic scale moisture transports using ECMWF analysis and satellite data. Preprints, *XIX General Assembly*, Vancouver, Canada, International Union of Geodesy and Geophysics (IUGG), 877.

University and Local Research Presentations

Blackwell, K. G., and R. Wade, 2006: *"The Historic and Record-Breaking 2005 Hurricane Season: Perspectives from USA's Coastal Weather Research Center"*; *Southeastern Coastal and Atmospheric Processes Symposium (SECAPS)*, USA Campus, Mobile AL , 31 March - 1April 2006.

Holmes, J., **K.G. Blackwell**, and R. Wade, 2005: "Collapsing Precipitation Cores in Open-Eyewall Hurricanes at Landfall: Could These Downbursts Be Associated with Extreme Surface Wind Gusts? "; *Southeastern Coastal and Atmospheric Processes Symposium (SECAPS)*, USA Campus, Mobile AL , 8-9 April 2005.

Holmes, J., **K.G. Blackwell**, and R. Wade, 2005: "Collapsing Precipitation Cores in Open-Eyewall Hurricanes at Landfall: Could These Downbursts Be Associated with Extreme Surface Wind Gusts?"; *13th Annual Research Forum*, University of South Alabama, 11-14 April 2005

Blackwell, K.G., 2004: "Hurricane Forecasting: The Good, The Bad, and The Ugly; *Southeastern Coastal and Atmospheric Processes Symposium (SECAPS)*, USA Mobile AL 26-27 March 2004.

Blackwell, K.G., 2003: "Some Problems with Hurricane Forecasting". *Central Gulf Coast Chapter of the National Weather Association*, USA Mitchell Center, Mobile AL, 20 November 2003.

Montoya, A.L., and **Blackwell, K.G.**, 2002: Hurricane Danny: Comparison and Analysis of Doppler Radar Imagery vs. Computer Model Simulations. *University of South Alabama's 4th Annual Undergraduate Research Week*, University Committee for Undergraduate Research, 21-25 October, 2002.

Blackwell, K.G. and Wallace E. Calhoun, III, 2000: Hurricane Georges' Storm Surge Exceeded 13 Feet Near Pascagoula MS: Mainland-side Levees Were Breached First. *University of South Alabama's 7th Annual Research Forum*, 20-24 March 2000.

Blackwell, K.G., 1999: The Contraction and Intensification of Hurricane Danny's Inner Core in Mobile Bay. *6th Annual Research Forum*, University of South Alabama, 26 March 1999.

Elliott, J. and **K.G. Blackwell**, 1999: Northern Gulf Coast Tropical Cyclone Climatology. *6th Annual Research Forum*, University of South Alabama, 26 March 1999.

Morvant, B. and **K.G. Blackwell**, 1999: Numerical Weather Prediction Model Performance in Forecasting Hurricane Georges. *6th Annual Research Forum*, University of South Alabama, 26 March 1999.

Blackwell, K.G., 1998: Hurricane Danny in Mobile Bay: A very unusual tropical cyclone. *5th Annual Research Forum*, University of South Alabama, Mobile AL, 8 May 1998.

Butts, D.A. Jr. and **K.G. Blackwell**, 1997: Unusual evolution of a tornadic supercell thunderstorm in north Alabama. *4th Annual Research Forum*, 9 May 97, University of South Alabama)

Lesson Plans for U.S. Navy Aerographer's Mate Technical Meteorology Training

Lesson Plan: **Atmospheric Physics I**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003. Peer-reviewed by meteorology faculty at Iowa State University.

Lesson Plan: **Atmospheric Physics II**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003 Peer-reviewed by meteorology faculty at Iowa State University.

Lesson Plan: **Atmospheric Dynamics I**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003. Peer-reviewed by meteorology faculty at Iowa State University.

Lesson Plan: **Atmospheric Dynamics II**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003. Peer-reviewed by meteorology faculty at Iowa State University.

Lesson Plan: **Atmospheric Dynamics III**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003. Peer-reviewed by meteorology faculty at Iowa State University.

Powerpoint Multimedia Lesson: **Tropical Weather Systems**, Navy Aerographer's Mate C-School, U.S. Navy Technical Training Unit, Keesler Air Force Base, August 2003.

Applied Research Activity

Provide real-time hurricane forecasting services to approximately 100 industrial and governmental clients through USA's Coastal Weather Research Center (CWRC). Since 1997, my *BLOHW* (*Blackwell Over-surface Hurricane Wind*) model has been used by the Coastal Weather Research Center to produce real-time forecasts of all hurricanes threatening the Southeast U.S., western Caribbean, and Gulf of Mexico. I developed this numerical hurricane wind profile model for real-time use in the CWRC during hurricane emergencies. The BLOHW Model forecasts tropical cyclone tracks and associated wind patterns out to 5 days into the future. The BLOHW Model also produces hourly wind estimates for specific sites along the Gulf and Atlantic coasts. This model relies on extensive interaction with a skilled hurricane forecaster. For instance, during Hurricanes Danny (1997), Georges (1998), Ivan (2004), and Katrina (2005), graphical and numerical products from the model, as well as detailed forecast discussions, were provided to and heavily utilized by industries, governmental agencies, university officials and local law enforcement/disaster officials; the use of these products helped officials anticipate the extent and severity of damaging winds near and along the path of the storm. For instance, the model correctly projected the future track of Danny into Mobile Bay while official forecasts projected the storm into Destin FL. The following year, the model provided 53-hour advanced warning of winds expected to exceed 110 mph along the Mississippi coast during Hurricane Georges; Gulfport MS actually reported gusts to 117 mph (ref. NHC Post Storm Report - Hurricane Georges, Guiney, 1999). In 2005, the model provided nearly 3 days advance warning of winds exceeding 100 mph on the Mississippi Coast in advance of devastating Hurricane Katrina. Similar accuracy has been achieved in numerous other Gulf storms. The number of CWRC clients subscribing to this hurricane forecasting service has more than quadrupled since the introduction of the BLOHW model in 1997.

Other Research Experience:

Lead Scientist: Air Weather Service-sponsored project: *The Relocatable Window Model for Military Contingencies*, Meteorological Models Section, Software Development Division, Air Force Global Weather Central, Air Weather Service, U.S. Air Force, Offutt, Air Force Base, Bellevue, NE, October 1990 - October 1993

Visiting Scientist/Meteorologist/Modeler: Defense Nuclear Agency-sponsored study: *Chemical/Biological Agent Dispersion Capabilities and Limitations within Atmospheric Dispersion Models used in DESERT STORM*, Defense Nuclear Agency, U.S. Department of Defense, Arlington, VA, Jan - Mar 1991

Graduate Researcher: *Meteorological Applications of Satellite Information over the Data-Sparse East Pacific Ocean*. NASA Grant NAS8-37284, P.I.s: A.H. Thompson and J.P. McGuirk, Department of Meteorology, Texas A&M University, August 1985 - August 1987

Wing Weather Officer/Meteorologist: Strategic Air Command-sponsored study: *Climatology of Northern Arkansas Missile Sites for 308th Strategic Missile Wing Deactivation*, Detachment 20, 17th Weather Squadron, 7th Weather Wing, Air Weather Service, U.S. Air Force, Little Rock Air Force Base, Jacksonville, AR, June 1984 - March 1985

Air Pollution Meteorologist: Environmental Protection Agency-sponsored study: *Jefferson County Air Quality*, Jefferson County Health Department, Birmingham, AL, March - July 1981

Professional Development Activities

Lecturer

U.S. Air Force Staff Meteorologist Workshop, Hanscom Air Force Base MA, November 1992

Department of Defense Mesoscale Forecasting and Modeling Seminar, Headquarters Air Weather Service, Scott Air Force Base IL, November 1992

Seminar Presentations

Seminar: *Quantitative Evaluation of Surface Wind Forecast Accuracy from the ETA, MM5, and GFS Weather Prediction Model*. 15th Operational Weather Squadron Weather Forecasting Seminar, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL, 18 May 2005.

Seminar: *A Quantitative Comparison of Convective Forecast Accuracy by the MM5, ETA,* *GFS, and NOGAPS Numerical Weather Prediction Models*, 15th Operational Weather Squadron Weather Forecasting Seminar, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL, 21 May 2004.

Invited Presentation: *Some Problems with Hurricane Forecasting*. LSU Hurricane Center and Coastal Ecological Institute seminar series, Louisiana State University, Baton Rouge, LA, 24 Oct 2003.

Seminar: *An Introduction to Convective Forecasting by the MM5, ETA, and GFS Numerical Models*, Air Mobility Command 15th Operational Weather Squadron Forecasting Seminar, 21 Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL, May 2003.

Seminar on East Coast Cold Air Damming, 15th Operational Weather Squadron Weather Forecasting Seminar, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base, IL, May 2002.

Shortwaves in Summer Northwesterly Flow: Convective initiation and feedback highlights severe model limitations. Centralized Weather Forecast Center, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base IL, July 2000.

Effective exploitation of Numerical Weather Forecast Guidance. Centralized Weather Forecast Center, 15th Operational Weather Squadron, Tanker Airlift Control Center, Air Mobility Command, U.S. Air Force, Scott Air Force Base IL, July 1999.

Tropical Plumes in a barotropic model. Visiting Scientist Seminar, NASA/University of Alabama-Huntsville/Global Hydrology and Climate Center, Huntsville AL. September 1996. (Invited Presentation)

Invited Panelist

Panelist, Tropical cyclone precipitation and inland flooding. U.S. Government Interdepartmental Hurricane Conference, NOAA-U.S. Navy-U.S. Air Force, New Orleans, LA, 13 March 2002.

Panelist, First Annual Coastal Issues Symposium (*Beach Erosion*). Dauphin Island Sea Lab AL, 20 February 1998.

Participant

Invited Participant: "USAF Air Mobility Command Midwest IMA Weather

Conference", Headquarters Air Mobility Command, Scott Air Force Base, IL, 14-17 October 2004.

Invited Participant: *USAF Air Mobility Command Weather Workshop*, Headquarters Air Mobility Command, Scott Air Force Base, IL, 12-16 April 2004.

Invited Participant: *US Navy, US Air Force, US Marine Corps, COMET, U. of S. Alabama Joint Conference on Distance Learning and USA B.S. Degree in Meteorology for Enlisted Military Personnel*. 29-30 January 2004, Navy Professional Development Center, Gulfport MS.

2002 NASA-NWS Joint Symposium on Short-Term Forecasting and the Convective Weather Warning Process, National Space Science Technology Center, NASA-UAH, Huntsville AL (9-10 April 2002).

Strategic Planning Retreat, National Space Science and Technology Center (NSSTC), Perdido Beach Resort, Orange Beach AL, 30 November - 1 December 2000.

Writing Across the Curriculum Seminar, Office of Academic Affairs and University Writing Program, University of South Alabama, 15-16 May 2000

Short Course on National Weather Service Data Sources, Formats, and Use, American Meteorological Society Pre-meeting Course, 1999 Annual Meeting, Phoenix AZ, January 1999

Doppler Weather Radar Training Course, 81st Training Group, Keesler Air Force Base, Biloxi MS. (Workshop at U.S. Air Force Academy, Colorado Springs, CO), April 1995.

Air Command and Staff College, Air University, Maxwell Air Force Base, AL (via seminar at U.S. Air Force Academy, Colorado Springs, CO), September 1994 - May 1995.

Mesoscale Meteorology Course for University Faculty, Cooperative Program for Operational Meteorology, Education, and Training (COMET), University Corporation for Atmospheric Research (UCAR), Boulder CO. May 1994 - June 1994

First International Conference on Computer-Aided Learning in Meteorology, Hydrology, and Oceanography (CALMET), University Corporation for Atmospheric Research, Boulder CO, July 1993.

Models Computer Vector Programming Course, Cray Research Inc., Mendota Heights MN, April 1991

Squadron Officer School, Air University, Maxwell Air Force Base, AL (via correspondence at Little Rock Air Force Base AR) September 1984 - July 1985

Lieutenant's Professional Development Program, Air University, Maxwell Air Force Base, October 1984.

Strategic Air Command Wing Weather Officer Workshop, Headquarters Third Weather Wing, Offutt Air Force Base NE, September 1984.

Air Pollution Dispersion Modeling Course, Environmental Protection Agency, Portland OR, February 1981

Air Pollution Meteorology Course, Environmental Protection Agency, Albany NY, December 1980

SERVICE

University Service

Member, *NCAA Re-Certification Committee* (August 2001 – May 2003)

Member, *NCAA Gender Equities Sub-Committee* (August 2001 – May 2003)

Member, *Faculty Senate* (April 2000 – May 2002)

Member, *Evaluation Committee, Faculty Senate* (August 2000 - May2002)

Member and USA Representative - *Mobile Area Air Quality Task Force*, Mobile Chamber of Commerce, March 2000 - 2002. (Appointed by USA President)

Expert Scientific Advisor - *Mobile Area Air Quality Task Force*, Mobile Chamber of Commerce, February 1999 - March 2000 (Requested by USA Associate Vice President for Academic Affairs)

College Committees

Member, *Arts and Sciences Tenure Committee* (2003/04)

Member, *Arts and Sciences Strategic Planning Committee* (2000/01 - present)

Member, *Arts and Sciences Support and Development Committee* (1996/97-1997/98)

Department Committees

Chair, *Tenure Committee* (2002 – 2004)

Member, *Tenure Committee* (2001/02, 2004/05)

Member, *Meteorology Assessment Committee* (2002/03, 2004/05)

Member, *Academic Standards Committee* (1999/00, 2004/05)

Alternate, *Academic Standards Committee* (1998/99 and 2002/03)

Member, *Scheduling Committee* (1997/98)

Member, *Curriculum Committee* (1996/97-1997/98)

Chair, *Faculty/Student Grievance Committee* (1997/98)

Member, *Faculty/Student Grievance Committee* (1996/97)

University Presentations

Guest Speaker: "Powerful Hurricane Ivan's Landfall on the Alabama and Northwest Florida Coast: How did Ivan compare to past major storms in this area?"; K.G. Blackwell, *Quarterly Meeting of the University of South Alabama National Alumni Association*, 19 November 2004.

Guest Lecturer: Civil Engineering 490: *Weather influences on beach erosion along the Alabama coast over the last 20 years*. 12 March 1998. Instructor: Dr. Scott Douglass

Department of Earth Sciences/Student Club Speaking Activities

Student Chapter of the American Meteorological Society, *What Happened to Hurricane Debby?* 14 September 2000

Host - Meteorology Program, University's *Get Acquainted Day*. February 1997 - 2006

Student Chapter of the American Meteorological Society, *The Structural Evolution of Hurricane Danny in Mobile Bay*. 8 September 1999.

Student Meteorology Club: *The Problem with Hurricane Intensity*. 10 February 1999

Student Meteorology Club: *Review of the 1997 Hurricane Season*. October 1997

Meteorology Undergraduate Orientation Seminar: *Hurricane Danny and the 1997 Hurricane Season*. September 1997

Student Meteorology Club: *The Upcoming 1997 Hurricane Season*. May 1997

Student Meteorology Club: *Review of the 1996 Hurricane Season*. November 1996

Meteorology Undergraduate Orientation Seminar: *The 1996 Hurricane Season (so far)*. Sept 1996

Community Service

Videos

2005: Professional DVD: "*Hurricane Katrina: America's Costliest Storm*". Producer: Dr. Bill Williams and Dogwood Productions, Inc. **Dr. Keith Blackwell** provided research and pictures, and accomplished a 10 minute segment on the DVD detailing physical mechanisms by which Katrina's nearly 30 foot storm surge exceeded much more powerful Hurricane Camille's storm surge in 1969. The Hurricane Katrina CD is being sold in regional stores and over the internet for $20 each. Proceeds go toward USA meteorology scholarships.

2004: Professional DVD: "*Hurricane Ivan: Portrait from Earth and Space*". Producer: Dr. Bill Williams and Dogwood Productions, Inc. **Dr. Keith Blackwell** accomplished a 15-20 minute segment on the DVD regarding hurricane structure and forecasting. The Hurricane Ivan CD is being sold in regional stores and over the internet for $20 each. Proceeds go toward USA meteorology scholarships.

Almanac Articles

A Review of the 2005 Hurricane Season, *2006 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 2004 Hurricane Season, *2005 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 2003 Hurricane Season, *2004 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 2002 Hurricane Season, *2003 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 2001 Hurricane Season, *2002 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 2000 Hurricane Season, *2001 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

The 1999 Hurricane Season in Review, *2000 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

A Review of the 1998 Hurricane Season, *1999 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

The 1997 Atlantic Hurricane Season in Review. *1998 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

The 1996 Atlantic Hurricane Season in Review. *1997 Mobile Weather and Marine Almanac*, Coastal Weather Research Center, University of South Alabama

Presentations to Local Civic Associations and Companies

Mississippi Association of Electric Cooperatives, *Realtime applications of USA's Coastal Weather Research Center BLOHW hurricane wind profile model during hurricane emergencies*. Guest Speeaker, Hattiesburg MS, 15 June 2005

Mobile Kiwanis Club, *Recent Hurricane Activity along the Northern Gulf Coast*. Guest speaker. Skyline Country Club,, Mobile, AL, 13 June 2001.

Greater Mobile Industrial Association. *Realtime applications of USA's Coastal Weather Research Center BLOHW hurricane wind profile model during hurricane emergencies*. Guest speaker. Mitchell Center, USA, 14 September 2000.

Ciba-Giegi Chemical Company. *Realtime applications of USA's Coastal Weather Research Center BLOHW hurricane wind profile model during hurricane emergencies*. Guest speaker. McIntosh, AL, 4 April 2000.

West Mobile Kiwanis Club, *Hurricane Climatology along the Northern Gulf Coast*. Guest speaker. Mazzarella's Restaurant,, Mobile, AL, 21 June 1999.

Mid-Gulf Business Roundtable, *Atlantic Hurricanes of 1998.* Guest speaker. Mobile International Trade Center, Mobile AL, 18 June 1999.

Mobile Rock and Gem Society, *Atlantic Hurricanes of 1997 and 1998.* Guest speaker. Mobile Botanical Gardens, 9 June 1999.

Chevron Pascagoula Refinery: *Hurricane Levy Protection Improvements.* Expert Scientific Advisor (non-pay) in exchange for Chevron's own Hurricane Georges' storm surge survey information which I am using for an upcoming research paper. Presented an overview of the refinery's hurricane risk. Pascagoula MS, February-March 1999.

Chickasaw Civitan Club. *Recent Hurricanes along the Northern Gulf Coast.* Guest speaker. Chickasaw Public Library, Chickasaw, AL, 12 Oct 98.

Sunrise Rotary Club of Mobile, *Hurricane Preparedness along the Northern Gulf Coast.* Guest speaker. Mobile Country Club, Mobile, AL, 19 Aug 98.

Dupont Chemical Company, *Real-time applications of USA's CWRC hurricane wind profile model during hurricane emergencies.*, Axis, AL, 11 Jun 98.

Mobile Lions Club, *Hurricanes along the Northern Gulf Coast: Recent history and what we can expect in 1998.* Guest speaker. International Trade Center, Mobile, AL, 26 May 1998.

Daphne/Spanish Fort Rotary Club, *Atlantic Hurricanes and the El Nino Phenomenon.* Guest speaker. Lake Forest Country Club, Daphne, AL., 27 Apr 98.

International Paper Company, *Realtime applications of USA's CWRC hurricane wind profile model during hurricane emergencies.* Guest speaker. Mobile Mill, Mobile, AL, 20 March 1998.

Mid-Gulf Business Roundtable, *The Effect of El Nino on the 1997 Hurricane Season / A Review of Hurricane Danny / El Nino's effects on the Gulf coast this winter.* Guest speaker, International Trade Center, Mobile, AL, 17 Oct 97.

Mobile Rotary Club: *The Effect of El Nino on the 1997 Hurricane Season / A Review of Hurricane Danny.* Mobile Country Club, Mobile, AL. August 1997

Local Grade Schools

Davidson High School: Scientific Advisor: Senior Honors Project on Hurricanes (Malcomb Arnold), Fall Semester 2005.

Dodge Elementary School: Weather Multimedia Presentation. 5th Graders (Mrs. Henderson's, Mrs. Coleman's, and Mrs. Auer's 5th grade classes. 9 am, Friday, 21 November 2003.

Appointed as **School Patron** to Summerdale Elementary School by the Baldwin County Board of Education. (4-year term, 2003-2007).

Summerdale School, Science Fair Judge, Summerdale, AL, 2 May 2002.

Daphne Intermediate School: *Weather, Clouds, and Hurricanes*. 3rd grade students. 30 January 1998.

Daphne Intermediate School: *Weather, Clouds, and Hurricanes*. 4th grade students. 30 January 1998.

Local Boy Scouts Programs

Scoutmaster and Assistant Scoutmaster: Troop 82, Daphne AL (2002-present) and Assistant Scout Master: Troop 177, Spanish Fort AL (2000-2002).

⇒ Routinely teach the weather merit badge at Winter Scout Camp (2003-2005) and periodically to boys in both troops.

Den Leader, Den 5, Cub Scout Pack 347 (2003-2005), Fairhope AL.

Media Activity

University Newspaper

Midweek Memo: *NASA Director visits USA in hopes of expanding research collaboration. "...NASA hopes to expand its collaboration with the USA Coastal Weather Research Center. ..."* 2 November 2000. Contributed 2 paragraphs.

Midweek Memo: *USA meteorologist receives grant to create hurricane model.* 14 September 2000. Contributed 23 paragraphs.

Midsummer Memo: *Early hurricane activity a real possibility.* July 2000. Contributed to 23 paragraphs.

Midweek Memo: *Coastal Weather Research Center Predicts Georges' Landfall. "While some hurricane forecasters were predicting Hurricane Georges' eventual landfall for the mouth of the Mississippi River, and other hurricane trackers were forecasting a Florida* *landfall, the University of South Alabama Coastal Weather Research Center correctly predicted landfall on the Mississippi coast two days before it happened". "The advance notice allowed [local industry], the City of Mobile and University to make appropriate plans". "Blackwell has developed a hurricane wind profile model and used it in the Weather Research Center's forecast."* 8 October 1998. Contributed 12 paragraphs.

Midweek Memo: *Goodbye El Nino, Hello Hurricane?* This was a timely article! *"...weather records indicate Mobile is due [for another hurricane strike], even factoring in last year's direct hit from Hurricane Danny. Mobile gets hit much more frequently than recent history would let on."* (Hurricane Georges strikes the Mobile area 4 months later). 28 May 1998. Contributed 13 paragraphs.

Mobile Register Newspaper

Over 75 weather-related newspaper interviews in the Mobile Register Newspaper since 1997. Quotes total over 400 paragraphs.

Mississippi Power Newsletter

⇒ *Unusual Weather Created Flood Situation*, 22 June 2001

Radio

The Mississippi Radio Network, Super-Talk Mississippi, *The Tropics Are About to Get Very Active*, The Mary Wieden Show, Jackson MS, 4:35 - 5:00 pm, 2 August 2000.

Forty-eight *Jag Tracks* radio shows on WNTM Radio, AM-710, between1996 and 1999.

⇒ WNTM Radio, Jag-Tracks (5 shows). *The 1999 Hurricane Season: Are the Predictions of an Active Season Still Justified?* AM-710, 23 - 27 August 1999. Reporter: Bob Lowry

⇒ WNTM Radio, Jag-Tracks (4 shows). *The 1999 Hurricane Season: A Preview.* AM-710, 8-17 June 1999. Reporter: Bob Lowry

⇒ WNTM Radio, Jag-Tracks (8 shows). *The 1998 Hurricane Season: A Review of Hurricanes Georges and Earl.* AM-710, 30 September - 9 October 1998. Reporter: Bob Lowry

⇒ WNTM Radio, Jag-Tracks (5 shows). *An Update on the 1998 Hurricane Season and La Nina.* AM-710, 23 June - 7 July 1998. Reporter: Bob Lowry.

- ⇒ WNTM Radio, Jag-Tracks (10 shows). *The Upcoming 1998 Hurricane Season.* Guest meteorologist. AM-710, 13 - 24 April 1998. Reporter: Bob Lowry.

- ⇒ WNTM Radio, Jag-Tracks (5 shows). *The Effect of El Nino on the 1997 Hurricane Season / El Nino's effects on the Gulf coast this winter.* AM-710, 22-26 September 1997. Reporter: Bob Lowry

- ⇒ WNTM Radio, Jag-Tracks (6 shows), *The Upcoming 1997 Hurricane Season.* AM-710, 17 June - 3 July 1997. Reporter Bob Lowry

- ⇒ WNTM Radio, Jag-Tracks (5 shows), *The recent unusually active hurricane seasons / The USA Meteorology Program.* AM-710, 4-7 November 1996. Reporter: Bob Lowry.

Television

Over 20 television interviews which aired on local, state, and some national news programs since 1998, including:

- ⇒ The Weather Channel, *Weather and War Series?,* Aired nationally between 9 and 11 pm, 28-29 April 2003.

Professional Service During Hurricane Emergencies

Provided continuous hurricane forecasting services, via the Coastal Weather Research Center (CWRC), to University officials, disaster preparedness officials, law enforcement officials, and industrial clients during the Hurricane Danny (July 1997), Hurricane Georges (September 1998), Hurricane Ivan (September 2004), and Hurricane Katrina (August 2005) disasters in southwest Alabama.

PROFESSIONAL AWARDS AND RECOGNITION

Dean's Lecture Award, College of Arts and Sciences, University of South Alabama, Fall 2006. Awarded annually for excellent scholarship or academic achievement. Highest academic award in the College of Arts and Sciences.

Meritorious Service Medal (1st oak leaf cluster), 15th Operational Weather Squadron, Scott Air Force Base IL, 2004. Awarded for duties related to the comparison of operational numerical forecast model accuracy to real weather events.

Promotion to the rank of Lieutenant Colonel, United States Air Force Reserves, November 2001

Fawbush-Miller Award, Member of the outstanding operational weather squadron in the U.S. Air Force, 15th Operational Weather Squadron, Scott Air Force Base IL, 1999, 2000, and 2001.

Meritorious Service Medal, U.S. Air Force Academy, August 1996. Awarded for duties related to the development of a new meteorology curriculum and major at the U.S. Air Force Academy.

Outstanding Academy Educator Annual Award for Teaching Excellence (top 3% of faculty), Dean of Faculty, US Air Force Academy, April 1996

Early Promotion (one year early) to the rank of Major, United States Air Force Academy, November 1994

Air Force Commendation Medal, Air Force Global Weather Central, October 1993. Awarded for duties performed as chief scientist of the regional numerical models team at Air Force Global Weather Central in Omaha Nebraska.

Lance P. Sijan Leadership Award, Headquarters Air Weather Service, 1993 (One weather officer selected annually from the entire U.S. Air Force).

Outstanding Company Grade Officer of the Quarter -- Air Force Global Weather Central, Offutt Air Force Base NE, October - December 1992

Outstanding Technical Achiever Award, Software Development Division, Air Force Global Weather Central, Offutt Air Force Base NE, October - December 1992

Outstanding Company Grade Officer of the Quarter -- Software Development Division, Air Force Global Weather Central, Offutt Air Force Base NE, October - December 1991

Outstanding Technical Achiever Award, Software Development Division, Air Force Global Weather Central, Offutt Air Force Base NE, January - March 1991

Air Force Commendation Medal, Defense Nuclear Agency, Washington D.C., April 1991. Awarded for duties relating to real-time chemical and biological agent dispersion forecasting for Operation Desert Storm in Iraq.

Distinguished Graduate Student Award - Masters Level, Graduate College, Texas A&M University, April, 1988

Air Force Achievement Medal, Detachment 20, 17th Weather Squadron, Little Rock Air Force Base AR, August 1985

Honorary Missileman Award (for Weather Forecasting Excellence) 308th Strategic Missile Wing, Little Rock Air Force Base AR, 1985

CURRENT AND PAST ACADEMIC/PROFESSIONAL ASSOCIATION MEMBERSHIPS

American Meteorological Society (National Chapter), *Member since* 1977

Alabama Academy of Science, *Member*, 1997 - 2001

National Weather Association (National Chapter), *Member*, 1998 - 2001

National Weather Association (Local Chapter), *Vice President*, 2004-2005; *Treasurer*, 2000 - 2003

Association of American Geographers, *Member*, 1998 - 2001

American Meteorological Society (Local Chapter), Colorado Springs CO, *Member*, 1993 - 1995

Colorado Alliance for Science, Colorado Springs CO, *Member*, 1993 - 1994

American Meteorological Society (Local Chapter), Omaha NE, Vice President (1992-93) and *Member*, 1991 - 1993

American Meteorological Society (Student Chapter), *Member*, Texas A&M University, 1985 - 1990

American Meteorological Society (Student Chapter), Florida State University, *President* (1976-77) and *Member*, 1975 - 1977

HONORARY SOCIETIES

Chi Epsilon Pi (*President* - Texas A&M Chapter of Chi Epsilon Pi, 1989-1990)

Court Cases Worked by Dr. Keith G. Blackwell (As of 15 Sep 2006).

Year: 1999

Sims vs. State Farm
Topic: Hurricane Erin/Opal, Gulf Breeze FL
Firm: Taylor, Day, and Currie

Year: 2000

Cutrell et al. v. Board of Water, et al.
Topic: Flash Flooding/Heavy Rainfall
Firm: Robert H. Mudd, Jr. (Mobile, AL)

Sportsman Marina and Drydock, Inc. V. Westchester Surplus Lines Insurance Company
Topic: Hurricane Georges
Firm: Carr, Alford, Clausen and McDonald, L.L.C. (Mobile, AL)

Year: 2001

Jacob Daniel Ramer and Jared Daniel Ramer v. Alvin Barnes, et al. in the Circuit Court of Jackson County Mississippi
Civil Action No. CI-2000-00.242(2)
Topic: Fog/Smoke and I-10 Auto Accident
Firm: Phelps Dunbar LLP (Jackson, MS) and Heidelberg and Woodliff, P.A (Hattiesburg MS)

Young et. al v. Woolpert LLP et al.
Circuit Court, Mobile AL
Civil Action No.: CV-98-391
    Consolidated with:
    Byrd et al., vs. Woolpert LLP et al.
    Circuit Court, Mobile AL
    Civil Action No. CV-98-392

    A.S. Alley II. vs. Woolpert LLP, et. al
    Circuit Court, Mobile AL
    Civil Action No. CV-99-2633
Topic: Rainfall/Traffic Accident
Firm: Stames and Atchison LLP (Mobile AL)

Pamela Holberg v. Prince Turner et al.
Case No., CV-00-1051-RV-L in the U.S. District Court for the Southern District of Alabama
Topic: Sailboat Accident during Hurricane Georges (1998)
Firm: Pierce, Ledyard, Latta, Wasden, and Bowron, P.C. (Mobile AL)

George's Candy Shop, Inc. et al., v. Mark Rowley, et al.
Civil Action No. CV-00-333
Daniell, Upton, and Perry, P.C. (Mobile AL)

JAMES PRESLEY, et al. v. AIR PRODUCTS AND CHEMICALS, INC.
CASE NO. 99-528-CA (SANTA ROSA FLORIDA CIRCUIT COURT)
Topic: Chemical Spill
Attorney: The Law Offices of Frank J. D'amico Jr. (New Orleans, LA) and Lindsay, Andrews and Leonard, P.A. (Milton FL)

Year: 2002

Patricia Springer and Reba Ann Barnes vs. Preston Rice, Monica Rice, and Julian Neese Construction, Inc.
Case No: CV-2001-1075
Topic: Flash Flooding/Heavy Rainfall
Attorney: Ben Stokes (Mobile, AL)
Provided professional advice.

Case: Marlin Key Condo, AL
Topic: Hurricane Georges
Firm: Olen, Nicholas & Copeland P.C.

Thomas Salac v. Cotton States Mutual Insurance Company
File #: 02-035
Topic: Hurricanes Erin and Opal (1995).
Firm: York and Legg (Mobile AL)
Deposed

Henry Clay Dumas and Betty L. Dumas vs. State Farm Fire and Casualty Company
File #: 50,055
Circuit Court of Washington Co. AL
Civil Action Number: CV-00-116
Topic: Hurricane Georges
Attorney: Robert Gottlieb, Jr., P.C. (Mobile AL)

Year: 2003

John L. Dees and Pearlie M. Dees v. Richard J. Gibson, et al. in the Circuit Court of Clarke County AL
Civil Action No.: CV-01-44-C, File Number: 50,214
Topic: Fire weather.
Attorney: C. Robert Gottlieb, Jr., P.C.

Doug McCrory vs. Rowan Companies
Topic: Off-shore weather and waves.
Attorney: David M. Huggins (Turner, Onderdonk, Kimbrough, and Howell, P.A.) (Mobile AL)

Louisiana Plane Crash
Attorney: Phyllis Johnson (Vickers, Riis, Murray and Curran, LLC)

Year: 2004

Eric Scarbrough, et al. v. Gerry P. Vice and Vice Construction Co., Inc., and Mississippi Power Company, Jointly and Severally; In the Circuit Court of Jackson County, MS; Cause No. CI-2003-00013(1)
Topic: Auto Accident
Attorney: Raymond L. Brown (Brown, Buchanan, and Sessoms) (Pascagoula MS)

MARUBENI CORPORATION, MARUBENI AMERICA CORPORATION, and MARUBENI PULP AND PAPER NORTH AMERICA, INC. v. SOUTHEAST WOOD FIBER, LLC, MID ATLANTIC TERMINAL, LLC, and MOBILE BAY WOOD CHIP CENTER
Topic: Rainfall related damages.
Attorney: Steve Nicholas (Olen, Nicholas & Copeland) (Mobile AL)

Brenda Smith, et al vs Operations Technologies, Inc.
Civil Action No. A2401-2001-00464
Topic: Tropical Storm Allison
Attorney: Karen K. Sawyer, (Bryant, Clark, Dukes and Blakeslee, P.L.L.C.) (Gulfport MS)

Year: 2005

Brenda Smith, et al. v. City of Gulfport, et al.; In the Circuit Court of Harrison County, First Judicial District, Mississippi
Cause No. A2401-2001-00464
Topic: Tropical Storm Allison
Attorney: Jeff Bruni (Gulfport MS City Attorney's Office)

Morgan vs. Transcontinental Gas Pipe Line Corporation; Dan Tanks, et al;
Circuit Court of Choctaw County, Alabama; Civil Action No. CV-03-078C.
Topic: Rainfall related damages.
Attorney: David M. Huggins (Turner, Onderdonk, Kimbrough, and Howell, P.A.) (Mobile AL)

Year: 2006

MOWA v. Sunbelt Resources
Topic: Air Pollution/Toxic chemical dispersion
Attorney: Olen, Nicholas, and Copeland P.C. (Mobile AL)

Swanstrom v. Teledyne Continental Motors, Teledyne Technologies, Inc, Cirrus Industries Inc, Cirrus Design Corporation, et al.,
Topic: Angelfire NM Aircraft Accident
Attorney: Norman E. Waldrop Jr., (Armbrecht Jackson Lawyers, LLP) Mobile AL

Numerous homeowners vs. Insurance Companies
Topic: Hurricane Katrina
Attorney: Richard F. Scruggs (Scruggs Law Firm, Oxford MS)

Numerous homeowners vs. Insurance Companies
Topic: Hurricane Katrina
Attorney: Ben F. Galloway, Owen and Galloway PLLC

Lee L. Saad Construction, Inc. vs. Loupe Development, LLC
Topic: Rainfall
Attorney: J. Marshall Gardner, Vickers, Riis, Murray, and Curran, LLC.

RESUME

AARON WILLIAMS

January 2006

Ph.D.	University of Oklahoma, 1971
M.A.	University of Missouri, 1967
B.S.	Florida State University, 1965

Address		Telephone
Office:	Coastal Weather Research Center Mitchell Center Room 1623 University of South Alabama Mobile, Alabama 36688	251-460-6915
Home:	P.O. Box 181 Montrose, Alabama 36559	251-928-2158

Professional Experience

I. Teaching:

University of South Alabama -- Department of Earth Sciences 1971 to date. Associate Professor of Geography and Coordinator of Meteorology. Courses taught: Intro. to Geography, physical geography, world regional geography, meteorology, climatology, geography of the United States and Canada, geography of Europe, seminar in physical geography, seminar in industrial meteorology.

Marine Environmental Sciences Consortium -- Summer 1977, 1978, 1979, 1980, 1987, 1990, 1995, 1996, 1998, and 1999. Course taught: coastal climatology.

University of West Florida -- Department of Earth and Atmospheric Sciences, Summer 1977. Adjunct Associate Professor. Courses taught: conservation of environmental resources and the geography of food and population.

University of Oklahoma -- Department of Geography, Graduate Assistant, 1969-1971.

University of South Alabama -- Department of Geology and Geography, Instructor, 1967-1969.

University of Missouri -- Department of Geography, Graduate Assistant, 1965-1967.

II. Meteorologist:

Coastal Weather Research Center -- University of South Alabama, Director, January 1988 to present.

WZEW and WNSP – Broadcast meteorologist for Mobile, Alabama radio stations October 2002 to present.

WKRG-TV -- Severe weather consultant for Mobile , Alabama television station, June 1999 to 2002.

WKSJ Radio -- Broadcast meteorologist for Mobile, Alabama radio station from January 29, 1979 to July 15, 1999.

WAVH Radio – Broadcast meteorologist for Mobile, Alabama radio station from May 1993 to October 1994.

Alabama Radio Network – Broadcast meteorologist, 1990-1995.

Capitol Weather Service – General Manager, 1981-1984.

United States Weather Bureau -- International Forecasting Unit, Jamaica, New York. Student Trainee: Summer 1963, 1964, 1965. Staff meteorologist: Summer 1966.

Major Publications

The Use of Radar in Climatological Research, Commission on College Geography, Resource Paper no. 21, Washington., D.C.; Association of American Geographers, (1973).

"The Interpretation of Rainfall Patterns in Northern Yucatan Utilizing Meteorological Satellite Imagery," Proceedings of the Association of American Geographers VIII (1976), pp. 15-19.

"The Use of Radar in Climatology," in Anthony Lewis, ed., Applications of Radar in Geoscience. Committee on Remote Sensing of the Electromagnetic Spectrum, Association of American Geographers, 1977.

Mobile Weather and Marine Almanac 1978 (with Eugene M. Wilson).

Mobile Weather and Marine Almanac 1979 (with Eugene M. Wilson).

"Frederic As Seen Through the Eyes of a Meteorologist," in Frank D. Redditt, ed., Baldwin's Longest Night, 1980.

"*A Coastal Ecosystem of Northwestern Yucatan,*" Yearbook, Proceedings of the Conference of Latin Americanist Geographers, Volume 13, 1987, pp. 82-86 (with Eugene M. Wilson).

Mobile Weather and Marine Almanac 1989. Capitol Broadcasting Corporation, Mobile, Alabama.

"*Climate and Oceanography,*" in Mobile Bay: Issues, Resources, Status, and Management, U.S. Department of Commerce, NOAA, January 1990 (with Schroeder, Wiseman, Ramey, and April).

Mobile Weather and Marine Almanac 1994, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 1995, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 1997, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 1998, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 1999, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2000, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2001, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2002, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2003, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2004, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Mobile Weather and Marine Almanac 2005, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

"*Hurricane Ivan: A Portrait from Earth and Space*", DVD Dogwood Productions, Mobile, Alabama. 2004

"Hurricane Katrina: America's Costliest Storm", DVD Dogwood Productions, Mobile, Alabama. 2005

Mobile Weather and Marine Almanac 2006, Coastal Weather Research Center, University of South Alabama, Mobile, Alabama.

Papers: Published Abstracts

"An Ecological System of Northwestern Yucatan," Alabama Academy of Science, April 1977 (with Jane D. Newman and Eugene M. Wilson).

"The Arc Cloud: A Convective Phenomenon of Subtropical Marine Weather," Association of American Geographers national meeting, Philadelphia, Pennsylvania, April 1979.

"Application of Remote Sensing to Field Study in Northern Yucatan," National Council for Geographic Education annual meeting, Mexico City, Mexico, October 1979 (with Eugene M. Wilson).

"Wind Channeling: A Major Factor in the Distribution of Hurricane Wind Damage," Association of American Geographers, Louisville, Kentucky, April 1980.

"VIP Radar: An Important Tool in Forensic Climatology," Association of American Geographers national meeting, San Antonio, Texas, April 1981.

Papers: Unpublished Abstracts

"The Operation of a Weather Service on a University Campus," Alabama Academy of Science, Mobile, Alabama, April 1997.

"The Interpretation of Rainfall Patterns in Northern Yucatan Utilizing Meteorological Satellite Imagery," Association of American Geographers national meeting, New York City, April 1976.

Education

University of Oklahoma -- Graduate School, Department of Geography, September 1969 to September 1971. Ph.D. degree received December 23, 1971. Dissertation: "The Effect of Air Mass Convective Rainfall on Summer Maximum Temperatures Along the Northern Gulf Coast."

University of Missouri -- Graduate School, Department of Geography, September 1965 to January 1967. M.A. degree received January 23, 1967.

Florida State University -- September 1960 to April 1965. Major in meteorology, minor in geography, B.S. degree received April 22, 1965.

Major Research Interests

Climatology of coastal and tropical environments, meteorological satellite imagery, weather communications, weather and industry.

Professional Memberships and Honorary Organizations

American Meteorological Society
Association of American Geographers
Gamma Theta Upsilon

Professional Activities

1969 Teacher Education Committee, University of South Alabama
1973-74 President's Faculty Advisory Committee, University of South Alabama
1975-76 Russian Area Studies Committee, University of South Alabama
1978 Promotions Committee, University of South Alabama

Grants

1969 "A Determination and Analysis of General Patterns of Convective Rainfall Cells along the Central Gulf Coast." (USA Research Committee)

1974-75 "Detection and Mapping of Archaeological Sites on the Yucatan Peninsula Utilizing Side-Looking Airborne Radar." (USA Research Committee)

1975 "An Investigation of Salt Basins on the Northwest Coast of Yucatan." (USA Research Committee)

2000 "Severe Coastal Weather Broadcast Services" (WKRG-TV Mobile)
2001 "Severe Coastal Weather Broadcast Services" (WKRG-TV Mobile)

Personal Information

Born January 29, 1942 in Newark, New Jersey. Attended grade schools in Union, New Jersey. Graduated from Union High School, Union, New Jersey, June 22, 1960. Marital Status: Married to the former Jane D. Newman of Fairhope, Alabama. Children: daughters (Lily Erin 13, Kristin 16, Susanna 19, and Mary Virginia 22).

COURTROOM TESTIMONY

Dr. Aaron Williams

(1998 to present)

March 1998	Stevens/Rodgers v. Lester Construction
December 1998	Jacque Pate v. City of Mobile
January 1999	Vernon Williams v. City of Mobile
January 1999	Hollins v. City of Mobile
September 1999	Hollins v. City of Mobile
September 2000	Jackson v. City of Mobile
October 2000	Howard v. City of Mobile
January 8, 2001	Skandia Insurance v. Star Shipping
February 21, 2001	Thompson v. City of Jackson
August 21, 2001	Brouwer v. Santa Rosa County
August 23, 2001	Dogwood Management v. Christiansen Marine
August 27, 2001	Reichert v. City of Mobile
February 27, 2003	Henderson v. City of Mobile
July 19, 2006	Cenac vs. Southport, LLC. and Lulu's LLC
July 25, 2006	Crown Point vs. Excel Specialties Insurance
April 10, 2007	Marshall vs. Tabacco Discount

EXPERT WITNESS RATE CARD

Dr. Aaron "Bill" Williams
Director
Coastal Weather Research Center
University of South Alabama
Mobile, Alabama

Research and Report Preparation:	$150 per hour
Deposition:	$350
Courtroom Testimony:	$500
Retainer per case:	$500

Retainer is non-refundable. Retainer will be applied to work time. Clients will be billed for all work in excess of $500 retainer. Hourly rate ($150) will apply to courtroom "wait time" and "travel time." If resources (data, images) of the Coastal Weather Research Center (CWRC) are used, a separate invoice will be forwarded from the CWRC.