

**Subject:** Re: Head's up: NOAA in the news/New Republic article on hurricanes and global warming  
**From:** Ants.Lleetmaa@noaa.gov  
**Date:** Sun, 12 Feb 2006 14:15:04 -0500  
**To:** Chester.J.Koblinsky@noaa.gov  
**CC:** "James R. Mahoney Ph.D." <James.R.Mahoney@noaa.gov>, Scott Rayder <Scott.Rayder@noaa.gov>, Richard Spinrad <Richard.Spinrad@noaa.gov>, Rick Rosen <Rick.Rosen@noaa.gov>, Robert.Atlas@noaa.gov, Mary Glackin <Mary.Glackin@noaa.gov>

This is an embarrassment that NOAA could have easily avoided by inserting something like "impacts of global warming can not be precluded" in the various press releases and Hill testimonies. A "one-NOAA" approach to press releases would have prevented this from happening. A more humble - not knowing everything approach would also have enabled us to highlight our research program, e.g. we are actively trying to understand the phenomena.

It is also disconcerting scientifically that synoptic meteorologists were making decadal hurricane projections based on a phenomena (Atlantic Decadal "Oscillation") of which they know nothing and which might or might not in recent years be forced by anthropogenic effects. The arguments on both sides of this "debate" rely on correlating hurricane activity with tropical Atlantic SST anomalies. We were taught early in our careers that correlation does not prove causality.

I've attached two presentation. The lengthier one we sent to NOAA HQ in September 2005 to provide talking points for Lautenbacher for a trip he was going on to the UK. Most likely he never saw this.

The 1-slide presentation will be the start of a fact sheet for hurricane related research we do at GFDL (and in the Climate Program). Some features to point out in this:

- the red temperatures in the central figure show that both the subtropical and subpolar Atlantic were unusually warm this past summer. Are the subpolar and subtropical signals linked - most likely - this has been termed the Atlantic Multi-Decadal Oscillation (AMO). The "NOAA" forecast is that this is now active and will remain so for another decade or two. The ocean observations however suggest that this overturning (active) circulation is slowing down, e.g. not at all obvious that current conditions will persist for a decade or so.
- our physical understanding of the AMO is that it is forced by the atmosphere, e.g. the North Atlantic Oscillation (NAO) ( or Arctic Oscillation). The "positive" phase of the AMO was kicked off when the NAO was in its positive phase in late 80's and early 90's. In recent years its phase has been close to neutral.
- a number of factors can cause decadal trends in the NAO - can't preclude that this recent positive phase was not linked to anthropogenic effects - if so, then the official NOAA position is that we are seeing a human induced effect on Atlantic hurricane activity!! Surprise!
- lower panel on right shows that the GFDL model with anthropogenic forcings captures the trend of sea surface temperatures over the 20th C (a slide in the Lautenbacher presentation shows the Atlantic trends are close to the global warming trend). So if folks want to tie hurricane activity to SST anomalies (which both sides do), hard to argue that anthropogenic effects might not be involved.
- center panel shows the GFDL model forecast for Katrina. It continues to irk me that all the NWS press releases during the hurricane season continue to ignore the contributions of OAR and its partners (URI) - the GFDL model is what the forecasters look to as providing the most reliable forecasts - the consistent record over the past 3-4 years in improving track (and starting to do intensity) forecast skill by this model in unequalled in any forecast the NWS makes
- lower left - to understand decadal (and seasonal) hurricane variability we need to go beyond simple correlation arguments. GFDL is running a basin model for the atlantic (16km resolution) where the atmosphere is weakly nudged by reanalysis data on a broad scale - goal is to see if a) can simulate the decadal hurricane variability; b) then pull apart the environmental forcing fields to understand the dynamics

forcing these changes. Tropical storms and hurricanes "self-generate" in these experiments. Figure shows that we can simulate the decadal shift reasonably well. Note the 2005 numbers are less than the 2004 numbers because in 2005 many of the storms occurred outside the August-October period being simulated. Despite doing the increased numbers reasonably well for 2005 - the model hindcasts did not have a large number of storms in the Gulf of Mexico - some work remains.

- upper left. in our climate of 20th C runs we have a subset where we "specify" the AMO (this initial set does not include the anthropogenic radiative forcings) Note that the model does a good job of simulating the decadal changes in atmospheric vertical shear - the spatial structure for this also is very good. So next step could include taking the atmospheric fields from runs like this - AMO specified with and without changes to radiative forcings - and driving the basin hurricane model (used in lower left) to see what the anthropogenic effects are. so NOAA does have a path forward to objectively approach the attribution issues vis a vis hurricane activity.

There is a chance NOAA will soon get another shot at talking about our state of knowledge of climate extremes and global warming. If significant droughts develop over the next year or so, the NWS response will be "just another la nina - no global warming". As I talked about at the CCSP workshop, as a result of the warming trends in the Indo-Pacific region La Nina effects are now superimposed on another signal which will amplify the drying over N.America.

ants

----- Original Message -----

From: Chet Koblinsky <Chester.J.Koblinsky@noaa.gov>

Date: Saturday, February 11, 2006 5:39 pm

Subject: Head's up: NOAA in the news/New Republic article on hurricanes and global warming

In addition to the article in the Post this morning, there is an article in next week's New Republic by John Judis that discusses NOAA's handling of hurricanes and global warming.

I have been unable to access that article, but there is a discussion about it by Roger Pielke Jr on his web site ([sciencepolicy.colorado.edu/prometheus/](http://sciencepolicy.colorado.edu/prometheus/)) attached below:

February 11, 2006

Slouching Toward Scientific McCarthyism

Posted to Author: Pielke Jr., R.

[http://sciencepolicy.colorado.edu/prometheus/archives/author\\_pielke\\_jr\\_r/index.html](http://sciencepolicy.colorado.edu/prometheus/archives/author_pielke_jr_r/index.html)  
| Climate Change

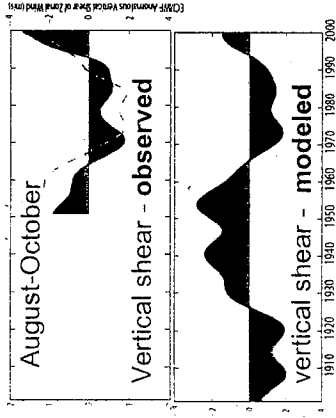
[http://sciencepolicy.colorado.edu/prometheus/archives/climate\\_change/index.html](http://sciencepolicy.colorado.edu/prometheus/archives/climate_change/index.html)

In the 20 February 2006 issue of The New Republic, John B. Judis has an article <http://www.tnr.com/doc.mhtml?i=20060220&s=judis022006> about how the issue of hurricanes and global warming has been handled by NOAA.

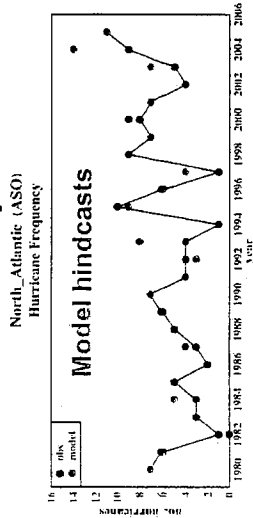
# Understanding and Prediction of Decadal Atlantic Variability and links to Changes in Hurricane Activity – a Research Program at GFDL

Simulating and understanding climate and hurricanes

Understanding decadal variability in atmospheric conditions impacting hurricane formation



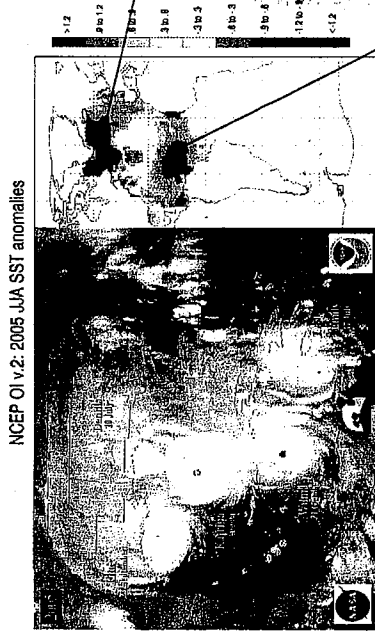
Simulating decadal Atlantic hurricane activity



Next step - develop understanding of causes

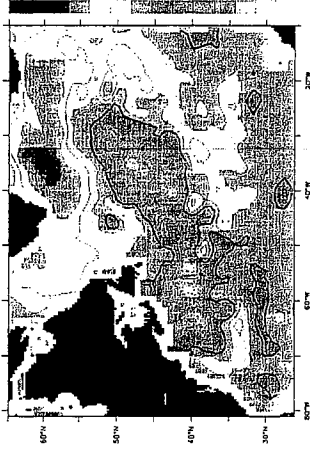
Composite of hurricanes in Gulf of Mexico and ocean surface temperatures summer 2005 -

what is link between these?

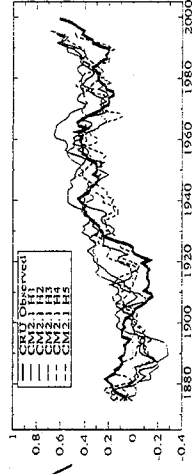


Understanding and ultimately forecasting state of Atlantic variability

Contrary to NOAA press release, data suggest Atlantic overturning circulation is slowing down

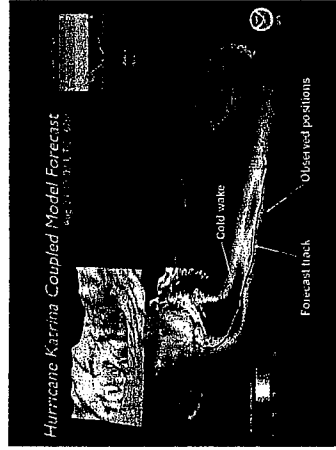


Ocean temperatures in hurricane formation area result from trends and (natural) decadal variability



A significant anthropogenic contribution to observed warming

Protecting the public with world's best operational hurricane forecast system



# Extreme Events and Climate Change

Slides prepared for VADM Lautenbacher

Source: Geophysical Fluid Dynamics Lab/NOAA

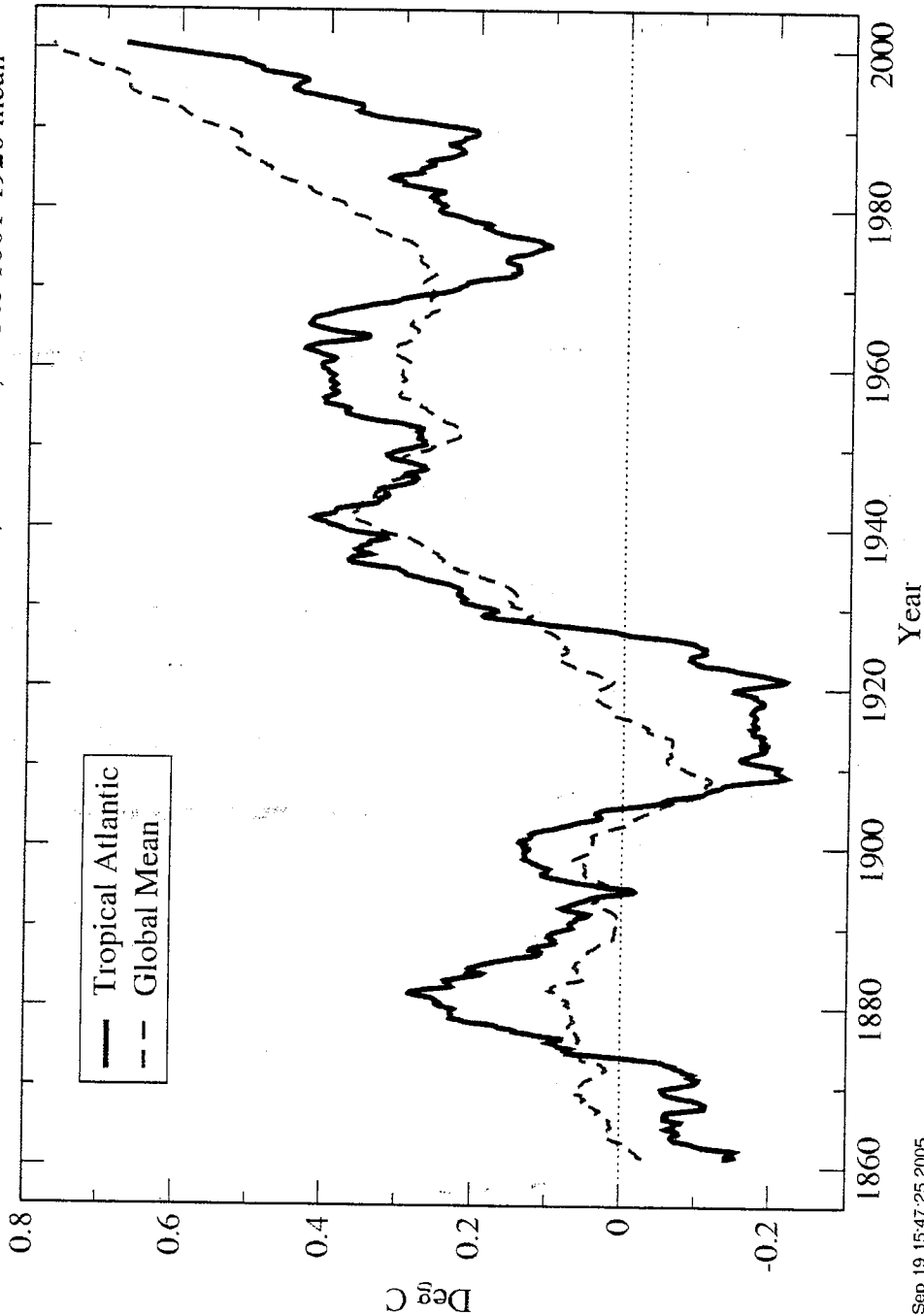
# Is Global Warming Affecting Hurricanes?

- **Intensity of Hurricanes:** There is some recent observational evidence that intensities have already increased, but this requires further evaluation. Hurricane model simulations at GFDL/NOAA project a gradual increase of intensities (roughly ½ category) over the 21<sup>st</sup> century.
- **Precipitation from Hurricanes:** Hurricane model simulations project an 18% increase over the 21<sup>st</sup> century, as the warmer atmosphere holds more water vapor. No observational evidence for an increasing trend has been reported. Measuring this will be a challenge.
- **Frequency of Tropical Storms:** No notable trends have been reported from observations. For future projections, inconclusive and/or conflicting results are obtained from current generation climate models.

Tropical Atlantic SSTs have been warming along with global temperatures...

### Tropical Atlantic Main Development Region vs Global Temperature

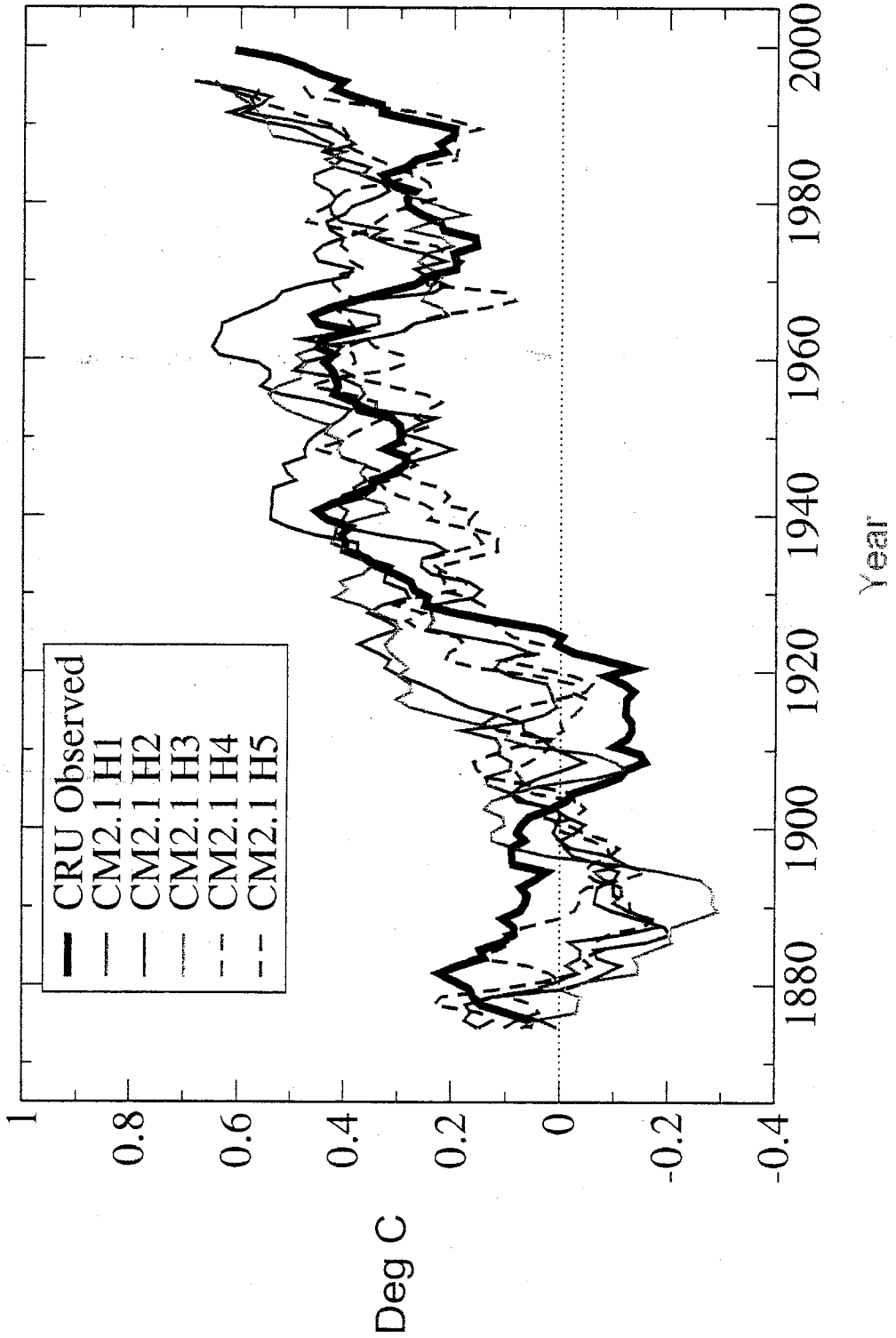
10-yr running means; HadCRUT2; 80W-20W, 10N-20N; Ref to 1881-1920 mean



Mon Sep 19 15:47:25 2005

Source: GFDL/NOAA

The Tropical Atlantic Main Development Region warming is mainly attributable to anthropogenic forcing, according to GFDL Climate Model historical simulations...

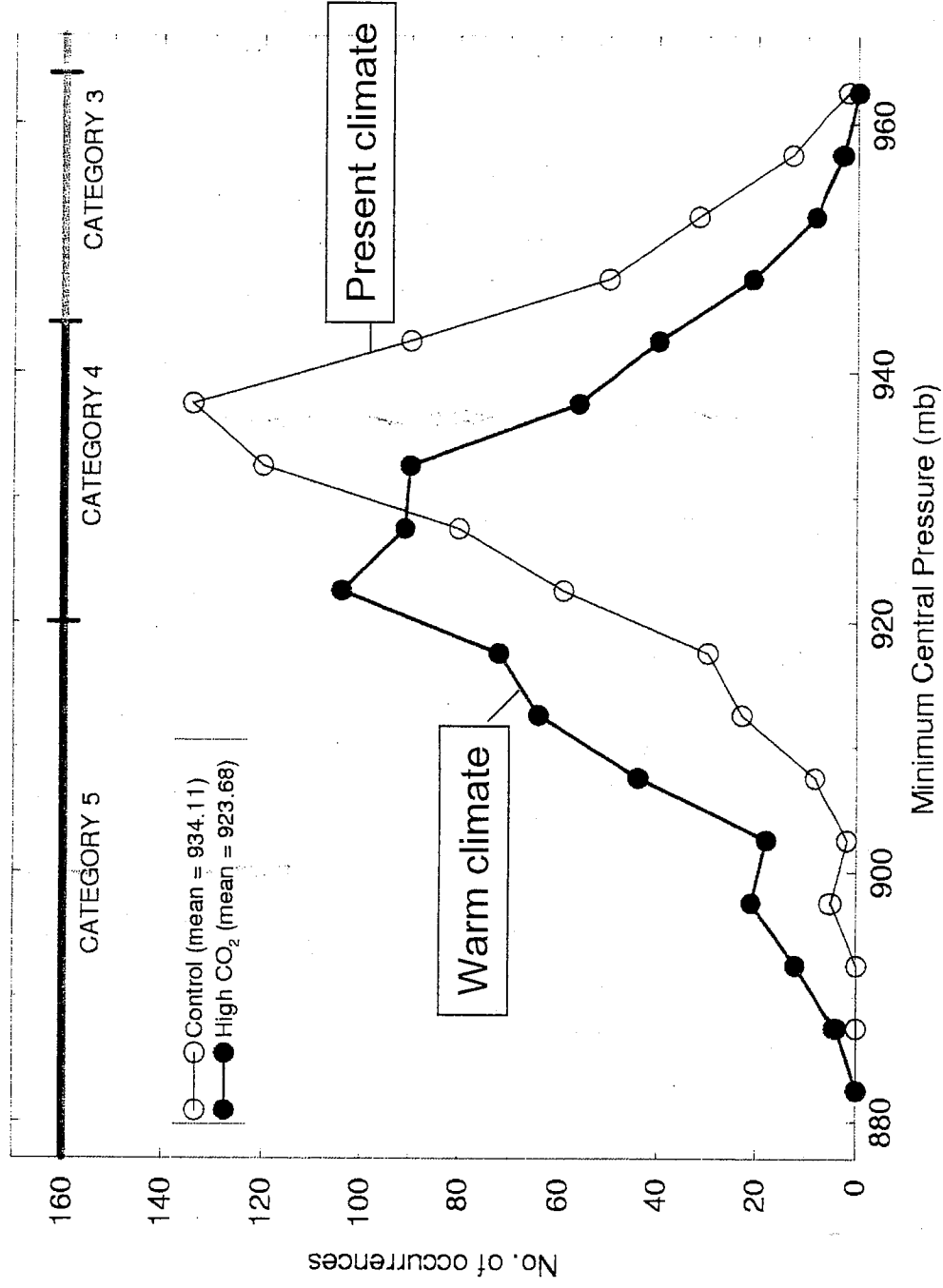


Source: Knutson et al. (2005) *J. of Climate*, accepted for publication

# GFDL/NOAA hurricane model simulates stronger hurricanes for warmer climate conditions:

## Idealized hurricane simulations

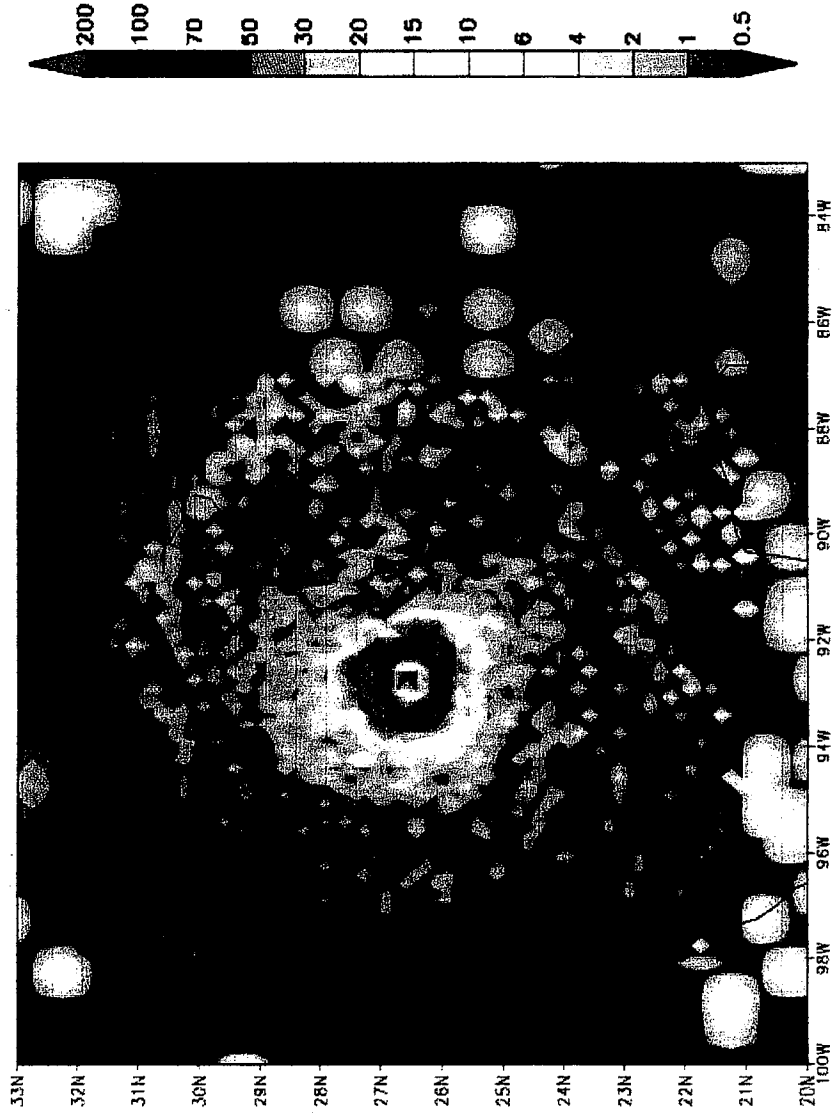
Aggregate results: 9 GCMs, 3 basins, 4 parameterizations, 6-member ensembles



Notes: One-half category (Saffir-Simpson) increase in 80 years, assuming a 1%/yr compounded increase in CO<sub>2</sub> concentrations.

The GFDL Hurricane Model simulates 18% higher rainfall rates (within 100 km of the hurricane center) in the warm climate scenario...

Sample hurricane precipitation pattern simulated by GFDL Hurricane Model



# Hurricanes and Climate Change:

## *Comments on Recent Observational Studies*

- Emanuel (*Nature*, Aug. 2005) – estimates that power dissipation in tropical cyclones has doubled over the past ~50 years in Northwest Pacific and Atlantic basins. Variations and trends are strongly correlated with SST changes in these basins.
- Webster et al. (*Science*, Sept. 2005) – find that the number of category 4 and 5 hurricanes worldwide has almost doubled in the past 35 years, increasing in all six tropical storm basins and coinciding with SST increases in all basins.
- COMMENTS:
  - These reported past changes are more rapid than future changes of intensity projected by the GFDL/NOAA hurricane model. Why?
  - Degraded data quality as records extend back in time could introduce important data inhomogeneities, which could substantially affect trend estimates.
  - Further research is needed to evaluate these issues before drawing firm conclusions.

## Midlatitude Extreme Events

### Extreme Monthly and seasonal anomalies

The intensity of droughts and floods will increase on average into the 21st century, according to nearly all models, but the evidence for this trend to date is unclear. The underlying physics, thought to be very robust, is that a warmer atmosphere carries more water. Therefore, even if the atmospheric circulation does not change, more water will be transported from regions of anomalous convergence (floods) to regions of anomalous divergence (droughts).

Nearly all models predict a poleward shift in the midlatitude storm tracks; this shift will intensify storminess poleward of the existing storm tracks and accentuate the frequency and intensity of droughts on the equatorward side. Evidence for this trend is building in the Southern Hemisphere and in the Mediterranean..

## Midlatitude Extreme Events

### Individual extratropical storms

Contravailing factors make projections for changes in extreme extratropical storms difficult. More atmospheric moisture increases the energy supply to individual storms, and results in increased precipitation even with no change in storm intensity, but expected decrease in the north south-temperature gradient reduces this primary energy source for midlatitude storms. The literature on trends in extreme extratropical storms is mixed. Some observational studies have argued for increases in very strong storms in the North Pacific and the Southern Oceans.

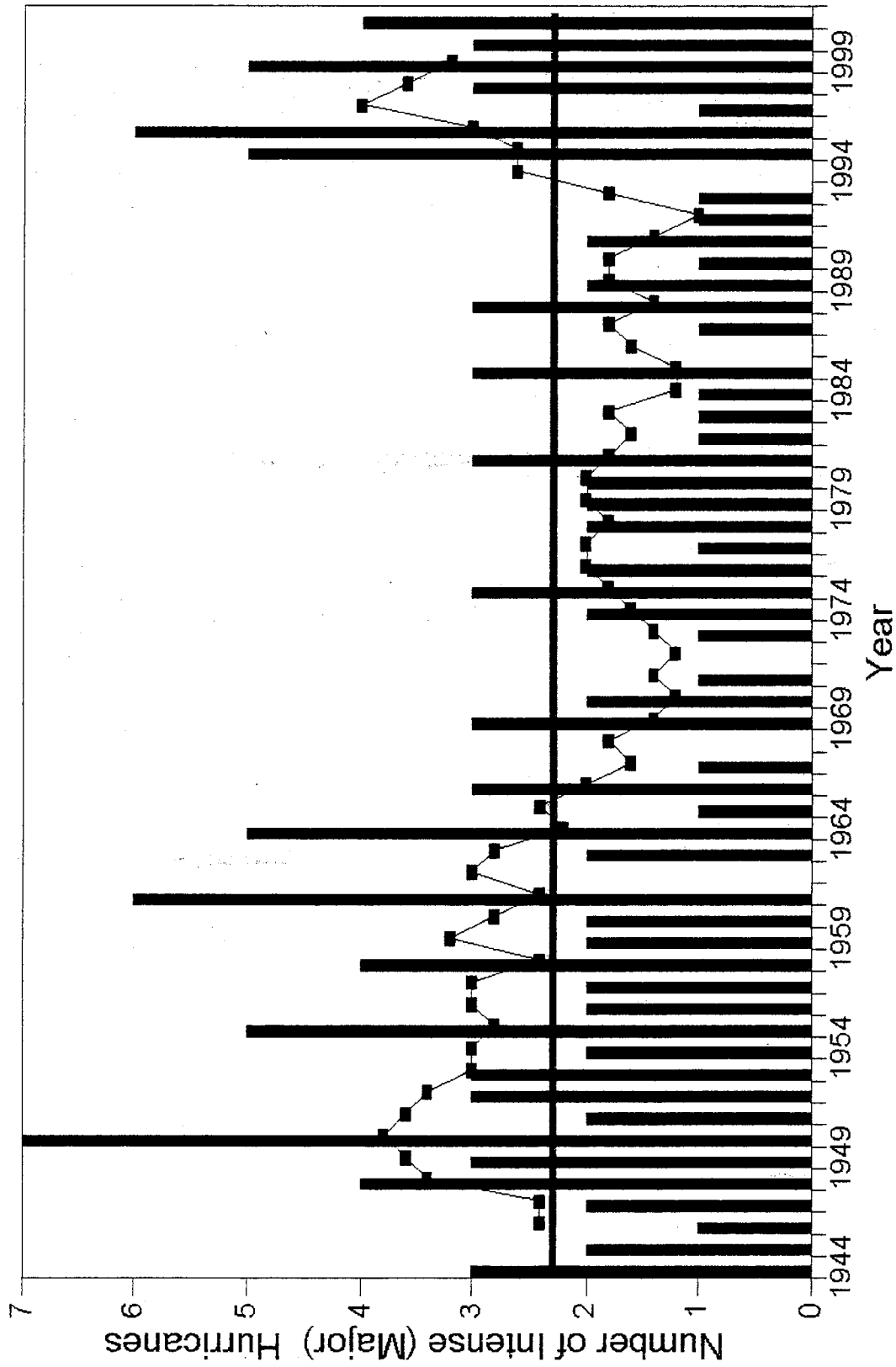
### Tornadoes and Extreme thunderstorms

There is no clear evidence for trends in these small scale events. The database is thought to be inadequate for studies of trends.

Background slides on hurricane observations – Work of others  
outside of GFDL, including Chris Landsea, Kerry Emanuel, Baik and Paek

# Atlantic Major Hurricanes

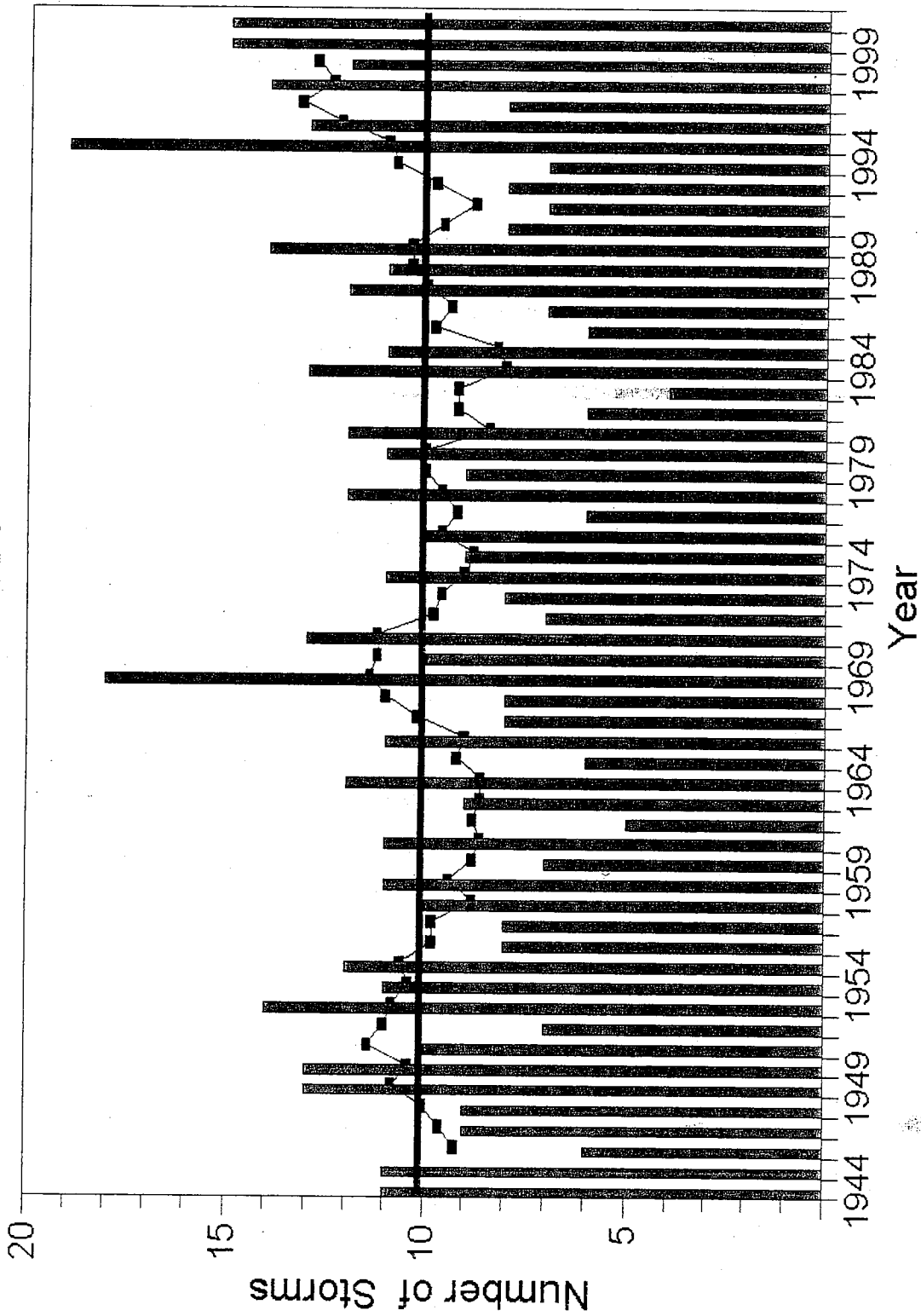
1944-2001



Source: Chris Landsea, NOAA/Hurricane Research Division.

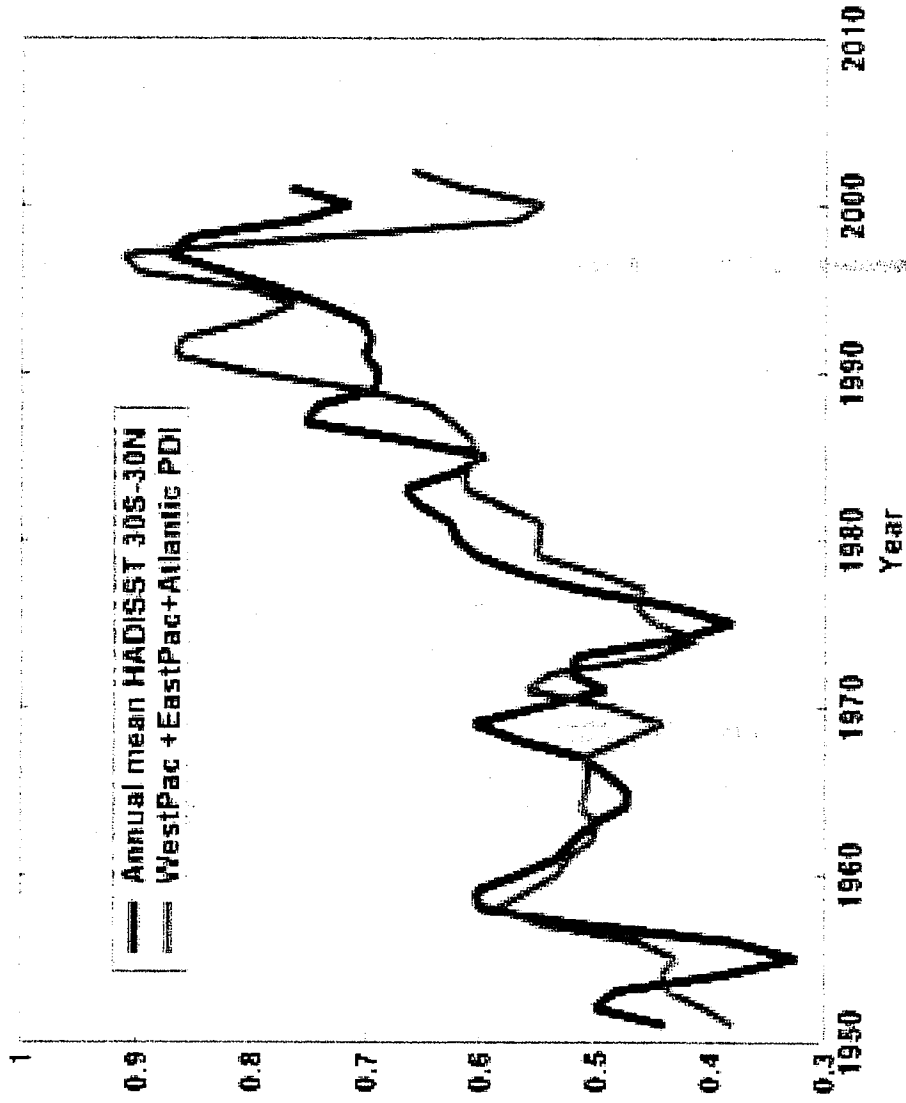
# Atlantic Named & Subtropical Storms

1944-2001



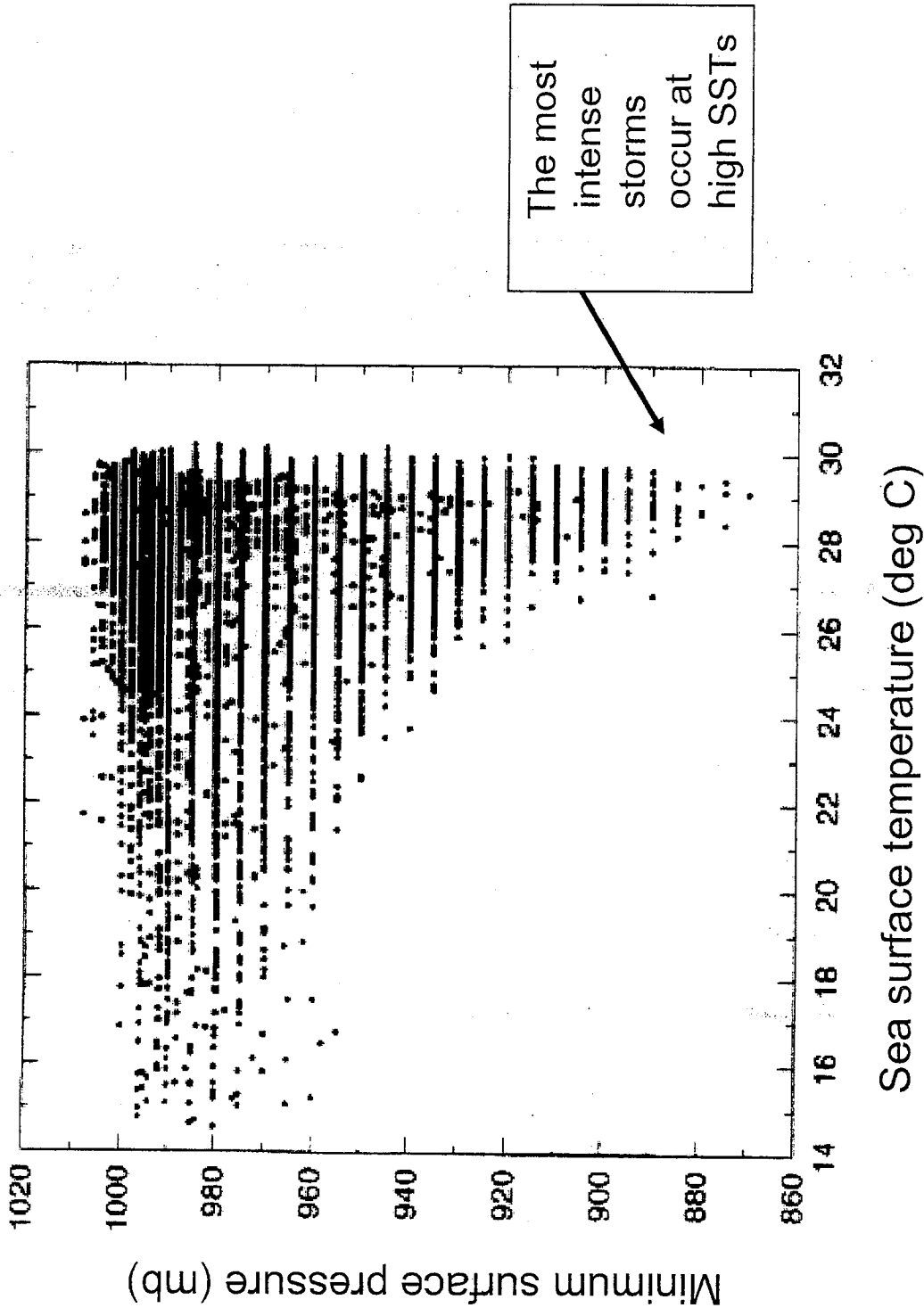
Source: Chris Landsea, NOAA/Hurricane Research Division.

Emanuel's Tropical Cyclone Power Dissipation Index (PDI) has increased substantially over past 50 years, along with tropical SSTs



Source: Kerry Emanuel, MIT, <http://wind.mit.edu/~emanuel/anthro2.htm>. SST anomaly (deg C) with arbitrary vertical offset. PDI scaled by constant.

# NW Pacific Basin: Intensity vs. SST



Source: Baik and Paek (1998), Journal of Meteorological Society of Japan