



A CLIMATOLOGY OF TROPICAL CYCLONE-INDUCED TORNADES IN THE FLORIDA KEYS



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SYNOPSIS

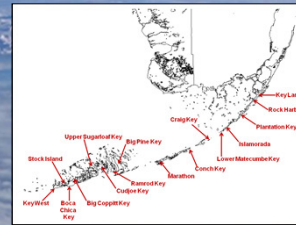
The Florida Keys are home to a vulnerable population at risk to the hazards associated with tropical cyclones. These hazards include storm surge, damaging winds, flooding rains, and tornadoes. On occasion, tornadoes associated with tropical cyclones have caused numerous injuries and extensive property damage in the Florida Keys.

Climatological descriptions of the frequency and variation of hazardous weather events are important to a wide variety of groups, including weather forecasters, emergency managers, insurance companies, and the public.

Several tropical cyclone tornadoes have affected Florida Keys communities since the late 1990s, and a scrutiny of this particular hazard of the tropical cyclone environment is timely.

Tropical cyclone tornado reports in the Florida Keys were examined, summarized, and compared with the larger climatologies in the literature.

Results from this investigation are intended to be used by severe weather forecasters and local emergency managers so that they may integrate knowledge of this hazard into their diagnostic routines and mitigation and preparedness activities, respectively.



Large waterspout near Key West, Florida (top left), 23 October 2005. Photograph by Tim Chapman; map of the Florida Keys with names and locations of communities affected by tropical cyclone tornadoes (top right).

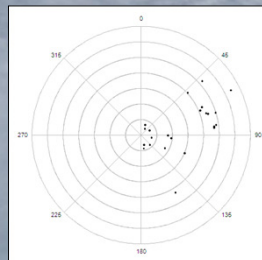
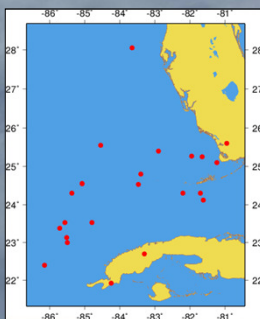


Tracks of tropical cyclones associated with tornadoes in the Florida Keys, 1950-2009. (above) Image courtesy of NOAA Coastal Services Center.

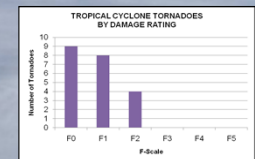
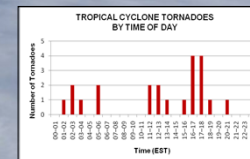
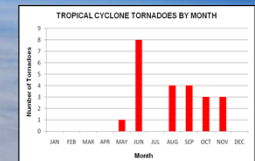
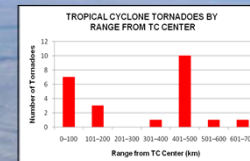
List of tropical cyclone tornadoes by date, tropical cyclone, and impact location (below).

DATE	TROPICAL CYCLONE	LOCATION
4 Jun 1953	TS Alice	Key West
8 Sep 1965	H Betty	Marathon
8 Sep 1965	H Betty	Big Pine Key
24 May 1970	TD Alma	Big Pine Key
18 Jun 1972	TS Agnes	Big Coppitt Key
18 Jun 1972	TS Agnes	Key West
18 Jun 1972	TS Agnes	Conch Key
15 Aug 1981	TS Dennis	Plantation Key
2 Jun 1982	TD 1 (Alberto)	Plantation Key
3 Jun 1982	H Alberto	Stock Island
3 Jun 1982	H Alberto	Cudjoe Key
11 Oct 1987	TS Floyd	Rock Harbor
4 Nov 1998	TS Mitch	Islamorada
4 Nov 1998	TS Mitch	Rock Harbor
4 Nov 1998	TS Mitch	Key Largo
15 Oct 1999	H Irene	Stock Cliche Key
15 Oct 1999	H Irene	Craig Key
26 Aug 2005	H Katrina	Marathon
1 Jun 2007	TS Barry	Sugarloaf Key
18 Aug 2008	TS Fay	Big Pine Key
18 Aug 2008	TS Fay	Flamingo Key
9 Sep 2008	H Ike	Key Largo
10 Sep 2008	H Ike	Lower Matecumbe Key

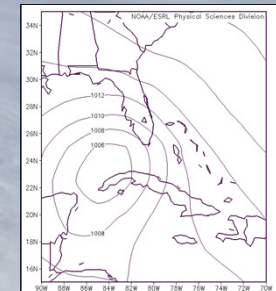
All tropical cyclone center locations near tornado time (below).



Polar coordinate plot of tornadoes with respect to TC center relative to true north (above). Range marks at intervals of 100 km.



Mean sea level pressure composite analysis for Florida Keys tropical cyclone tornadoes using six-hourly NCEP/NCAR reanalysis data (right); image provided by NOAA/ESRL Physical Sciences Division, Boulder, Colorado from their web site at <http://www.esrl.noaa.gov/psd/>.



WHAT DID WE LEARN?

- ▶ 61% all tropical cyclone tornadoes in the Florida Keys between 1950 and 2009 were associated with cyclones of less than hurricane intensity.
- ▶ The data revealed a bimodal spatial distribution with respect to radial distance from the cyclone center.
- ▶ Tropical cyclone centers of circulation associated with tornadoes were tightly clustered over the southeastern Gulf of Mexico; no centers occurred east of -80.5 west longitude.
- ▶ Over a third (35%) of tornadoes occurred during the two-hour period between 1600 and 1800 EST (2100-2300 UTC).
- ▶ Over half (62%) of the tornado reports examined are associated with poleward-moving tropical cyclones of Caribbean origin.