The 2014 Atlantic Hurricane Season

What is New and What to Expect

Mark Chambers
President & CEO
ImpactWeather, Inc.
• Hurricane Climatology for the Gulf of Mexico
• A Look back at 2013
• The outlook for this year
• Preparedness Suggestions
Hurricane Charley landfall in Punta Gorda, FL – August, 2004
Winds 140 mph
Super Typhoon Haiyan Striking the Philippines (Storm Surge)
Season is June 1\textsuperscript{st} to Nov. 30\textsuperscript{th} but most storms form between August & October

**Number of North Atlantic Basin Tropical Cyclones per 100 Years**

- Depressions + Storms + Hurricanes + Major Hurricanes
- Storms + Hurricanes + Major Hurricanes
- Hurricanes + Major Hurricanes
- Major Hurricanes

Based on all North Atlantic Basin Tropical and Subtropical Cyclones that were observed from 1851 to 2010 and recorded in NOAA’s Best Track Database.

90%+
Tropical Cyclone Tracks

North Atlantic Basin Tropical Cyclone Tracks (1950 - 2012)

Two-thirds of storms did not enter GOMR...
Tropical Cyclone Tracks

North Atlantic Basin Tropical Cyclone Tracks (1950 - 2012)

...but one-third did.
Tropical Cyclone Tracks

North Atlantic Basin Tropical Cyclone Tracks (1950 - 2012)

Major Hurricanes

Total for entire basin: **155**
Mean number per year: **2.46**

Total for GOMR: **45 (29.03%)**
Mean number per year: **0.71**
On average, 5 tropical cyclones (depressions or stronger) impact the Gulf each season.

Mean number per year: 5.11
Median: 5  Mode: 6
Annual probability of >0: 99.40%
Return period of >0: 1.01 years
1969 and 2005 hold the record for the most cyclones in the Gulf in a single season.

Total Number of Tropical Cyclones in the Gulf of Mexico Region (Yearly, 1950 - 2012)

- **1969, 2005:** 11 systems
- **1962, 1963, 1997:** 1 system
- **Tropical Depressions and stronger**
2005 holds the record for the most tropical storms (or greater) in the Gulf of Mexico.
On average, between 3 and 4 tropical storms impact the Gulf of Mexico each season.
Almost 2 hurricanes per season impact the Gulf of Mexico, on average

**Total Number of Tropical Cyclones in the Gulf of Mexico Region (Yearly, 1950 - 2012)**

- Mean number per year: **1.76**
- Median: **2**  
- Mode: **2**
- Annual probability of >0: **82.83%**
- Return period of >0: **1.21 years**

- Hurricanes and stronger
- 9 years with no hurricanes
- 2005: 6 hurricanes
Last major hurricane in the Gulf (north of 20N) was Hurricane Gustav in September, 2008

Total Number of Tropical Cyclones in the Gulf of Mexico Region (Yearly, 1950 - 2012)

- Mean number per year: 0.71
- Median: 0  Mode: 0
- Annual probability of >0: 51.05%
- Return period of >0: 1.96 years

33 years with no major hurricanes

2005: 5 major hurricanes
Approaching 9 years since the last Cat. 3-4-5 hurricane struck the U.S. Coast

Record # days between Cat 3+ US Landfalls: **3133** and counting...

Days Between Major Hurricane (Cat 3, 4, 5) Landfalls in the US:
1900 - May 22, 2014

Original Graph by: Dr. Roger Pielke Jr.

78 Total Storms 1900-2013

Red Line Shows the Trend
A Look Back at 2013
2013 was not a banner year for any of the regular seasonal forecast groups

<table>
<thead>
<tr>
<th>Source</th>
<th>Date</th>
<th>Named Storms</th>
<th>Hurricanes</th>
<th>Intense Hurricanes</th>
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<td>Tropical Storm Risk</td>
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<td>The Weather Channel</td>
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<td>14</td>
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<td><strong>Actual</strong></td>
<td><strong>14</strong></td>
<td><strong>2</strong></td>
<td><strong>0</strong></td>
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</table>
2013: 14 named storms but only 2 hurricanes, one of the quietest seasons in many years
Atlantic came within hours of breaking the record of latest first hurricane formation.

Earliest – May 20th
Latest – Sept. 11th
Median – August 6th
2013 – Sept. 11th
Season started in early June with the formation of Tropical Storm Andrea (65 mph)
Many 2013 storms were weak and suffered from moderate wind shear

TS Barry (45 mph)

TS Chantal (65 mph)

TS Jerry (50 mph)

TS Karen (65 mph)
Hurricane Ingrid was typical of 2013 storms, meaning it was weak and short-lived.
A big early-season inhibitor last year was an above-normal Saharan Air Layer
Dust and dry air confined to the lower levels of the atmosphere inhibited development.

Saharan Air Layer as seen from the NOAA G-IV northeast of Barbados. Cumulus clouds can be seen poking through the tops of the dust layer, which is seen as a milky white haze. (Photo: Jason Dunion NOAA/Hurricane Research Division)
2013: Cooler water in west Indian Ocean had significant impact on the African wave train.
The main inhibitor in 2013 was dry air that dominated the mid levels of the atmosphere.
In 2013, ACE was well below normal in all basins except the Indian Ocean.
Accumulated Cyclone Energy (ACE) in 2013 was the lowest in 30 years.
What To Expect in 2014
There are a number of seasonal predictors that we can use

• **El Niño, La Niña or Neutral Conditions in Pacific?**
  (determines amount of upper-level wind shear)

• **Water Temperatures in the Atlantic**
  (warmer water = stronger hurricanes)

• **Strength of the Bermuda High Pressure System**
  (stronger high = more low-level shear & dry air)

• **Arabian Sea Water Temperatures**
  (can impact tropical wave development/strength)
Water temperatures in the El Niño region of the Tropical Pacific are rising as fast as 1997.
The El Niño of 1997 (left) was one of the strongest on record. On the right is 2014.
El Niño conditions would mean greater wind shear (hostile conditions) in deep tropics.
Model consensus is that there will be a 65%-75% chance of El Niño this summer.
Even though the Atlantic is in a warm cycle, current temperatures are below normal.
Cooling Atlantic Ocean is a signal of more hostile conditions aloft in 2014.
Current water temperatures are below normal across the Tropical Atlantic & Gulf of Mexico

May 13, 2014
Water temperatures near normal in Arabian Sea but forecast to drop this summer.
European model predicting Accumulated Cyclone Energy 70% of normal (60% in April)
European model predicting 10 named storms, which is 1 more than it predicted in April
European model predicting 6 hurricanes, which is 1 more than was predicted in April.
Above-normal pressure means dry, sinking air & more low-level wind shear in deep tropics

ECMWF AUG-OCT Pressure Anomaly Forecast
Drier than normal conditions in deep tropics would reduce development chances.

ECMWF AUG-OCT Rainfall Anomaly Forecast

Less Rainfall
Analog years point to a quiet season as well

<table>
<thead>
<tr>
<th>Year</th>
<th>Named Storms</th>
<th>Hurricanes</th>
<th>Intense Hurricanes</th>
<th>ACE</th>
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<tr>
<td>1957</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>84</td>
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<td>1965</td>
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<td>1972</td>
<td>7</td>
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<td>28</td>
</tr>
<tr>
<td>1982</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>29</td>
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<tr>
<td>Average</td>
<td>7.2</td>
<td>3.8</td>
<td>1.2</td>
<td>68.6</td>
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</table>
Audrey claimed over 400 lives and produced over $4 Billion in damage (today’s dollars)

Only 8 Named Storms in 1957 (ACE 75)
Only 6 Named Storms (ACE 78)
$22.3 Billion in U.S.
Damage in 1965

Cat 4 Betsy struck Florida & Louisiana, causing widespread damage and 81 deaths

The first view was taken from Air Force One when President Lyndon Johnson came down to look at things. The photo on the right was taken in the Ninth Ward of New Orleans.
Hurricane risk level near normal across the north-central Gulf Coast

2014 Forecast
9 Named Storms
4 Hurricanes
1 Intense Hurricane

Risk Areas
- Below Normal
- Near Normal
- Above Normal

Lower Than Normal Pressure

Higher Than Normal Pressure
<table>
<thead>
<tr>
<th>Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Arthur</td>
<td>Hanna</td>
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<tr>
<td>Gonzalo</td>
<td>Nana</td>
<td>Wilfred</td>
</tr>
</tbody>
</table>
Recommended Preparedness

- Review and update your response plans
- Conduct drills
- Teach employees personal preparedness
- Verify that you have access to good, reliable and trusted sources of information
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