



## **SHORELINES – July 2009**

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### **The 2009 Hurricane Season**

June 1<sup>st</sup> serves as important date for Bogue Banks and just about all beaches along the southeast Atlantic and Gulf of Mexico seaboard as we usher in the annual Hurricane Season, which will continue to run through November 30<sup>th</sup>.

Regardless of complex ocean-atmosphere interactions, and the inherent complexities involved with trying to predict all the changes that impact these phenomena; most hurricane experts agree the Atlantic Ocean basin is in the middle of a trend of heightened tropical cyclone activity. Warming climate and seas may help produce larger numbers and more intense hurricanes over the next several years but the jury is really still out concerning these relationships. As of now, it appears there *may* be a positive corollary between global warming and the *intensity* of storms – the relationship between the *number (frequency)* of storms and warming climate appears to be further away from any type of consensus.

Regardless, it's important to remember that a **tropical cyclone** is a warm-core, atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere (that's us) and clockwise in the Southern Hemisphere. A tropical cyclone becomes a **tropical storm** when the maximum sustained surface wind speed ranges from 39 mph to 73 mph using the U.S. 1-minute average, and a **hurricane** is designated when the cyclone reaches a maximum sustained surface wind of 74 mph or more.

Most of us are also aware that hurricanes are further segregated utilizing the Saffir Simpson scale that includes a 1 to 5 rating based upon wind speeds, again utilizing the U.S. 1-minute average. A category 1 hurricane has winds ranging from 74 to 95 miles per hour (mph), category 2 ranges from 96 to 100 mph, category 3 ranges from 111 to 130 mph, category 4 ranges from 131 to 155 mph, and a category 5 hurricane has sustained winds exceeding 155 mph. Category 3 or higher is classified as a major hurricane. Interestingly, category 5 hurricanes very rarely make landfall while maintaining their category 5 status - only three have ever done so in the U.S. – the Labor Day hurricane (1935), *Camille* (1969), and *Andrew* (1992).

Before we dive into this year's hurricane season predictions, one important factor to discuss is the impacts of the *El Niño* Southern Oscillation (ENSO) that occur in the Pacific Ocean basin. ENSO "warm phase" or *El Niño* occurs once every 2 to 7 years and generally produces atmospheric conditions that suppress the formation of tropical cyclones in the Atlantic. Interestingly, the term "*El Niño*" means Little Boy or Christ Child, which was coined by South American fishermen noting the appearance of unusually warm water in the Pacific Ocean occurring near Christmas. As you may have guessed by now, "*La Niña*" (the girl child) is the "cold phase" of ENSO and tends to produce atmospheric conditions more favorable for tropical cyclone development.



Traditionally, ENSO cycles were determined empirically based upon the differences in surface air pressure between Tahiti and Darwin, Australia. Today, scientists use sea surface temperature measurements along the equatorial pacific as indicator of *El Niño* or *La Niña* (particularly in a region known as *Niño 3.4*). As the 2009 hurricane season begins, we're currently in an ENSO neutral phase (neither *La Niña* nor *El Niño*) with most of the prediction models indicating a continuation of this trend for most of the summer. However, some of the more dynamic models are suggesting ENSO "warm phase" or *El Niño* conditions to develop.

So what can we expect this year? If you're a frequent reader of the *Island Review*, then you will already know that my personal preference is to review the predictions produced by groups that make not just their prediction public, but verify their prediction skill in the public arena as well. This really leaves us with two groups - the Tropical Meteorology Project at Colorado State University, and the University College London, U.K. for Tropical Storm Risk. We'll add the National Oceanic & Atmospheric Administration (NOAA) to the mix because this is our Federal voice for climatology/meteorology matters. We then take these groups' last prediction before or near when the hurricane season starts and begin to crunch the numbers.

As the accompanying prediction summary chart indicates, we could expect 12 total cyclones, 6 of which will generate into hurricanes, with 2 of these becoming major hurricanes (on average). This results in a prediction of an "average" or even "slightly below average" hurricane season, which is credited to possible *El Niño* conditions developing over the summer (explained above), and cooler than normal sea surface temperatures in the Atlantic (often referred to as the fuel for tropical cyclones).

	NOAA (max.)	Colorado State University, US	University College London, UK	Average of Predictions	Average (1950-2000)
<b>Total No. of Named Tropical Cyclones</b>	14	11	11	12	10
<b>Tropical Storms</b>	7	6	6	6	4
<b>Hurricanes / Major</b>	7/3	5/2	5/2	6/2	6/2
<b>Accumulated Cyclone Energy (ACE) Index</b>	125	85	69	93	96

**Fig. 1** - Summary comparing publicly available pre-season predictions for the 2009 Hurricane Season with average activity.

One term we haven't discussed that appears on the prediction chart is the *Accumulated Cyclone Energy Index* (ACE Index), which is simply a measurement taking a storm's wind speed strength for each 6-hour period of its existence into account. The larger the ACE Index value, the more active the season. This is actually one of the more revealing parameters in my humble opinion (and others) and likely serves as a better barometer of whether or not a hurricane season is truly "active" or not. The last two years (2007 and 2008) are great examples.

In 2007, we had 5 more tropical cyclones than average, but most of the cyclones were very short-lived or rather weak, with the exception of two category 5 hurricanes that



impacted Central America. The mood for most of Atlantic and Gulf States was that the hurricane season was very benign. The ACE Index for 2007 was 68 – the average is 96. The 2006, 2005, 2004, and 2003 Index figures were 79, 248 (highest on record), 225, and 175, respectively.

Last year the ACE Index was 141, meaning that the 2008 season was not as active as 2003 (175 ACE Index), 2004 (225 ACE Index), and 2005 (248 ACE Index) but definitely busier than 2006 (79 ACE Index) and 2007 (68 ACE Index). For 2008, the intense hurricanes of *Gustav* and *Ike*, and the longevity associated with *Bertha* were the biggest factors contributing to the ACE Index, and again make a lot sense when comparing hurricane activity from year to year. The average predicted ACE Index for 2009 is 93 - the average is 96.

Obviously, tropical cyclone forecasting can sometimes be as much of an art form as an applied science with *El Niño* conditions, local and regional weather patterns, sea surface temperatures, and a host of other variables complicating an expert's predictive capacity. And finally, just remember the predictions summarized this month reflect the proposed activity and intensity of the 2009 hurricane season, but in no way represent any type of landfall probability. As we all know, it only takes one cyclone to make or break a hurricane season, with 1992 being a perfect example – 7 named cyclones, 4 of which were hurricanes, with one of those classified as major, and an ACE index value of 75. Sounds like a very quiet year, except the one major hurricane was *Andrew*, which struck Florida and was the costliest natural disaster in U.S. history until *Katrina* in 2005.