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An analysis of Super typhoon Rammasun's(2014) peak intensity

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Super typhoon Rammasun (2014) made landfall over Hainan Island, China, at 0730UTC 18 July 2014. Due to the damage of the anemometers, the Automatic Weather Stations (AWS) and the bouy which by Rammasun passed, failed to obtain its peak wind. Lack of the direct evident, in real-time monitoring, its peak intensities were given by 110kts (.i.e. 60m/s)/910hPa,135kts/922hPa , and 90kts/935hPa based on Dvorak technique , which were made by China Meteorological Administration (CMA),Joint Typhoon Warning Center(JTWC), and Japan Meteorological Agency (JMA) respectively. However, a minimum pressure of 881.2hPa recorded by a barometer which located at Qixhou island (19.982[U+FE12]N,111.269[U+FE12]E) while Rammasun approaching, indicates that its intensity was under estimated. By using observation data such as AWS, satellite, Doppler radar and wind tower near the ground, this study performs a detail evaluation to obtain its actual intensity. At 0521UTC, Qizhou Island station recorded 881.2hPa of the minimum station pressure and 899.2hPa of minimum sea level pressure (MSLP) while the anemometer had been destroyed. These are the lowest records in Chinese history and also are ones of the global lowest pressures obtained directly by barometer. It is evident that Rammasun's eyewall did not pass across Qizhou Island directly, so the actual MSLP should be lower than 899.2hPa. By applying wind-pressure relationship, it is reckoned that the reasonable MSLP and peak wind of Rammasun should be 888hPa and 70-76m/s, which makes Rammasun the strongest typhoon ever made landfall in China's history. In order to intuitively investigate the real intensity of Ramasun, eyewall structures are compared with some historical extreme typhoons (hurricanes) such as Saomai(2006), Haiyan(2013) and Katrina(2005). Satellite images show that the dense overcast convection strength of Rammasun is stronger than those when Saomai and Katrina were in their peak intensities and before landing, but weaker than Haiyan. The advanced Dvorak Technique (ADT), which was developed by Cooperative Institute for Meteorological Satellite Studies (CIMSS) of University of Wisconsin, is used to estimate their intensities. The results show that Rammasun is significantly stronger than Saomai and Katrina in peak and before landing, but weaker than that of Haiyan. Moreover, the 891.7hPa of MSLP given by ADT is approximately the same as the estimated value of 888hPa. The study demonstrates that there the pure Dvorak technique has still limitations in operational monitoring, and presents significant insights for validation and improvement of satellite-based intensity estimates.