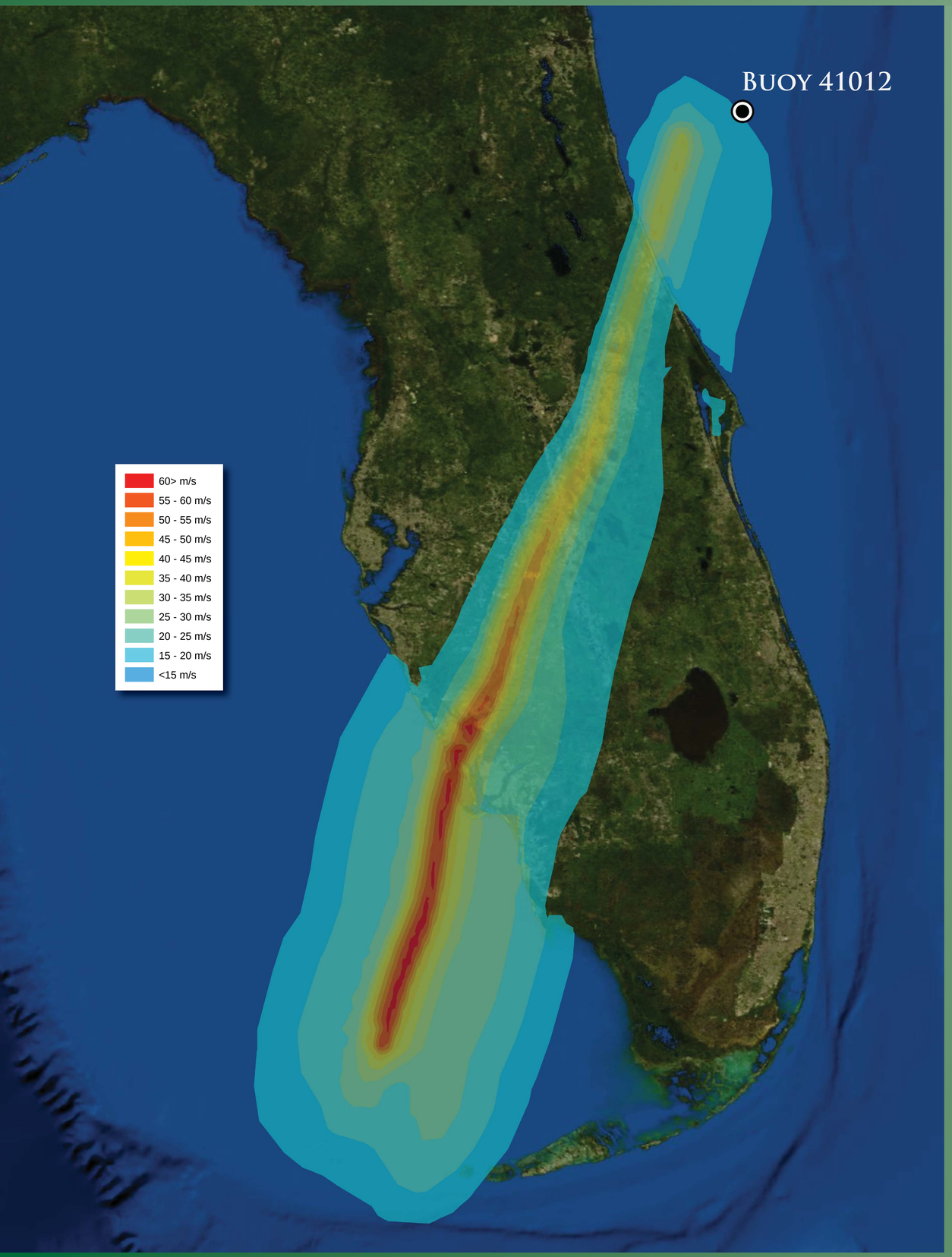
Hurricane Charley: How Fast Can Waves Grow?



In the early hours of 14 August 2004, Hurricane Charley passed offshore of St Augustine, Florida after crossing the Florida Peninsula from its Port Charlotte-Punta Gorda landfall then passing through eastern Orlando before remerging into the Atlantic near Daytona Beach. At the time of its occurrence, this was the second most damaging hurricane in history in spite of its small size.

One of the interesting questions arising from its passage is the recorded 6 meter sea-state at buoy 41012 which is ENE of St Augustine. Examination of the H*Wind data and graphics (Powell and Houston 1996) from HRD reveals a very short period of greater than gale force winds to generate that sea state. In one sense this is a unique case of both a fetch and duration limited sea forced by strong winds, since the Florida coast and rapid movement of the small hurricane, both constrained the wind and wave field to the extreme. Based upon the data, winds at the buoy location are estimated as follows:

0200Z 23 KT H*Wind	Buoy 41012	23KT	11.0 M/S	E
0300Z 18 KT H*Wind	Buoy 41012	32KT	15.3 M/S	ESE
0430Z 35KT H*Wind	Buoy 41012 (0500Z)	52KT	24.4 M/S	E
0600Z 66KT H*Wind	Buoy 41012	Not Available		

The wave field increased from a quiescent 0.93 M (3 ft) at 0200Z to 2.39 M (~8 ft) by 0500Z, but continued to rise dramatically to 6 M by 0800Z (Rogers and Welsh 2005). Assuming this data was valid, we compared
the fetch limited and duration limited growth rates from H.O. 603 (Pierson et al. 1971) to the apparent growth rates in this case.

For a 6 M (~20 ft) sea driven by 25 M/S wind with 9 sec period: Fetch limited @ ~75 NM
Duration Limited @ ~11.5 hr

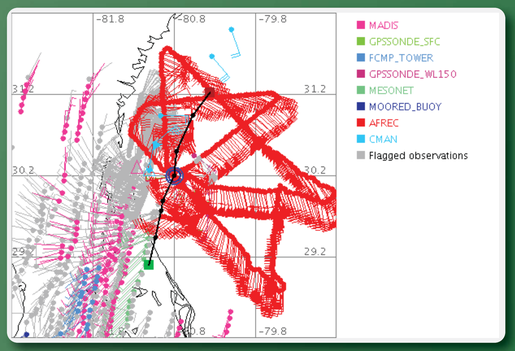
Clearly the Hurricane Charley case is anomalous by these standards, but it is unclear why that is the case. It is unlikely the H*Wind product is too far from accurate as the Hurricane was well sampled over land and the USAFR aircraft was on station as the storm moved off the coast.

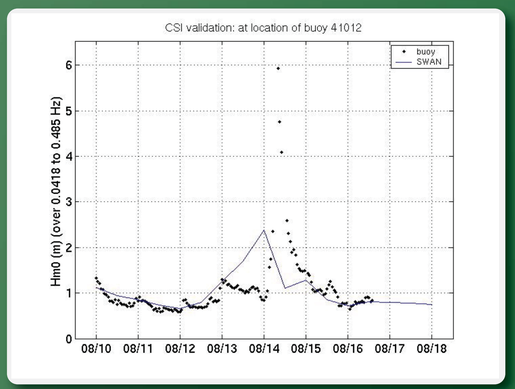
REFERENCES:

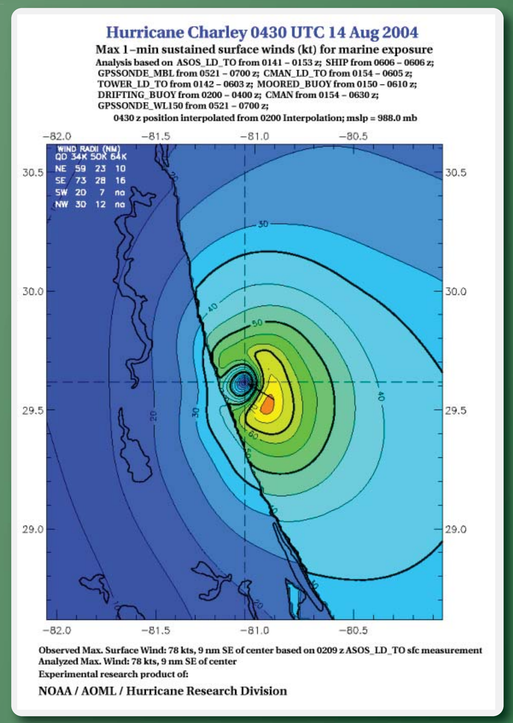
Pierson, W.J. Jr,, Neumann, G., James R.W. 1971: H. O. 603 Practical Methods for Observing and Forecasting Ocean Waves by means of Wave Spectra and Statistics 1971. U.S. Naval Hydrographic Office, Third Printing.

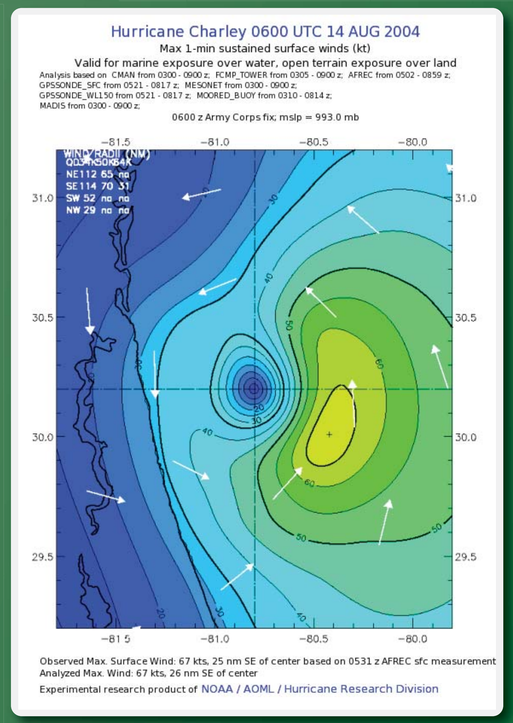
Powell, M. D., and S. H. Houston, 1996: Hurricane Andrew's Landfall in South Florida. Part II: Surface Wind Fields and Potential Real-time Applications. Weather. Forecast., 11, 329-349.

Rogers, E. W. and Welsh P.T. 2005: Wave and Local Storm Modeling at NWS Jacksonville, FL. NOAA Coastal Storms Initiative Conference Jacksonville Fl.









Dr. Patrick Welsh
Graphics By: Robert Richardson
NOAA HRD
Erick Rogers, NRL

University of North Florida
Jacksonville, Florida