www.seasonalhurricanepredictions.org

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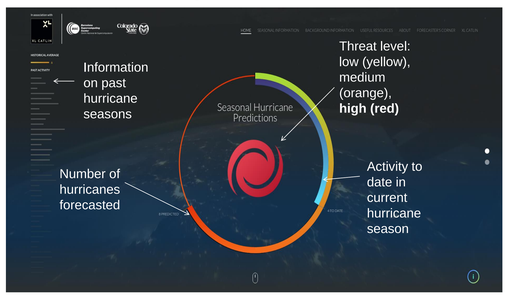
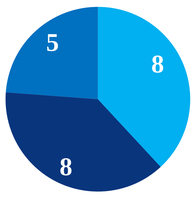
Introduction

Seasonal hurricane forecasts are produced ahead of each hurricane season by a range of different groups, from national meteorological services to academic groups to private weather forecasting companies. While these forecasts are generally made freely available by the groups who produce them (usually on their organization's website), there was, until recently, no website centralizing these predictions. This made gathering that information time consuming (if one was aware of all of the given forecasts in the first place) and made ensemble operations and comparisons between different forecast agencies difficult. In that context, the Barcelona Supercomputing Center, Colorado State University and XL Catlin have collaborated to produce a platform offering the most up-to-date view of upcoming Atlantic hurricane activity.

www.seasonalhurricanepredictions.org **aggregates all freely available seasonal forecasts of Atlantic hurricane activity** ahead of the peak of the hurricane season and displays them on a **user-friendly platform**. The site offers ensemble forecasts of named storms, hurricane and major hurricane numbers as well as accumulated cyclone energy (ACE) as soon as the first predictions are produced in March and is updated throughout the early part of the season as more forecasts become available. The website also supplies supporting information on the forecasts themselves and their performance at the end of the season, but also more broadly on seasonal forecasting and hurricane activity.



Who is participating?



Private companies

1. AccuWeather
2. Radiant Solutions
3. StormGeo
4. Tropical Storm Risk
5. WeatherBell Analytics
6. The Weather Company
7. Weather Tiger
8. Wilkens Weather Technologies

Types of forecasts

1. Dynamical
2. Statistical
3. Hybrid
4. Machine learning

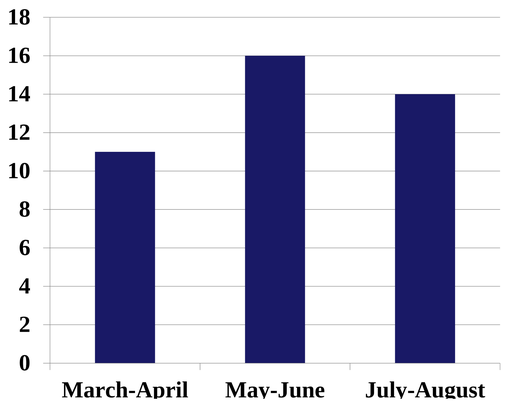
Government Agencies

1. NOAA
2. Insmet
3. Mexican National Meteorological Service
4. Met Office
5. NMME

Universities

1. Coastal Carolina University
2. Colorado State University
3. North Carolina State University
4. Penn State University
5. University of Arizona
6. University of Colorado
7. University of Technology Sydney / CSIRO / University of Oklahoma

When are forecasts released?

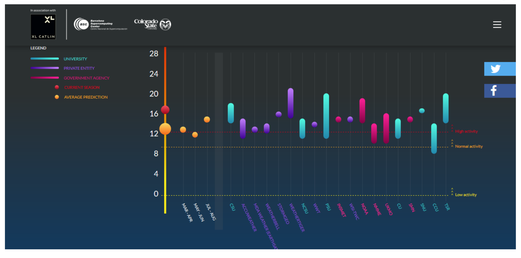


Number of organizations which issued a forecast for…	
Named storms	19
Hurricanes	18
Major hurricanes	15
ACE	12

What else is provided?

- **Ensemble analysis**
- **Short description of forecasts**
- **Background information**
  - Seasonal forecasting
  - Factors modulating Atlantic hurricane variability
  - Descriptions of different methodologies
- **Links to useful resources**
  - Current hurricane activity
  - General atmospheric and oceanic conditions
  - Satellite imagery
  - General interest blogs
- **Short summary in pdf format**
- **Post-mortem of the season**
- **All forecast data in .csv format**

What it looks like



Predictions for 2018

The Atlantic hurricane season is underway, and **six** groups have submitted their initial forecasts for the 2018 season. Forecasts that have been submitted so far can be generally characterized as predicting **slightly above-normal** hurricane activity, with the average of seasonal forecasts issued to date calling for a total of six hurricanes (the same as the long-term average). However, two groups are forecasting near-normal or below-normal activity, so no consensus has yet emerged.

	Average Forecast (range)	Climatology (1981-2010 median)	Number of forecasts
Named storms	**13 (12-14)**	12	5
Hurricanes	**6 (5-7)**	6	5
Major hurricanes	**3 (2-4)**	2	4
ACE	**105 (73-135)**	92	5

2016 Season

The 2016 Atlantic hurricane season was generally fairly quiet until late September, when long-lived major hurricane Matthew formed. Matthew was responsible for over 40% of all ACE generated during this season. 2016 was the 3rd year in a row where more ACE was generated in October than in September. On average, about three times as much ACE is generated in the Atlantic in September compared with October. The hurricane season was generally characterized by cool neutral El Niño-Southern Oscillation (ENSO) conditions. Contrary to the past two years, this season was characterized by below-average vertical wind shear when averaged from August-October across most of the tropical Atlantic. Slightly above-average vertical wind shear prevailed over the Caribbean. While the tropical Atlantic was somewhat warmer-than-normal, the mid-levels of the atmosphere were quite dry during this hurricane season. Dry mid-levels enhance downdrafts and suppress the deep convection necessary for supporting hurricanes.

The season was characterized **by above-average hurricane activity** with a total of **15 named storms**, **7 hurricanes**, **4 major hurricanes** and an **Accumulated Cyclone Energy of 141**. The **ensemble mean** forecast called for **15 named storms** (--), **8 hurricanes** (+1), **3 major hurricanes** (-1) and an **ACE of 108** (-23%). For comparison, the 1981-2010 median values of these quantities are 12 named storms, 6.5 hurricanes, 2 major hurricanes and an ACE of 92.

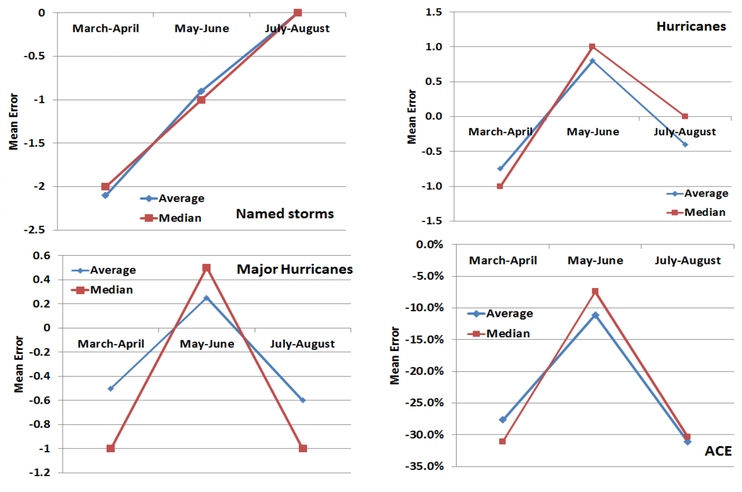
The aggregate forecast was relatively successful, accurately predicting the total number of storms, but slightly overestimating the number of hurricanes while at the same time underestimating the number of major hurricanes and the ACE. It should be noted however that Otto was considered a major hurricanes for just over 6 hours. The average forecast outperformed a forecast based on climatology.

	Average forecast	Observed	Mean Error
Named storms	15	15	**-**
Hurricanes	8	7	**+1**
Major hurricanes	3	4	**-1**
ACE	108	141	**-23%**

Change in forecast skill with lead time

The average values predicted by all groups issuing forecasts in March/April were 14 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 107. These numbers increased in May/June to 14 named storms, 8 hurricanes, 3 major hurricanes and an ACE of 117. Predictions issued in July/August were generally lower than in the previous period, with 15 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 97. The number of forecasts for each period was 10 for March-April, 10 for May-June and 6 for July-August. Since the number of forecasts and the composition of the ensemble changes for each 2 month period, it is difficult to determine exactly how the skill of the average forecast changed as a function of the forecast time.

The figure below shows the changes in the forecast error of an ensemble constructed using only the individual forecasts which were updated at least once during the months leading up to the hurricane season.



The tendency to increase the predictions for May-June (compared to March-April) and to revise the forecasts downward after the start of the season is clearly visible. While one would generally expect an increase in skill with forecast time, except for forecasts of named storms, this is not observed in this case. That being said, forecasts of named storms and hurricanes produced in July-August performed better than those produced in March-April and May-June.

2017 Season

The 2017 Atlantic basin hurricane season was extremely active with a total of **17 named storms**, **10 hurricanes, 6 major hurricanes** and **an Accumulated Cyclone Energy (ACE) of 226**. The 1981-2010 median values of these quantities are 12 named storms, 6.5 hurricanes, 2 major hurricanes and an ACE of 92.

The 2017 Atlantic hurricane season was dominated by September, which generated the most ACE by any Atlantic calendar month on record. All other months had near-normal activity. The continental United States was devastated by two Category 4 hurricane landfalls: Harvey and Irma. Irma and Maria brought incredible levels of death and destruction across points of the Caribbean and other parts of the tropical Atlantic.

The 2017 Atlantic hurricane season was generally characterized by cool neutral El Niño-Southern Oscillation (ENSO) conditions. During the record-breaking September of 2017, vertical wind shear levels were well below normal, providing conditions more conducive for hurricane formation and intensification. Sea surface temperatures in the tropical Atlantic were also much warmer than normal, providing a more conducive thermodynamic environment for hurricanes to thrive.

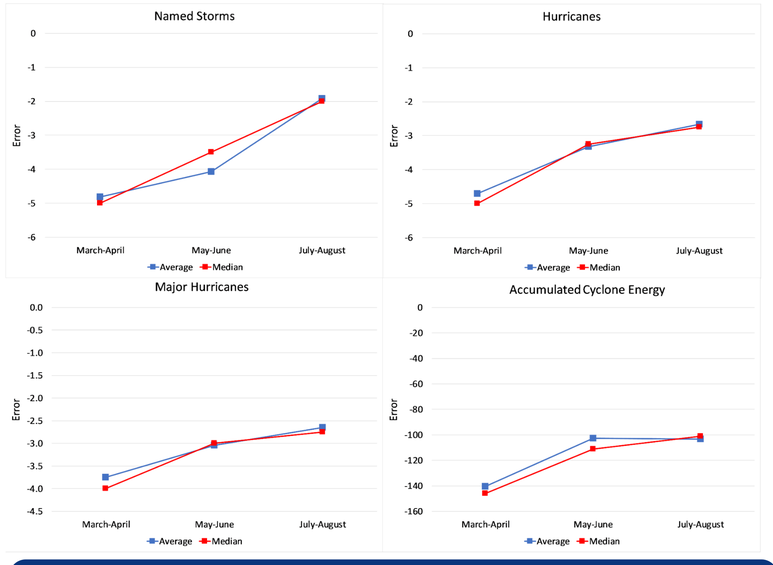
The **ensemble mean** forecast called for **14 named storms** (-3), 7 **hurricanes** (-3), **3 major hurricanes** (-3) and an **ACE of 128** (-43%). For comparison, the 1981-2010 median values of these quantities are 12 named storms, 6.5 hurricanes, 2 major hurricanes and an ACE of 92. Needless to say, the aggregate forecast considerable underestimated the observed level of activity.

	Average	Observed	Mean error
Named storms	14	17	**-3**
Hurricanes	7	10	**-3**
Major hurricanes	3	6	**-3**
ACE	128	226	**-43%**

Change in forecast skill with lead time

In general, Atlantic seasonal hurricane forecasts called for a slightly below-average Atlantic hurricane season in March/April, with agencies generally increasing their forecasts in May/June and July/August. This increase in predicted storm activity was due to several factors including the lack of development of predicted El Niño conditions as well as anomalous warming in the tropical Atlantic. The average values predicted by all groups issuing forecasts in March/April were 12 named storms, 5 hurricanes, 2 major hurricanes and an ACE of 86. These numbers increased in May/June to 13 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 123. Predictions issued in July/August called for 15 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 123. It should be noted that not all forecast groups issue predictions for all four tropical cyclone intensity metrics. The most successful seasonal forecast for 2017 was issued by the University of Arizona in early June. This forecast called for 11 hurricanes, 6 major hurricanes and an ACE of 181.

The figure below shows the changes in the forecast error of an ensemble constructed using only the individual forecasts which were updated at least once during the months leading up to the hurricane season.



Acknowledgments

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This poster can be downloaded at
https://earth.bsc.es/wiki/doku.php?id=library:external:posters
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