

# A Typhoon Swell Freak Wave Hindcast Example

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## Abstract

At about 4 a.m. on August 7, 1992, four fishing ships were totally destroyed by sudden huge waves in the vicinity of Suao Harbor(24.63°N, 121.93°E) at the east coast of Taiwan. One man died, two persons were missing and five fishermen were wounded. As the accident was close to the harbor, some wrecks were drifted to shore. One fisherman reminded that he has never confronted such big waves in his 40 years' fishing career. Two days ago, a medium scale typhoon Janis had been in the area around 19°N, 136°E and moved fast toward Taiwan (Liang, 2006). The data of typhoon Janis are shown in Table I. There was unfortunately no wave measurement. Using the author's "typhoon swell prediction scheme" and assuming Kuroshio current being 2.5 knot, the hindcasted wave are shown in Table II.

Table I Data of typhoon Janis

Month	Day	Time (local)	Latitude	Longitude	Central Pressure $P_C$ (hPa)	Radius of Beaufort Scale No.7 $R7$ (km)	Note
8	4	20	16.5	139.6	990	150	
		5	2	17.3	138.5	990	150
	5	8	18.6	137.5	980	200	
		14	19.1	136.3	970	200	
	17	19.5	135.75	962.5	250	interpolated	
	19	19.77	135.38	957.5	283	interpolated	
	20	19.9	135.2	955	300		
	21	20.05	134.98	954.2	300	interpolated	
	23	20.35	134.55	952.5	300	interpolated	
	6	2	20.8	133.9	950	300	
8			21.7	133.2	950	350	
14		22.7	132.2	950	350		
20		24.1	131.2	945	350		

7	2	25.3	130.2	940	350
	8	26.6	129.5	945	350
	14	28.1	129.1	945	350
	20	29.3	129.1	950	350
8	2	30.5	129.7	950	350

Table II Hindcasted typhoon Janis swell

No.	Day	Time	$H_{1/3}$ (Meter)	$T_P$ (Sec.)	$T_S$ (Sec.)	$\lambda$	DD (N.M.)	$T_D'$ (Hour)	Approaching Speed (knot)	Note
1	7	20.6	0.96	6.9	8.28	2.29	1026.8	1.15		
2		9.88	1.17	8.7	10.49	1.414	940.6	-10.7	14.36	overrun
3		7.85	1.53	9.72	11.66	1.414	886.1	-2.03	12.4	overrun
4		5.58	2.14	10.75	12.9	1.414	827.8	-2.26	12.77	overrun
5		4.73	2.59	11.37	13.64	1.414	802.1	-0.85	12.85	overrun
6		4.46	2.8	11.66	14.0	1.414	789.6	-0.27	12.5	overrun
7		4.73	3.95	11.71	14.05	1.93	774.7	0.27	14.9	
8		5.3	3.99	11.8	14.17	1.88	745	0.57	14.85	
9		6.2	4.08	11.95	14.34	1.82	701.4	0.91	14.53	
10		9.47	3.56	12.22	14.66	1.35	646.3	3.27	9.18	

Due to the swiftly approaching speed around 14 knots and the quickly enhancing typhoon strength increasing from 970 hPa to 955 hPa in 6 hours, the data from No. 2 through No. 6 in Table II are always overrun. No. 7 is the first datum which is not overrun and the wave height modification factor  $\lambda$  amounts to 1.93. After 4.46 O'clock, August 7 (No. 6), the formerly-generated waves are overlapped to the newly-generated swell. One can notice that the time of No. 5 is the same as that of No. 7. This hindcast can answer the reason of the accident. The source of No. 7 datum was when the typhoon was at 21 h, August 5. It was 31 hours before the accident. Actually one could predict it!

## Reference

Liang, N.K. (2006) "The freak wave mystery—a new hypothesis for its occurrence", *Journal of Marine Science and Technology* (accepted).