

UPDATED (as of 27 July 1985)
FORECAST OF ATLANTIC SEASONAL HURRICANE
ACTIVITY FOR 1985

By
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This updated forecast is based on background material contained in the Colo. State Univ. Dept. of Atmospheric Science forecast report which was issued by the author on 28 May 1985. This updated forecast is based on June and July 1985 meteorological information and issued just before the start of the active part of the hurricane season.

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ABSTRACT

This short paper discusses the author's updated forecast of the amount of seasonal hurricane activity which can be expected to occur in the Atlantic Ocean region in 1985. A previous forecast for 1985 was issued on 28 May 1985 and called for 11 named tropical storms, 8 hurricanes, and 35 hurricane days.

This updated forecast is based on the author's previous forecast and June and July meteorological data. For background information on this forecast please consult the past and current research on this subject by the author (Gray, 1984a, 1984b, 1985a, 1985b) which relates seasonal amount of Atlantic hurricane activity to: 1) the El Nino (EN); 2) the Quasi-Biennial Oscillation of equatorial stratospheric wind (QBO); 3) the Caribbean Basin and Gulf of Mexico Sea-Level Pressure Anomaly (SLPA); and 4) 200 mb Zonal Wind Anomaly (ZWA) at 5 key low latitude Caribbean Basin stations in the months of June and July.

Information received by the author as of 26 July 1985 indicates that the hurricane activity in 1985 can now be expected to be slightly above average, with about 7 hurricanes (6 is average), 10 hurricanes and tropical storms (9 is average), and 30 hurricane days (25 is average).

This revised forecast reduces the number of hurricanes and named storms by one and the number of hurricane days by 5 from the forecast issued in late May. New June and July meteorological information indicates that the coming Atlantic hurricane season can be expected to be slightly less active than the estimate made on 28 May 1985.

1. INTRODUCTION

The reader is referred to the 34 page paper of 28 May 1985 which is titled, "Forecast of Atlantic Seasonal Hurricane Activity for 1985" for detailed background information on the methodology of the author's Atlantic seasonal forecast for this year. Other background information on this subject is contained in papers cited in the abstract.

The hurricane season is now nearly two months old and two July named cyclones (Ana and Bob) have occurred. This should not be taken by itself to indicate that the 1985 season will be an especially active one, since the bulk of the activity historically occurs in August, September and October (Fig. 1). Records since 1900 indicate that seasons with two tropical storms or hurricanes forming prior to August have had total activity ranging from 12 tropical storms and hurricanes (1964) to 5 in 1902. Total hurricane activity for such seasons ranges from 8 in 1954 to 2 in 1931. Other factors must be considered.

This revised forecast is thus made at the start of the really active part of the hurricane season, and expectations for the overall character of the season are not based upon the activity to date.

The next four sections discuss how new June and July 1985 meteorological information on the Quasi-Biennial Oscillation (QBO), El Nino, Caribbean Basin Sea-Level Pressure Anomaly (SLPA) and low latitude Caribbean Basin 200 mb (12 km) upper level zonal wind information are used to update the author's original 1985 seasonal forecast which was made on 28 May 1985.

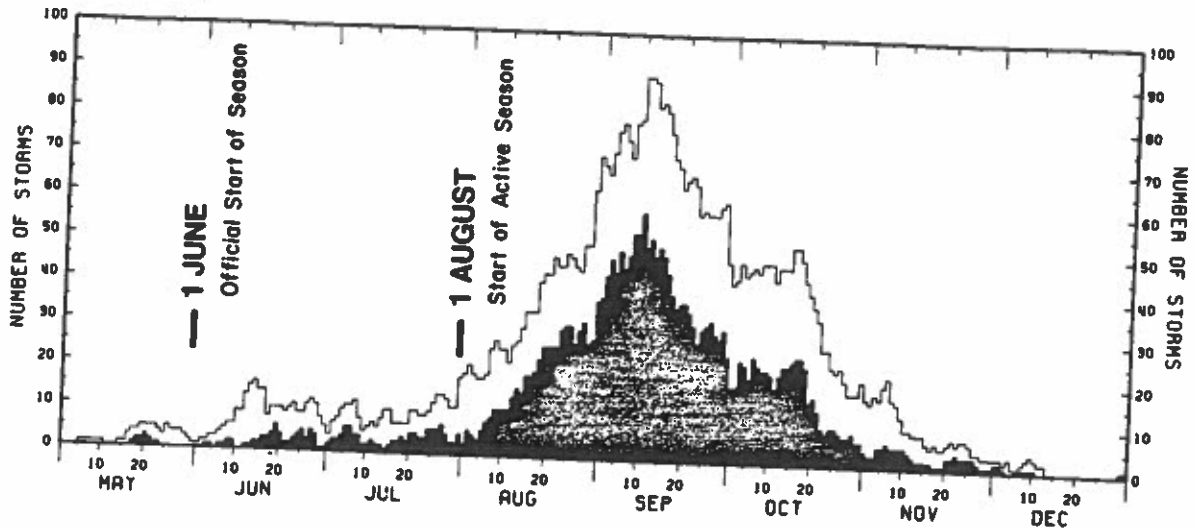


Fig. 1. Number of tropical storms and hurricanes (open curve) and hurricanes (solid curve) observed on each day, May 1, 1886 through December 31, 1980 (from Neumann, et al., 1981).

2. QUASI-BIENNIAL OSCILLATION (QBO) INFLUENCE

Information on the equatorial stratospheric zonal winds from Balboa, C.Z (9°N), Ascension Island (8°S), and Singapore (1.5°N) in May, June, and early July of 1985 does not cause the author to alter his original assessment made in late May that the 1985 hurricane season will be one in which 30 mb QBO equatorial stratospheric westerly zonal winds (with the annual cycle removed) will be present (see Fig. 2). The 30 mb westerly winds (on which this forecast is based) are now reaching their peak values and should be maintained throughout the 1985 hurricane season. These westerly QBO winds are typically (as previously discussed in the 28 May forecast) associated with an enhancement of hurricane activity above average to the extent of about one hurricane, and 5 hurricane days.

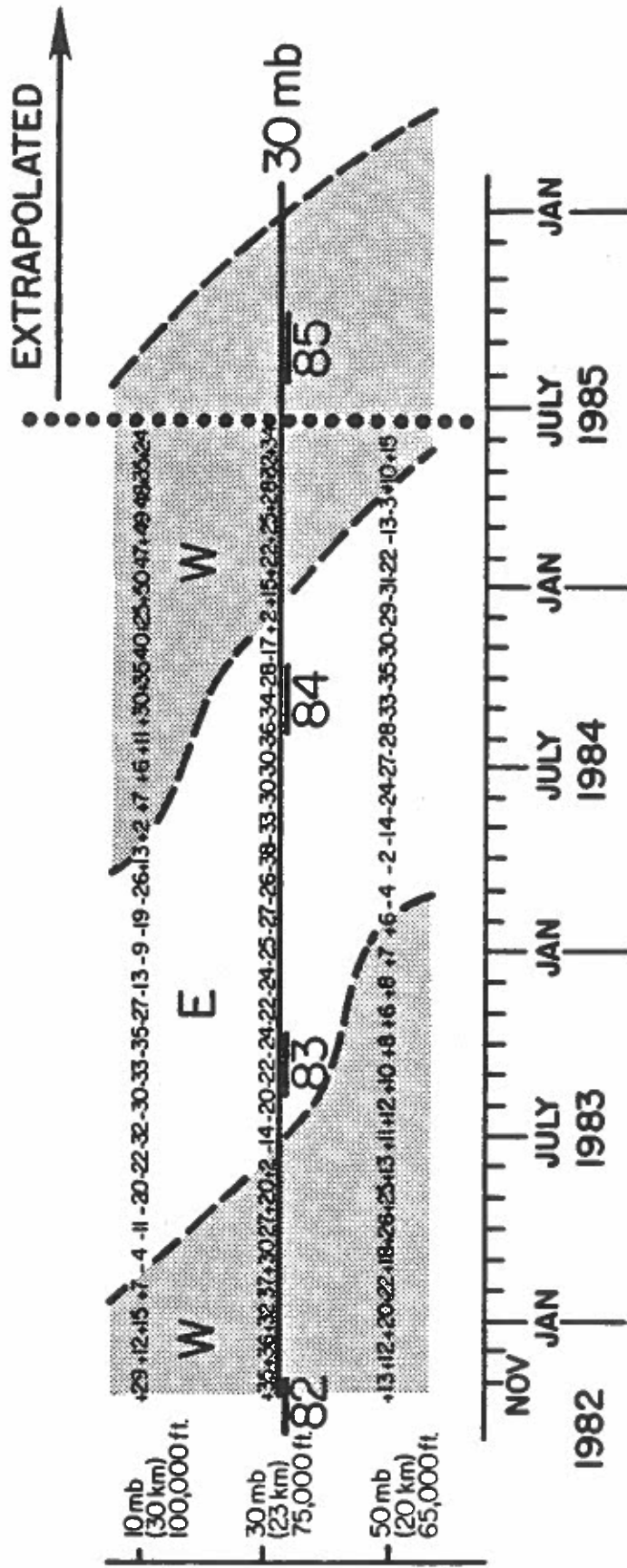


Fig. 2. Vertical cross-section of recent stratosphere monthly average QBO west-to-east or zonal wind (in knots). This figure represents an average of the Balboa, C.Z. (9°N) and Ascension (8°S) rawinsondes. The annual cycle has been removed from each sounding before averaging. Winds from a westerly direction have been shaded. Information beyond early July 1985 has been extrapolated.

3. EL NINO INFLUENCES

The best estimates by those who study El Ninos is that 1985 will not be an El Nino year. This assessment still holds. The strong inhibiting influences on hurricane activity of an El Nino event are thus not to be expected in 1985. Conditions quite opposite to those associated with an El Nino event (a so-called anti-El Nino) appeared to be establishing themselves in the Pacific by late May of this year. New June and July information indicates a small relaxation of this anti-El Nino condition. Although cool eastern and central tropical Pacific Ocean temperatures characteristic of non El Nino conditions persist, the Southern Oscillation Index (SOI) has not risen as anticipated in May. Darwin and Tahiti surface pressure are now nearly equal, indicating a neutral SOI. The low latitude Pacific easterly trade winds have also weakened somewhat. This new information thus indicates a small relaxation of anti-El Nino conditions from conditions indicated in late May. These changes are in the sense to slightly reduce Atlantic hurricane activity. Nevertheless, one can be confident that the next three months of the hurricane season will not experience a significant El Nino event, and the influence of El Nino conditions is unchanged from the assessment made on 28 May 1985.

4. CARIBBEAN BASIN SEA-LEVEL PRESSURE ANAMOLY (SLPA) INFLUENCE

Atlantic seasonal hurricane activity is inversely related to Caribbean Sea Level Pressure Anomaly (SLPA) in the period of April through July. The lower the SLPA, the more likely the hurricane season will be active.

Table 1 gives information on 1 April to 25 July 1985 Caribbean-Gulf of Mexico SLPA in mb. Data are derived from six key stations in

this region. The average of these stations was near zero in April-May and positive by + .37 mb in the period 1 June to 25 July. Values in the most recent period of 1-25 July are near zero. These pressure anomaly values are small enough to indicate that no correction to average hurricane conditions should be made because of the SLPA. This aspect of the forecast remains the same.

TABLE 1

PRE-1985 HURRICANE SEASON
SEA-LEVEL PRESSURE ANOMALY (SLPA) - IN MB
(FROM DATA SUPPLIED BY A. PIKE OF NHC AND LIXION AVILA
OF THE UNIVERSITY OF MIAMI)

	<u>APRIL-MAY</u>	<u>1 JUNE-25 JULY</u>	<u>1-25 JULY</u>
BROWNSVILLE	+0.4	+0.3	+0.5
MERIDA	-0.1	+0.1	+0.0
MIAMI	-0.6	-0.2	-0.1
SAN JUAN	-0.6	+0.2	-0.1
CURACAO	+0.5	+0.8	+0.5
BARBADOS	<u>+0.3</u>	<u>+1.0</u>	<u>-0.6</u>
MEAN	-0.0	+0.37	+0.03

5. 200 MB ZONAL WIND ANOMALY (ZWA)

A study of hurricane frequency over the 35-year period of 1950-1984 shows that Atlantic hurricane activity is also related to late spring and early summer upper tropospheric west to east zonal wind velocities at the low latitude Caribbean Basin stations of Balboa, C.Z. (9°N), San Andres (12.5°N), Curacao (12°N), Trinidad (10.5°N) and Barbados (13°N). Stronger than normal 200 mb (12 km or 40,000 ft level) winds from the west are associated with fewer hurricanes. By contrast, hurricane activity is more prevalent when early summer 200 mb winds at these stations are weaker than average from the west or stronger than average from the east. It is only the June-July winds which are related to

hurricane activity. Wind data from earlier months do not correlate. These winds are thus not used for the 1 June forecast but assist with the late July updated forecast. Due to a suspected 40-60 day oscillation frequency in the 200 mb wind reports, it is desirable to average the zonal wind data over at least a two month period and try not to make judgements based on individual monthly information alone.

Table 2 shows 200 mb (~ 12 km height) zonal or west-to-east wind anomaly for these 5 key low latitude Caribbean Basin upper air stations for the period 1 June to 25 July 1985. These recent north positive west wind anomalies indicate that one should expect a reduction of Atlantic hurricane activity from average by about 1 hurricane, and about 5 hurricane days.

TABLE 2

200 MB (OR 12 KM HEIGHT) ZONAL WIND ANOMALY (IN M/S) FOR NON EL NINO YEARS FOR 5 KEY LOW-LATITUDE CARIBBEAN BASIN UPPER AIR STATIONS FOR THE PERIOD OF 1 JUNE THROUGH 25 JULY 1985.

Balboa, C.Z. (9°N)	+2
San Andres	+1
Curacao	+5
Trinidad (10.5°N)	+4
Barbados (13°N)	<u>+5</u>
Average	+3.4

6. UPDATED 1985 SEASONAL PREDICTION

Table 3 combines all four of these influences on hurricane activity and gives the author's updated numerical estimates of each term of his three prediction equations for the 1985 season. This revised forecast is lower than the forecast estimate made in late May by one hurricane and 5 hurricane days. The number of hurricanes, number of hurricanes and tropical storms, and number of hurricane days are thus forecast to be 7 (1 above average), 10 (1 above average), and 30 (5 above average) respectively. The 1985 hurricane season is thus predicted to be a season of slightly above average hurricane activity.

TABLE 3

REVISED 1985 PREDICTED SEASONAL HURRICANE ACTIVITY

$$\begin{aligned} \left(\begin{array}{l} \text{PREDICTED NO.} \\ \text{OF HURRICANES} \\ \text{PER SEASON} \end{array} \right) &= 6 + (QBO_1 + QBO_2) + EN + SLPA + ZWA \\ &= 6 + (+1) + (0) + (+1) + (0) + (-1) = \boxed{7}, 1 \text{ Above} \\ &\hspace{15em} \text{Average} \end{aligned}$$

$$\begin{aligned} \left(\begin{array}{l} \text{PREDICTED NO. OF} \\ \text{HURRICANES AND} \\ \text{TROPICAL STORMS} \\ \text{PER SEASON} \end{array} \right) &= 9 + QBO + EN + SLPA + ZWA \\ &= 9 + (1.5) + (0.7) + (0) + (-1) = \boxed{10}, 1 \text{ Above} \\ &\hspace{15em} \text{Average} \end{aligned}$$

$$\begin{aligned} \left(\begin{array}{l} \text{PREDICTED NO. OF} \\ \text{HURRICANE DAYS} \\ \text{PER SEASON} \end{array} \right) &= 25 + 5 [(QBO_1 + QBO_2) + EN + SLPA + ZWA] \\ &= 25 + (+5) + (0) + (+5) + (0) + (-5) = \boxed{30}, 5 \text{ Above} \\ &\hspace{15em} \text{Average} \end{aligned}$$

An average of about two-thirds of all named storm days are hurricane days. If 1985 follows the average pattern then one might expect about 45 to 50 named storm days. With the presence of QBO west

winds and the anticipated lack of El Nino conditions in the Pacific the odds favor a return to a more typical and active hurricane season such as occurred in the early 1980's and late 1970's when cyclone development took place at lower latitudes and cyclones were typically more intense than in the last three years.

Because the major period for lower latitude cyclones of African origin is late July to mid-September, it should be expected that the active portion of the 1985 season will commence a few weeks earlier than the 1984 season did. This would be in contrast to the last three seasons when only one named storm (Alberto 2-6 June 1982) formed prior to the middle of August and only 3 named storms in all three years formed before the 28th of August.

The Caribbean Basin in particular should expect an increased probability of tropical cyclone activity and increased probability of more westerly tracking tropical cyclones.

For more information on this forecast please see the more detailed earlier forecast paper by the author (1985b) which was issued on 28 May 1985.

7. CAUTIONARY NOTE

It is important that the reader realize that this forecast scheme, although showing quite promising statistical skill in the typically meteorological sense, can only predict about 50% of the total long term variability in Atlantic seasonal hurricane activity. This forecast scheme will likely fail in some years when the other unknown factors (besides the QBO, EN, SLPA and ZWA) which cause cyclone variability are more dominant, or if the QBO or EN conditions should be misforecast. It

is impossible to determine beforehand which years this scheme will work best or worst.

This forecast scheme also does not specifically predict where within the Atlantic basin the storms will strike. For instance, 1981 was a moderately active season (7 hurricanes, 12 hurricanes and tropical storms) but only two of the weaker systems affected the US, while 1983 was one of the most inactive seasons on record but Hurricane Alicia caused over a billion dollars of damage in the Houston area.

8. ACKNOWLEDGEMENTS

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