SIDEBAR 4.1: 2013 VS. 2014 ATLANTIC HURRICANE ACTIVITY—A BRIEF COMPARISON OF TWO BELOW-AVERAGE SEASONS—

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Both the 2013 and 2014 Atlantic hurricane seasons were characterized by below-average levels of hurricane activity when evaluated by the number of storms, and for the 2013 season, by the accumulated cyclone energy (ACE) metric. However, for the 2014 season, the ACE metric just reached the threshold for a normal season (see Fig. 4.18). The 1981–2010 median for ACE is 92×10^4 kt^2. In comparison, the 2013 season was only 36×10^4 kt^2 and the 2014 season was 66×10^4 kt^2. The combined ACE in 2013 and 2014 of 102×10^4 kt^2 units is the lowest two-year ACE for the Atlantic basin since 1993–1994 (71×10^4 kt^2).

The quiet 2013 Atlantic hurricane season was not well anticipated by most agencies issuing preseason hurricane outlooks, whereas the 2014 Atlantic hurricane season was predicted well by virtually every forecasting group. Here, the preseason conditions that likely led to differences in seasonal forecast skill are briefly assessed and the large-scale conditions present during the peak months of the Atlantic hurricane season are then examined.

As discussed in Fogarty and Klotzbach (2013) one of the primary reasons for the forecast problem in 2013 was what were perceived as favorable SST conditions for tropical cyclone formation at the start of the hurricane season. Anomalously warm conditions existed in the Atlantic main development region (MDR; 10°–20°N, 60°–15°W) while cooler-than-normal conditions prevailed throughout the eastern and central tropical Pacific (Fig. SB4.1a). Conditions were perceived to be much less favorable for hurricanes in May 2014, with cooler-than-normal temperatures in the Atlantic MDR and what was considered to be a developing El Niño event in the tropical Pacific (Fig. SB4.1b). The differences in SST patterns throughout the northern portion of the Western Hemisphere are further emphasized by considering the difference between May 2013 and May 2014 (Fig. SB4.1c). Overall, the hurricane response in 2014 was in line with preseason expectations, despite the lack of a robust El Niño.

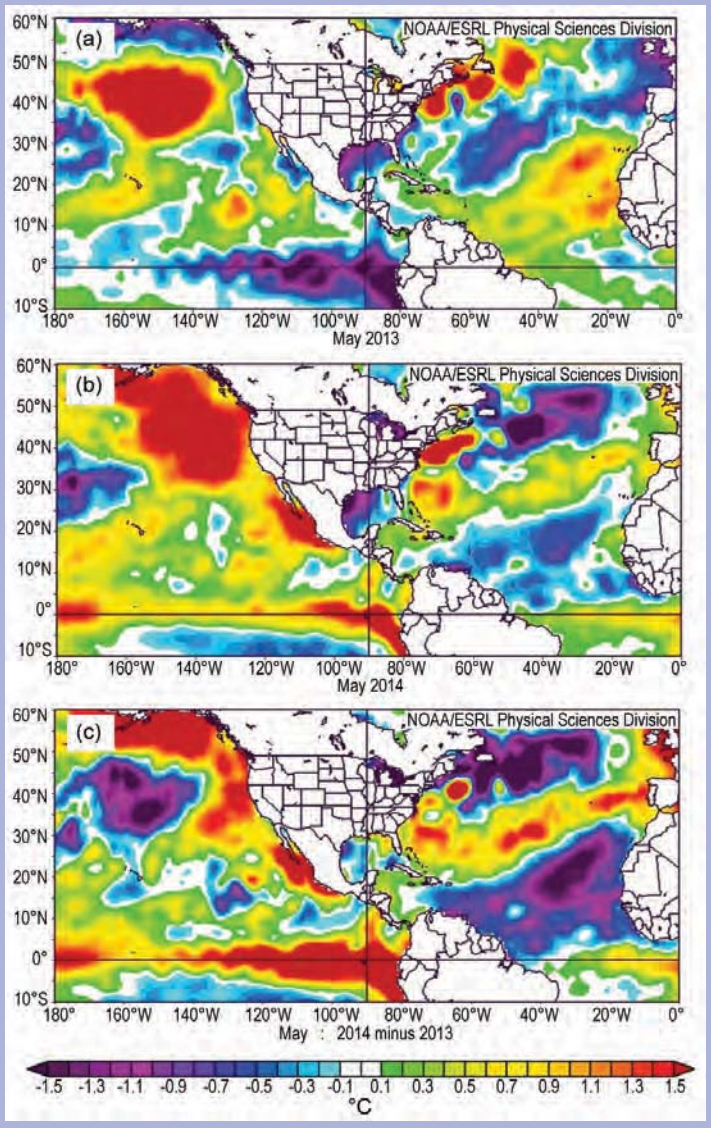

FIG. SB4.1. NOAA OI SST anomalies (°C) for (a) May 2013, (b) May 2014, and (c) May 2014–May 2013.

The 2013 season had 14 named storms, which exceeded the climatological median from 1981–2010 of 12, but these storms were generally short-lived and weak (Fig. SB4.2a). There were no hurricanes between 85°–35°W in 2013, while all six hurricanes that formed in 2014 did so between those two longitudes. Both years had a paucity of storms in the Caribbean basin (10°–20°N, 90°–60°W), with no hurricanes in 2013 and Gonzalo representing the lone hurricane in 2014. The 2014 season was notable for its late season activity with more ACE generated in October than in August and September combined (the first time that this has occurred since 1963). Gonzalo alone generated more ACE (26×10^4 kt^2) than did the combined output of all storms during August–September of 2013 (21×10^4 kt^2).

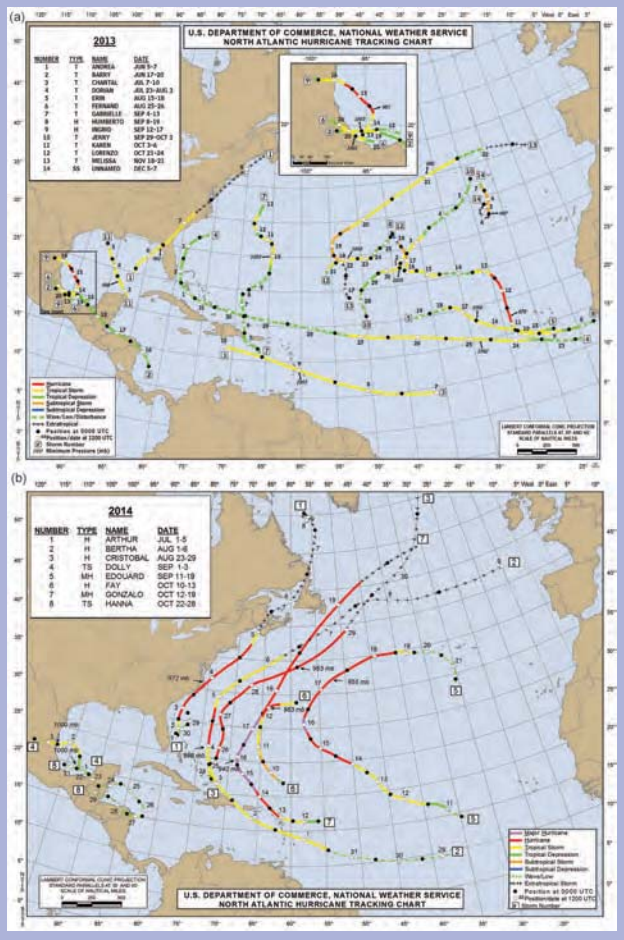

Fig. SB4.2. Tracks of Atlantic basin TCs during the (a) 2013 Atlantic hurricane season and (b) 2014 Atlantic hurricane season. (Source: NOAA's National Hurricane Center.)

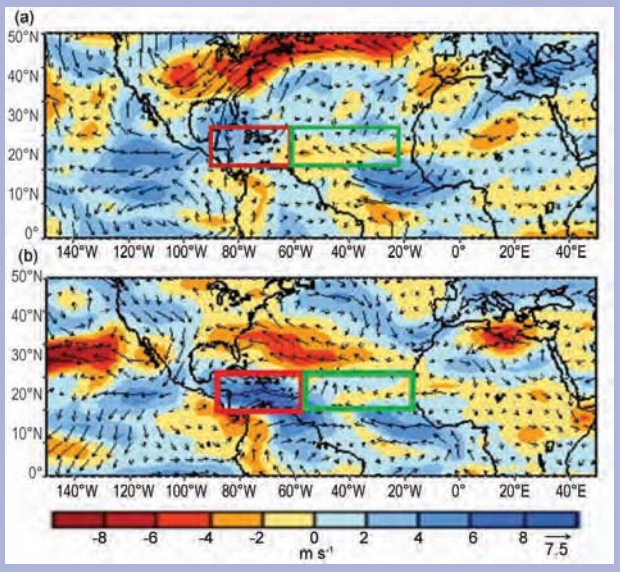

Fig. SB4.3. 60-day average vertical (200–850 hPa) wind shear (m s^{-1}) across the Caribbean (red box) and Main Development Region (green box) for the approximate climatological peak of the Atlantic hurricane season from 17 Aug–15 Oct.

During the 2013 Atlantic hurricane season, the Caribbean experienced slightly stronger-than-normal vertical (200–850-hPa) zonal wind shear, while in the tropical Atlantic, vertical shear was slightly less than the long-term average (Fig. SB4.3a). During 2014, vertical shear anomalies were strongly positive throughout the Caribbean basin, with September values the second highest on record, according to the NCEP/NCAR Reanalysis, trailing only 1972 (Fig. SB4.3b). Unlike 2013, anomalously weak vertical wind shear prevailed across most of the subtropical Atlantic during 2014, which was likely the reason why many of the storms that did form in 2014 reached hurricane strength at these latitudes.

Finally, both the 2013 and 2014 Atlantic hurricane seasons were characterized by much drier-than-normal conditions across the MDR. According to the NCEP/NCAR Reanalysis, 500-hPa specific humidity values were the lowest on record in 2013, only to be eclipsed by even drier conditions in 2014. Thermodynamic conditions were quite harsh in both years.

In summary, the explanation for the quiet 2014 Atlantic hurricane season seems fairly straightforward, with cooler-than-normal MDR SSTs, above-average vertical wind shear, and drier-than-normal conditions. The MDR SSTs during ASO 2014 were cooler compared to many seasons during the Atlantic hurricane era from 1995 to 2012 (see Fig. 4.19b). The MDR SSTs were also comparable to the remainder of the global tropics during ASO 2014, which is another indicator for a less-active season (see Fig. 4.19c). While dynamic conditions such as vertical wind shear were more favorable in 2013, it appears that the highly unfavorable thermodynamic environment in 2013 prevented significant development of most tropical cyclones. However, a full understanding of why 2013 was even quieter than 2014 still remains elusive.