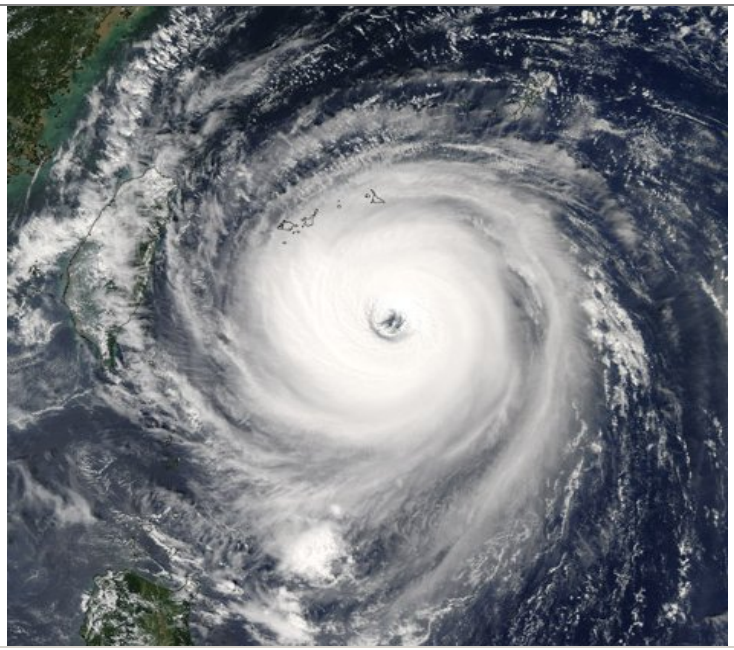
2005

Annual Tropical Cyclone Report

U.S. Naval Maritime Forecast Center/ Joint Typhoon Warning Center
Pearl Harbor, Hawaii



Composite MODIS true color image of Typhoons 19W (Longwang) in the Northwest Pacific Ocean taken on 01 October, 2005. Image courtesy of MODIS Rapid Response Team, NASA Goddard Space Flight Center.

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EDITOR'S NOTE

In an attempt to streamline the process of producing the ATCR, the format for 2005 has changed slightly from the previous two years. The layout of the website is much the same, but there are some major changes to the content. Most noteable is the lack of satellite data for each system, which is readily available via the FNMOC and NRL Monterey websites. To save on loading time of website, and creation time in the development of the website, these images are simply referenced with a hyperlink in each storm page. In addition, the complete PDF version of the ATCR has been removed. Individual storm pages will still have subsequent PDF files that will be downloadable. If there is a need for a complete PDF file, please contact the editor at the below listed link. You can download Adobe Acrobat Reader, free of charge, from the Adobe website.

To use the ATCR, expanding menus indicated by plus (+) and minus (-) signs in the frame on the left side of the screen permit easy navigation. Simply click any (+) sign to open a menu another level.

Feedback is much appreciated and needed to create a product that will remain valuable in future years. Please email the editor at the following link.

ATCR Editor

LT A. D. Lana, USN

Editor, 2005 ATCR

1. SUMMARY OF WESTERN NORTH PACIFIC AND NORTH INDIAN OCEAN TROPICAL CYCLONES

1.1 WESTERN NORTH PACIFIC OCEAN TROPICAL CYCLONES

Tropical cyclone genesis regions compared to the 10-year average are shown in Figure 1-1. This year's tropical cyclones are listed in Table 1-1. Table 1-2 shows the monthly distribution of tropical cyclones for each year since 1959 and Table 1-3 shows the monthly average occurrence of tropical storms separated into: (1) typhoons only; and (2) tropical storms and typhoons. A summary of this year's Tropical Cyclone Formation Alerts is shown in Table 1-4. The annual number of tropical cyclones of tropical storm strength or higher appear in Figure 1-2, while the number of super typhoons are shown in Figure 1-3. Figure 1-4 illustrates a monthly breakdown of system formations based on intensity categories. Composites of the tropical cyclone best tracks for the Western North Pacific appear following Figure 1-4.

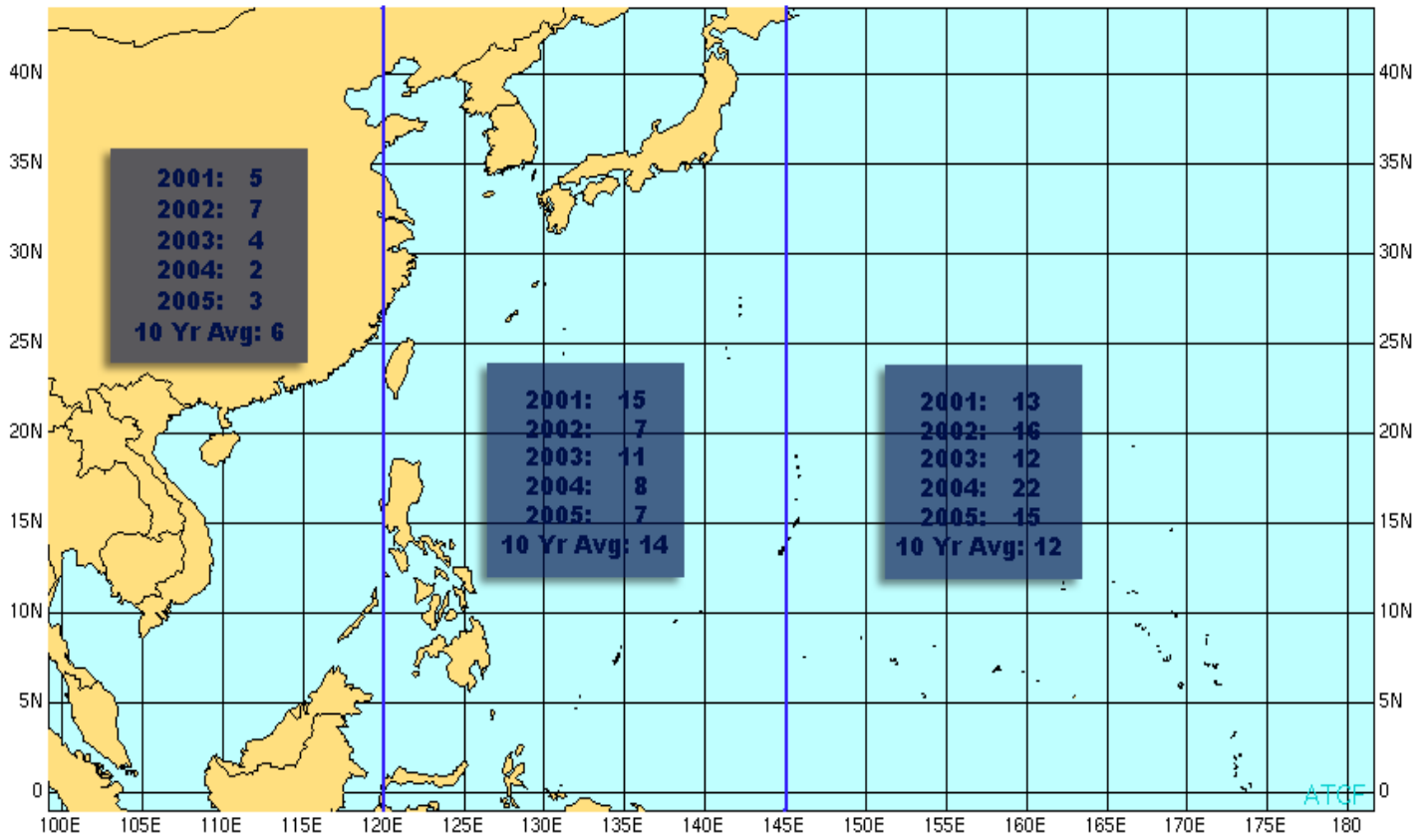


Figure 1-1. Comparison of the number of tropical cyclones that developed within 3 designated areas for 2001 through 2005 and the 10-year average.

Table 1-1 WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES FOR 2005 (01 JAN 2005 - 31 DEC 2005)

TC	NAME *	PERIOD	WARNINGS ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)**
TY 01W	KULAP	13 JAN – 18 JAN	21	65(32.5)	976
TY 02W	ROKE	13 MAR – 17 MAR	19	80(40)	963
TY 03W	SONCA	20 APR – 26 APR	26	115(60)	927
TY 04W	NESAT	30 MAY – 10 JUN	44	125(65)	916
STY 05W	HAITANG	11 JUL – 19 JUL	33	140(70)	898
TS 06W	NALGAE	20 JUL – 23 JUL	15	55(28)	984
TS 07W	BANYAN	21 JUL – 27 JUL	23	60(30)	980
TS 08W	WASHI	28 JUL – 31 JUL	11	45(23)	991
TY 09W	MATSA	31 JUL – 06 AUG	25	90(45)	954
TY 10W	SANVU	10 AUG – 13 AUG	12	65(32.5)	976
TY 11W	MAWAR	19 AUG – 27 AUG	31	125(65)	916
TY 12W	GUCHOL	19 AUG – 25 AUG	21	65(32.5)	976
STY 13W	TALIM	26 AUG – 01 SEP	26	130(67)	910
STY 14W	NABI	29 AUG – 06 SEP	35	140(70)	898
TY 15W	KHANUN	06 SEP – 11 SEP	25	115(60)	927
TS 16W	VICENTE	16 SEP – 18 SEP	11	50(25)	987
TY 17W	DAMREY	20 SEP – 27 SEP	28	90(45)	954
TY 18W	SAOLA	20 SEP – 26 SEP	23	100(50)	943
TY 19W	LONGWANG	25 SEP – 02 OCT	29	125(65)	916
TD 20W	-	07 OCT	2	30(15)	1000
TY 21W	KIROGI	10 OCT – 19 OCT	36	115(60)	927
TY 22W	KAI-TAK	28 OCT -02 NOV	20	85(44)	958
TS 23W	TEMBIN	07 NOV – 11 NOV	19	45(23)	991
TY 24W	BOLAVEN	13 NOV – 20 NOV	29	70(36)	972
TS 25W	-	18 NOV – 20 NOV	8	45(23)	991
		Total#	**572**		

* As Designated by RSMC Tokyo or CPHC

** MSLP Converted from estimated maximum surface winds using Atkinson/Holiday wind-pressure relationship

Table 1-2 DISTRIBUTION OF WESTERN NORTH PACIFIC TROPICAL CYCLONES FOR 1959 - 2005

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
1959	0	1	1	1	0	1	3	8	9	3	2	2	31
	0 0 0	0 1 0	0 1 0	1 0 0	0 0 0	0 0 1	1 1 1	5 1 2	4 2 3	2 1 0	2 0 0	2 0 0	17 7 7
1960	1	0	1	1	1	3	3	9	5	4	1	1	30
	0 0 1	0 0 0	0 0 1	1 0 0	0 1 0	2 1 0	2 1 0	8 1 0	0 4 1	4 0 0	1 0 0	1 0 0	19 8 3
1961	1	1	1	1	4	6	5	7	6	7	2	1	42
	0 1 0	0 1 0	1 0 0	0 1 0	2 1 1	1 1 4	3 2 0	3 1 3	5 1 0	3 2 2	1 0 1	1 0 0	20 11 11
1962	0	1	0	1	3	0	8	8	7	5	4	2	39
	0 0 0	0 1 0	0 0 0	1 0 0	2 0 1	0 0 0	5 1 2	7 0 1	3 1 3	3 1 1	3 0 1	0 2 0	24 6 9
1963	0	0	1	1	0	4	5	4	4	6	0	3	28
	0 0 0	0 0 0	0 0 1	1 0 0	0 0 0	3 1 0	3 1 1	3 0 1	2 2 0	5 1 0	0 0 0	2 1 0	19 6 3
1964	0	0	0	0	3	2	8	8	8	7	6	2	44
	0 0 0	0 0 0	0 0 0	0 0 0	2 0 1	2 0 0	6 1 1	3 5 0	5 2 1	3 3 1	4 2 0	1 0 1	26 13 5
1965	2	2	1	1	2	4	6	7	9	3	2	1	40
	1 1 0	0 2 0	0 1 0	1 0 0	1 0 1	3 1 0	4 1 1	3 2 2	5 3 1	2 0 1	1 1 0	0 1 0	21 13 6
1966	0	0	0	1	2	1	4	9	10	4	5	2	38
	0 0 0	0 0 0	0 0 0	1 0 0	2 0 0	1 0 0	3 1 0	5 3 1	5 3 2	1 1 2	1 2 2	1 0 1	20 10 8
1967	1	0	2	1	1	1	8	10	8	4	4	1	41
	0 1 0	0 0 0	1 1 0	1 0 0	0 1 0	1 0 0	3 3 2	3 4 3	5 3 0	2 1 1	4 0 0	0 1 0	20 15 6
1968	0	1	0	1	0	4	3	8	4	6	4	0	31
	0 0 0	0 0 1	0 0 0	1 0 0	0 0 0	2 0 2	1 2 0	3 4 1	4 0 0	5 1 0	4 0 0	0 0 0	20 7 4
1969	1	0	1	1	0	0	3	3	6	5	2	1	23
	1 0 0	0 0 0	0 1 0	1 0 0	0 0 0	0 0 0	2 1 0	2 1 0	2 0 4	4 1 0	1 1 0	0 1 0	13 6 4
1970	0	1	0	0	0	2	3	7	4	6	4	0	27
	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	1 1 0	0 2 1	4 2 1	2 2 0	3 2 1	1 3 0	0 0 0	12 12 3
1971	1	0	1	2	5	2	8	5	7	4	2	0	37
	0 1 0	0 0 0	0 1 0	2 0 0	2 3 0	2 0 0	6 2 0	3 1 1	5 1 1	3 1 0	1 1 0	0 0 0	24 11 2
1972	1	0	1	0	0	4	5	5	6	5	2	3	32
	1 0 0	0 0 0	0 0 1	0 0 0	0 0 0	2 2 0	4 1 0	3 2 0	4 1 1	4 1 0	2 0 0	2 1 0	22 8 2
1973	0	0	0	0	0	0	7	6	3	4	3	0	23
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 0	2 3 1	2 0 1	4 0 0	0 3 0	0 0 0	12 9 2
1974	1	0	1	1	1	4	5	7	5	4	4	2	35
	0 1 0	0 0 0	0 1 0	0 1 0	1 0 0	1 2 1	2 3 0	2 3 2	3 2 0	4 0 0	2 2 0	0 2 0	15 17 3
1975	1	0	0	1	0	0	1	6	5	6	3	2	25
	1 0 0	0 0 0	0 0 0	0 0 1	0 0 0	0 0 0	0 1 0	4 1 1	4 1 0	3 2 1	2 1 0	0 2 0	14 6 5
1976	1	1	0	2	2	2	4	4	5	0	2	2	25
	1 0 0	0 1 0	0 0 0	1 1 0	2 0 0	2 0 0	2 2 0	1 3 0	4 1 0	0 0 0	1 1 0	0 2 0	14 11 0
1977	0	0	1	0	1	1	4	2	5	4	2	1	21
	0 0 0	0 0 0	0 1 0	0 0 0	0 0 1	0 1 0	3 0 1	0 2 0	2 3 0	3 1 0	2 0 0	1 0 0	11 8 2

1978	1	0	0	1	0	3	4	8	4	7	4	0	32
	0 1 0	0 0 0	0 0 0	1 0 0	0 0 0	0 3 0	3 1 0	3 4 1	3 1 0	4 1 2	1 2 1	0 0 0	15 13 4
1979	1	0	1	1	2	0	5	4	6	3	2	3	28
	1 0 0	0 0 0	1 0 0	1 0 0	0 1 1	0 0 0	2 2 1	2 0 2	3 3 0	2 1 0	1 1 0	1 1 1	14 9 5
1980	0	0	1	1	4	1	5	3	7	4	1	1	28
	0 0 0	0 0 0	0 0 1	0 1 0	2 2 0	0 1 0	3 1 1	2 0 1	5 1 1	2 2 0	1 0 0	0 1 0	15 9 4
1981	0	0	1	1	1	2	5	8	4	2	3	2	29
	0 0 0	0 0 0	1 0 0	0 1 0	0 1 0	2 0 0	2 3 0	2 5 1	4 0 0	1 1 0	2 1 0	2 0 0	16 12 1
1982	0	0	3	0	1	3	4	5	6	4	1	1	28
	0 0 0	0 0 0	2 1 0	0 0 0	1 0 0	1 2 0	2 2 0	5 0 0	3 2 1	3 0 1	1 0 0	1 0 0	19 7 2
1983	0	0	0	0	0	1	3	6	3	5	5	2	25
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	3 0 0	2 3 1	1 1 1	3 2 0	3 2 0	0 2 0	12 11 2
1984	0	0	0	0	0	2	5	7	4	8	3	1	30
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	4 1 0	2 3 2	1 3 0	5 2 1	3 0 0	1 0 0	16 11 3
1985	2	0	0	0	1	3	1	7	5	5	1	2	27
	0 2 0	0 0 0	0 0 0	0 0 0	1 0 0	2 0 1	1 0 0	5 2 0	3 2 0	4 1 0	0 1 0	1 1 0	17 9 1
1986	0	1	0	1	2	2	2	5	2	5	4	3	27
	0 0 0	1 0 0	0 0 0	1 0 0	1 1 0	1 1 0	2 0 0	4 1 0	2 0 0	3 2 0	2 2 0	2 1 0	19 8 0
1987	1	0	0	1	0	2	4	4	7	2	3	1	25
	1 0 0	0 0 0	0 0 0	0 1 0	0 0 0	1 1 0	4 0 0	3 1 0	5 1 1	2 0 0	1 2 0	1 0 0	18 6 1
1988	1	0	0	0	1	3	2	5	8	4	2	1	27
	1 0 0	0 0 0	0 0 0	0 0 0	1 0 0	1 1 1	1 1 0	2 3 0	2 6 0	4 0 0	2 0 0	0 1 0	14 12 1
1989	1	0	0	1	2	2	6	8	4	6	3	2	35
	0 1 0	0 0 0	0 0 0	1 0 0	2 0 0	1 1 0	2 3 1	3 3 2	2 2 0	6 0 0	3 0 0	1 0 1	21 10 4
1990	1	0	0	1	2	4	4	5	5	5	4	1	32
	1 0 0	0 0 0	0 0 0	0 1 0	1 1 0	2 1 1	2 2 0	5 0 0	4 1 0	2 3 0	3 1 0	1 0 0	21 10 1
1991	0	0	2	1	1	1	4	8	6	3	6	0	32
	0 0 0	0 0 0	1 1 0	0 1 0	1 0 0	1 0 0	4 0 0	3 3 2	4 2 0	3 0 0	3 3 0	0 0 0	20 10 2
1992	1	1	0	0	0	3	4	8	5	6	5	0	33
	1 0 0	0 1 0	0 0 0	0 0 0	0 0 0	2 1 0	2 2 0	4 4 0	4 1 0	5 1 0	3 1 1	0 0 0	21 11 1
1993	0	0	2	2	1	2	5	8	5	6	4	3	38
	0 0 0	0 0 0	0 1 1	0 0 2	0 1 0	1 0 1	3 2 0	6 1 1	4 1 0	3 2 1	1 1 2	3 0 0	21 9 8
1994	1	0	1	0	2	2	9	9	8	7	0	2	41
	0 0 1	0 0 0	1 0 0	0 0 0	1 0 1	0 2 0	3 4 2	6 3 0	4 4 0	5 1 1	0 0 0	1 1 0	21 15 5
1995	1	0	0	0	1	2	3	7	7	8	2	3	34
	0 0 1	0 0 0	0 0 0	0 0 0	0 1 0	0 2 0	2 1 0	4 2 1	4 1 2	5 1 2	0 2 0	0 1 2	15 11 8
1996	1	1	0	2	2	0	7	10	7	5	6	3	43
	0 0 1	0 0 1	0 0 0	0 1 1	1 1 0	0 0 0	6 1 0	4 3 3	6 1 0	2 1 2	1 3 2	1 1 1	21 12 10
1997	1	0	0	2	3	3	4	8	4	6	1	1	33
	0 1 0	0 0 0	0 0 0	1 1 0	1 2 0	3 0 0	3 1 0	6 1 1	3 1 0	4 1 1	1 0 0	1 0 0	23 8 2
1998	0	0	0	0	0	0	3	3	8	6	3	4	27
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 2	2 1 0	4 1 3	2 1 3	0 3 0	1 1 2	9 8 10
1999	1	1	0	3	0	1	5	9	6	2	3	3	34
	0 1 0	0 1 0	0 0 0	2 1 0	0 0 0	1 0 0	1 1 3	4 2 3	2 4 0	1 1 0	1 1 1	0 0 3	12 12 10
2000	0	0	0	0	4	0	8	9	6	3	3	1	34
	0 0 0	0 0 0	0 0 0	0 0 0	1 1 2	0 0 0	2 3 3	4 3 2	4 1 1	2 1 0	1 1 1	1 0 0	15 10 9
2001	0	1	0	1	1	2	6	7	5	3	3	4	33
	0 0 0	0 0 1	0 0 0	0 0 1	0 1 0	2 0 0	4 1 1	3 3 1	5 0 0	3 0 0	1 2 0	2 2 0	20 9 4

2002	1	1	1	1	2	3	6	8	3	5	1	1	33
	0 1 0	1 0 0	0 0 1	0 0 1	1 0 1	3 0 0	3 2 1	4 3 1	1 2 0	3 0 2	1 0 0	1 0 0	18 8 7
2003	1	0	0	1	3	2	2	5	3	6	3	1	27
	0 1 0	0 0 0	0 0 0	1 0 0	1 1 1	1 1 0	2 0 0	4 1 0	3 0 0	2 1 3	3 0 0	0 1 0	17 6 4
2004	0	1	1	1	3	5	2	9	3	3	2	2	32
	0 0 0	0 1 0	0 1 0	1 0 0	2 1 0	5 0 0	1 1 0	6 2 1	1 1 1	3 0 0	2 0 0	0 2 0	21 9 2
2005	1	0	1	1	0	1	4	6	5	3	2	1	25
	1 0 0	0 0 0	1 0 0	1 0 0	0 0 0	1 0 0	1 3 0	6 0 0	4 1 0	2 0 1	1 1 0	0 1 0	18 6 1
(1959-2005)													
MEAN	0.6	0.3	0.6	0.8	1.4	2.0	4.6	6.6	5.6	4.7	2.9	1.6	31.6
CASES	28	15	26	39	64	96	215	312	262	219	134	75	1484

The criteria used in TABLE 1-2 are as follows:

1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.

2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.

3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

Table 1-2 Legend:		
Total month/year		
GTE 64 knots (Typhoon)	35 to 63 knots (Tropical Storm)	LTE 34 knots (Tropical Depression)

TABLE 1-3 WESTERN NORTH PACIFIC TROPICAL CYCLONES

TYPHOONS (1945-1958)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.4	0.1	0.3	0.4	0.7	1.1	2	2.9	3.2	2.4	2	0.9	24.4
CASES	5	1	4	5	10	15	28	41	45	34	28	12	228
TYPHOONS (1959-2005)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.2	0.1	0.2	0.4	0.7	1.2	2.6	3.5	3.3	3.1	1.6	0.7	17.7
CASES	11	3	9	19	31	54	120	163	154	143	73	33	795
TROPICAL STORMS AND TYPHOONS (1945-1958)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.4	0.1	0.5	0.5	0.8	1.6	2.9	4	4.2	3.3	2.7	1.2	22.2
CASES	6	2	7	8	11	22	44	60	64	49	41	18	332
TROPICAL STORMS AND TYPHOONS (1959-2005)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.5	0.2	0.4	0.6	1.0	1.6	3.8	5.1	4.7	3.8	2.4	1.2	26.4
CASES	22	9	18	30	47	74	179	240	220	177	114	55	1215

TABLE 1-4 TROPICAL CYCLONE FORMATION ALERTS FOR THE WESTERN NORTH PACIFIC OCEAN FOR 1976-2005

YEAR	INITIAL TCFAS	TROPICAL CYCLONES WITH TCFAS	TOTAL TROPICAL CYCLONES	PROBABILITY OF TCFA WITHOUT WARNING*	PROBABILITY OF TCFA BEFORE WARNING
1976	34	25	25	36%	100%
1977	26	20	21	29%	95%
1978	32	27	32	16%	84%
1979	27	23	28	14%	82%
1980	37	28	28	32%	100%
1981	29	28	29	3%	97%
1982	36	26	28	36%	93%
1983	31	25	25	24%	100%
1984	37	30	30	23%	100%
1985	39	26	27	48%	96%
1986	38	27	27	41%	100%
1987	31	24	25	28%	96%
1988	33	26	27	26%	96%
1989	51	32	35	54%	91%
1990	33	30	31	10%	97%
1991	37	29	31	26%	94%
1992	36	32	32	13%	100%
1993	50	35	38	39%	92%
1994	50	40	40	25%	100%
1995	54	33	35	60%	94%
1996	41	39	43	5%	91%
1997	36	30	33	18%	91%
1998	38	18	27	74%	67%
1999	39	29	33	30%	88%
2000	40	31	34	26%	91%
2001	34	28	33	18%	82%
2002	39	31	33	24%	94%
2003	31	27	27	15%	100%
2004	35	32	32	9%	100%
2005	26	25	25	4%	100%
(1976-2005)					
MEAN:	36.7	28.5	30.5	27%	94%
TOTALS:	1100	856	914		

* Percentage of initial TCFAs not followed by warnings.

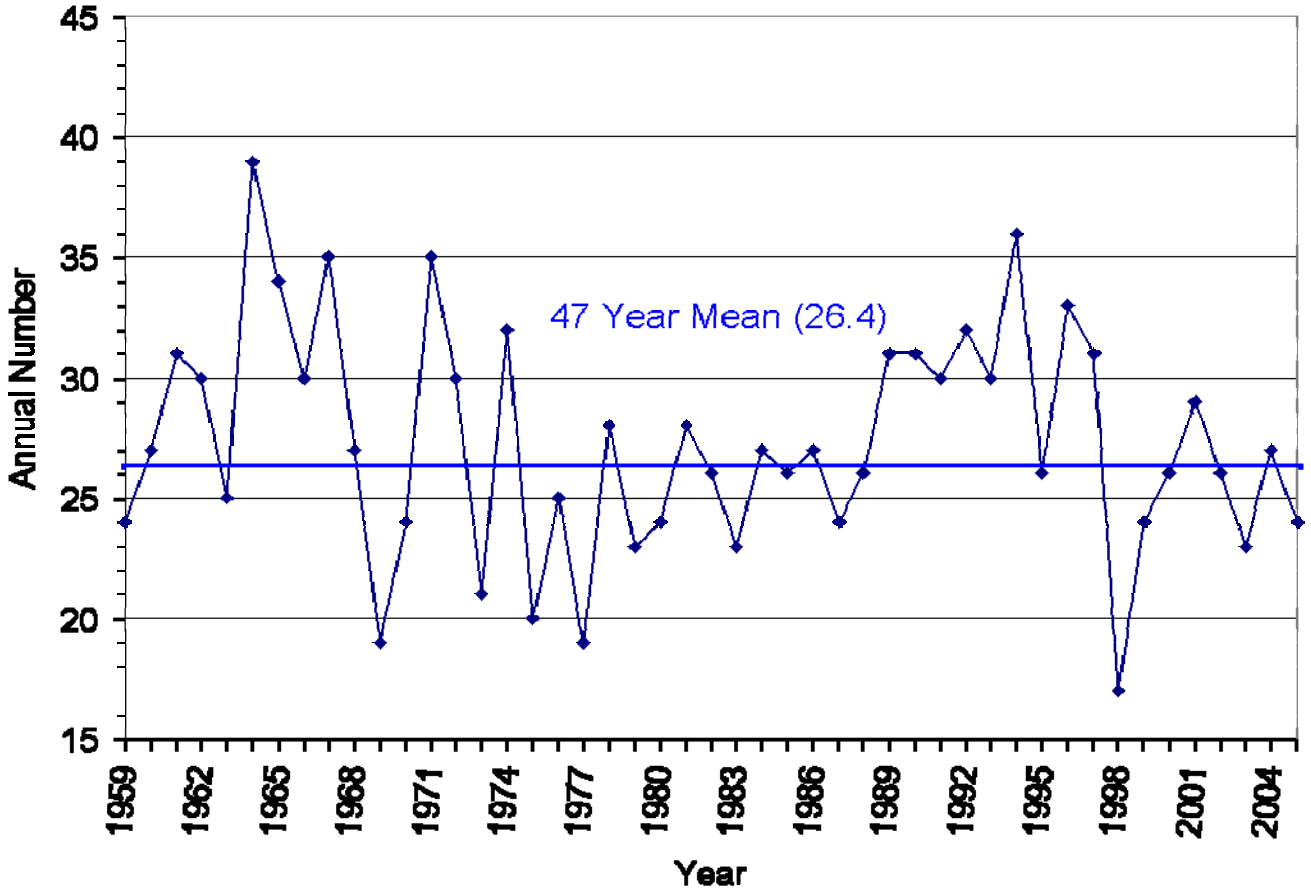


Figure 1-2. Tropical cyclones of tropical storm or greater intensity in the western North Pacific (1959-2005).

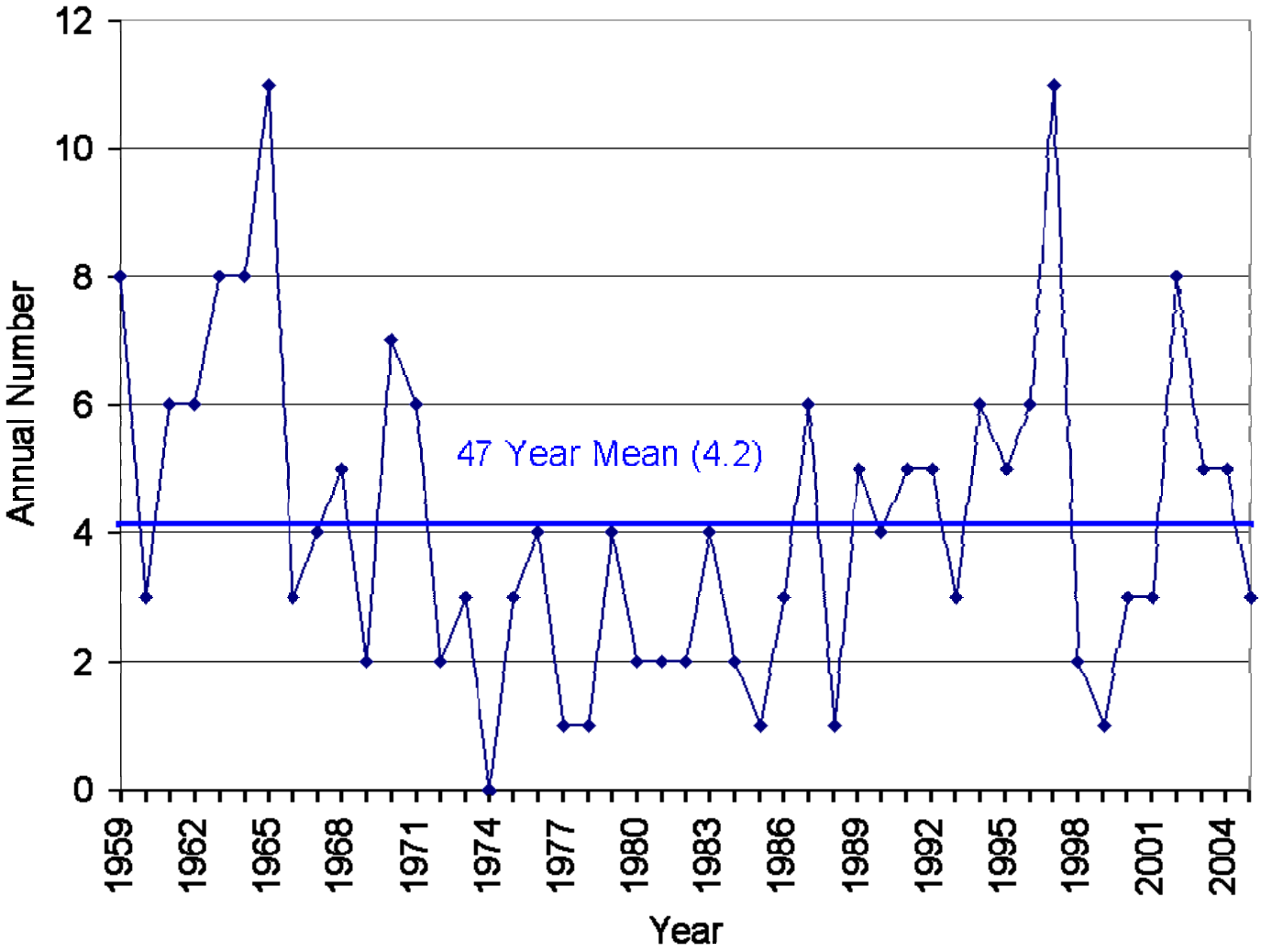


Figure 1-3. Number of Western North Pacific super typhoons (1959-2005).

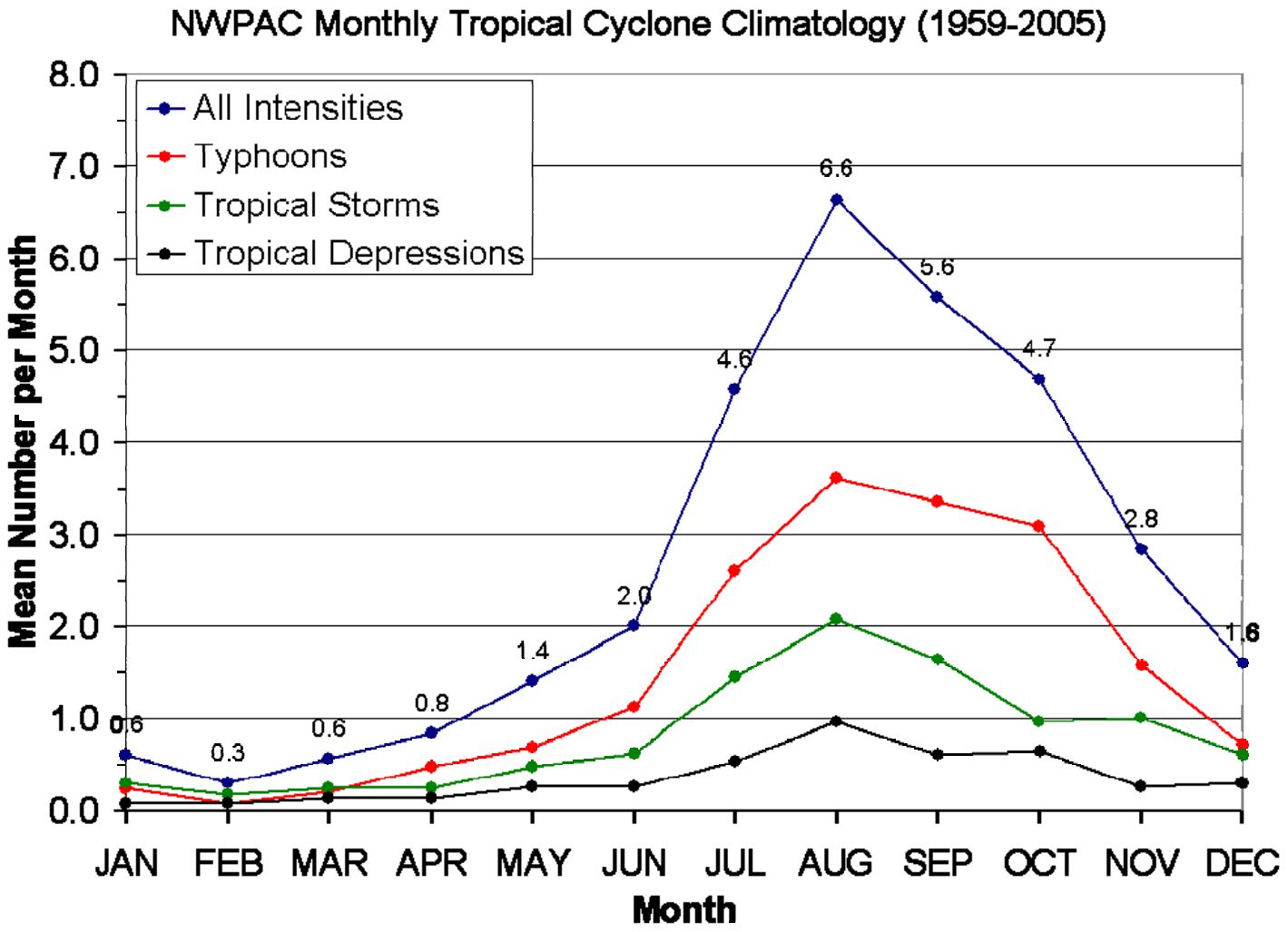
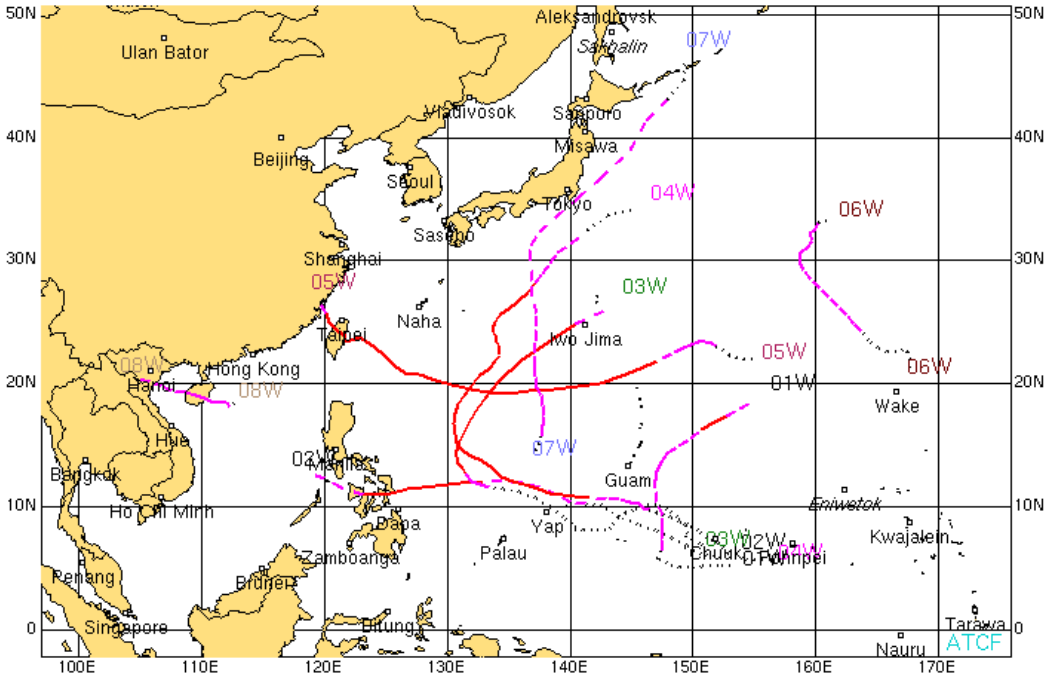


Figure 1-4. Average monthly tropical cyclones of all strengths (1959-2005).

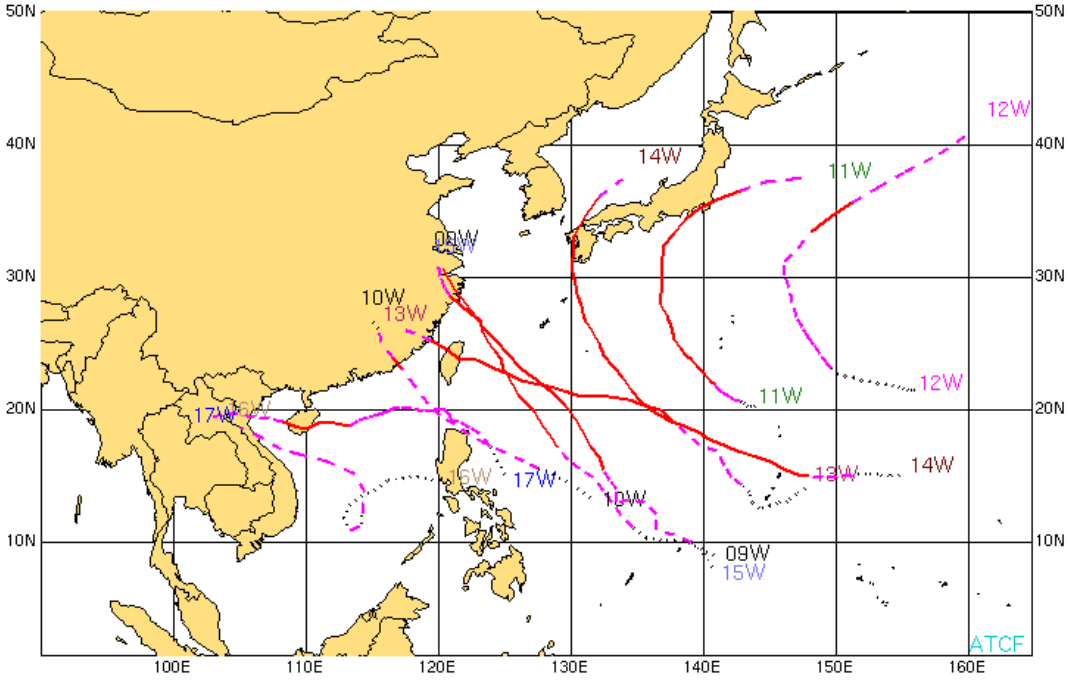
NORTHWEST PACIFIC TROPICAL CYCLONES 12 JAN 05 – 31 JUL 05



01W	TS KULAP	12 JAN - 18 JAN
02W	TY ROKE	11 MAR - 17 MAR
03W	TY SONCA	16 APR - 26 APR
04W	TY NESAT	27 MAY - 10 JUN
05W	ST HAITANG	10 JUL - 19 JUL
06W	TS NALGAE	17 JUL - 23 JUL
07W	TS BANYAN	19 JUL - 29 JUL
08W	TS WASHI	27 JUL - 31 JUL

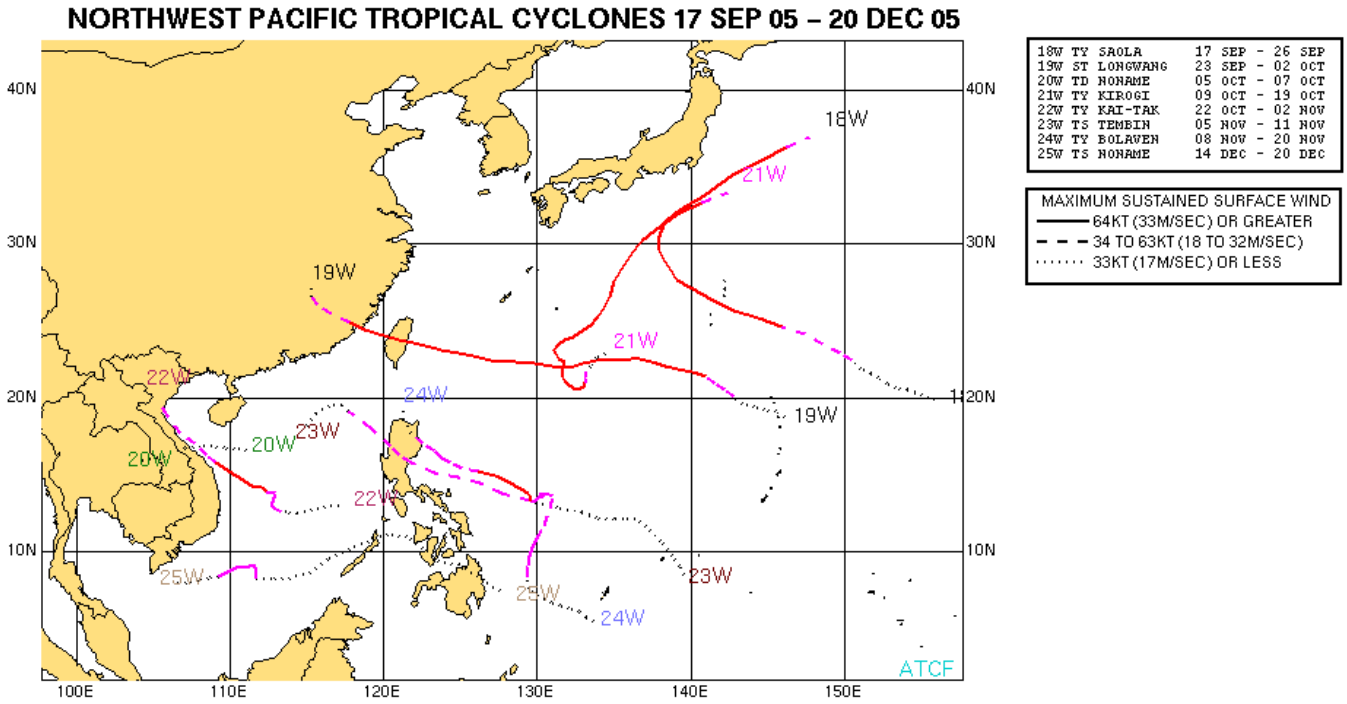
MAXIMUM SUSTAINED SURFACE WIND
64KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS

NORTHWEST PACIFIC TROPICAL CYCLONES 29 JUL 05 – 29 SEP 05



09W	TY MATSA	29 JUL - 06 AUG
10W	TY SANVU	08 AUG - 13 AUG
11W	ST MAWAR	18 AUG - 27 AUG
12W	TS GUCHOL	16 AUG - 25 AUG
13W	TY TALIM	22 AUG - 01 SEP
14W	ST NABI	28 AUG - 06 SEP
15W	TY KHANUN	04 SEP - 11 SEP
16W	TS VICENTE	13 SEP - 18 SEP
17W	TY DAMREY	18 SEP - 29 SEP

MAXIMUM SUSTAINED SURFACE WIND
64KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS



1.2 NORTH INDIAN OCEAN TROPICAL CYCLONES

Tropical cyclone genesis regions are compared to the overall 10-year average in Figure 1-5.This year's North Indian Ocean tropical cyclones are listed in Table 1-5. The monthly distribution of tropical cyclones for each year since 1975 is shown in Table 1-6. Composites of the tropical cyclone best tracks for the Northern Indian Ocean appear following Table 1-6.

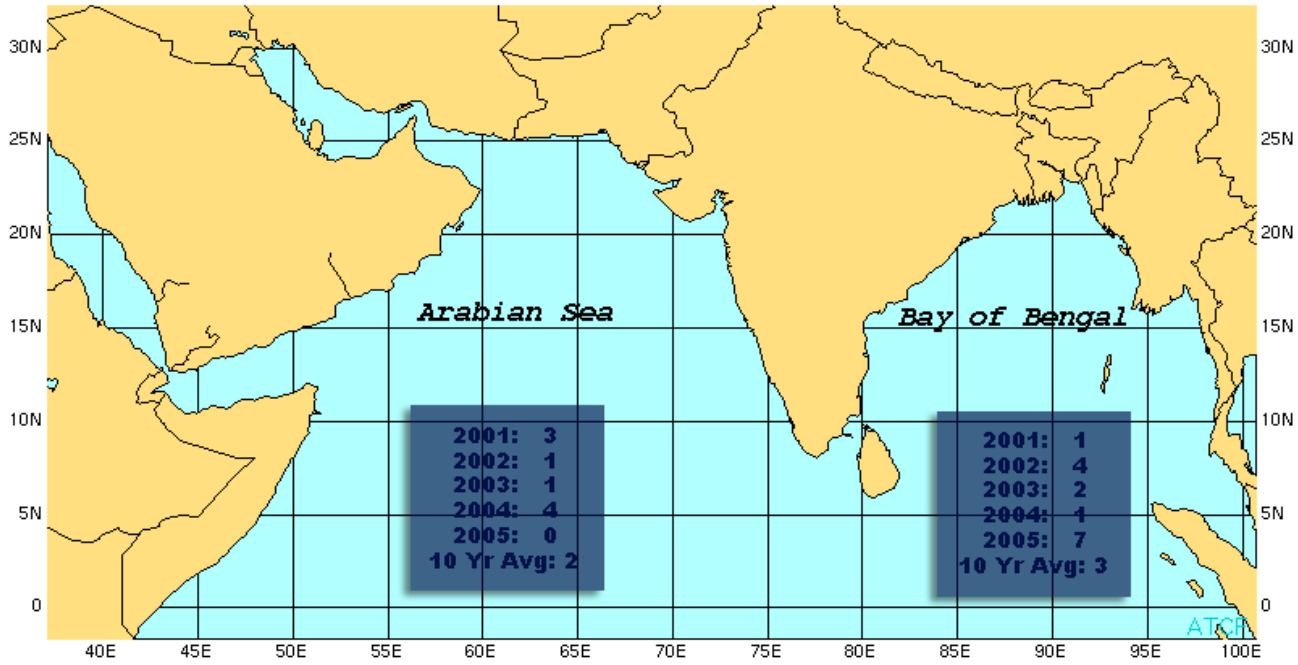


Figure 1-5. Comparison of the number of tropical cyclones that developed in Bay of Bengal and Arabian Sea for 2001 through 2005 and the 10-year average.

Table 1-5 NORTH INDIAN OCEAN SIGNIFICANT TROPICAL CYCLONES FOR 2005 (01 JAN 2004 - 31 DEC 2005)

TC	NAME	PERIOD	WARNINGS ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)*
01B	-	05May-10May	7	30 (15)	1000
02B	Hibaru	17May-19May	10	35 (17.5)	997
03B	-	01Oct-03Oct	3	35 (17.5)	997
04B	-	04Oct-07Oct	3	35 (17.5)	997
05B	Baaz	28Nov-03Dec	10	45 (23)	991
06B	Fanoos	06 Dec – 10 Dec	11	60(30)	980
07B	-	17 Dec – 22 Dec	12	45(23)	992
		Total #	**56**		

*MSLP Converted from estimated maximum surface winds using Atkinson/Holliday wind-pressure relationship

Table 1-6 DISTRIBUTION OF NORTHERN INDIAN OCEAN TROPICAL CYCLONES FOR 1975 - 2005

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
	010	000	000	000	200	000	000	000	000	100	020	000	330
1976	0	0	0	1	0	1	0	0	1	1	0	1	5
	000	000	000	010	000	010	000	000	010	010	000	010	050
1977	0	0	0	0	1	1	0	0	0	1	0	2	5
	000	000	000	000	010	010	000	000	000	010	000	110	140
1978	0	0	0	0	1	0	0	0	0	1	2	0	4
	000	000	000	000	010	000	000	000	000	010	200	000	220
1979	0	0	0	0	1	1	0	0	2	1	2	0	7
	000	000	000	000	100	010	000	000	011	010	011	000	142
1980	0	0	0	0	0	0	0	0	0	0	1	1	2
	000	000	000	000	000	000	000	000	000	000	010	010	020
1981	0	0	0	0	0	0	0	0	1	0	1	1	3
	000	000	000	000	000	000	000	000	010	000	100	100	210
1982	0	0	0	0	1	1	0	0	0	2	1	0	5
	000	000	000	000	100	010	000	000	000	020	100	000	230
1983	0	0	0	0	0	0	0	1	0	1	1	0	3
	000	000	000	000	000	000	000	010	000	010	010	000	030
1984	0	0	0	0	1	0	0	0	0	1	2	0	4
	000	000	000	000	010	000	000	000	000	010	200	000	220
1985	0	0	0	0	2	0	0	0	0	2	1	1	6
	000	000	000	000	020	000	000	000	000	020	010	010	060
1986	1	0	0	0	0	0	0	0	0	0	2	0	3
	010	000	000	000	000	000	000	000	000	000	020	000	030
1987	0	1	0	0	0	2	0	0	0	2	1	2	8
	000	010	000	000	000	020	000	000	000	020	010	020	080
1988	0	0	0	0	0	1	0	0	0	1	2	1	5
	000	000	000	000	000	010	000	000	000	010	110	010	140
1989	0	0	0	0	1	1	0	0	0	0	1	0	3
	000	000	000	000	010	010	000	000	000	000	100	000	120
1990	0	0	0	1	1	0	0	0	0	0	1	1	4
	000	000	000	001	100	000	000	000	000	000	001	010	112
1991	1	0	0	1	0	1	0	0	0	0	1	0	4
	010	000	000	100	000	010	000	000	000	000	100	000	220
1992	0	0	0	0	1	2	1	0	1	3	3	2	13
	000	000	000	000	100	020	010	000	001	021	210	020	382
1993	0	0	0	0	0	0	0	0	0	0	2	0	2
	000	000	000	000	000	000	000	000	000	000	200	000	200
1994	0	0	1	1	0	1	0	0	0	1	1	0	5
	000	000	010	100	000	010	000	000	000	010	010	000	140
1995	0	0	0	0	0	0	0	0	1	1	2	0	4
	000	000	000	000	000	000	000	000	010	010	200	000	220

1996	0	0	0	0	1	3	0	0	0	2	2	0	8
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	1 2 0	0 0 0	0 0 0	0 0 0	1 1 0	2 0 0	0 0 0	4 4 0
1997	0	0	0	0	1	0	0	0	1	1	1	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	0 1 0	0 0 0	2 2 0
1998	0	0	0	0	2	1	0	0	1	1	2	1	8
	0 0 0	0 0 0	0 0 0	0 0 0	1 1 0	1 0 0	0 0 0	0 0 0	0 1 0	0 1 0	2 0 0	1 0 0	5 3 0
1999	0	1	0	0	1	1	0	0	0	2	0	0	5
	0 0 0	0 1 0	0 0 0	0 0 0	1 0 0	0 1 0	0 0 0	0 0 0	0 0 0	2 0 0	0 0 0	0 0 0	3 2 0
2000	0	0	0	0	0	0	0	0	0	2	1	1	4
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	1 0 0	0 1 0	1 3 0
2001	0	0	0	0	1	0	0	0	1	1	1	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 1	0 0 0	1 2 1
2002	0	0	0	0	2	0	0	0	0	0	2	1	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 1 0	0 5 0
2003	0	0	0	0	1	0	0	0	0	0	1	1	3
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	2 1 0
2004	0	0	0	0	2	0	0	0	0	2	1	0	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	1 0 0	0 0 0	1 4 0
2005	2	0	0	0	0	0	0	0	0	2	1	2	7
	0 1 1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 1 0	0 2 0	0 6 1
(1975-2005)													
MEAN	0.1	0.1	0	0.1	0.7	0.6	0	0	0.3	1.0	1.3	0.5	5
CASES	5	2	1	4	23	17	1	1	9	32	41	18	154

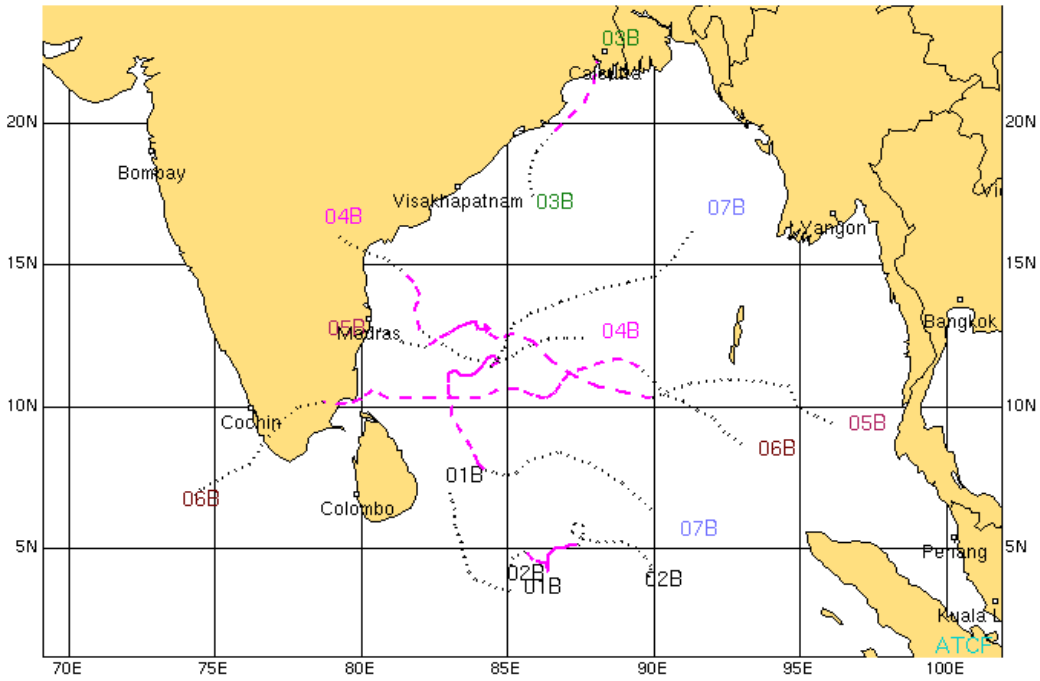
The criteria used in TABLE 1-6 are as follows:

1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.

2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.

3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

NORTH INDIAN OCEAN TROPICAL CYCLONES 01 JAN 05 – 24 DEC 05



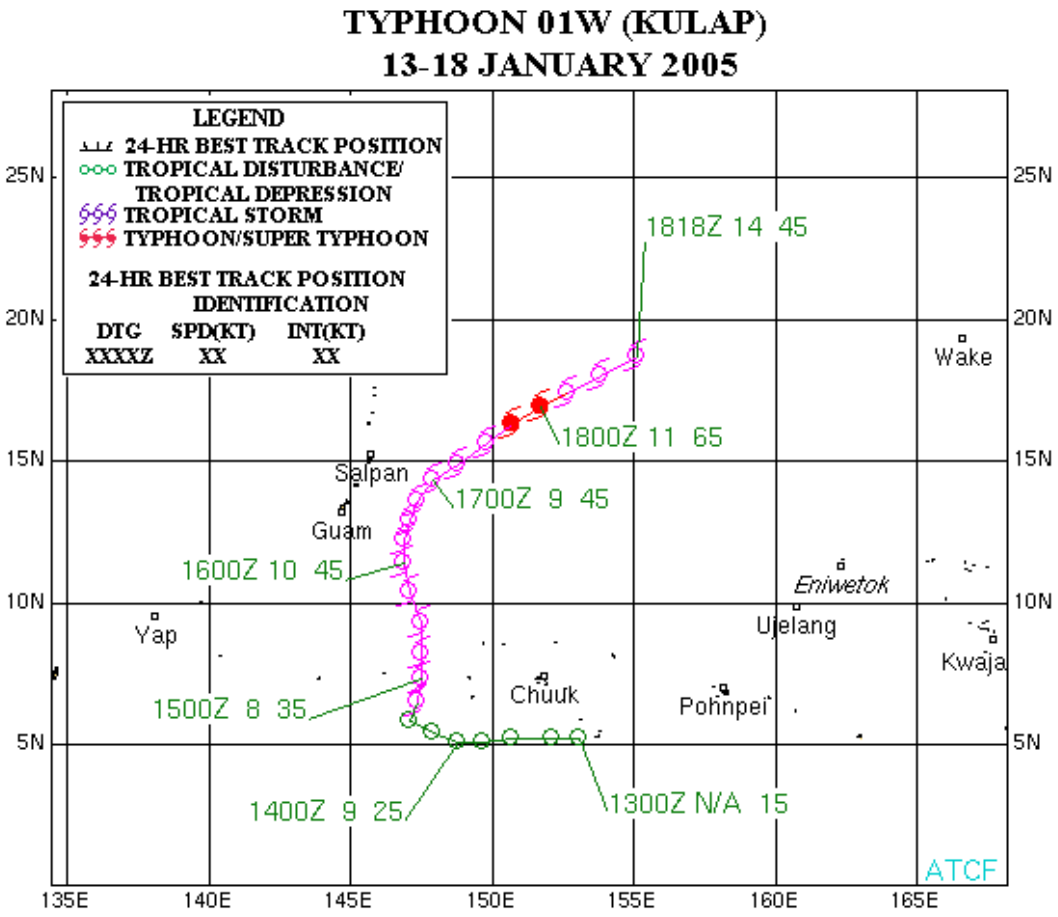
01B	TD NONAME	01 JAN - 10 JAN
02B	TS HIBARU	11 JAN - 17 JAN
03B	TS NONAME	01 OCT - 03 OCT
04B	TS NONAME	24 OCT - 29 OCT
05B	TS BAAZ	24 NOV - 04 DEC
06B	TY FANOOS	03 DEC - 13 DEC
07B	TS NONAME	12 DEC - 24 DEC

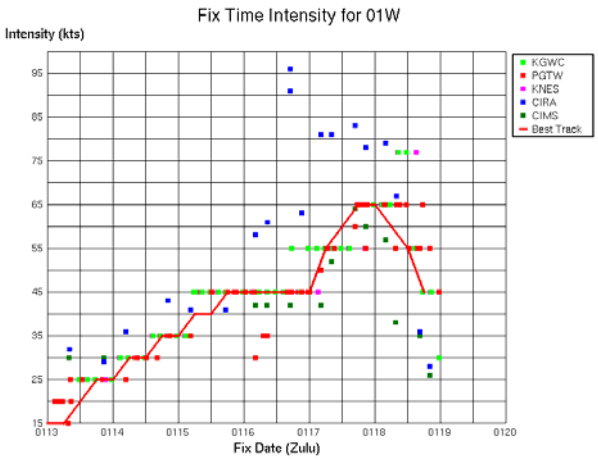
MAXIMUM SUSTAINED SURFACE WIND

- 64KT (33M/SEC) OR GREATER
- 34 TO 63KT (18 TO 32M/SEC)
- 33KT (17M/SEC) OR LESS

Typhoon (TY) 01W (Kulap)

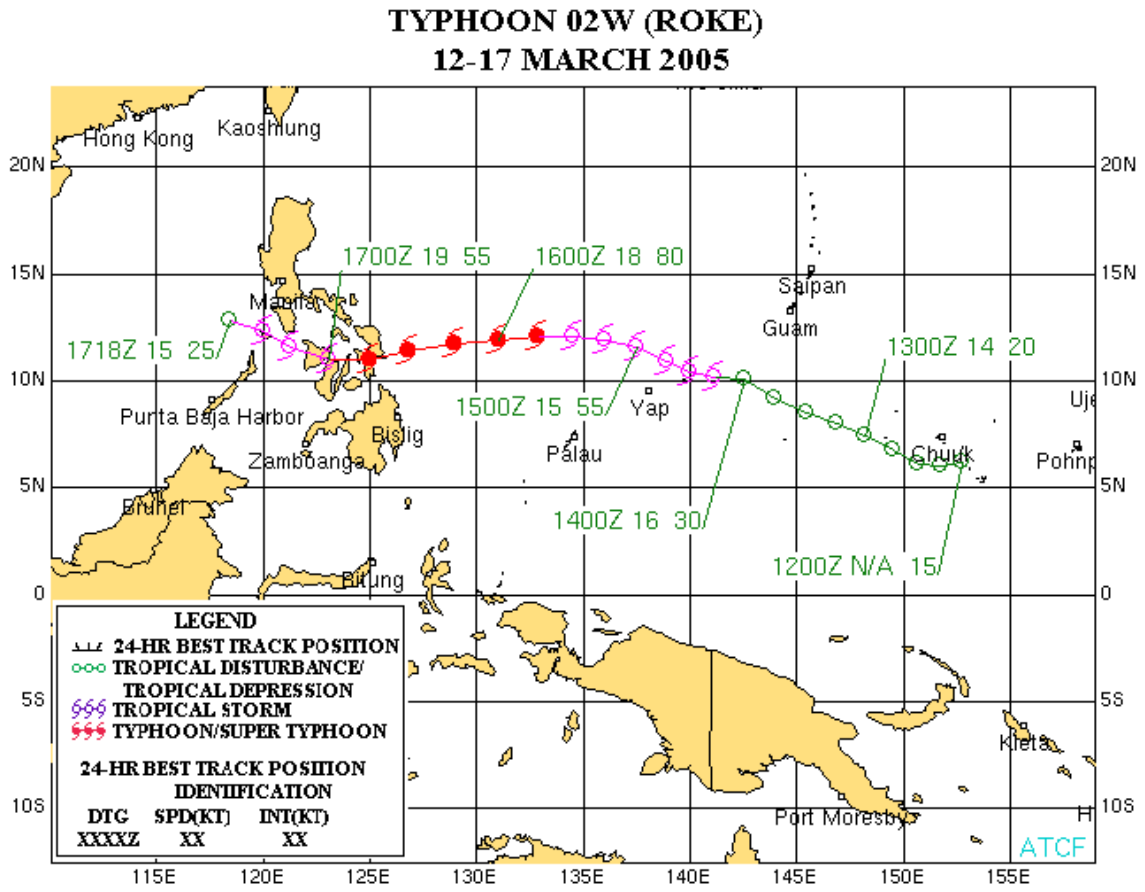
First Poor : 1200Z 12 Jan 05
First Fair : 2100Z 12 Jan 05
First TCFA : 1400Z 13 Jan 05
First Warning : 1800Z 13 Jan 05
Last Warning : 1800Z 18 Jan 05
Max Intensity : 65 kts, gusts to 80 kts
Total Warnings : 21

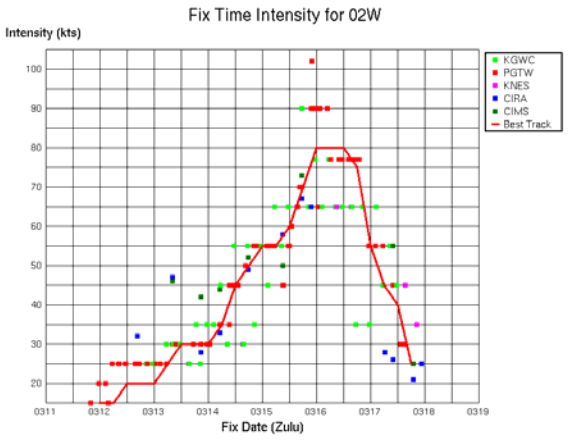




Typhoon 02W (Roke)

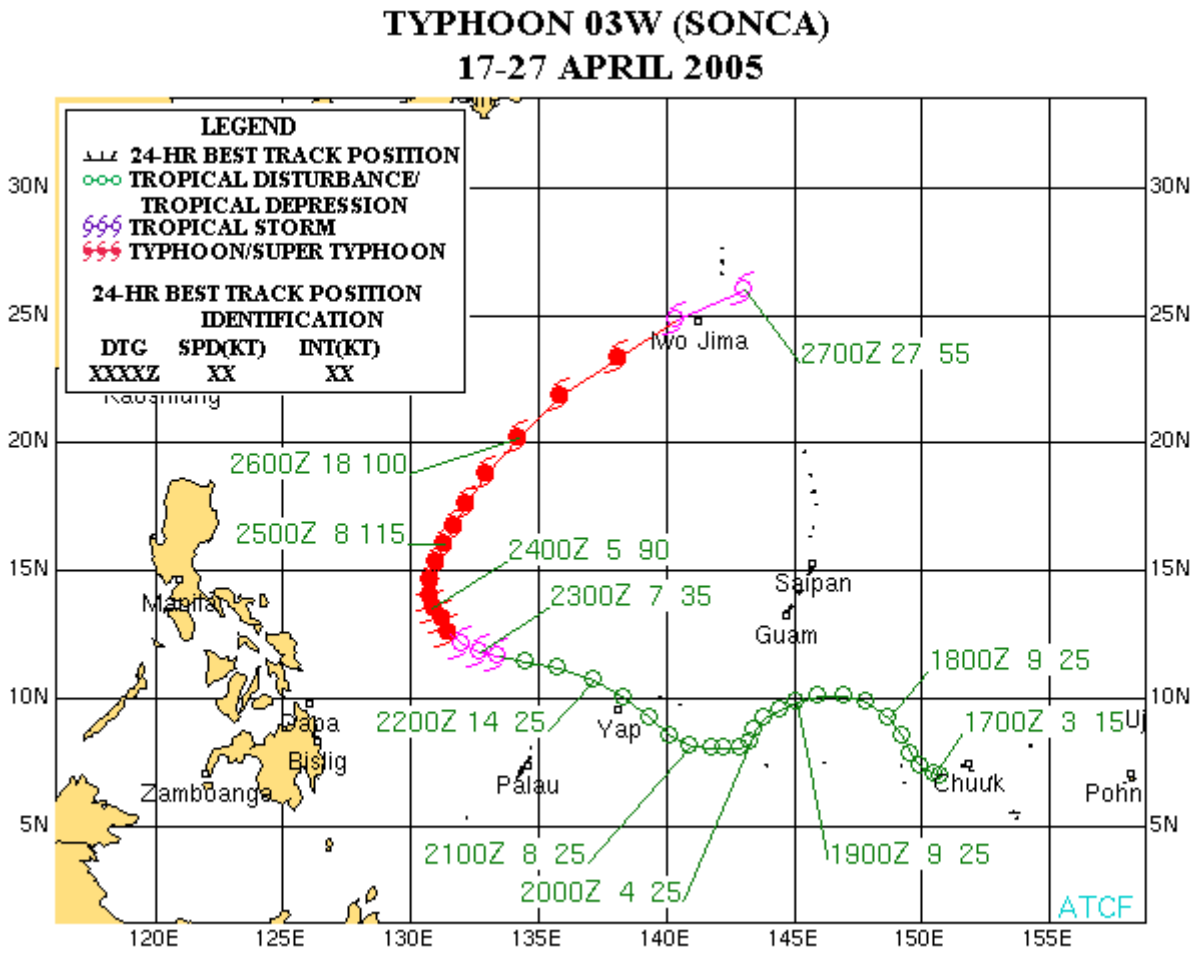
First Poor : 2300Z 11 Mar 05
First Fair : 1100Z 12 Mar 05
First TCFA : 2200Z 12 Mar 05
First Warning : 0600Z 13 Mar 05
Last Warning : 1800Z 17 Mar 05
Max Intensity : 80 kts, gusts to 100 kts
Total Warnings : 19

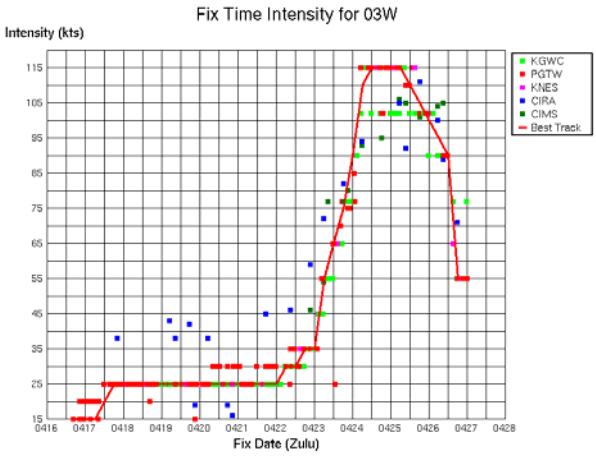




Typhoon (TY) 03W (Sonca)

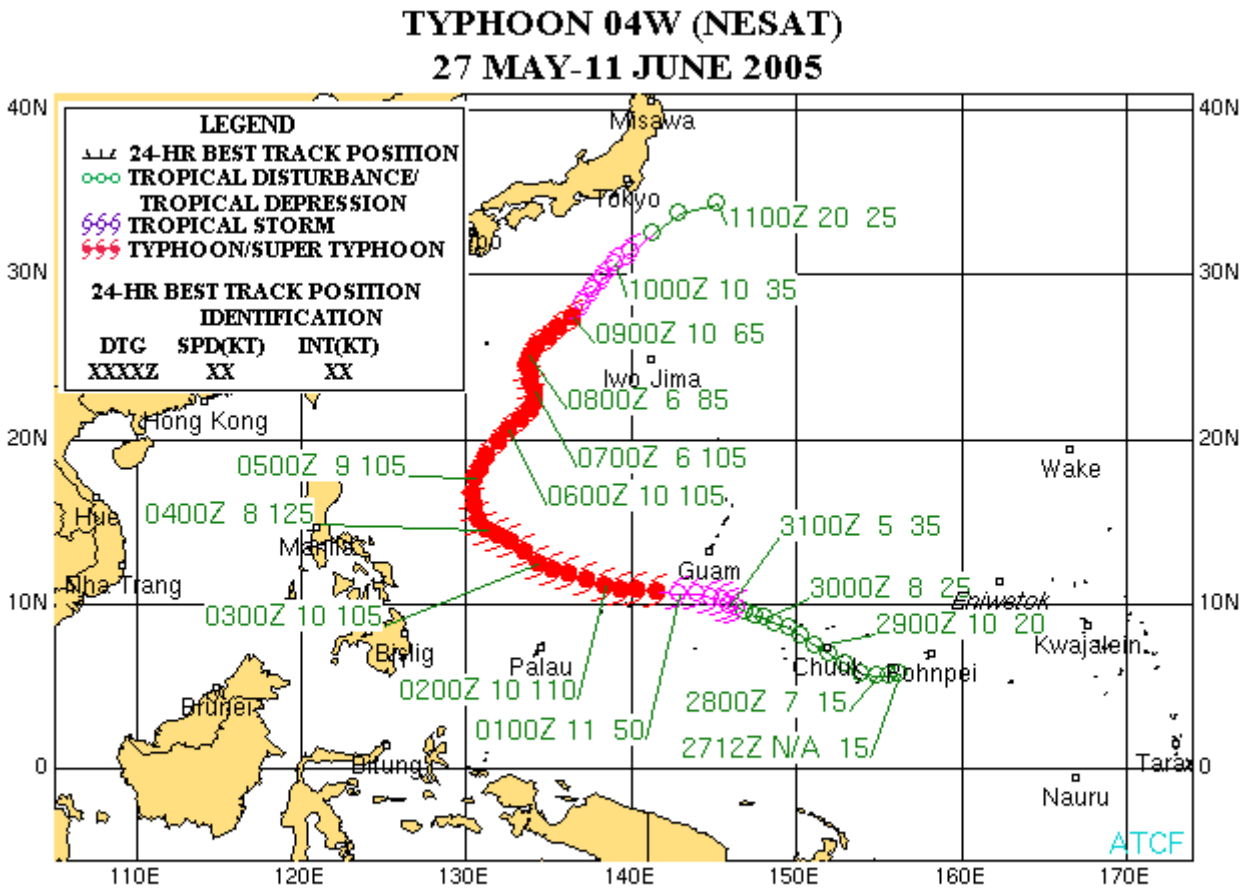
First Poor : 2000Z 16 Apr 05
First Fair : 2200Z 18 Apr 05
First TCFA : 0530Z 20 Apr 05
First Warning : 1200Z 20 Apr 05
Last Warning : 1800Z 26 Apr 05
Max Intensity : 115 kts, gusts to 140 kts
Total Warnings : 26

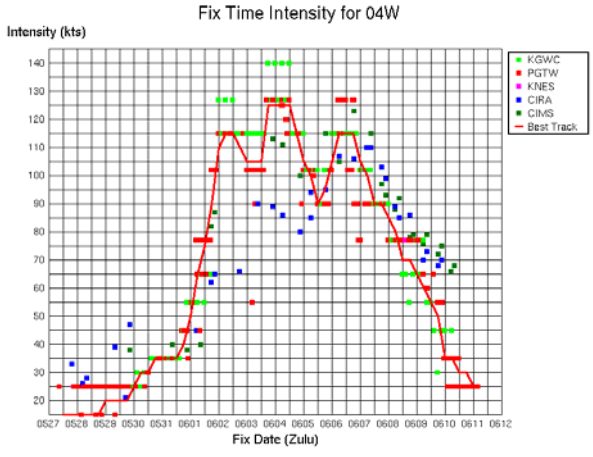




Typhoon (TY) 04W (Nesat)

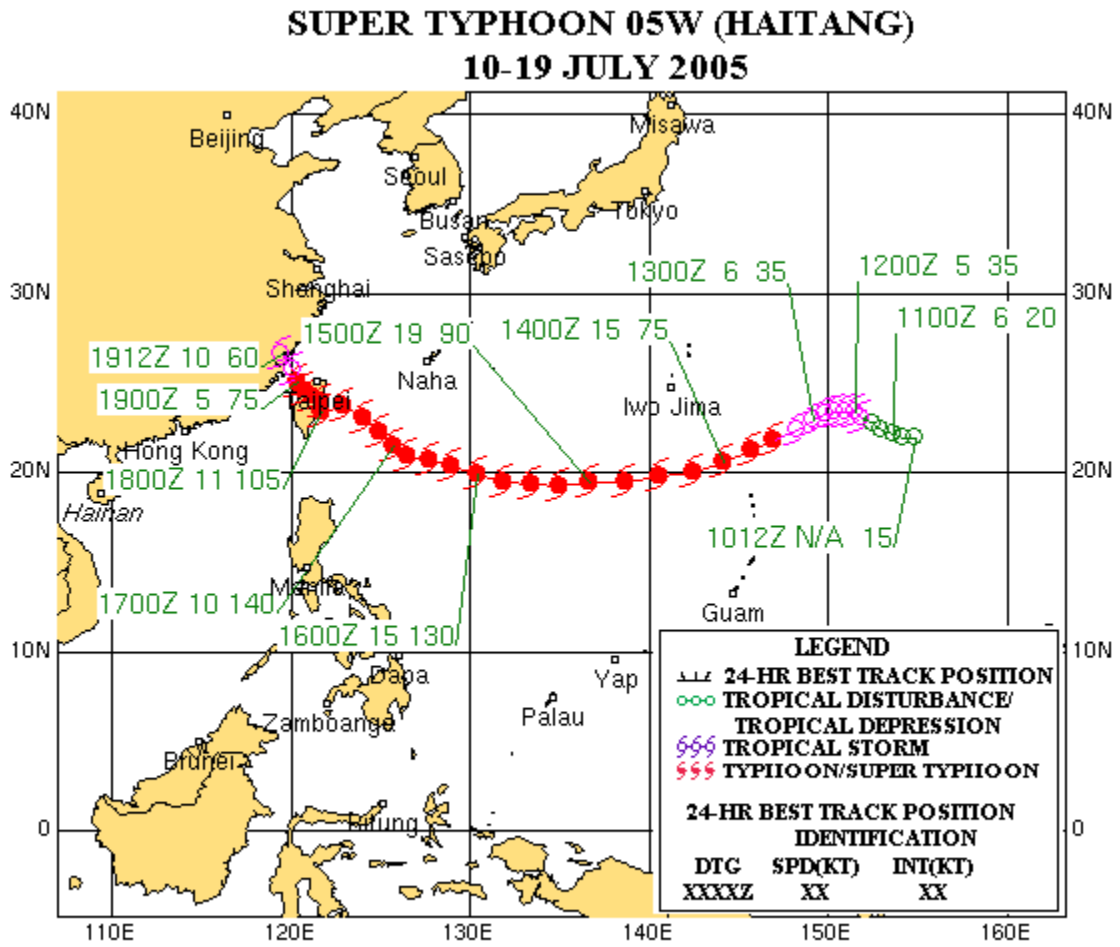
First Poor : N/A
First Fair : 2130Z 27 May 05
First TCFA : 0200Z 30 May 05
First Warning : 0600Z 30 May 05
Last Warning : 0000Z 10 Jun 05
Max Intensity : 125 kts, gusts to 150 kts
Total Warnings : 44

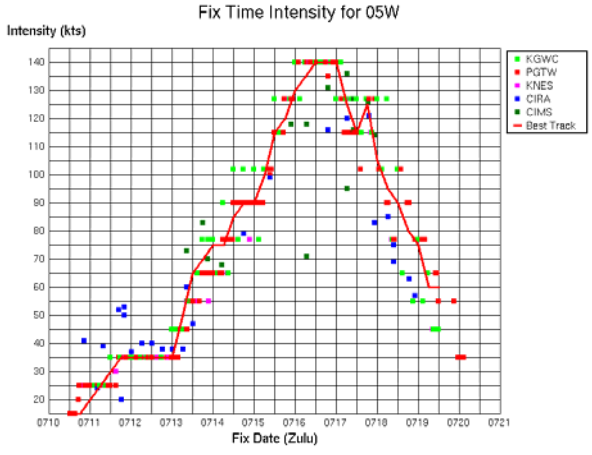




Super Typhoon (STY) 05W (Haitang)

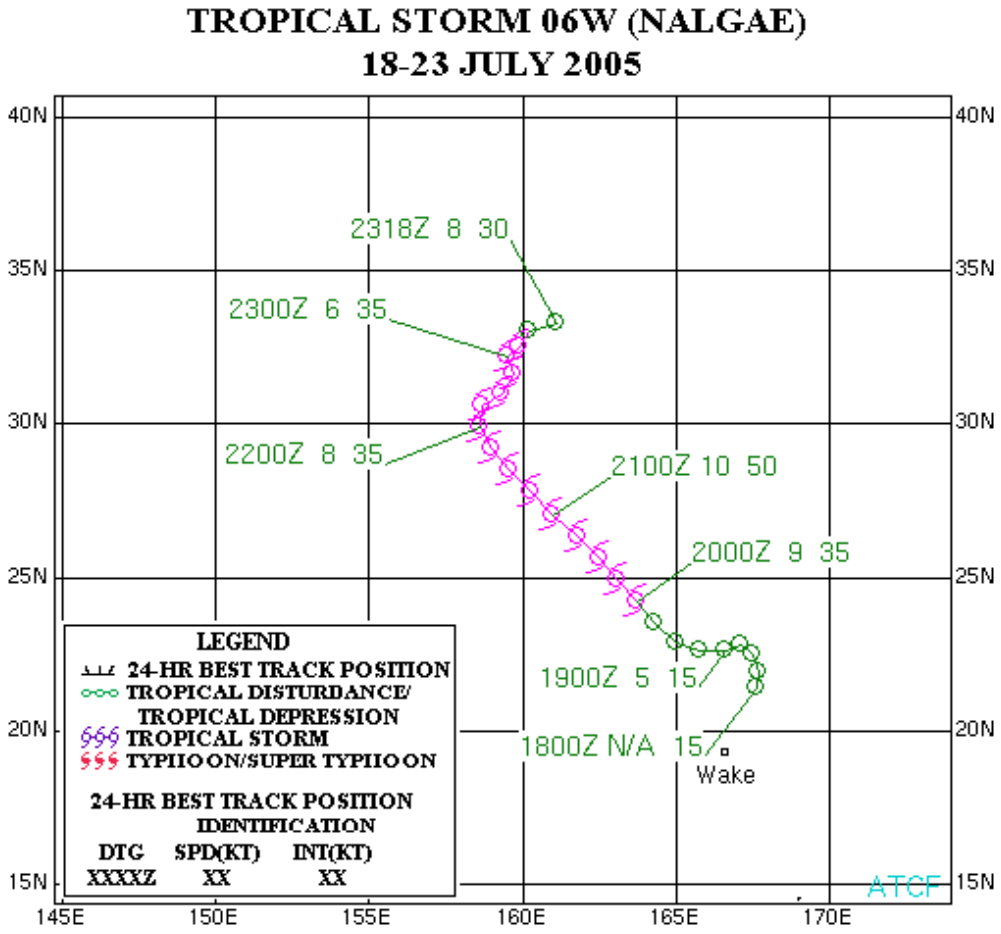
First Poor : 1800Z 10 Jul 05
First Fair : 2130Z 10 Jul 05
First TCFA : 0030Z 11 Jul 05
First Warning : 1200Z 11 Jul 05
Last Warning : 1200Z 19 Jul 05
Max Intensity : 140 kts, gusts to 170 kts
Total Warnings : 33

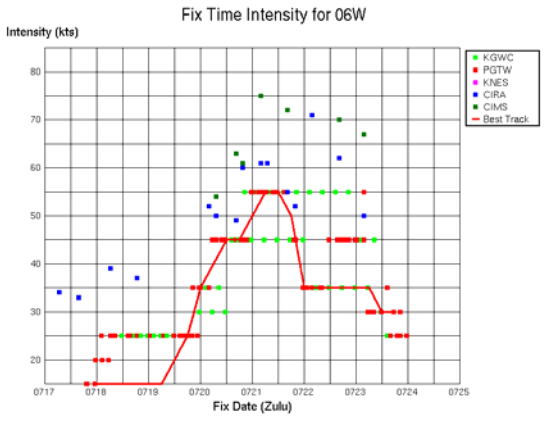




Tropical Storm (TS) 06W (Nalgae)

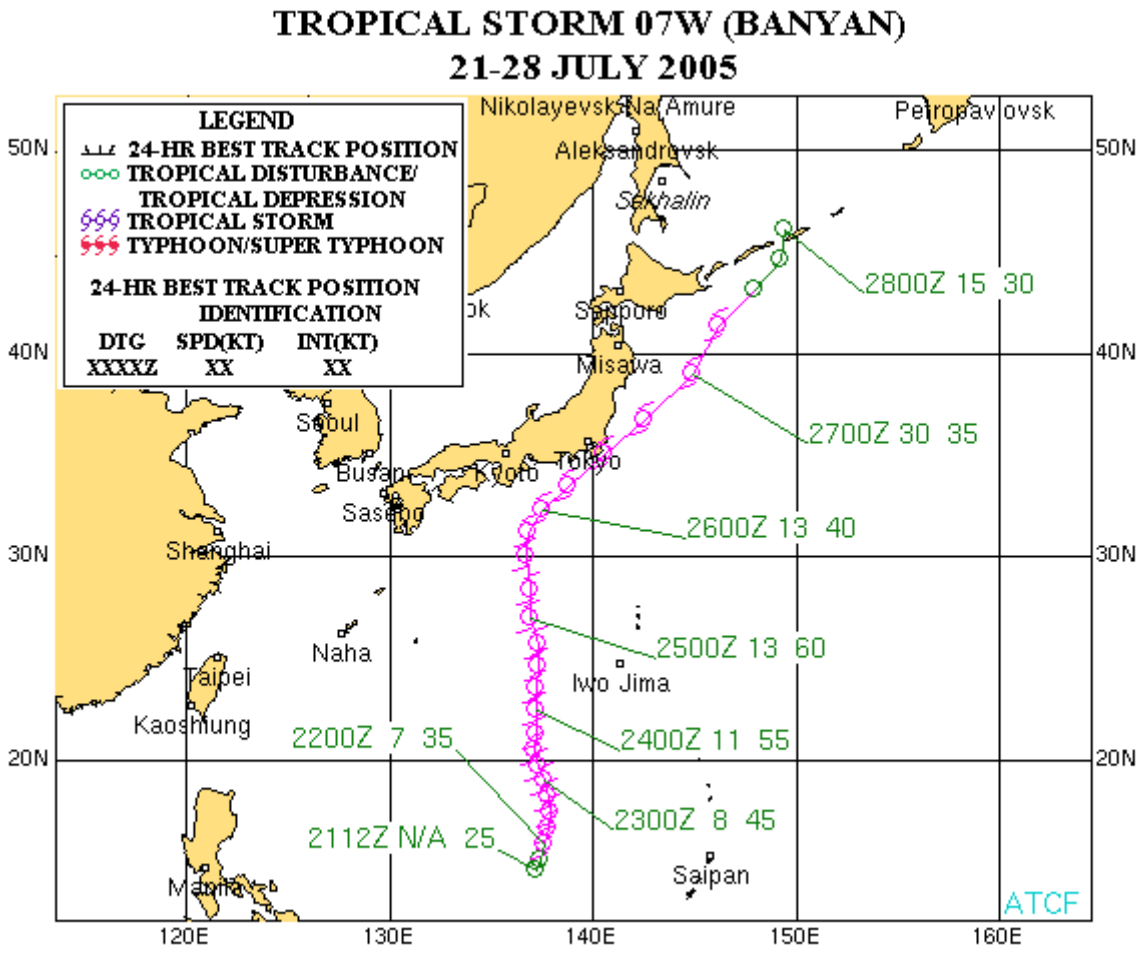
First Poor : 0000Z 18 Jul 05
First Fair : 1430Z 18 Jul 05
First TCFA : 2200Z 19 Jul 05
First Warning : 0000Z 20 Jul 05
Last Warning : 1200Z 23 Jul 05
Max Intensity : 55 kts, gusts to 70 kts
Total Warnings : 15

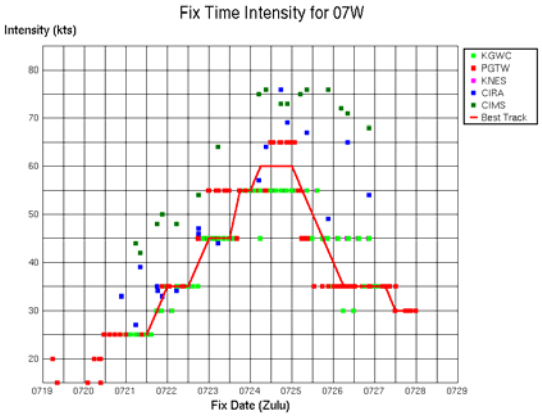




Tropical Storm (TS) 07W (Banyan)

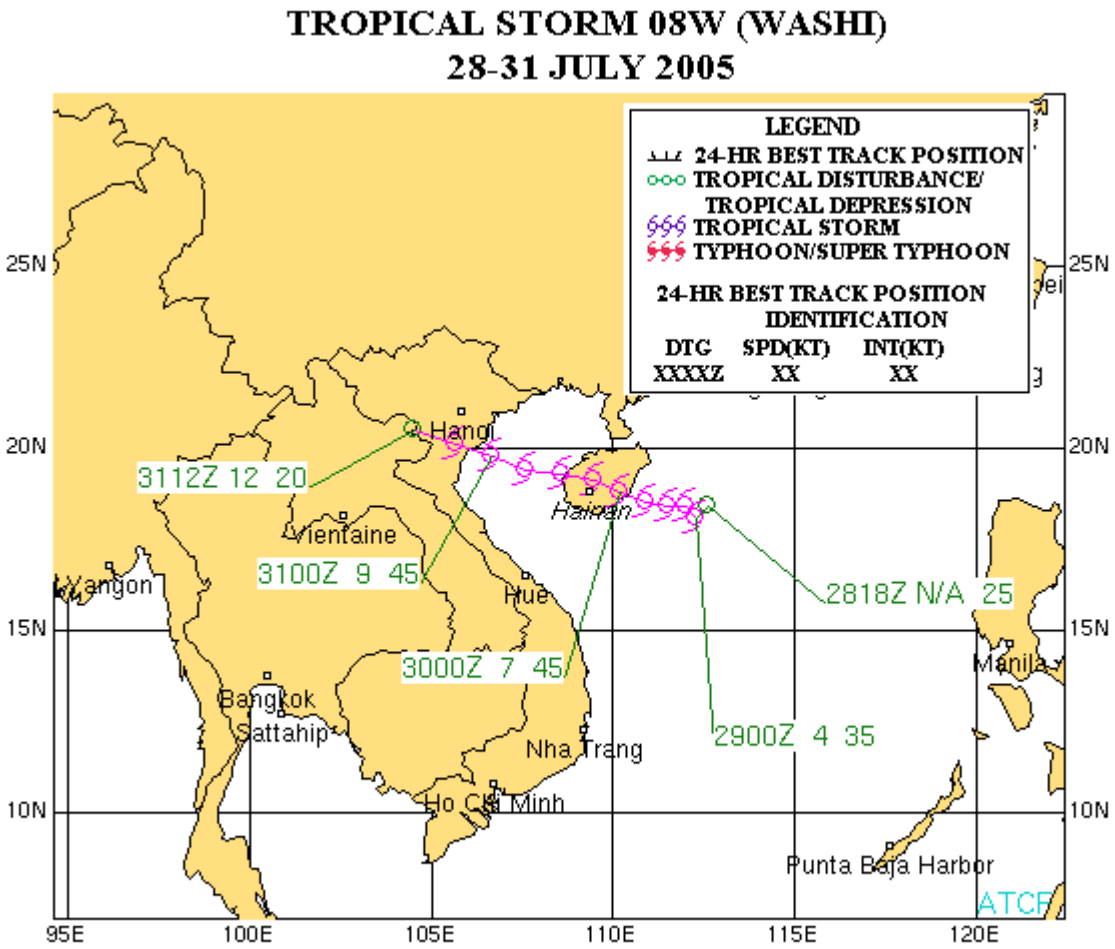
First Poor : 1230Z 20 Jul 05
First Fair : 0000Z 21 Jul 05
First TCFA : 0230Z 21 Jul 05
First Warning : 1200Z 21 Jul 05
Last Warning : 0000Z 27 Jul 05
Max Intensity : 60 kts, gusts to 75 kts
Total Warnings : 23

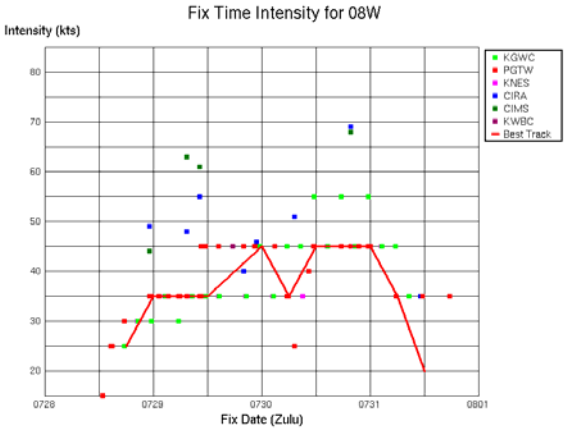




Tropical Storm (TS) 08W (Washi)

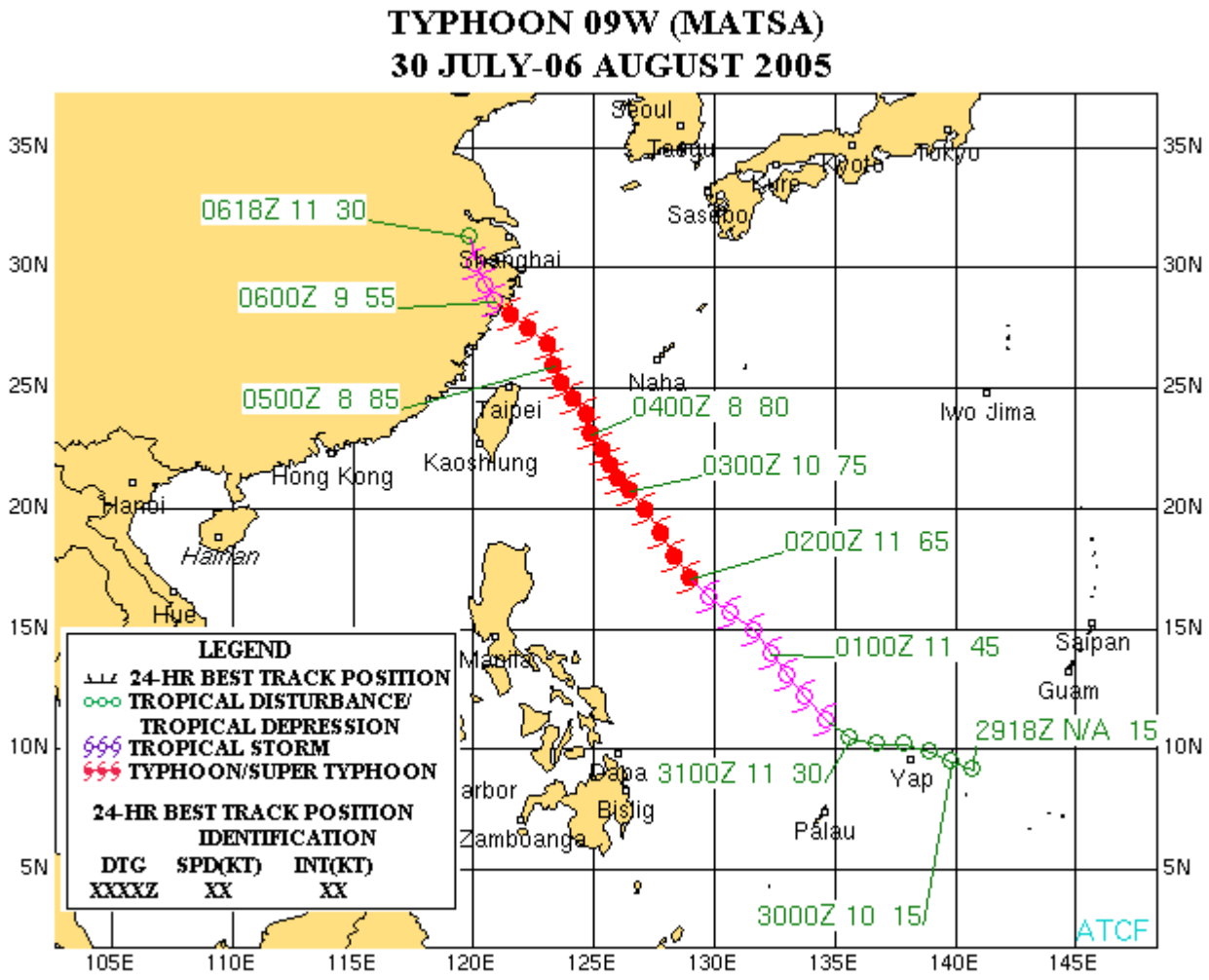
First Poor : 0300Z 28 Jul 05
First Fair : 1330Z 28 Jul 05
First TCFA : 1730Z 28 Jul 05
First Warning : 1800Z 28 Jul 05
Last Warning : 0600Z 31 Jul 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 11

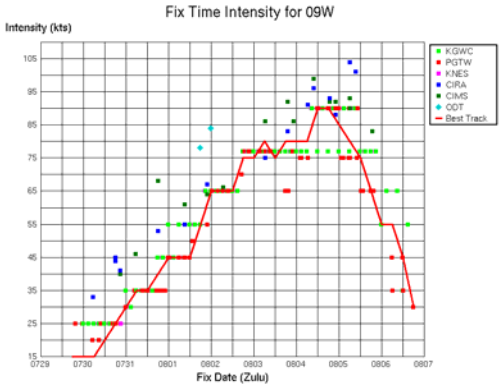




Typhoon (TY) 09W (Matsa)

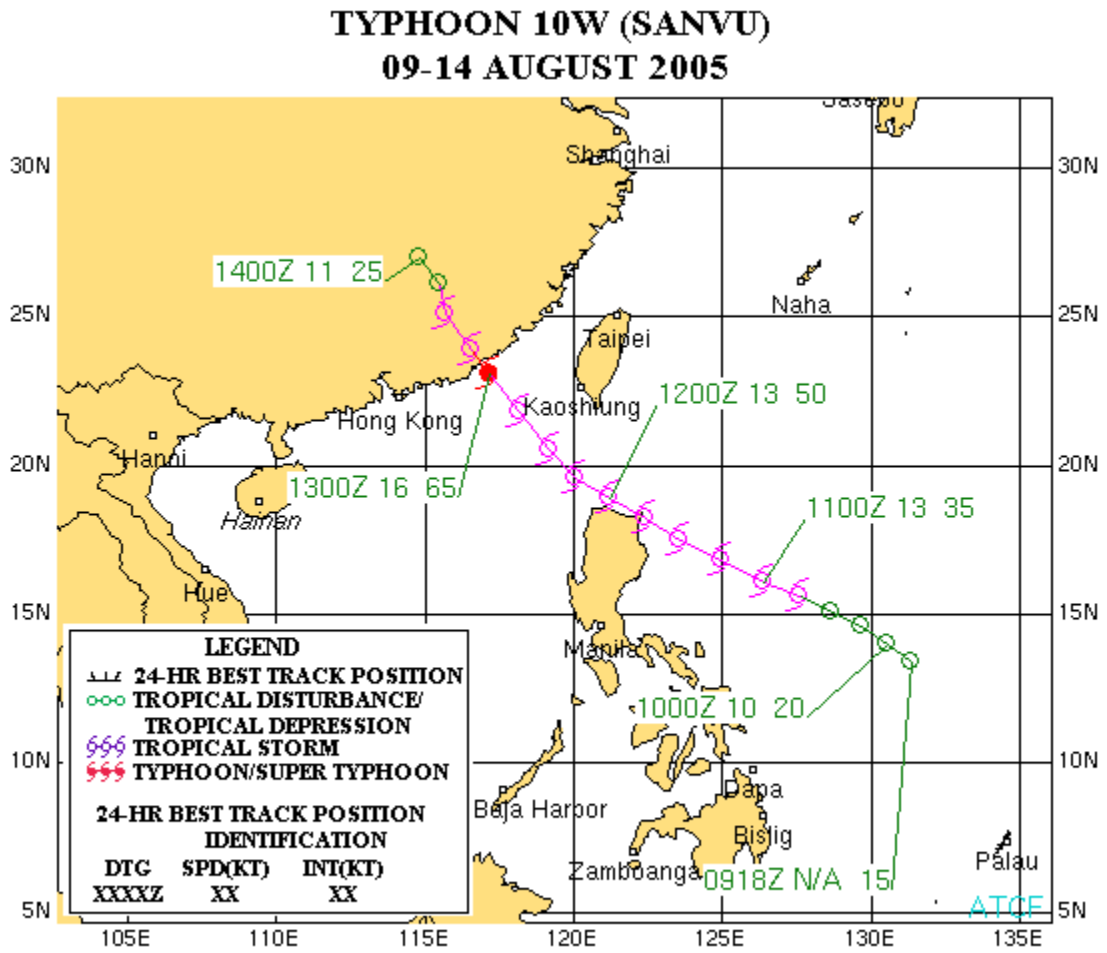
First Poor : 0300Z 30 Jul 05
First Fair : 0600Z 30 Jul 05
First TCFA : 1430Z 30 Jul 05
First Warning : 0000Z 31 Jul 05
Last Warning : 0000Z 06 Aug 05
Max Intensity : 90 kts, gusts to 110 kts
Total Warnings : 25

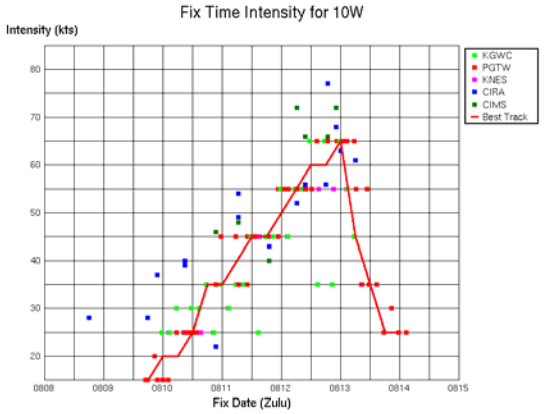




Typhoon (TY) 10W (Sanvu)

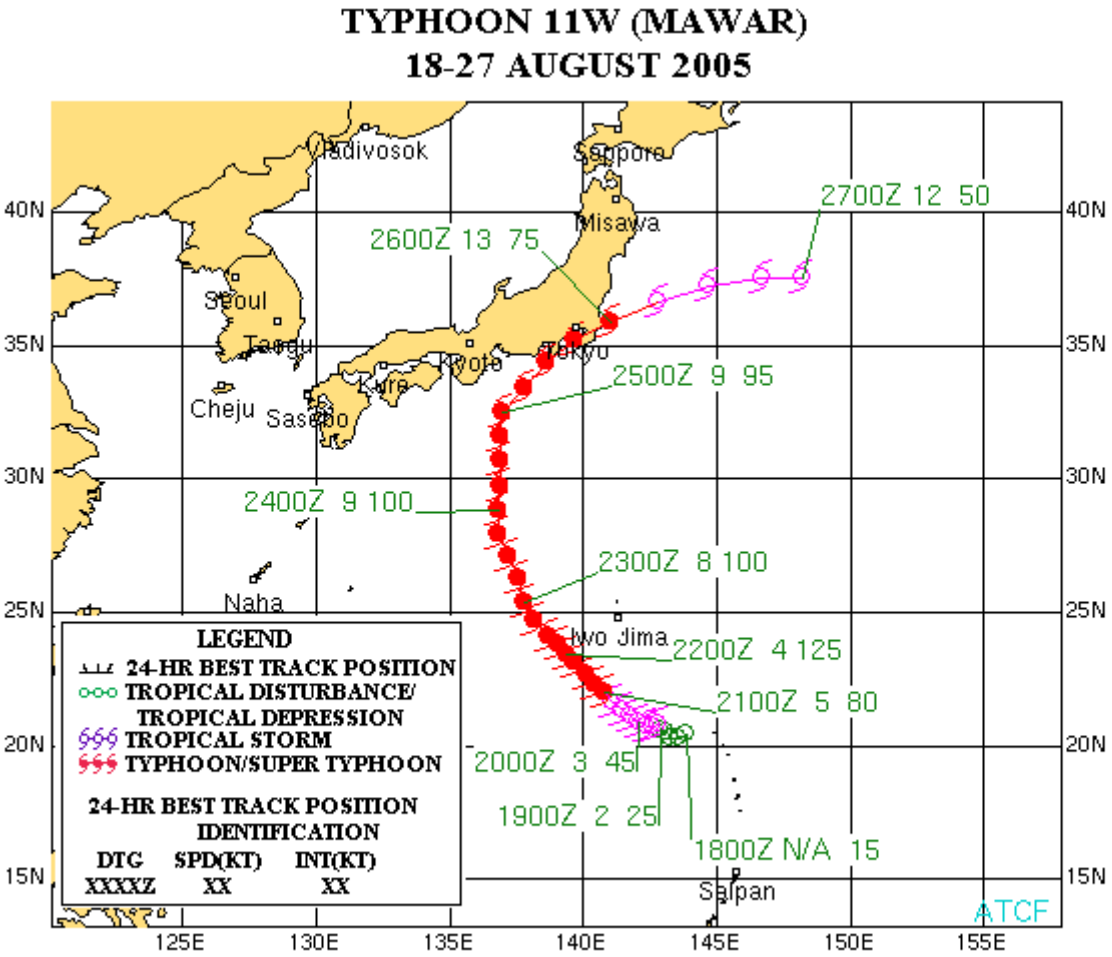
First Poor : 1430Z 08 Aug 05
First Fair : 2100Z 09 Aug 05
First TCFA : 0000Z 10 Aug 05
First Warning : 1200Z 10 Aug 05
Last Warning : 0600Z 13 Aug 05
Max Intensity : 65 kts, gusts to 80 kts
Total Warnings : 12

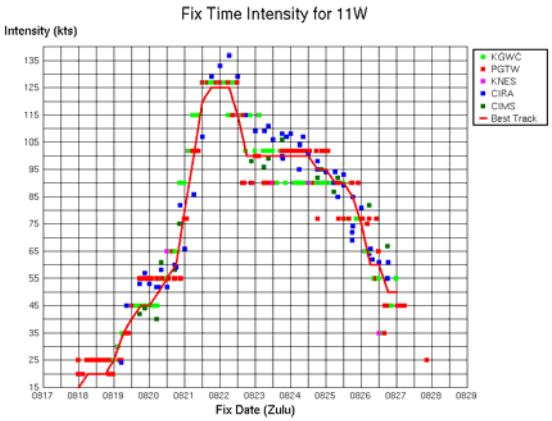




Typhoon (TY) 11W (Mawar)

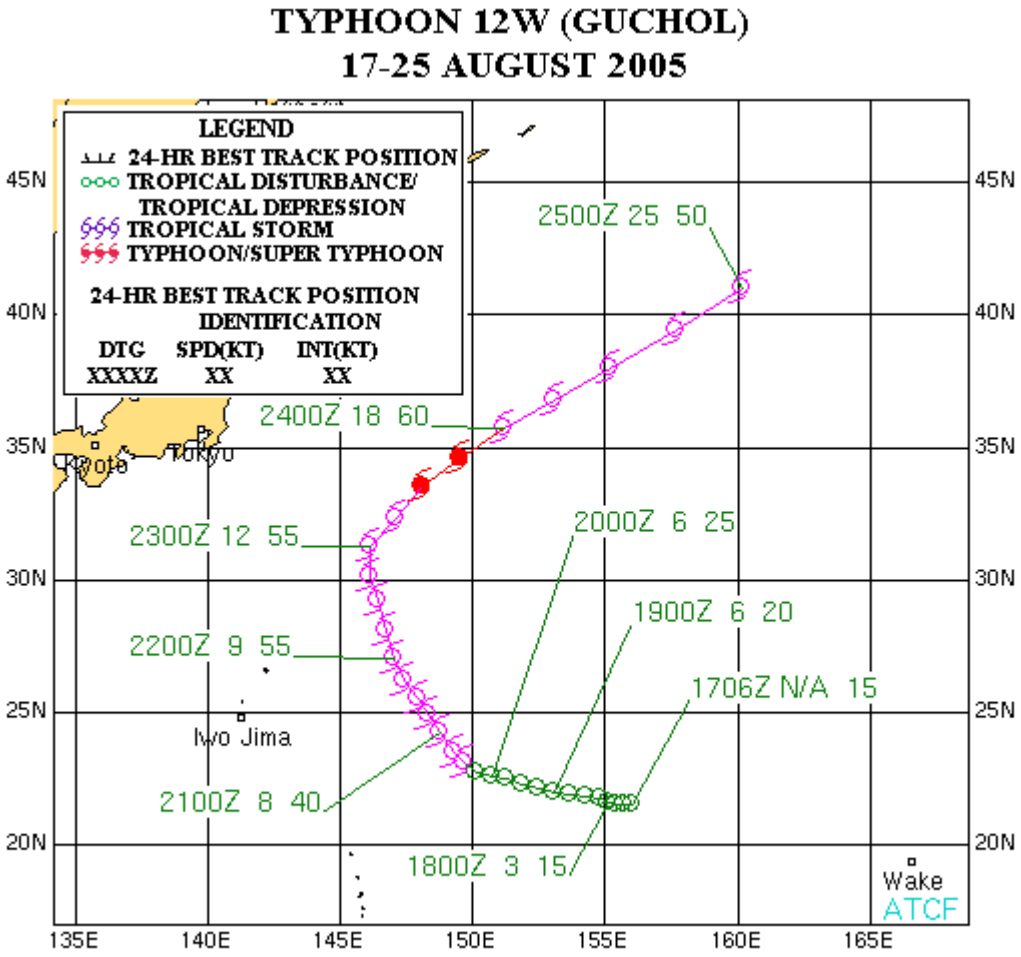
First Poor : 0600Z 18 Aug 05
First Fair : 0100Z 19 Aug 05
First TCFA : 0530Z 19 Aug 05
First Warning : 1200Z 19 Aug 05
Last Warning : 0000Z 27 Aug 05
Max Intensity : 125 kts, gusts to 150 kts
Total Warnings : 31

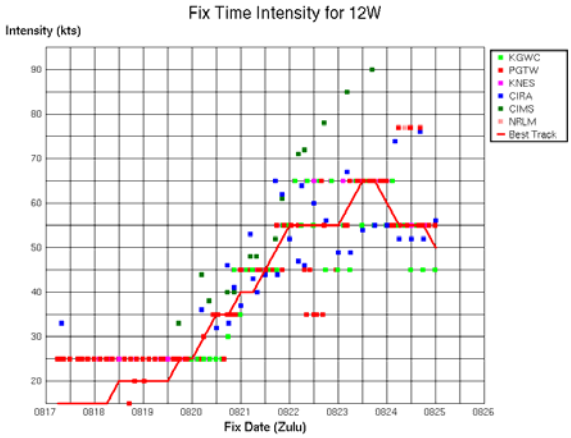




Typhoon (TY) 12W (Guchol)

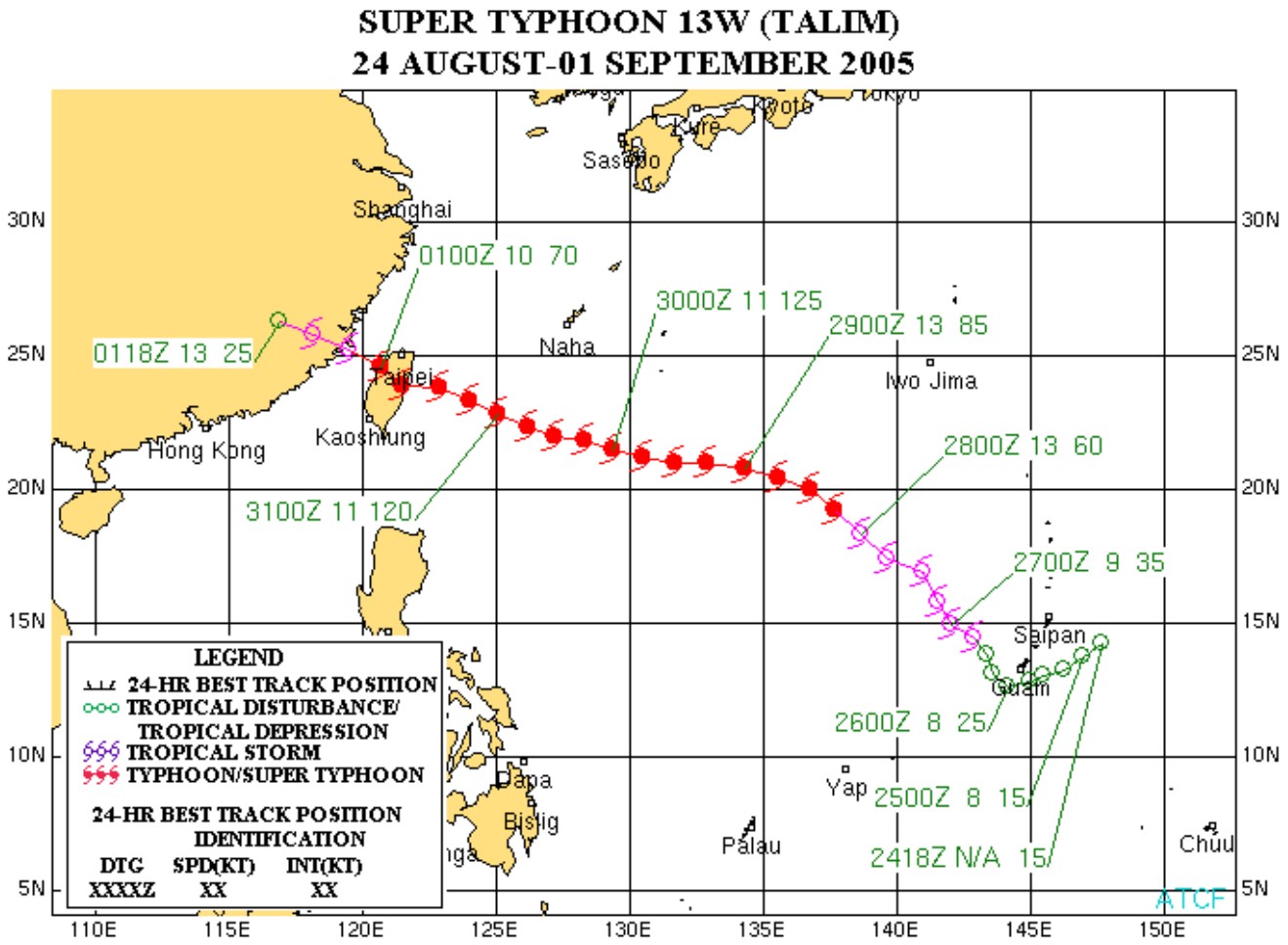
First Poor : 0930Z 17 Aug 05
First Fair : 1500Z 19 Aug 05
First TCFA : 2130Z 19 Aug 05
First Warning : 0000Z 19 Aug 05
Last Warning : 0000Z 25 Aug 05
Max Intensity : 65 kts, gusts to 80 kts
Total Warnings : 21

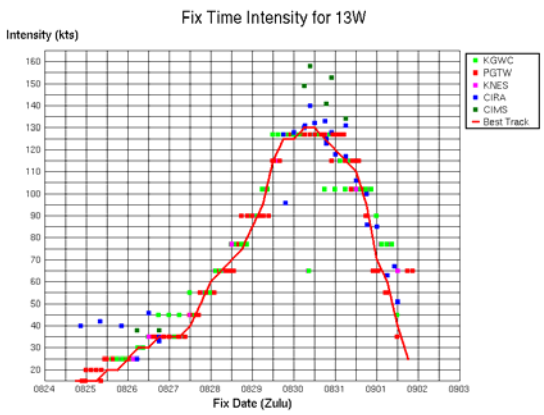




Super Typhoon (STY) 13W (Talim)

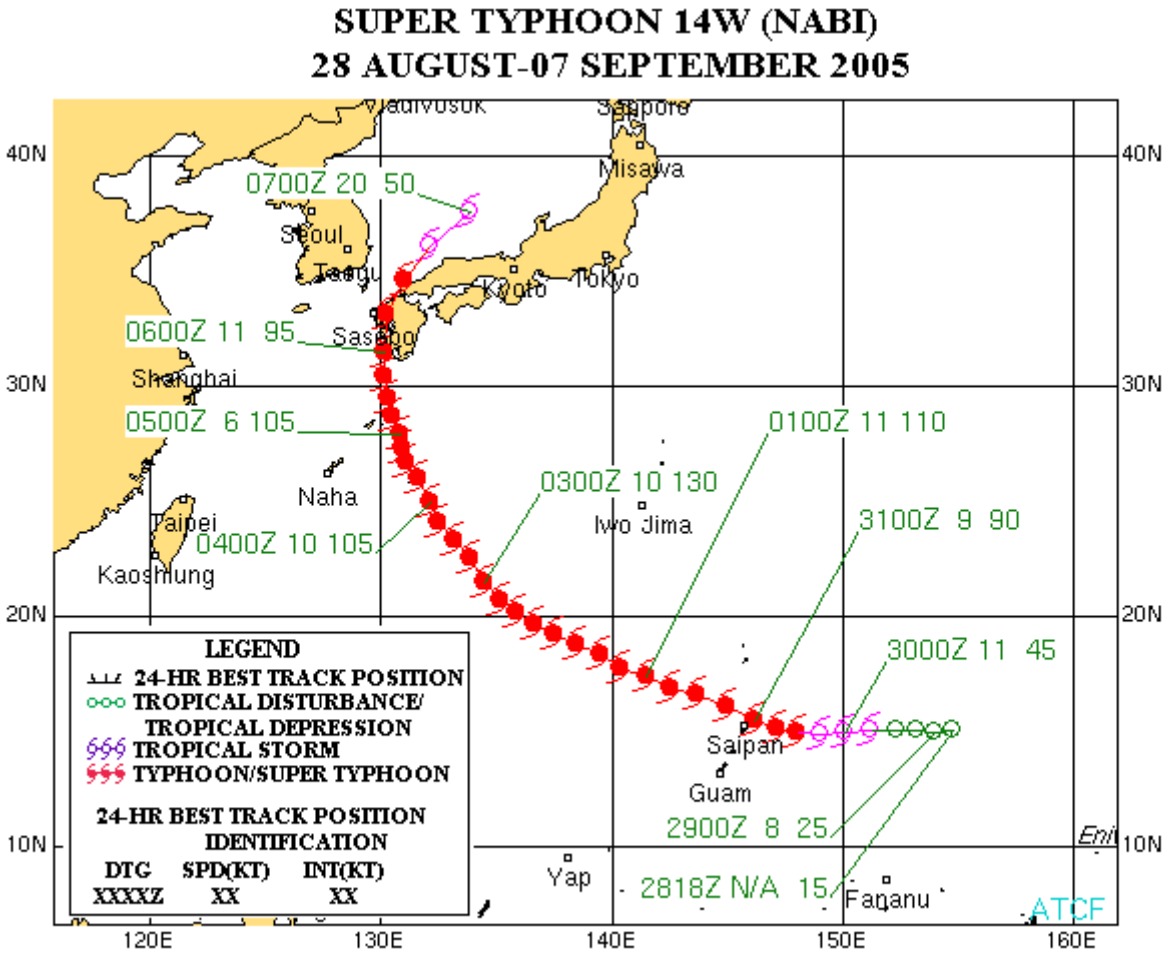
First Poor : 0600Z 24 Aug 05
First Fair : 1130Z 25 Aug 05
First TCFA : 2200Z 25 Aug 05
First Warning : 0600Z 26 Aug 05
Last Warning : 1200Z 01 Sep 05
Max Intensity : 130 kts, gusts to 160 kts
Total Warnings : 26

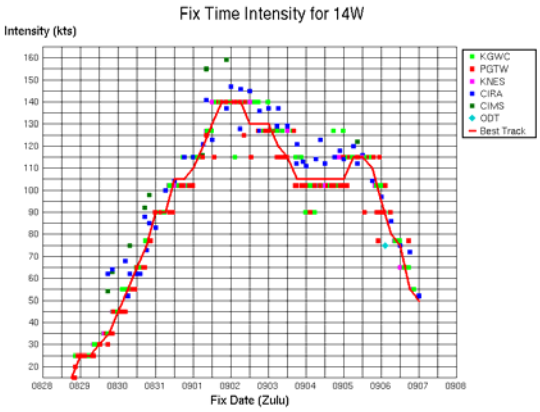




Super Typhoon (STY) 14W (Nabi)

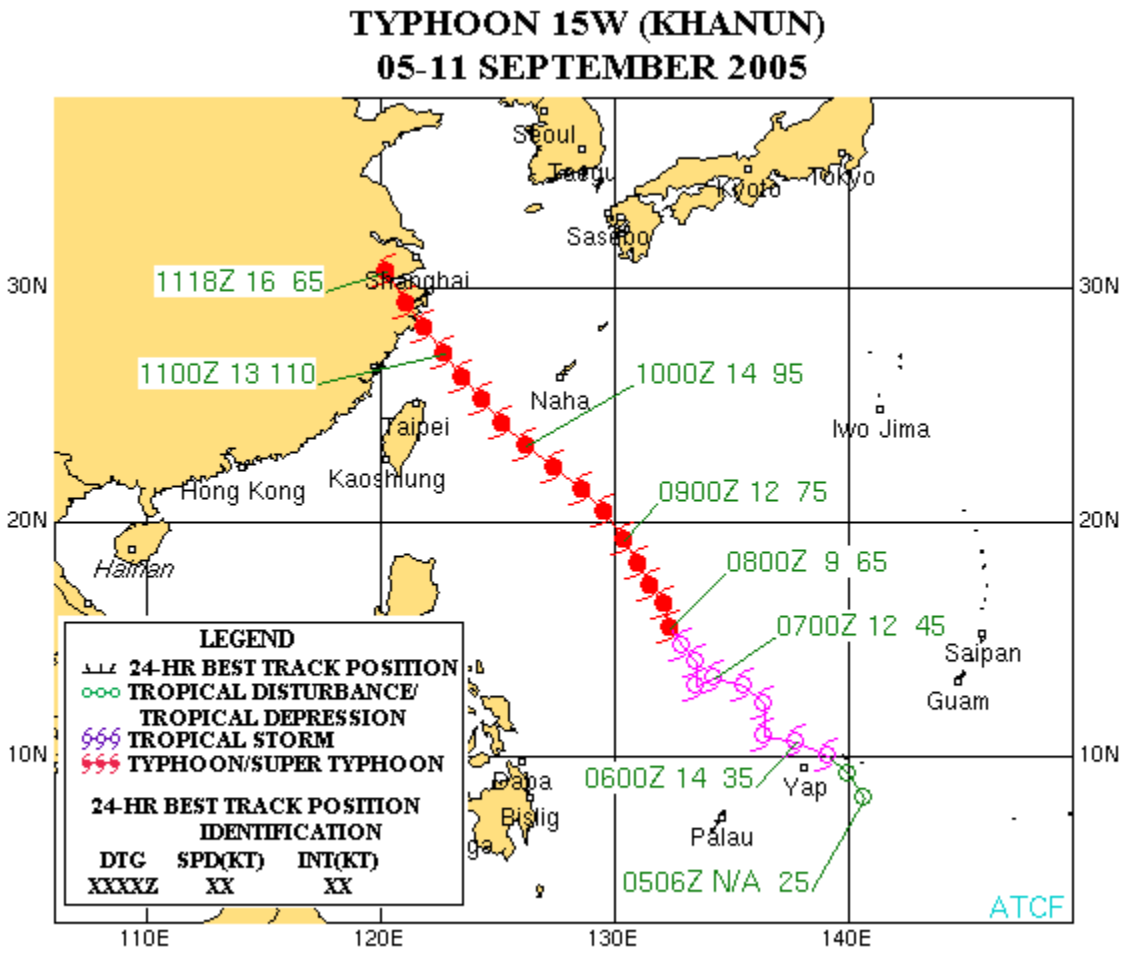
First Poor : 1900Z 28 Aug 05
First Fair : N/A
First TCFA : 0300Z 29 Aug 05
First Warning : 0600Z 29 Aug 05
Last Warning : 1800Z 06 Sep 05
Max Intensity : 140 kts, gusts to 170 kts
Total Warnings : 35

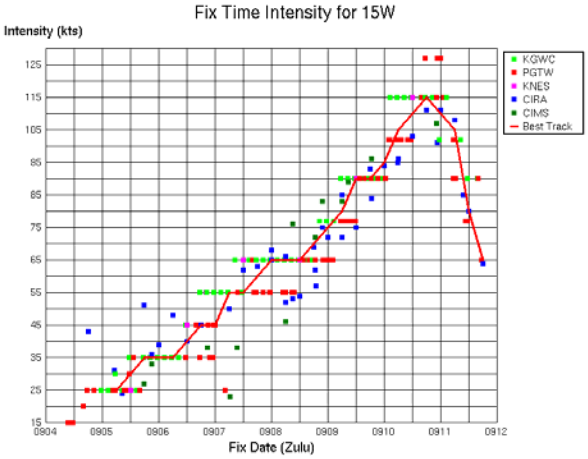




Typhoon (TY) 15W (Khanun)

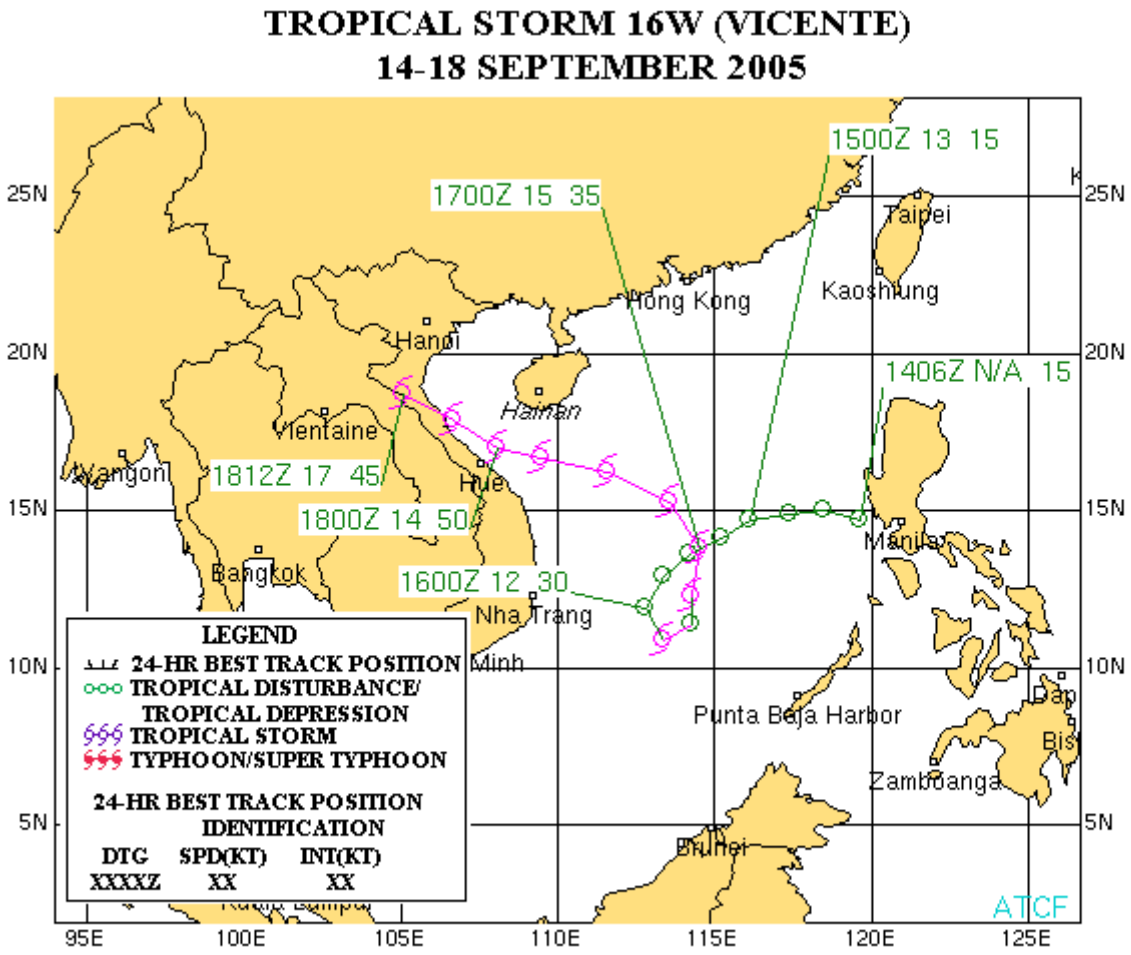
First Poor : 1130Z 04 Sep 05
First Fair : 0030Z 05 Sep 05
First TCFA : 1500Z 05 Sep 05
First Warning : 0000Z 06 Sep 05
Last Warning : 1800Z 11 Sep 05
Max Intensity : 115 kts, gusts to 140 kts
Total Warnings : 25

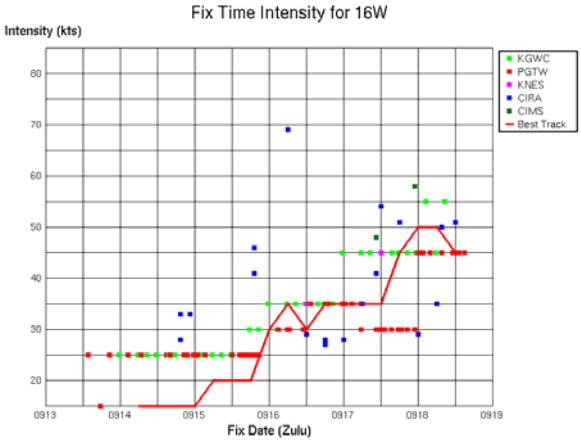




Tropical Storm (TS) 16W (Vicente)

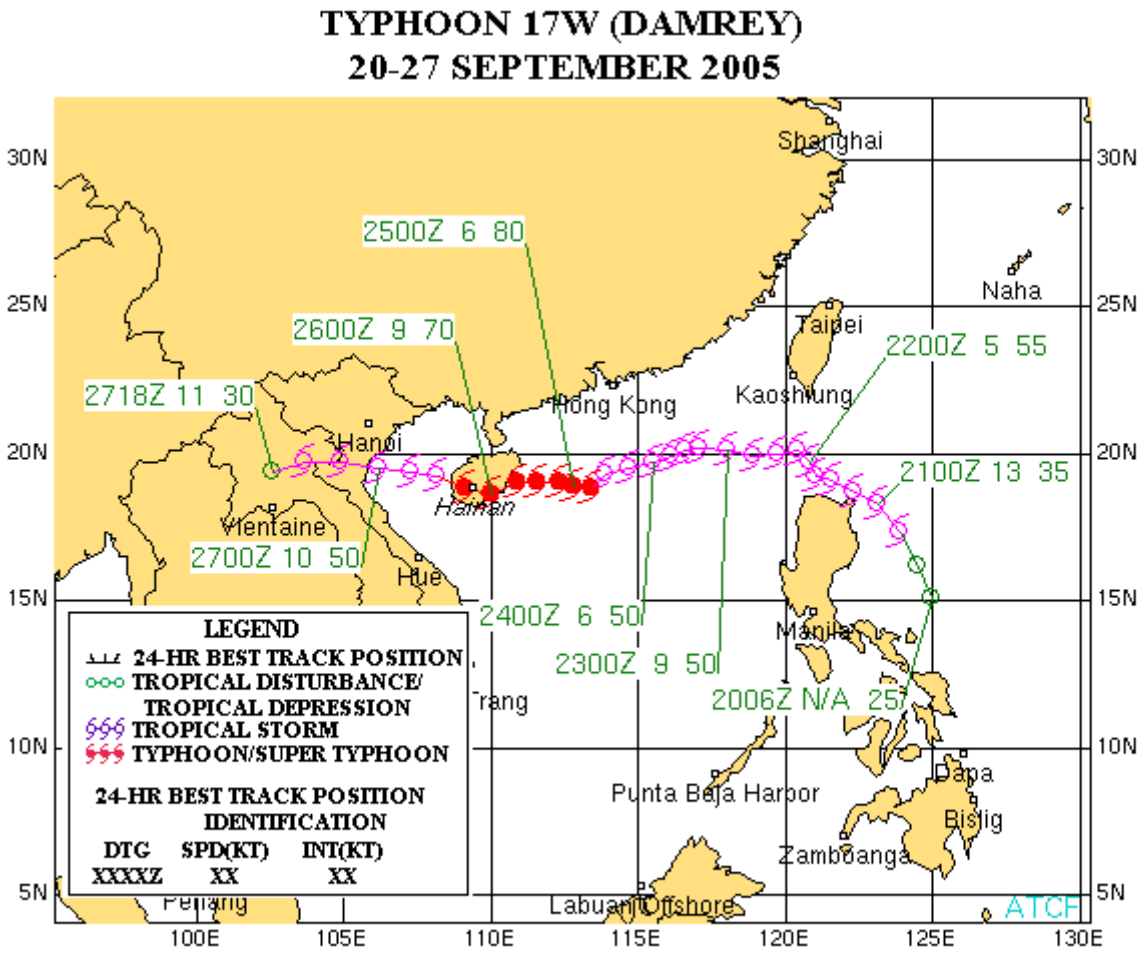
First Poor : 0230Z 15 Sep 05
First Fair : 0830Z 15 Sep 05
First TCFA : 2100Z 15 Sep 05
First Warning : 0000Z 16 Sep 05
Last Warning : 1200Z 18 Sep 05
Max Intensity : 50 kts, gusts to 65 kts
Total Warnings : 11

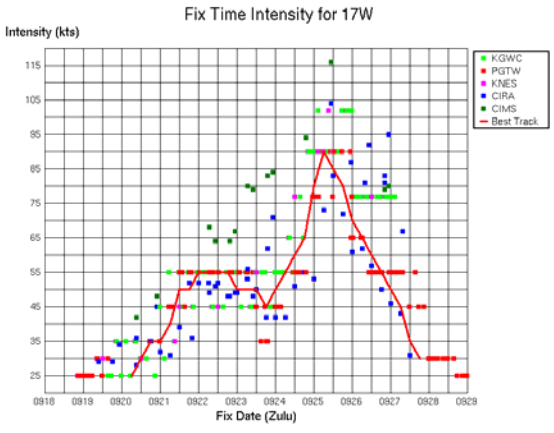




Typhoon (TY) 17W (Damrey)

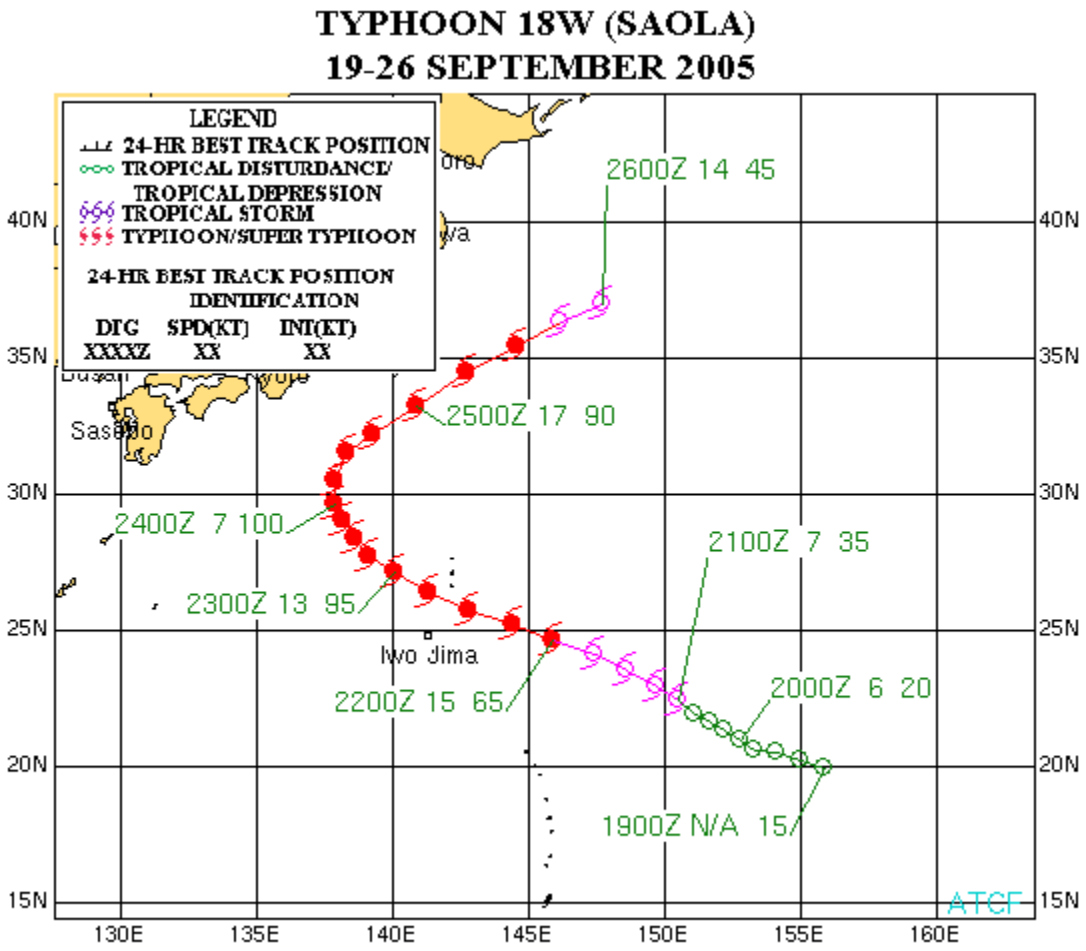
First Poor : N/A
First Fair : 2000Z 18 Sep 05
First TCFA : 0230Z 19 Sep 05
First Warning : 1200Z 20 Sep 05
Last Warning : 0600Z 27 Sep 05
Max Intensity : 90 kts, gusts to 110 kts
Total Warnings : 28

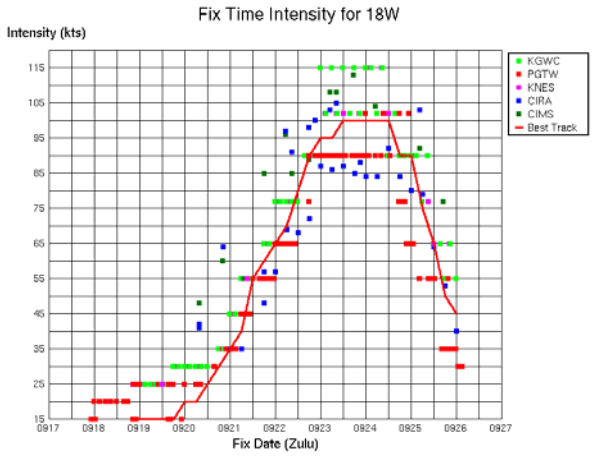




Typhoon (TY) 18W (Saola)

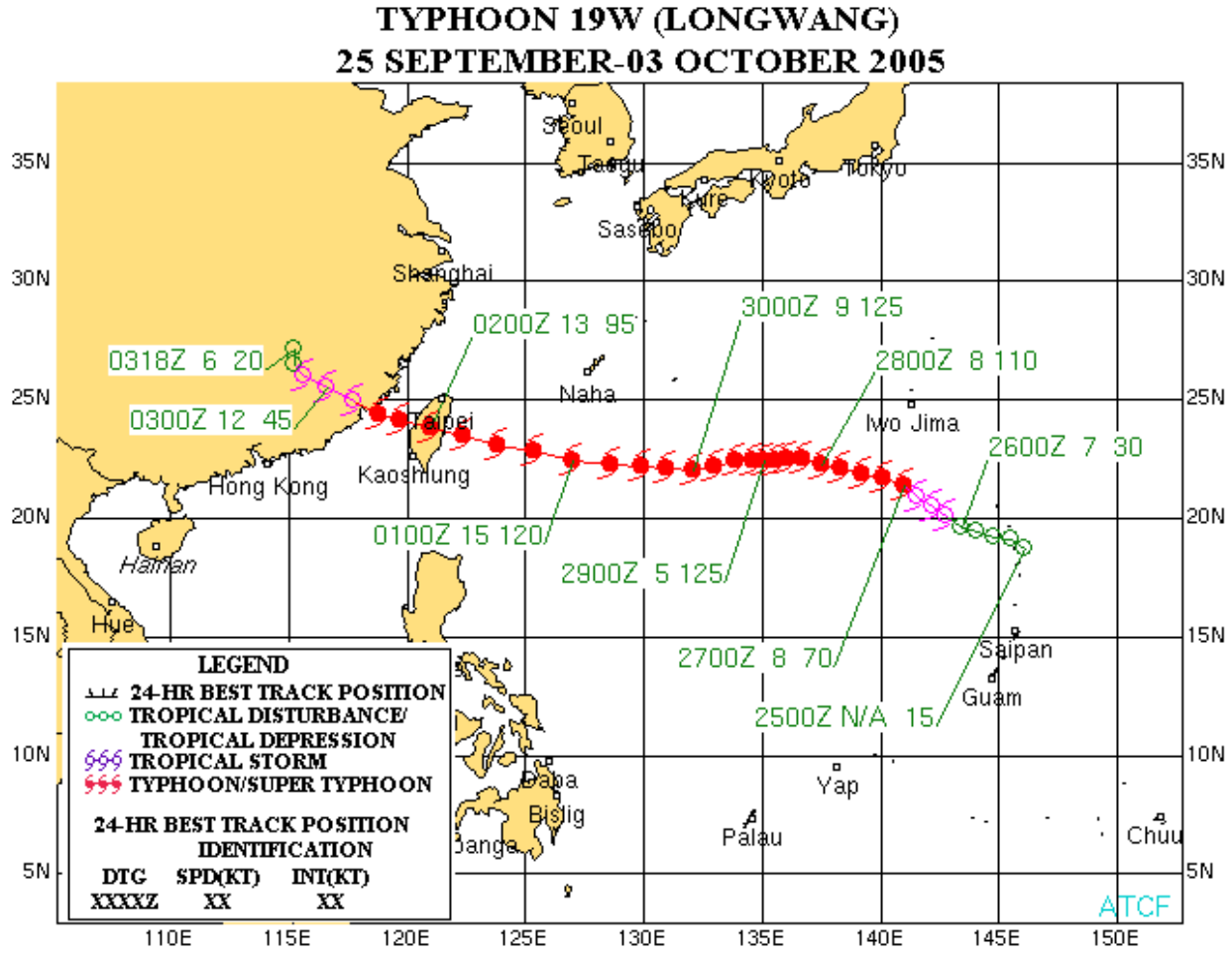
First Poor : 0300Z 19 Sep 05
First Fair : N/A
First TCFA : 0100Z 20 Sep 05
First Warning : 1200Z 20 Sep 05
Last Warning : 0000Z 26 Sep 05
Max Intensity : 100 kts, gusts to 125 kts
Total Warnings : 23

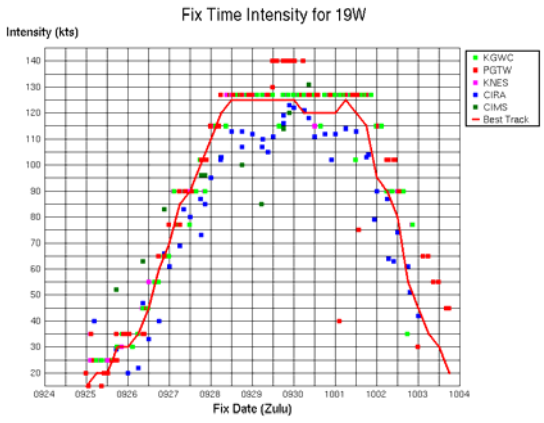




Typhoon (TY) 19W (Longwang)

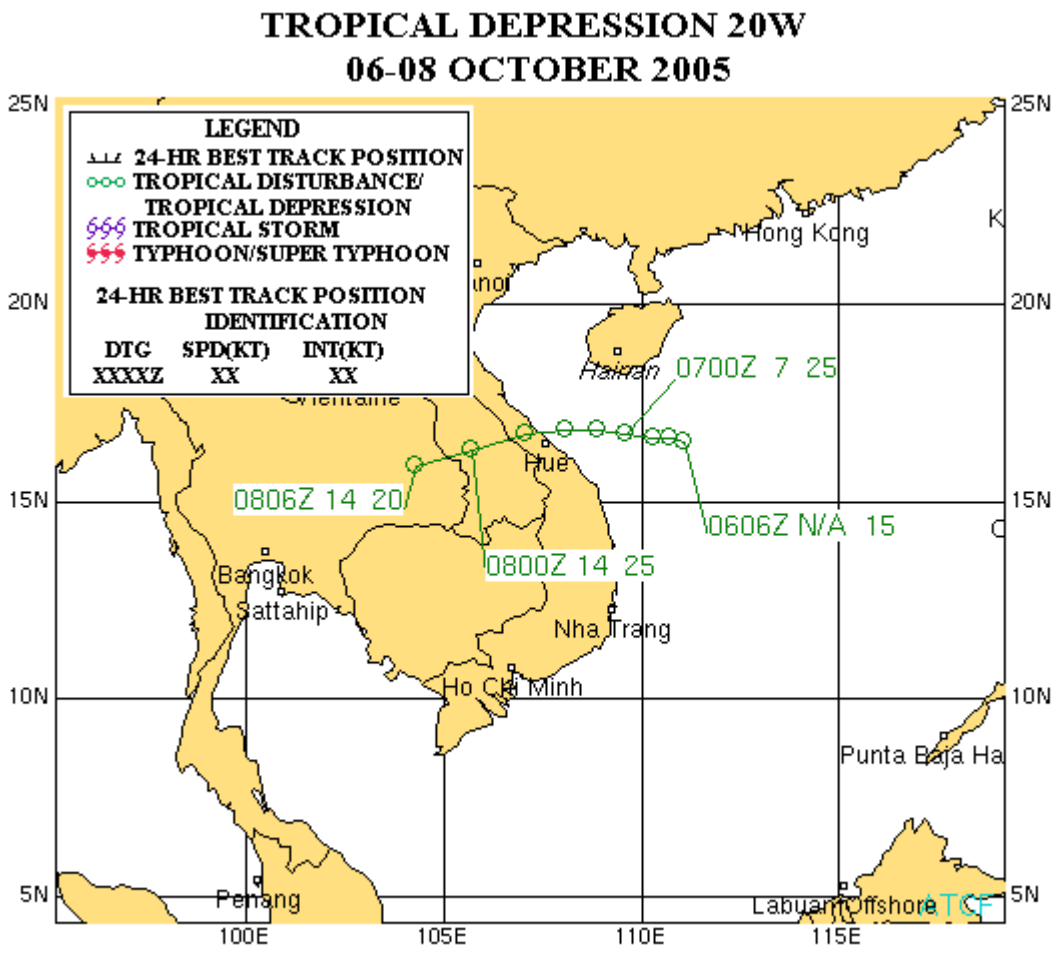
First Poor : 0600Z 24 Sep 05
First Fair : 0600Z 25 Sep 05
First TCFA : 1530Z 25 Sep 05
First Warning : 1800Z 25 Sep 05
Last Warning : 1800Z 02 Oct 05
Max Intensity : 125 kts, gusts to 150 kts
Total Warnings : 29

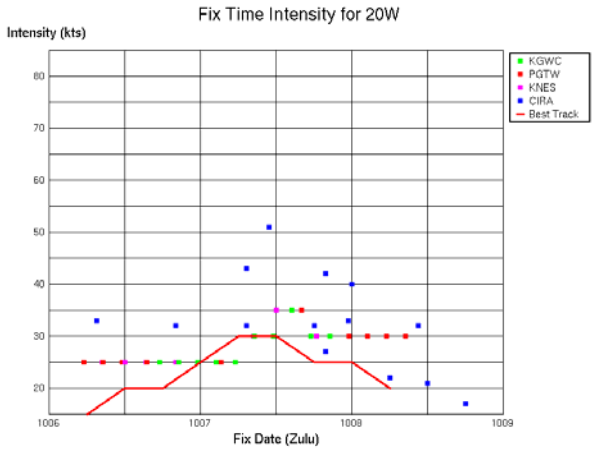




Tropical Depression (TD) 20W

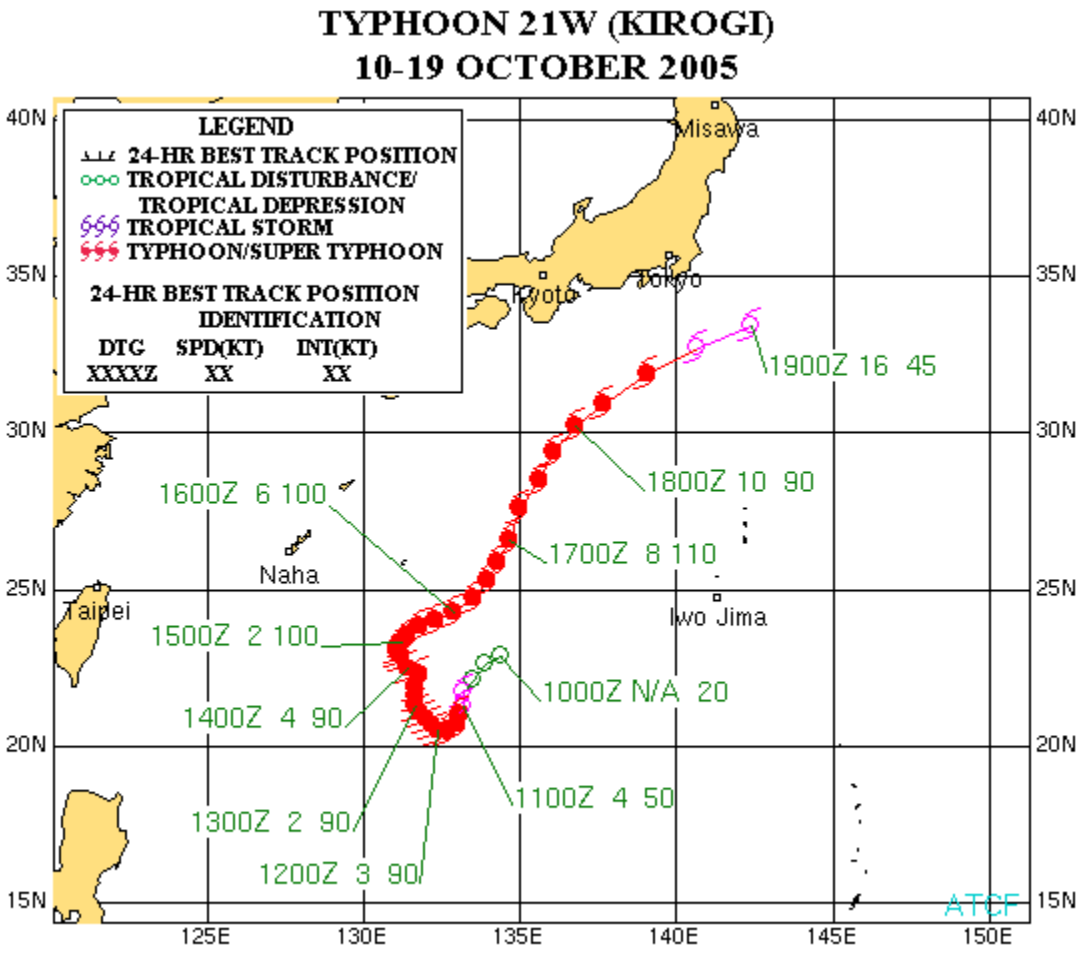
First Poor : 0600Z 06 Oct 05
First Fair : N/A
First TCFA : 1400Z 06 Oct 05
First Warning : 1200Z 07 Oct 05
Last Warning : 1800Z 07 Oct 05
Max Intensity : 30 kts, gusts to 40 kts
Total Warnings : 2

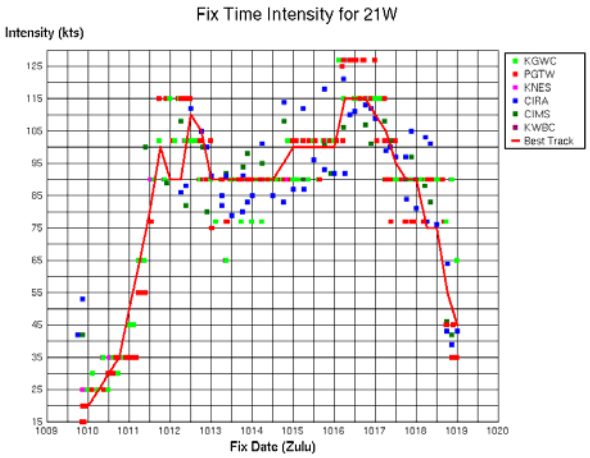




Typhoon (TY) 21W (Kirogi)

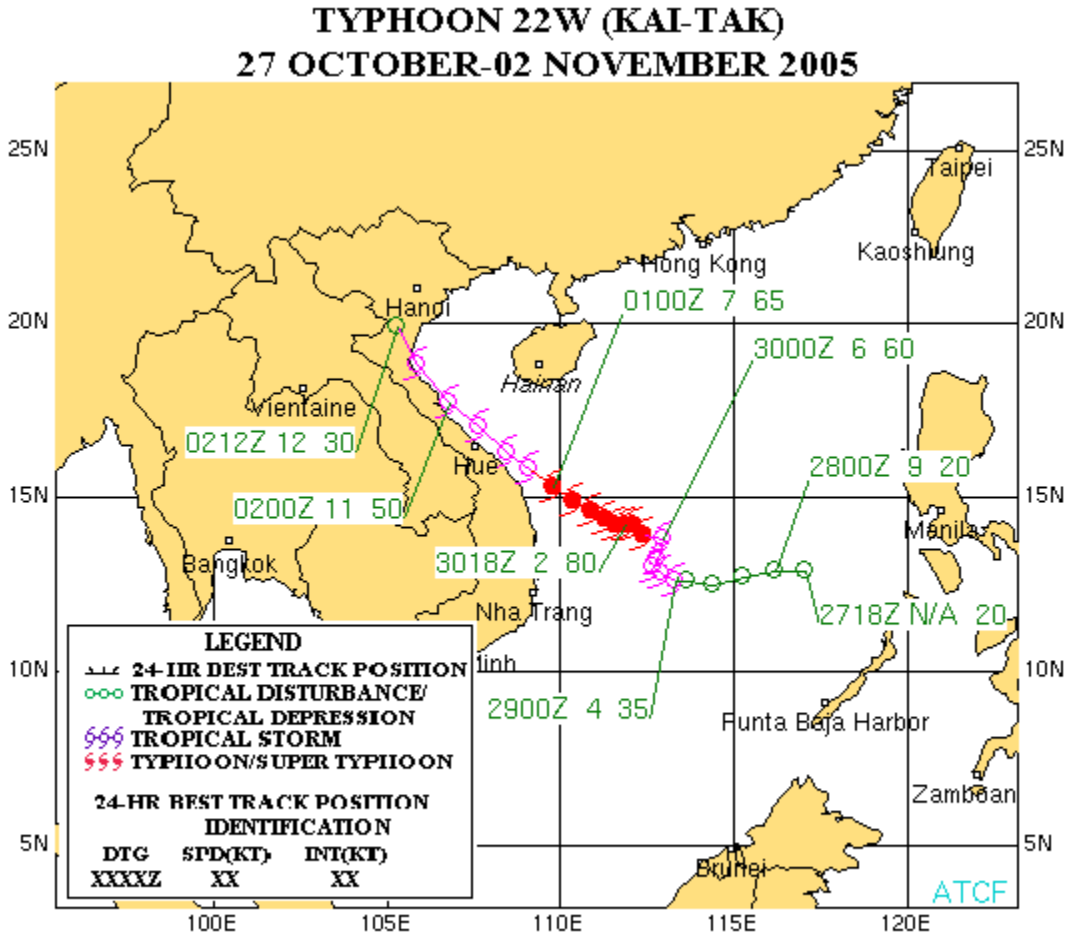
First Poor : 2330Z 07 Oct 05
First Fair : 0600Z 08 Oct 05
First TCFA : 2330Z 09 Oct 05
First Warning : 0600Z 10 Oct 05
Last Warning : 0000Z 19 Oct 05
Max Intensity : 115 kts, gusts to 140 kts
Total Warnings : 36

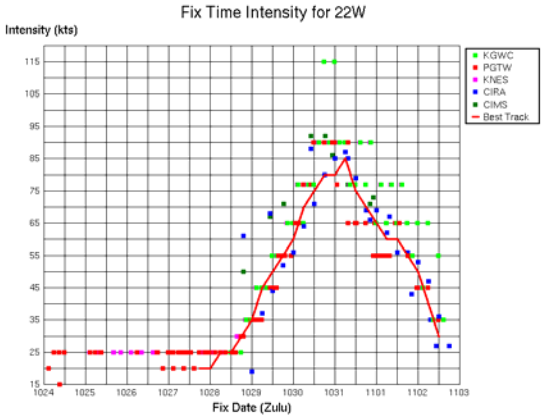




Typhoon (TY) 22W (Kai-Tak)

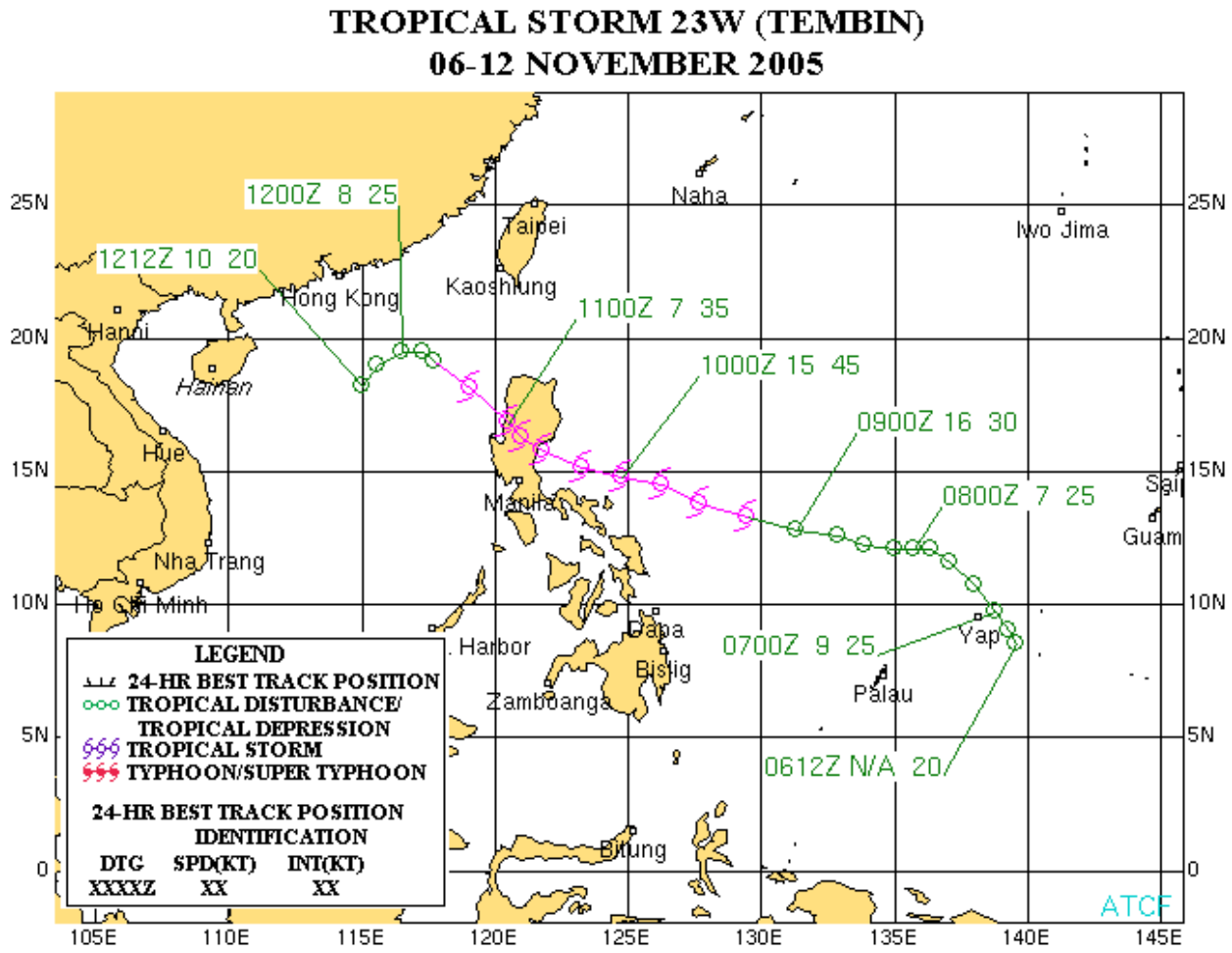
First Poor : 2300Z 27 Oct 05
First Fair : 0600Z 28 Oct 05
First TCFA : 0930Z 28 Oct 05
First Warning : 1800Z 28 Oct 05
Last Warning : 1200Z 02 Oct 05
Max Intensity : 85 kts, gusts to 105 kts
Total Warnings : 20

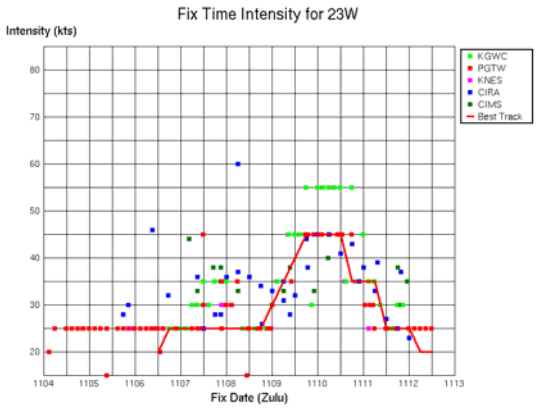




Tropical Storm (TS) 23W (Tembin)

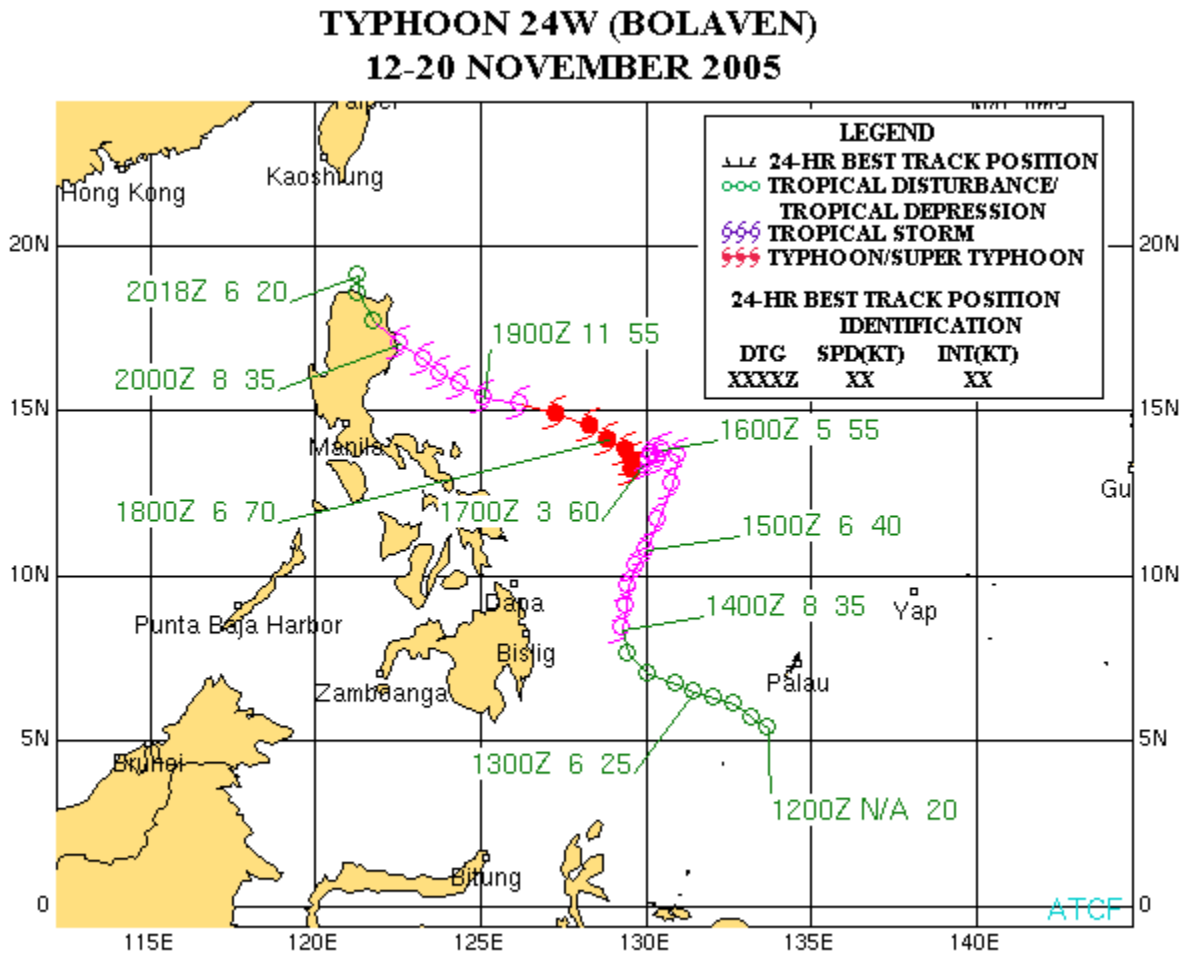
First Poor : 0600Z 04 Nov 05
First Fair : 2300Z 04 Nov 05
First TCFA : 1400Z 06 Nov 05
First Warning : 0600Z 07 Nov 05
Last Warning : 1800Z 11 Nov 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 19

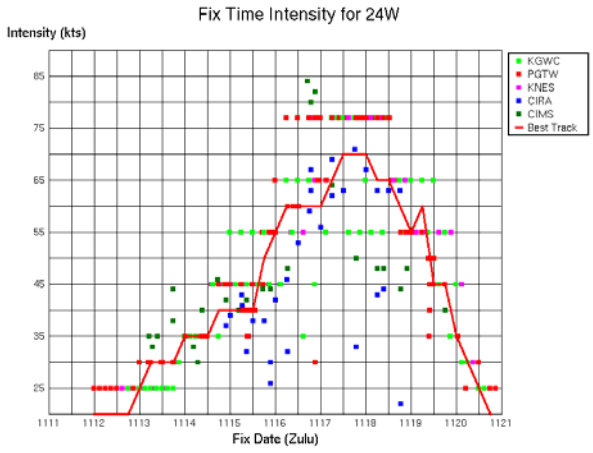




Typhoon (TY) 24W (Bolaven)

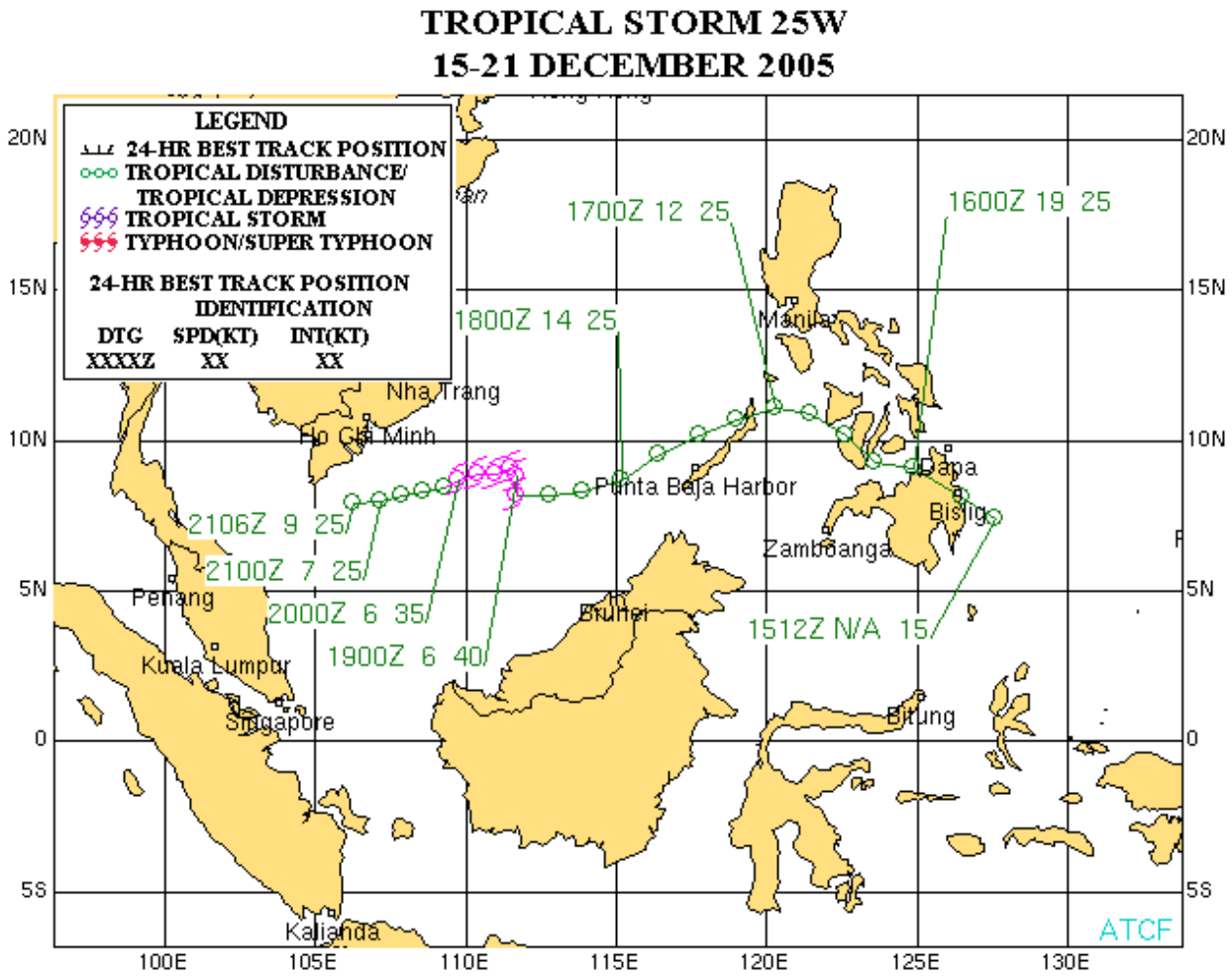
First Poor : 0100Z 12 Nov 05
First Fair : 1400Z 12 Nov 05
First TCFA : 2200Z 12 Nov 05
First Warning : 1200Z 13 Nov 05
Last Warning : 1200Z 20 Nov 05
Max Intensity : 70 kts, gusts to 85 kts
Total Warnings : 29

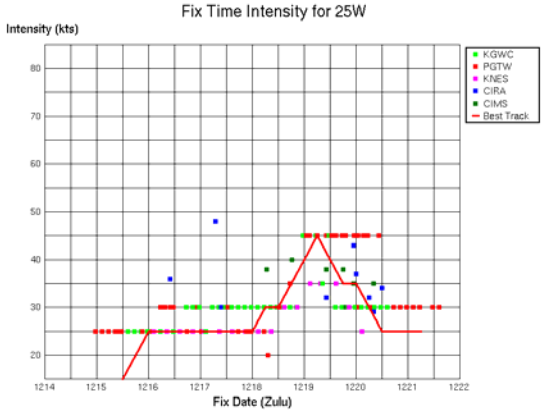




Tropical Storm (TS) 25W

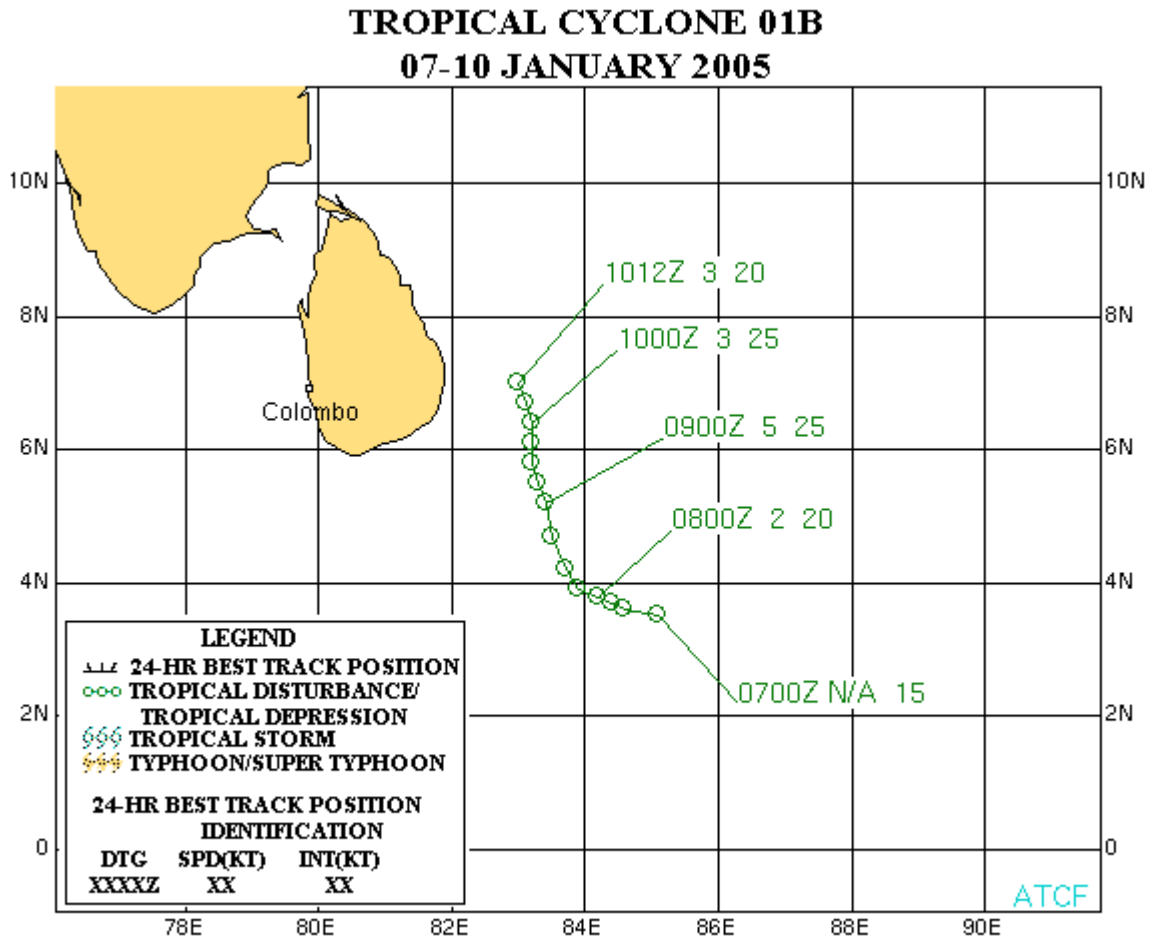
First Poor : 0600Z 14 Dec 05
First Fair : 0600Z 16 Dec 05
First TCFA : 0230Z 17 Dec 05
First Warning : 1200Z 18 Dec 05
Last Warning : 1200Z 20 Dec 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 8

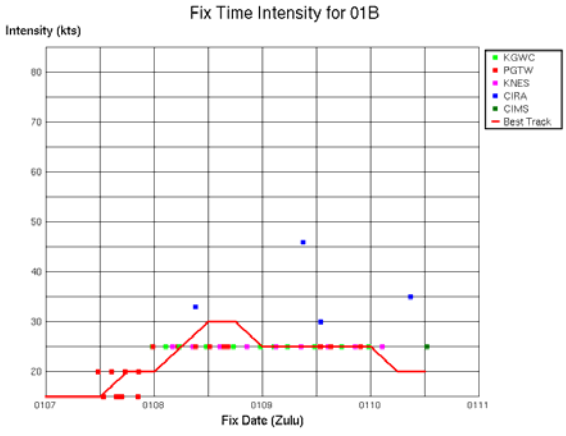




Tropical Cyclone (TC) 01B

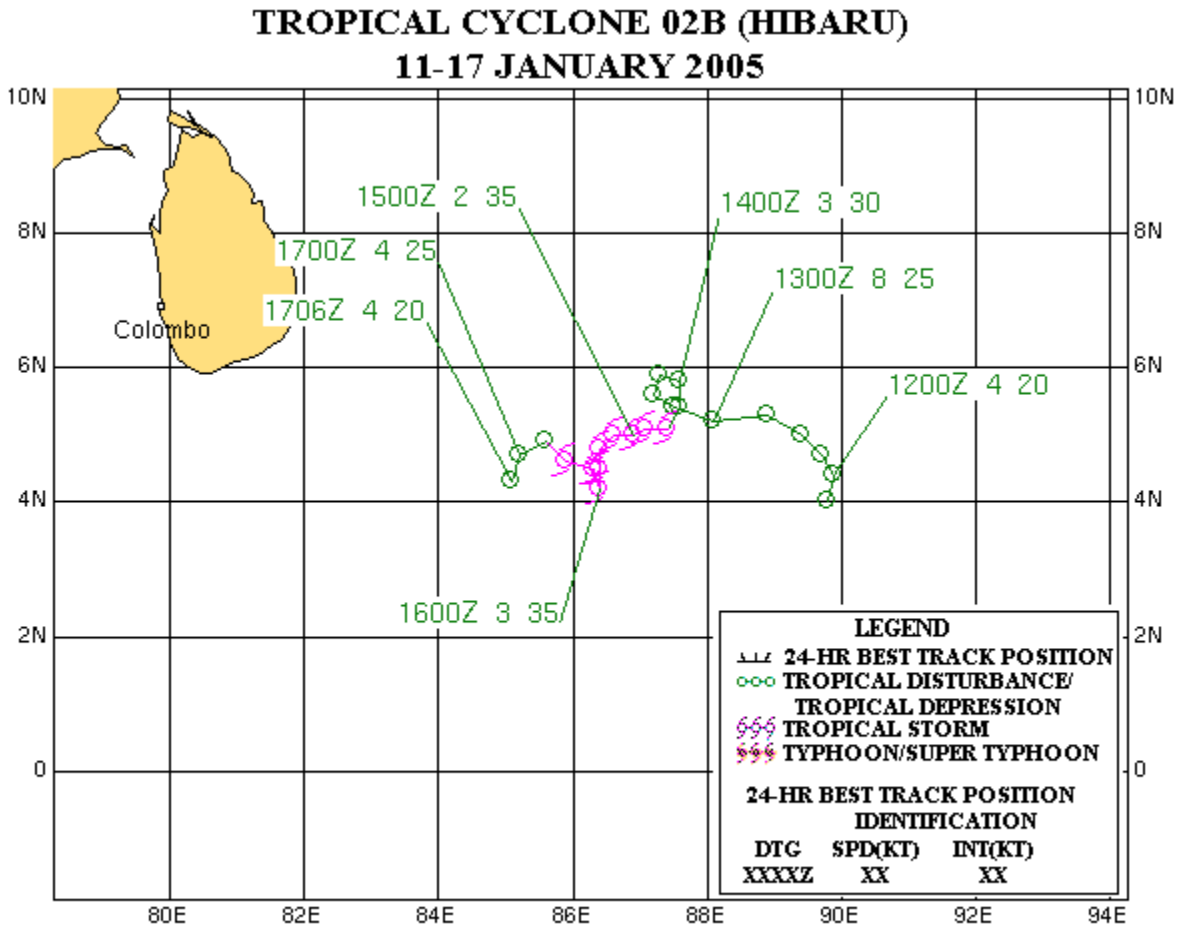
First Poor : 1800Z 04 Jan 05
First Fair : 1800Z 07 Jan 05
First TCFA : 2300Z 07 Jan 05
First Warning : 1800Z 08 Jan 05
Last Warning : 0600Z 10 Jan 05
Max Intensity : 30 kts, gusts to 40 kts
Total Warnings : 7

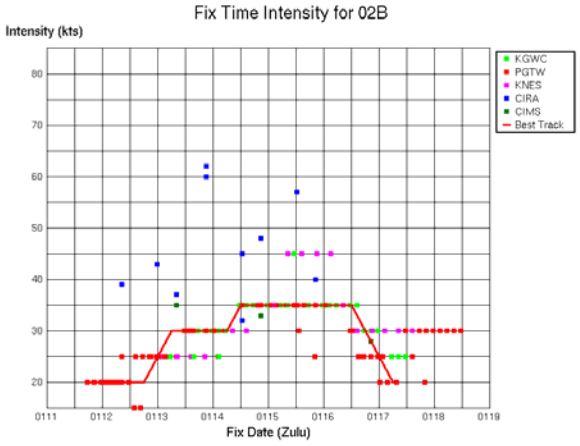




Tropical Cyclone (TC) 02B (Hibaru)

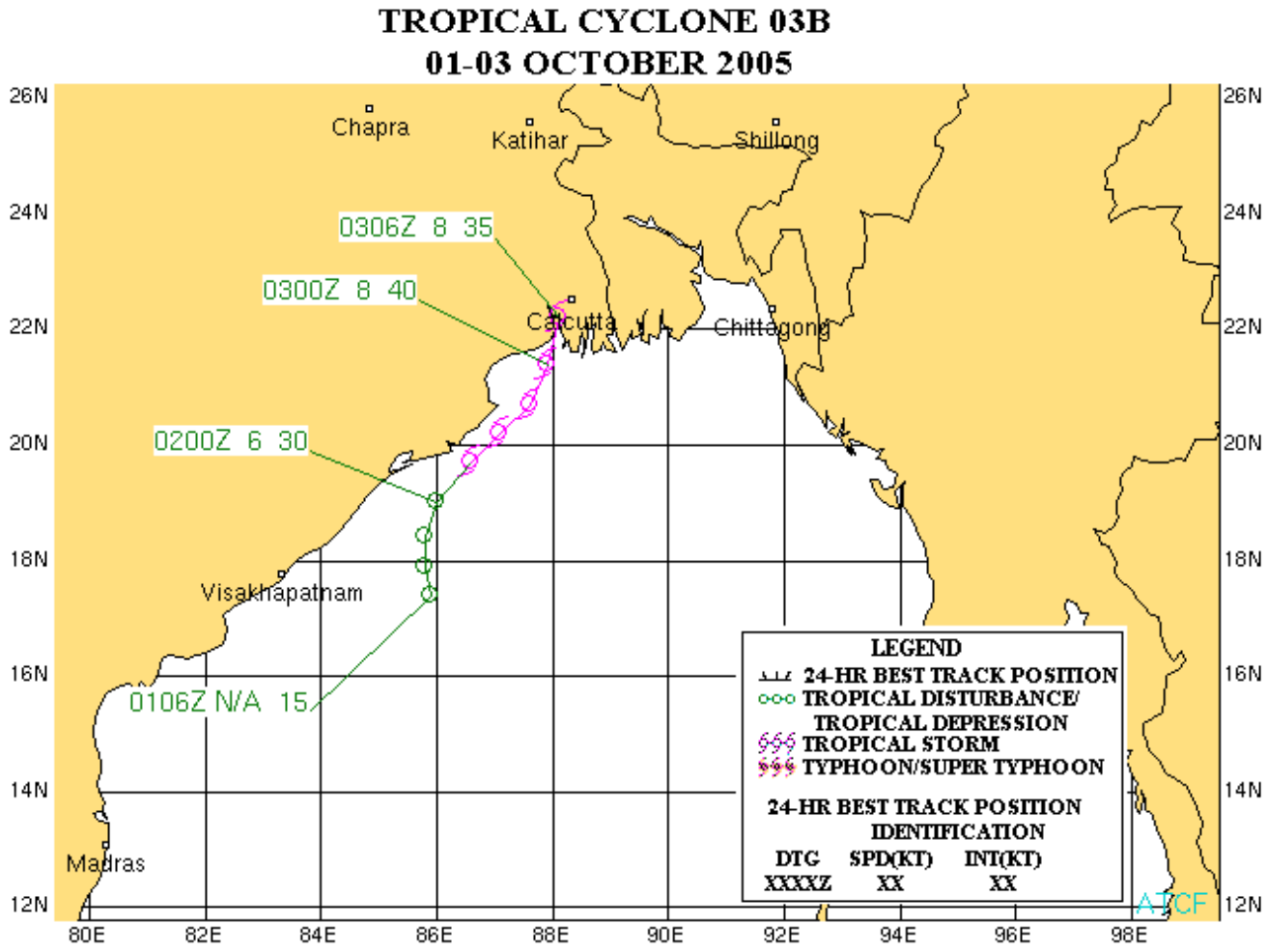
First Poor : 1800Z 10 Jan 05
First Fair : 1800Z 11 Jan 05
First TCFA : 1330Z 13 Jan 05
First Warning : 1800Z 14 Jan 05
Last Warning : 0000Z 17 Jan 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 10

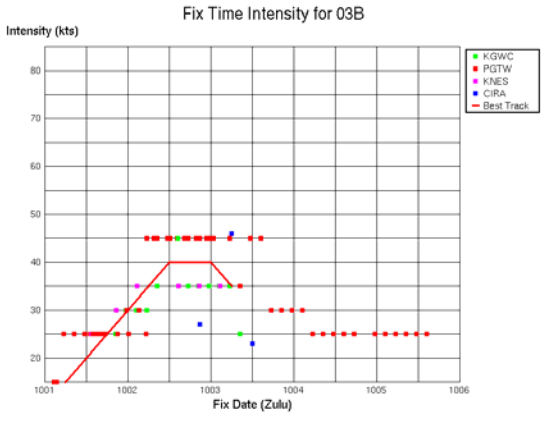




Tropical Cyclone (TC) 03B

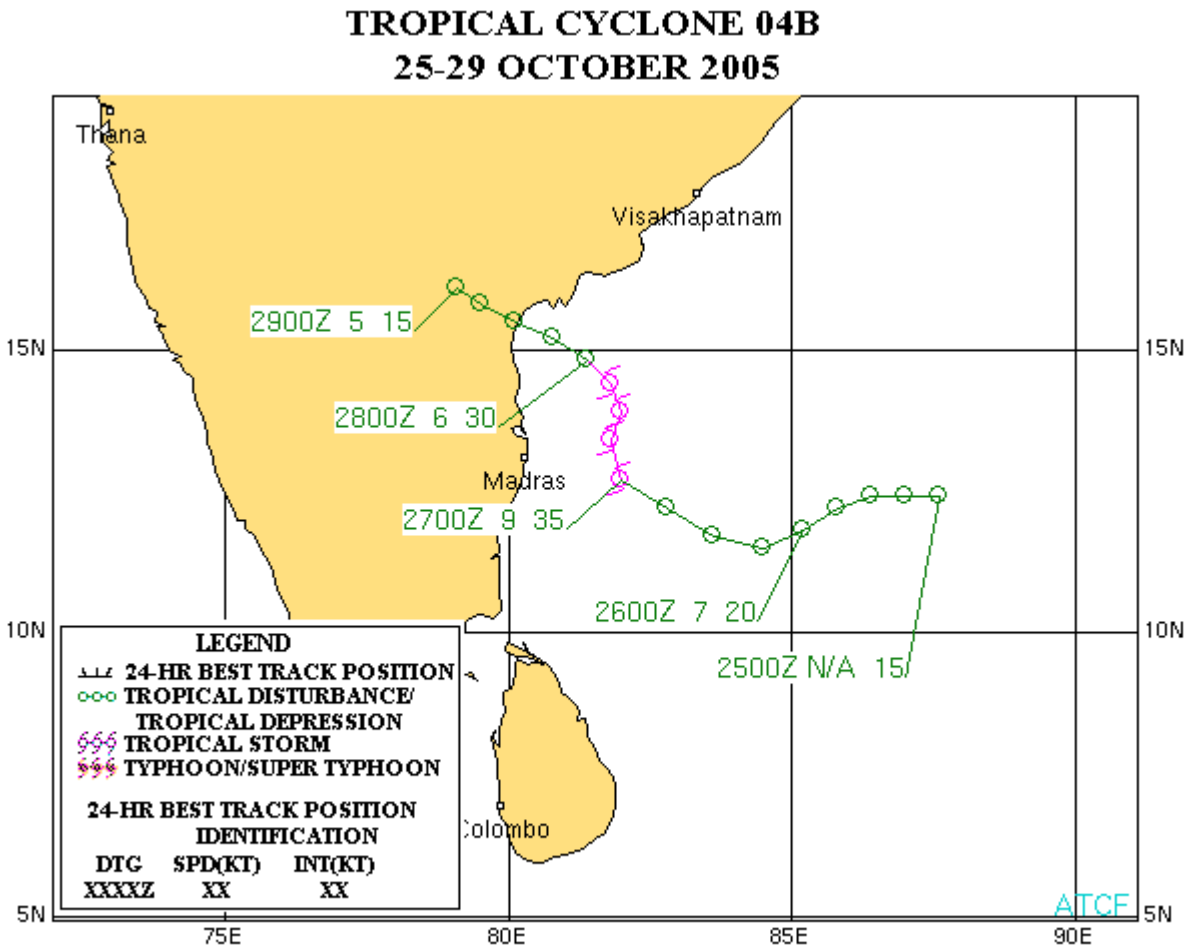
First Poor : 0900Z 01 Oct 05
First Fair : 1900Z 01 Oct 05
First TCFA : N/A
First Warning : 0600Z 02 Oct 05
Last Warning : 0600Z 03 Oct 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 3

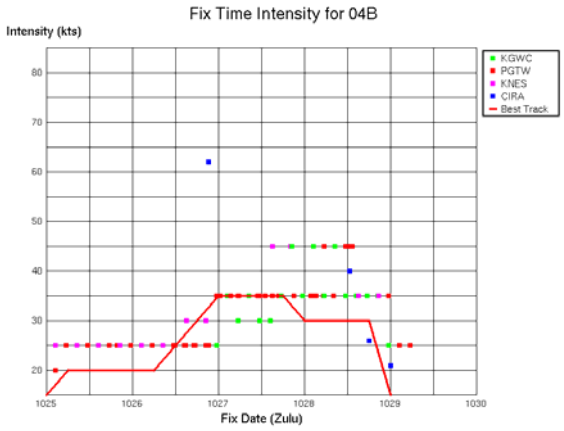




Tropical Cyclone (TC) 04B

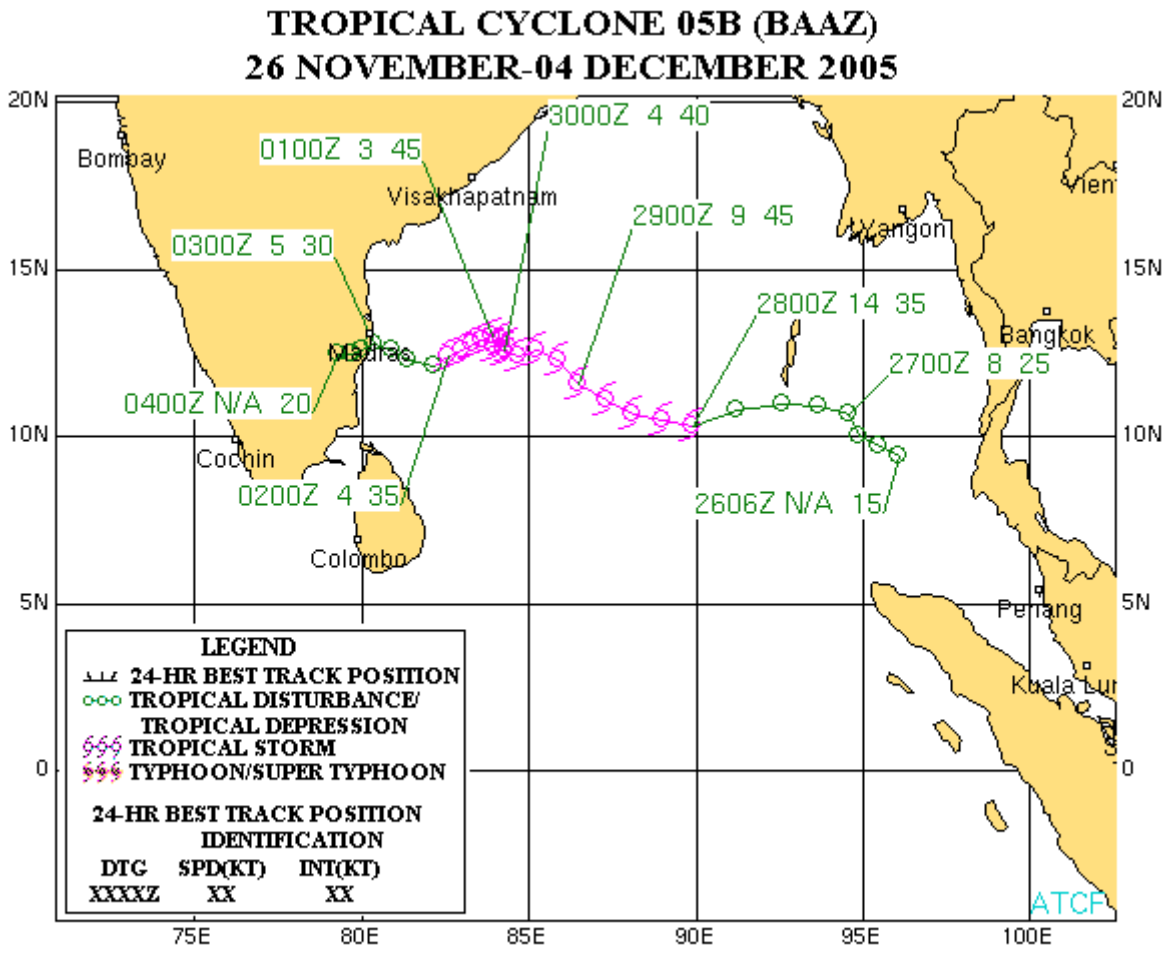
First Poor : 0730Z 25 Oct 05
First Fair : 1800Z 26 Oct 05
First TCFA : 0130Z 27 Oct 05
First Warning : 1800Z 27 Oct 05
Last Warning : 1800Z 28 Oct 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 3

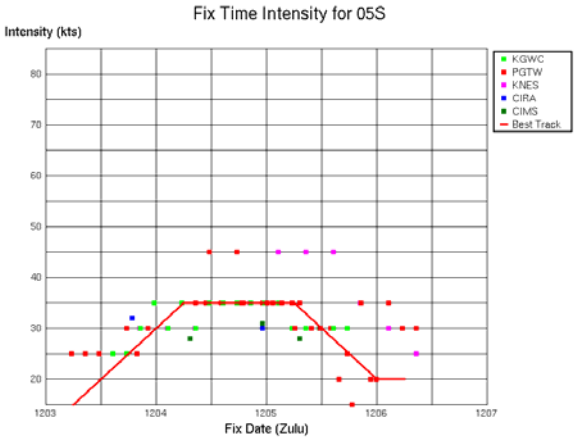




Tropical Cyclone (TC) 05B (Baaz)

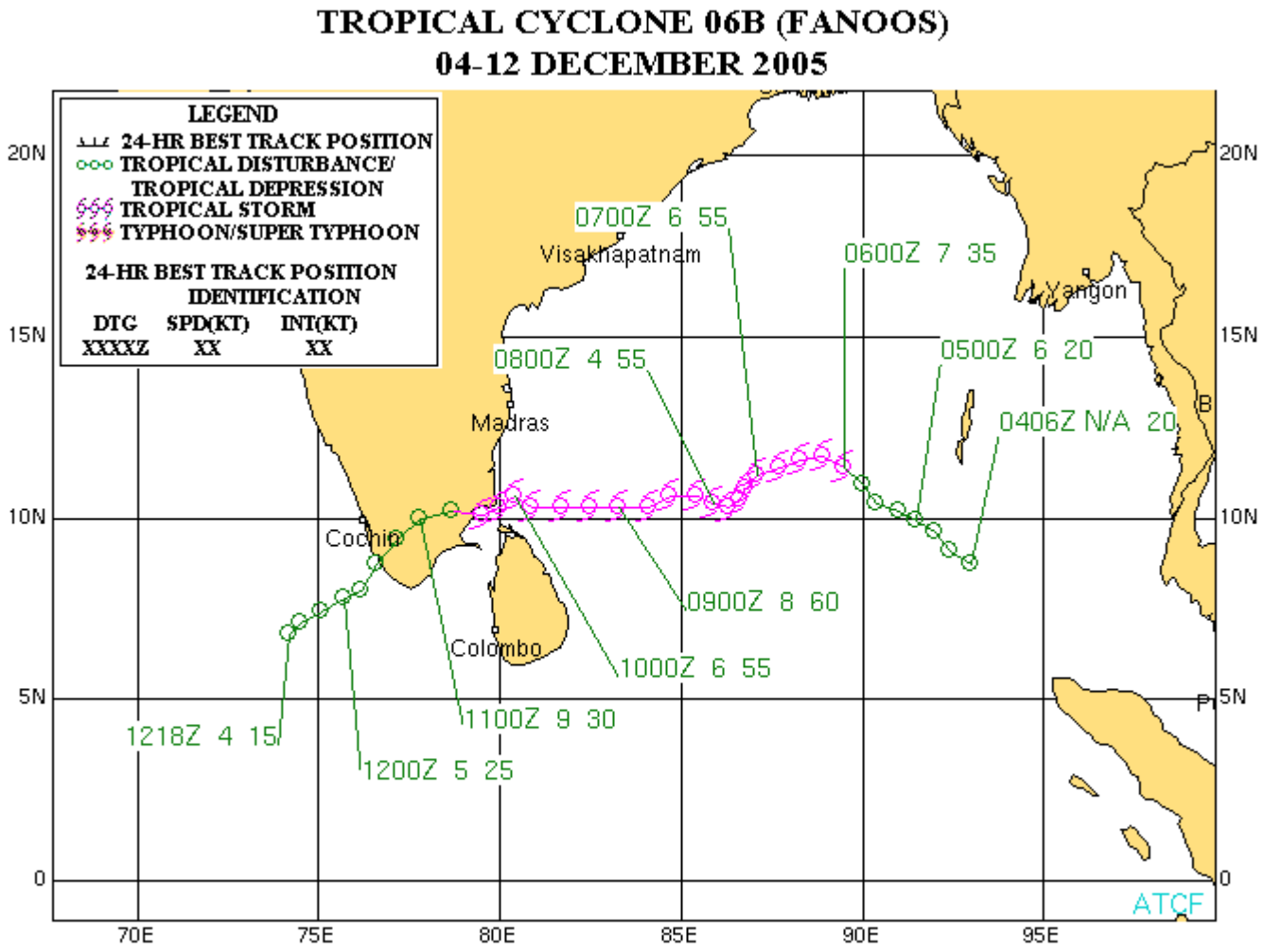
First Poor : 0500Z 26 Nov 05
First Fair : 0130Z 27 Nov 05
First TCFA : 1200Z 27 Nov 05
First Warning : 1800Z 27 Nov 05
Last Warning : 0600Z 02 Dec 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 10

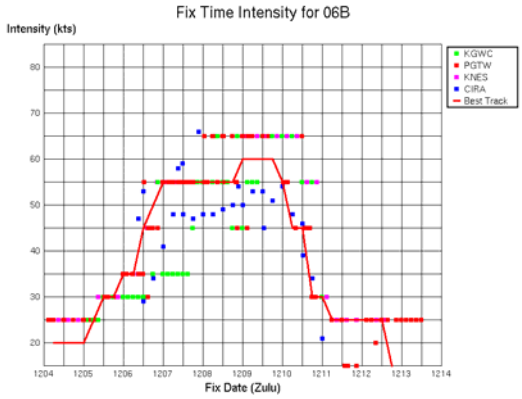




Tropical Cyclone (TC) 06B (Fanoos)

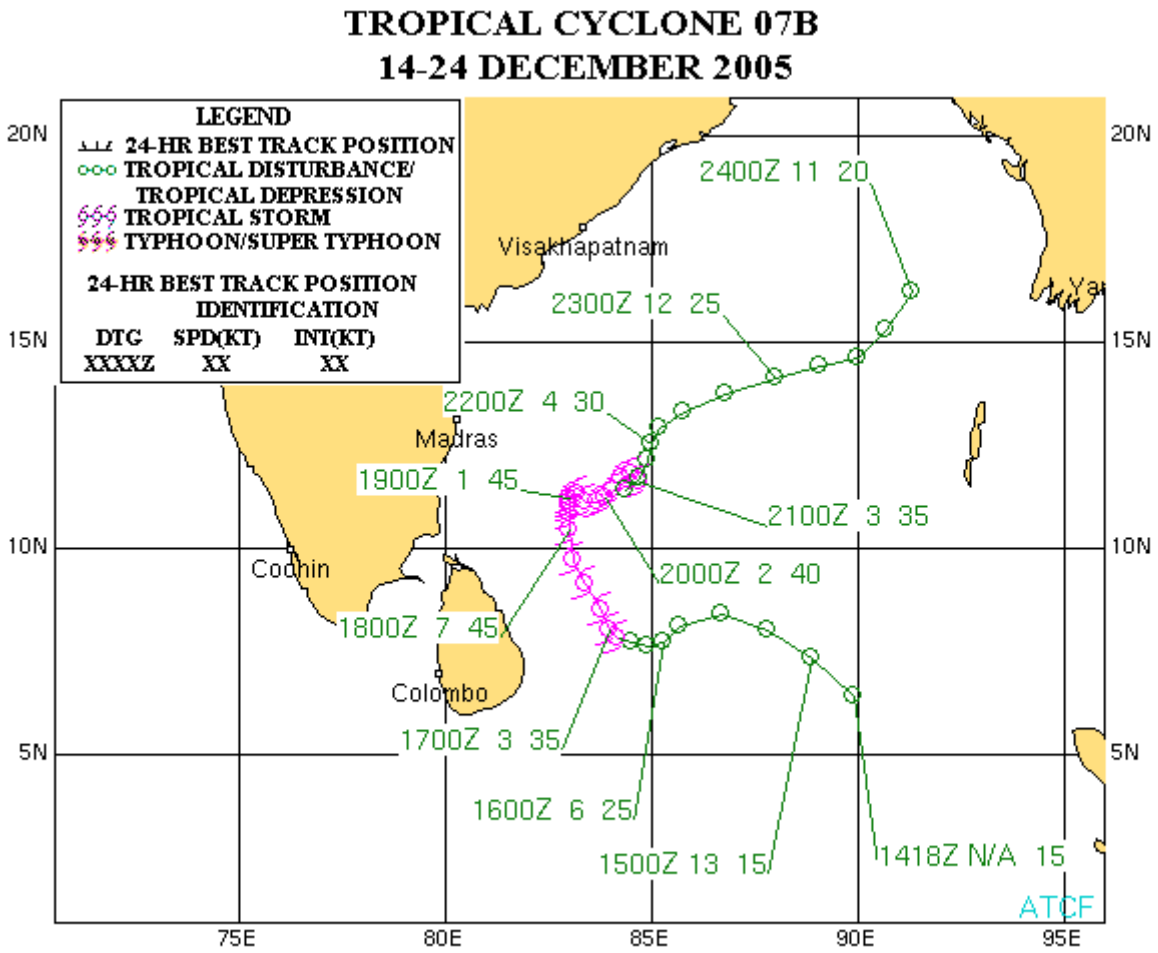
First Poor : 0230Z 04 Dec 05
First Fair : 0230Z 05 Dec 05
First TCFA : 1430Z 05 Dec 05
First Warning : 0000Z 06 Dec 05
Last Warning : 1800Z 10 Dec 05
Max Intensity : 60 kts, gusts to 75 kts
Total Warnings : 11

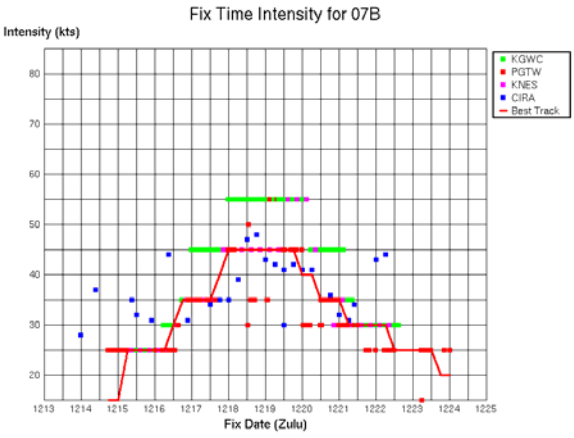




Tropical Cyclone (TC) 07B

First Poor : 1800Z 14 Dec 05
First Fair : 1200Z 15 Dec 05
First TCFA : 2000Z 16 Dec 05
First Warning : 0000Z 17 Dec 05
Last Warning : 0000Z 22 Dec 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 12





2. SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

2.1 GENERAL

In accordance with CINCPACINST 3140.1 (series), Southern Hemisphere tropical cyclones are numbered sequentially from 01 July through 30 June to reflect the Southern Hemisphere tropical season.

For warning message delineation, the Southern Hemisphere Area of Responsibility (AOR) is divided into two basins: the South Indian (west of 135° East longitude) and the South Pacific Ocean (east of 135° East longitude). The suffixes "S" (South Indian Ocean) and "P" (South Pacific Ocean) are appended to the tropical cyclone number to differentiate warnings for these basins. For this report, the Southern Hemisphere AOR is broken down into three sub-basins, reflecting primary cyclogenesis areas: South Indian (west of 105° East longitude), Australia (105° East longitude to 165° East longitude), and South Pacific (east of 165° East longitude).

2.2 SUMMARY

Table 2-1 lists the significant tropical cyclones during the 2005 season and can be compared to the climatological mean presented in Table 2-2. Table 2-3 compares this year's tropical cyclone activity in the Southern Hemisphere sub-basins to previous years and climatology. Composites of the tropical cyclone best tracks for the Southern Hemisphere appear following Table 2-3.

Table 2-1 SOUTHERN HEMISPHERE TROPICAL CYCLONES FOR 2005 (01 JULY 2004 - 30 JUNE 2005)

TC	NAME	WARNING PERIOD	NUMBER ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)**
01S	PHOEBE	02 SEP – 04 SEP	6	55(27.5)	984
02S	-	27 OCT – 29 OCT	5	35(17.5)	997
03S	AROLA	08 NOV – 13 NOV	11	65(32.5)	976

04S	BENTO	21 NOV – 29 NOV	23	140(70)	898
05S	-	04 DEC – 05 DEC	4	35(17.5)	997
06S	CHAMBO	23 DEC – 28 DEC	10	105(52.5)	938
07S	RAYMOND	31 DEC – 03 JAN	6	50(25)	987
08P	KERRY	05 JAN – 12 JAN	15	90(45)	954
09S	SALLY	08 JAN – 10 JAN	5	45(22.5)	991
10S	-	15 JAN – 17 JAN	4	35(17.5)	997
11S	DAREN	18 JAN – 20 JAN	7	45(22.5)	991
12S	ERNEST	19 JAN – 23 JAN	8	100(50)	944
13S	TIM	23 JAN – 25 JAN	4	35(17.5)	997
14S	GERARD	03 FEB – 05 FEB	4	60(30)	980
15P	MEENA	03 FEB – 07 FEB	9	125(62.5)	916
16P	HARVEY	06 FEB – 07 FEB	4	50(25)	987
17S	VIVIENNE	07 FEB – 08 FEB	4	35(17.5)	997
18P	NANCY	13 FEB – 16 FEB	8	125(62.5)	916
19P	OLAF	13 FEB – 22 FEB	22	145(72.5)	892
20P	PERCY	25 FEB – 04 MAR	24	140(70)	898
21P	RAE	06 MAR – 06 MAR	3	35(17.5)	997
22P	INGRID	06 MAR – 15 MAR	21	135(67.5)	904
23S	WILLY	09 MAR – 14 MAR	12	90(45)	954
24S	HENNIE	21 MAR – 27 MAR	12	65(32.5)	976
25S	ISANG	03 APR – 06 APR	7	40(20)	994
26S	ADELINE-JULIET	04 APR – 12 APR	16	130(65)	910
		Total	254		

**MSLP Converted from estimated maximum surface winds using Atkinson/Holiday wind pressure relationship. Number of warnings issued includes Amended warnings.

Table 2-2

DISTRIBUTION OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

FOR 1958 - 2005

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTALS
1958-1977 AVE*	-	-	-	0.4	1.5	3.6	6.1	5.8	4.7	2.1	0.5	-	**24.7**
1981	0	0	0	1	3	2	6	5	3	3	1	0	**24**
1982	1	0	0	1	1	3	9	4	2	3	1	0	**25**
1983	1	0	0	1	1	3	5	6	3	5	0	0	**25**
1984	1	0	0	1	2	5	5	10	4	2	0	0	**30**
1985	0	0	0	0	1	7	9	9	6	3	0	0	**35**
1986	0	0	1	0	1	1	9	9	6	4	2	0	**33**
1987	0	1	0	0	1	3	6	8	3	4	1	1	**28**
1988	0	0	0	0	2	3	5	5	3	1	2	0	**21**
1989	0	0	0	0	2	1	5	8	6	4	2	0	**28**

1990	2	0	1	1	2	2	4	4	10	2	1	0	**29**
1991	0	0	1	1	1	3	2	5	5	2	1	1	**22**
1992	0	0	1	1	2	5	4	11	3	2	1	0	**30**
1993	0	0	1	1	0	5	7	7	2	2	2	0	**27**
1994	0	0	0	0	2	4	8	4	9	3	0	0	**30**
1995	0	0	0	0	2	2	5	4	5	4	0	0	**22**
1996	0	0	0	0	1	3	7	6	6	4	1	0	**28**
1997	1	1	1	2	2	6	9	8	3	1	3	1	**38**
1998	1	0	0	3	2	3	7	9	6	6	0	0	**37**
1999	1	0	1	1	1	6	6	8	7	2	0	0	**33**
2000	0	0	0	0	0	3	6	5	7	6	0	0	**27**
2001	0	1	0	0	1	1	4	6	2	5	0	1	**21**
2002	0	0	0	2	4	1	4	5	4	2	3	0	**25**
2003	0	0	1	0	2	5	5	7	5	2	1	1	**29**
2004	0	0	0	1	1	3	6	3	7	1	1	0	**23**
2005	0	0	1	1	2	2	7	7	4	2	0	0	**26**
(1981-2005)													
MEAN	0.3	0.1	0.4	0.7	1.6	3.3	6.0	6.5	4.8	3.0	0.9	0.2	27.8
CASES	8	3	9	18	39	82	150	163	121	75	23	5	**696**

* (GRAY, 1978)

The criteria used in TABLE 2-2 are as follows:

1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.

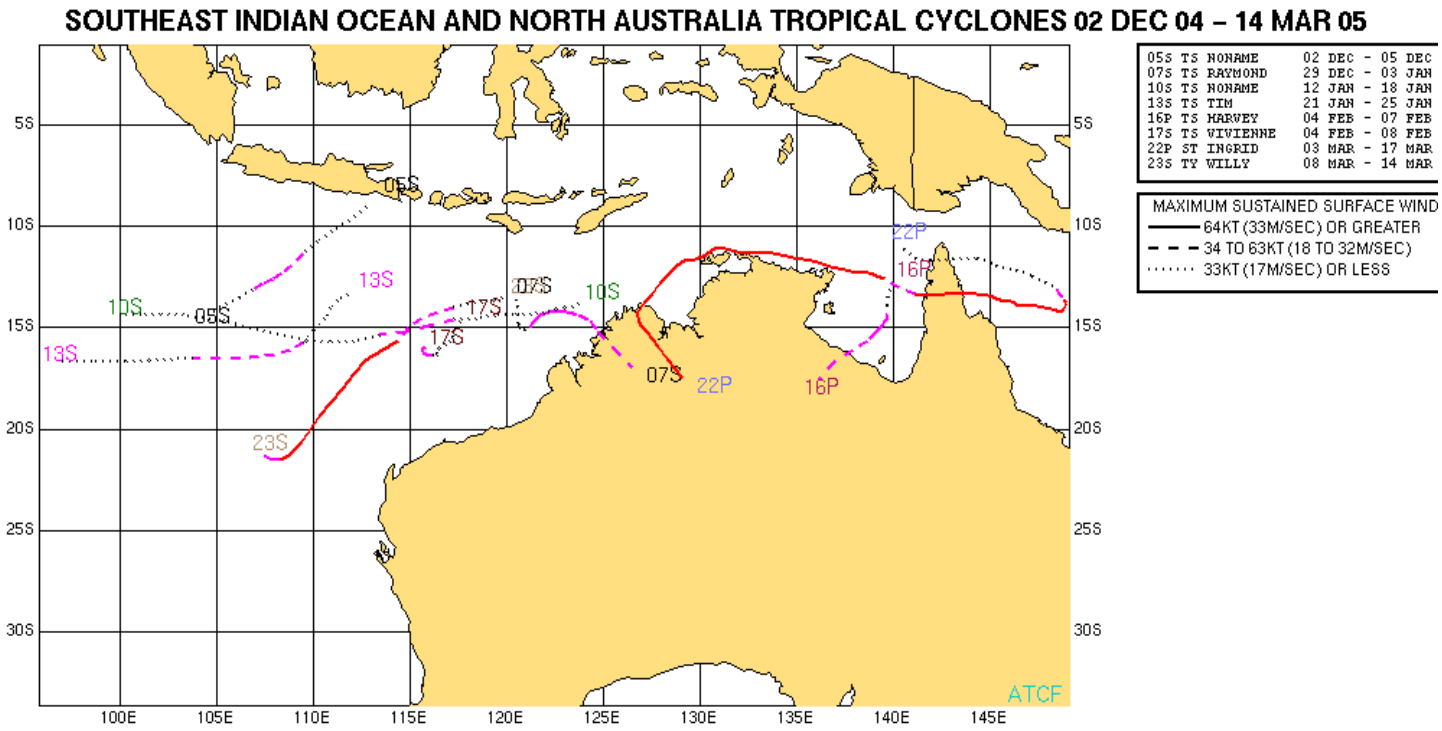
2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.

3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

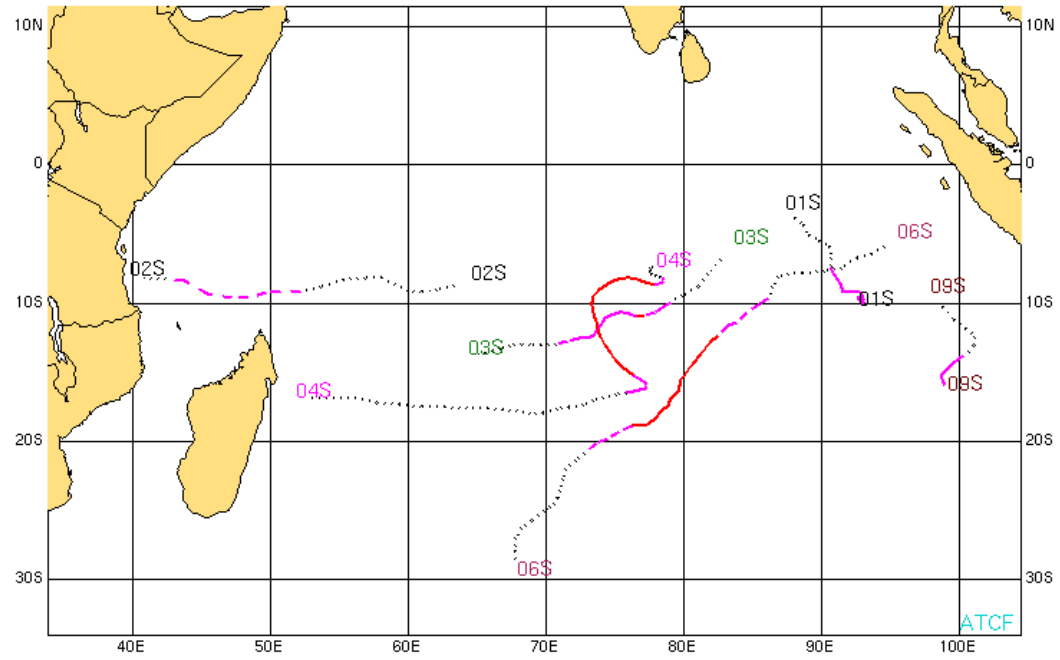
Table 2-3 ANNUAL VARIATION OF SOUTHERN HEMISPHERE TROPICAL CYCLONES BY OCEAN BASIN 1958-2004

YEAR	SOUTH INDIAN	AUSTRALIAN	SOUTH PACIFIC	
	(WEST OF 105°E)	(105°E - 165°E)	(EAST OF 165°E)	TOTAL
1958-1977 AVERAGE*	8.4	10.3	5.9	24.6
1981	13	8	3	24
1982	12	11	2	25
1983	7	6	12	25
1984	14	14	2	30
1985	14	15	6	35
1986	14	16	3	33
1987	9	8	11	28
1988	14	2	5	21

1989	12	9	7	28
1990	18	8	3	29
1991	11	10	1	22
1992	11	6	13	30
1993	10	16	1	27
1994	16	10	4	30
1995	11	7	4	22
1996	13	11	4	28
1997	17	5	16	38
1998	12	10	15	37
1999	13	16	4	33
2000	10	12	5	27
2001	10	8	3	21
2002	14	7	4	25
2003	14	6	9	29
2004	13	7	3	23
2005	12	8	6	26
(1981-2004)				
TOTAL	322	246	152	721
AVERAGE	12.6	9.4	5.8	27.8
* (Gray,1978)				



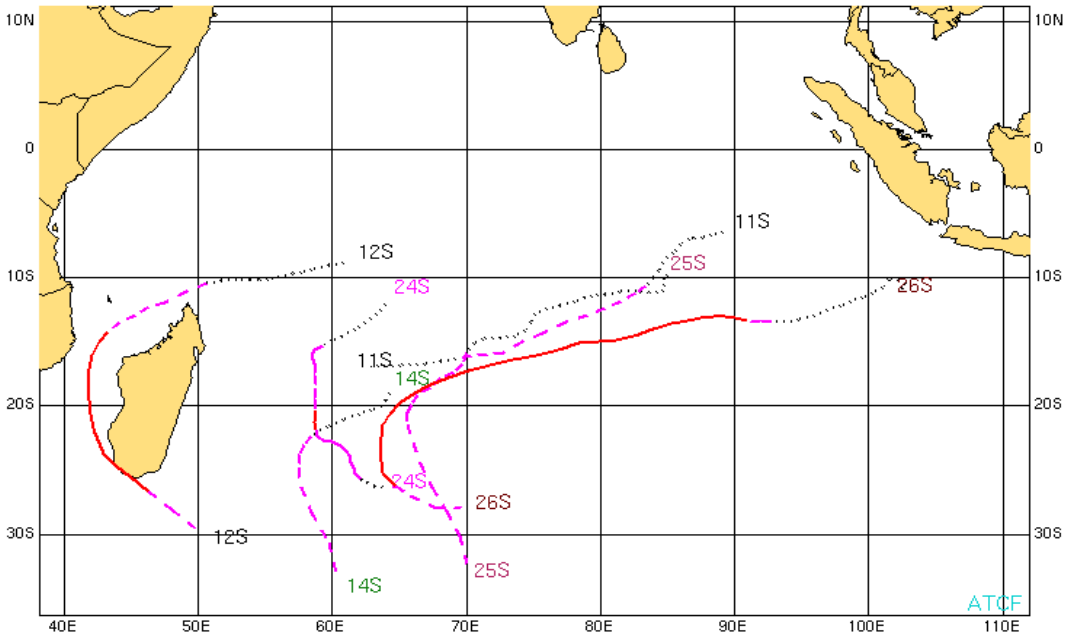
SOUTH INDIAN OCEAN TROPICAL CYCLONES 30 AUG 04 – 10 JAN 05



01S	TS PHOEBE	30 AUG - 04 SEP
02S	TS NONAME	22 OCT - 29 OCT
03S	TY AROLA	06 NOV - 13 NOV
04S	ST BENTO	17 NOV - 29 NOV
06S	TY CHAMBO	20 DEC - 01 JAN
09S	TS SALLY	06 JAN - 10 JAN

MAXIMUM SUSTAINED SURFACE WIND
- 64KT (33M/SEC) OR GREATER
- 34 TO 63KT (18 TO 32M/SEC)
- 33KT (17M/SEC) OR LESS

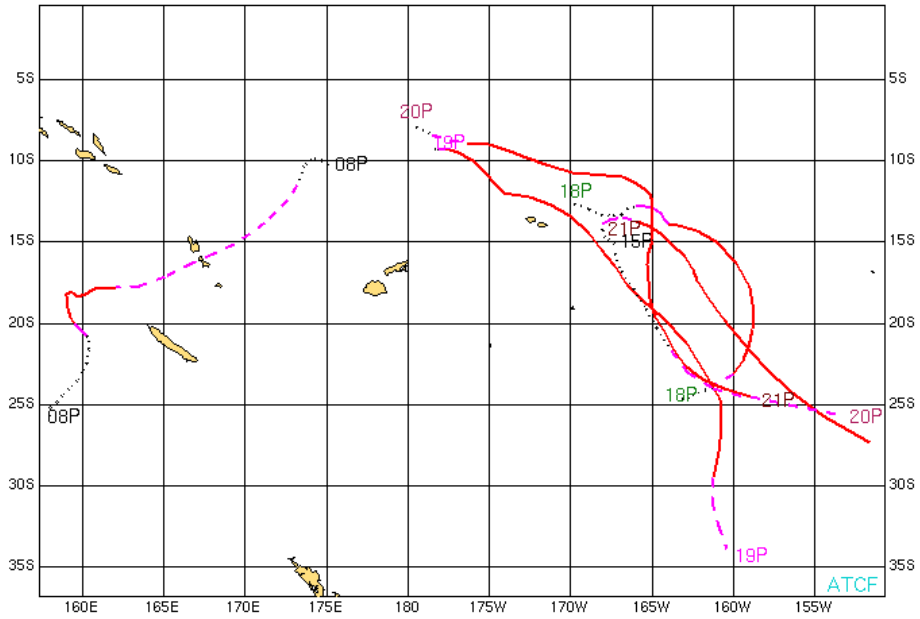
SOUTH INDIAN OCEAN TROPICAL CYCLONES 13 JAN 05 – 12 APR 05



11S	TS DAREN	13 JAN - 20 JAN
12S	TY ERNEST	16 JAN - 24 JAN
14S	TS GERARD	01 FEB - 05 FEB
24S	TY HENNIE	17 MAR - 27 MAR
25S	TS ISANG	29 MAR - 06 APR
26S	ST ADELINE	31 MAR - 12 APR

MAXIMUM SUSTAINED SURFACE WIND
- 64KT (33M/SEC) OR GREATER
- 34 TO 63KT (18 TO 32M/SEC)
- 33KT (17M/SEC) OR LESS

SOUTH PACIFIC OCEAN TROPICAL CYCLONES 04 JAN 05 – 06 MAR 05

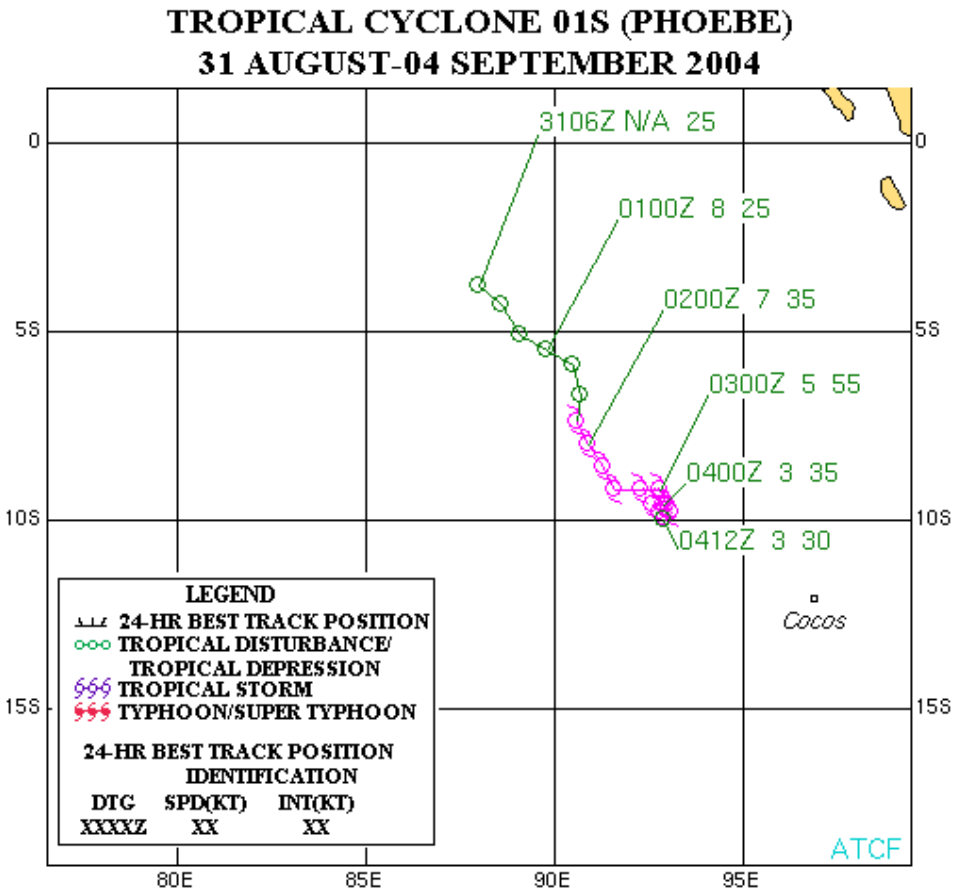


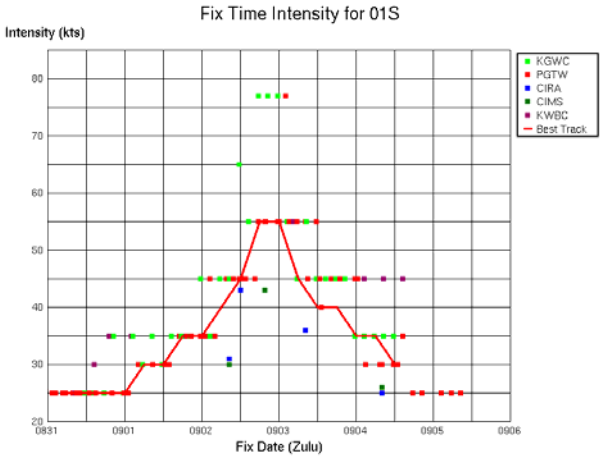
08P	TY KERRY	04 JAN - 15 JAN
15P	TY MEENA	01 FEB - 07 FEB
18P	TY NANCY	11 FEB - 16 FEB
19P	ST OLAF	11 FEB - 20 FEB
20P	ST PERCY	24 FEB - 04 MAR
21P	TS RAE	04 MAR - 06 MAR

MAXIMUM SUSTAINED SURFACE WIND
- ——— 64KT (33M/SEC) OR GREATER
- – – – 34 TO 63KT (18 TO 32M/SEC)
- ····· 33KT (17M/SEC) OR LESS

Tropical Cyclone (TC) 01S (Phoebe)

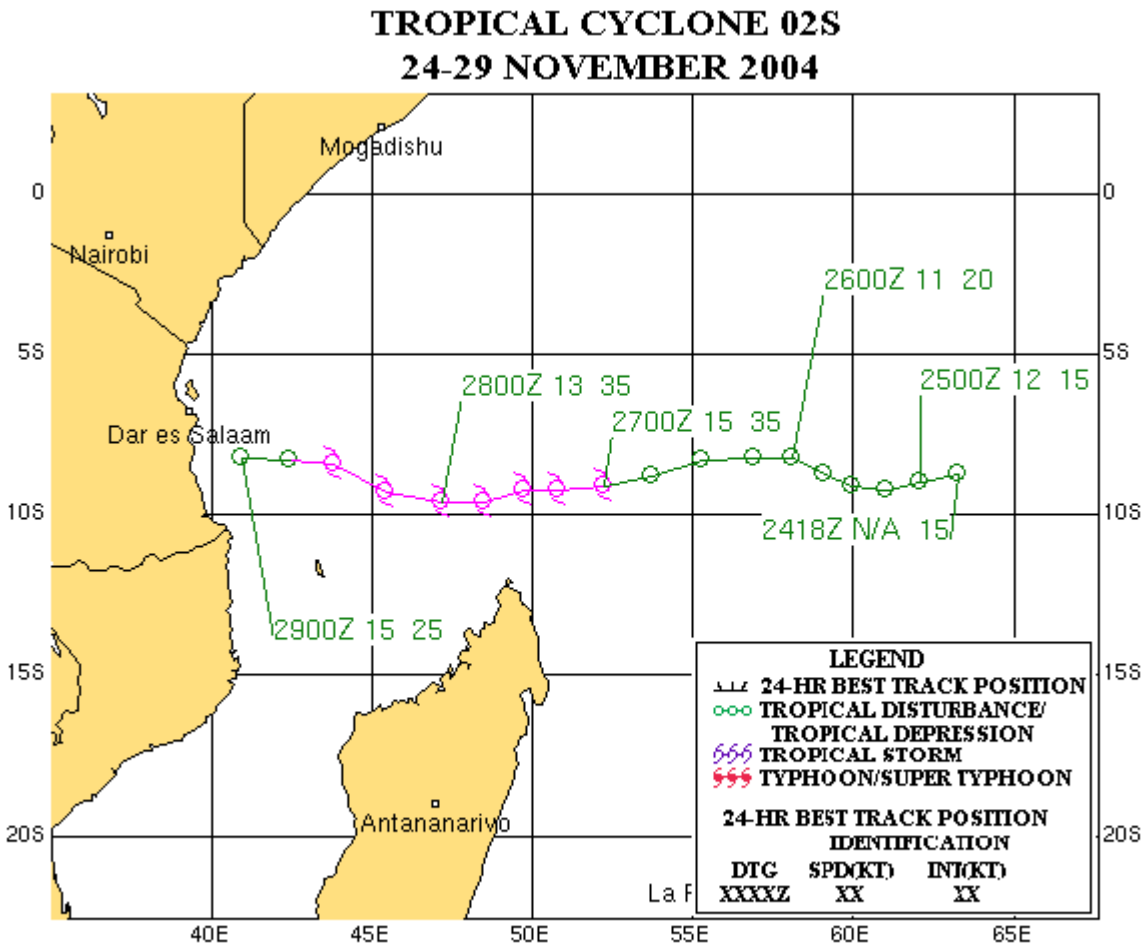
First Poor : 0600Z 31 Aug 04
First Fair : 1800Z 31 Aug 04
First TCFA : 0900Z 01 Sep 04
First Warning : 0000Z 02 Sep 04
Last Warning : 1200Z 04 Sep 04
Max Intensity : 55 kts, gusts to 70 kts
Total Warnings : 6

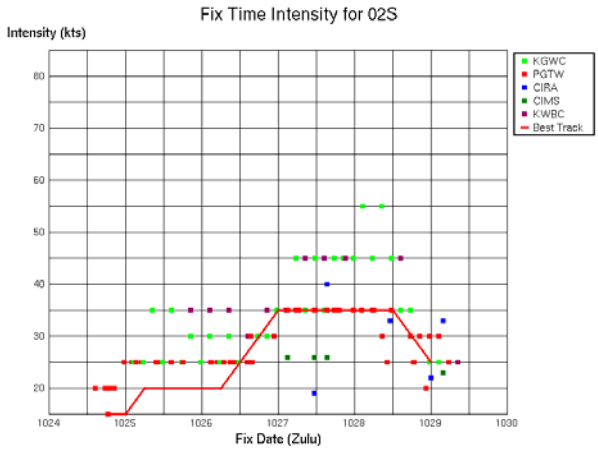




Tropical Cyclone (TC) 02S

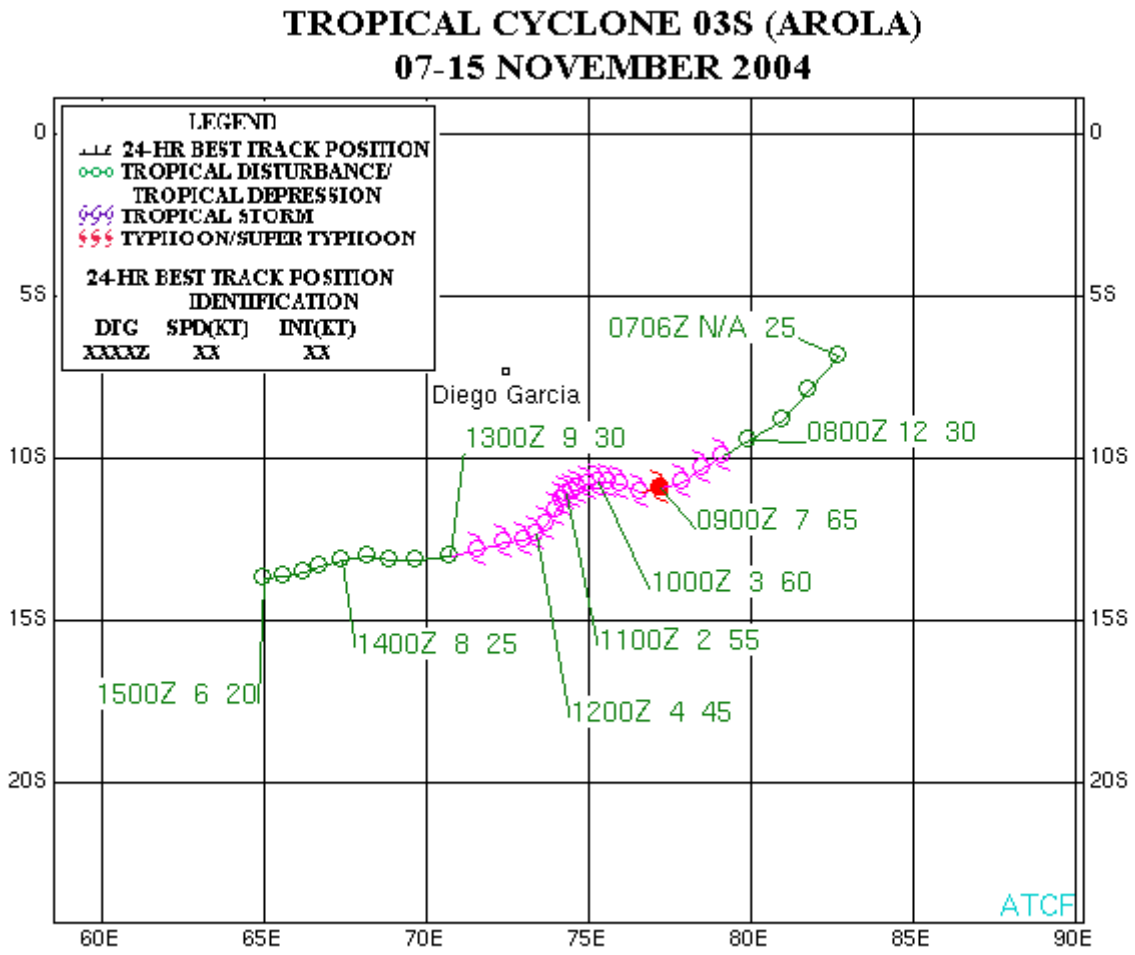
First Poor : 1800Z 22 Oct 04
First Fair : 0230Z 25 Oct 04
First TCFA : 1930Z 26 Oct 04
First Warning : 0000Z 27 Oct 04
Last Warning : 0000Z 29 Oct 04
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 5

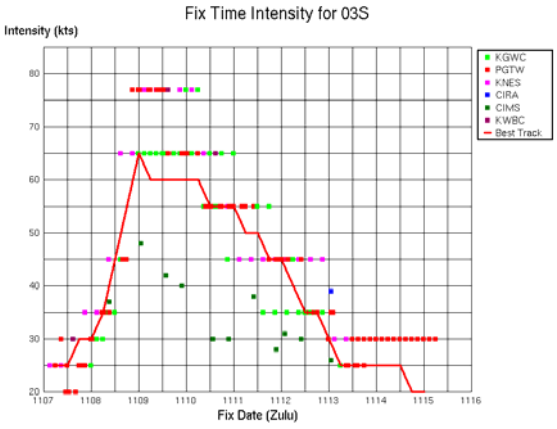




Tropical Cyclone (TC) 03S (Arola)

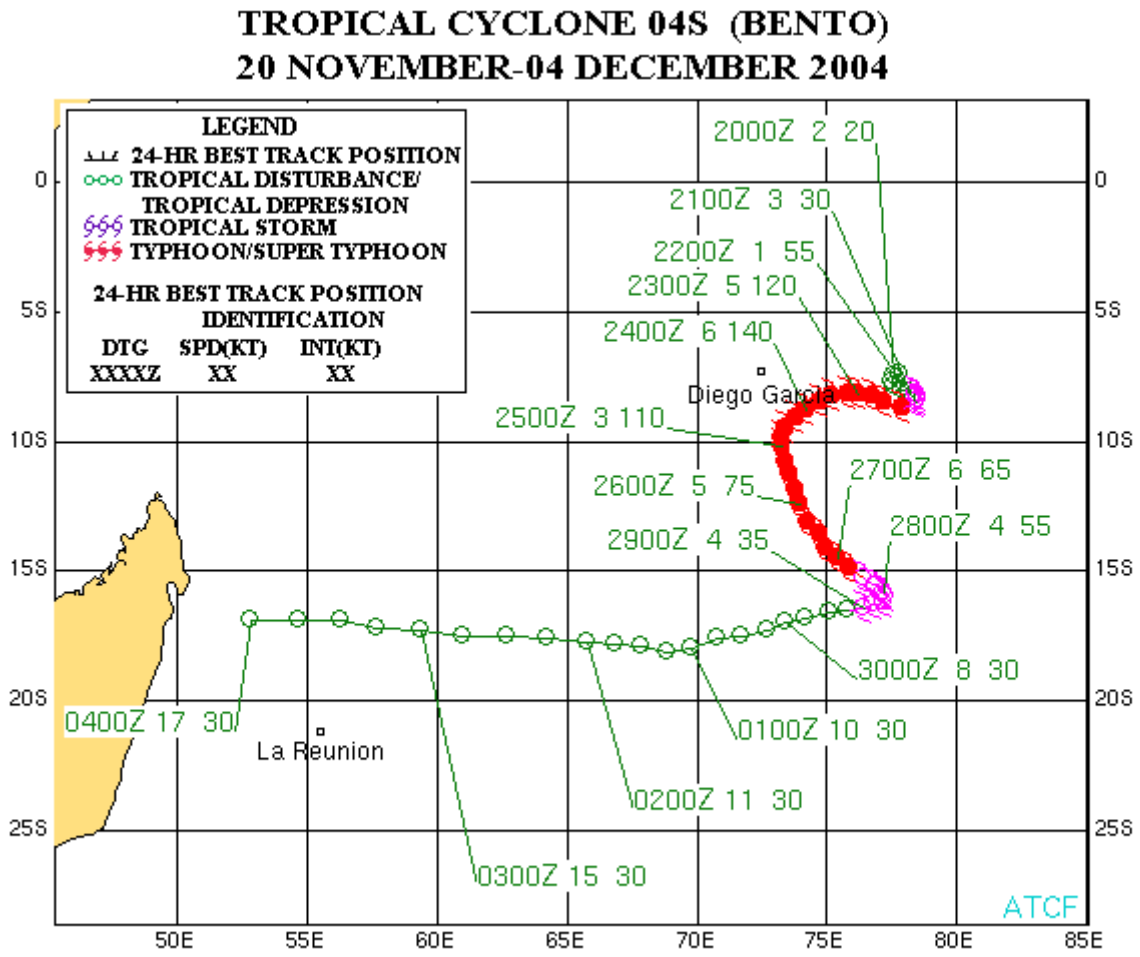
First Poor : 0130Z 07 Nov 04
First Fair : 1800Z 07 Nov 04
First TCFA : 0200Z 08 Nov 04
First Warning : 0600Z 08 Nov 04
Last Warning : 0600Z 13 Nov 04
Max Intensity : 65 kts, gusts to 80 kts
Total Warnings : 11

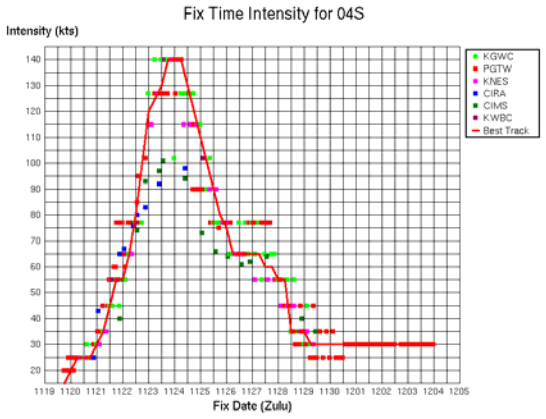




Tropical Cyclone (TC) 04S (Bento)

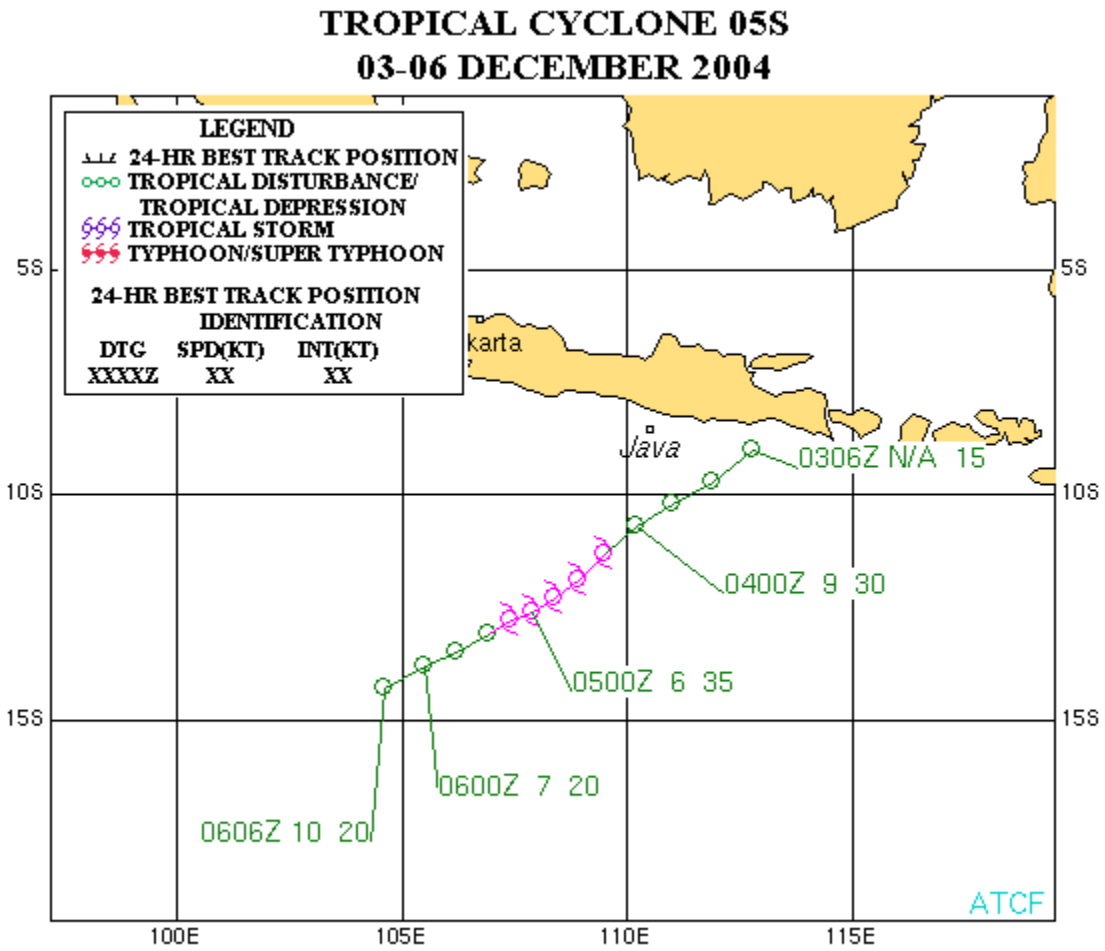
First Poor : 1800Z 18 Nov 04
First Fair : N/A
First TCFA : 0830Z 20 Nov 04
First Warning : 0600Z 21 Nov 04
Last Warning : 0600Z 29 Nov 04
Max Intensity : 140 kts, gusts to 170 kts
Total Warnings : 23

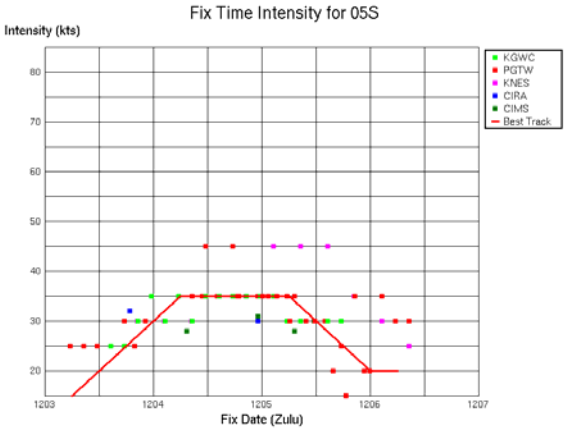




Tropical Cyclone (TC) 05S

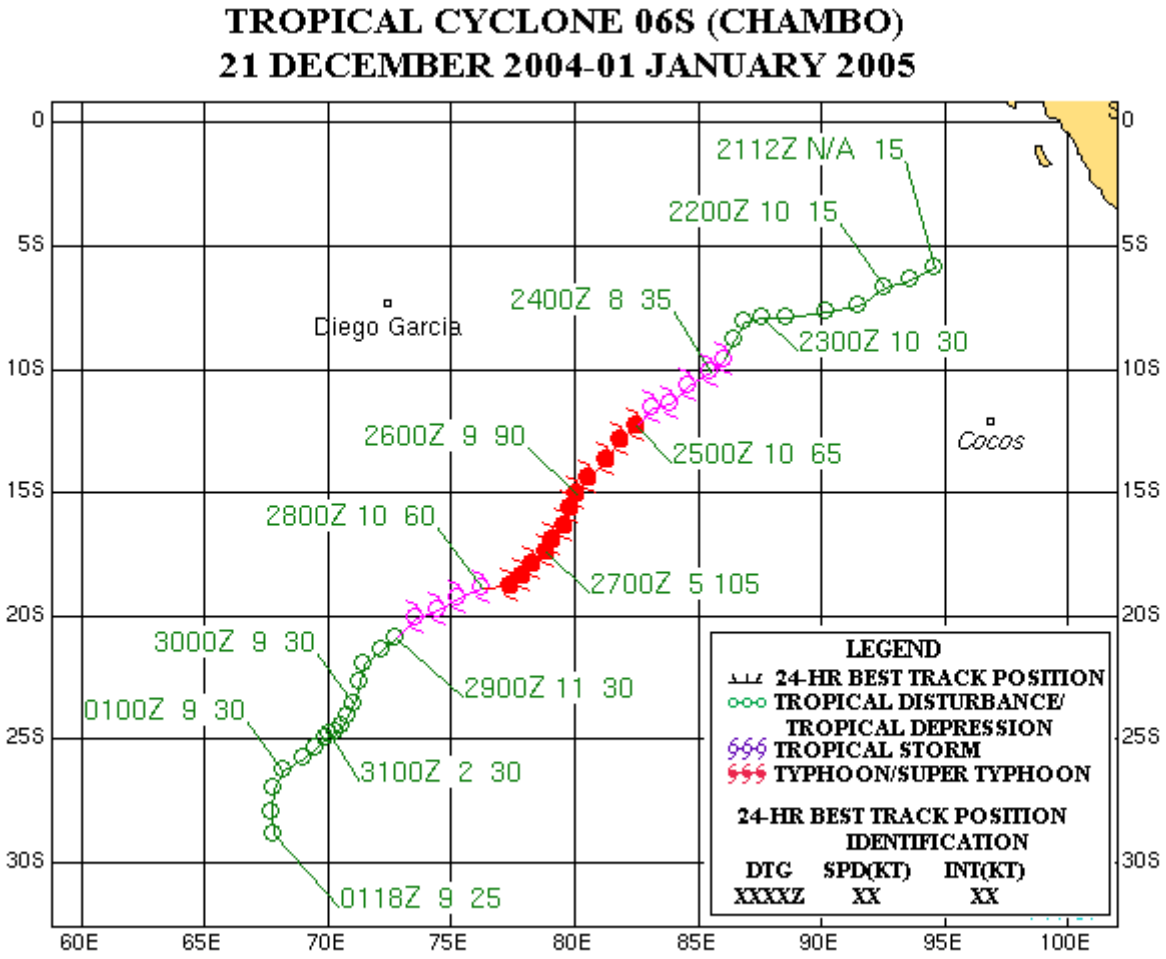
First Poor : N/A
First Fair : 1000Z 03 Dec 04
First TCFA : 0200Z 04 Dec 04
First Warning : 0600Z 04 Dec 04
Last Warning : 1800Z 05 Dec 04
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 4

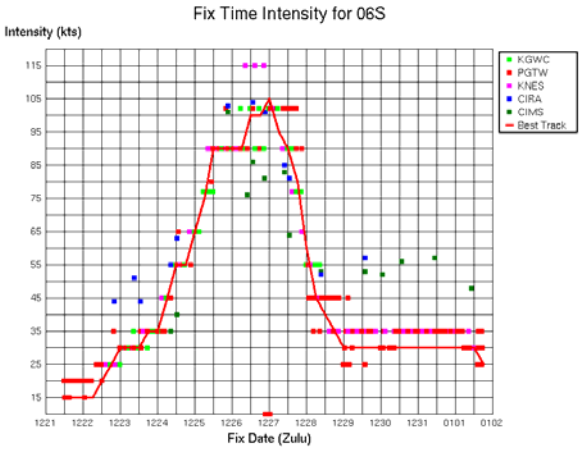




Tropical Cyclone (TC) 06S (Chambo)

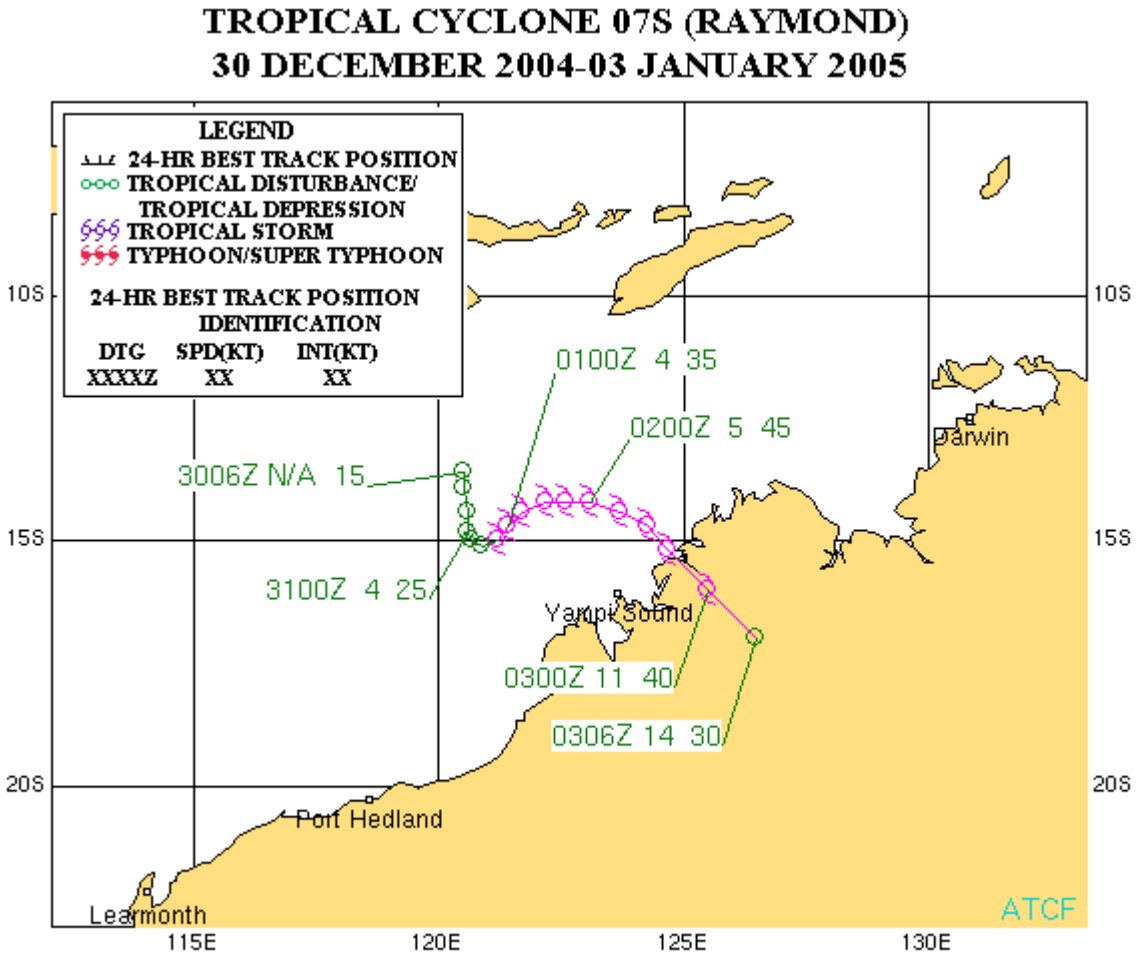
First Poor : 1800Z 18 Dec 04
First Fair : 0930Z 22 Dec 04
First TCFA : 0130Z 23 Dec 04
First Warning : 1800Z 23 Dec 04
Last Warning : 0600Z 28 Dec 04
Max Intensity : 105 kts, gusts to 130 kts
Total Warnings : 10

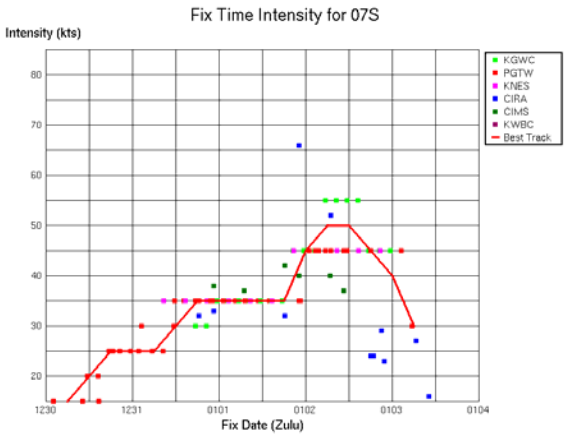




Tropical Cyclone (TC) 07S (Raymond)

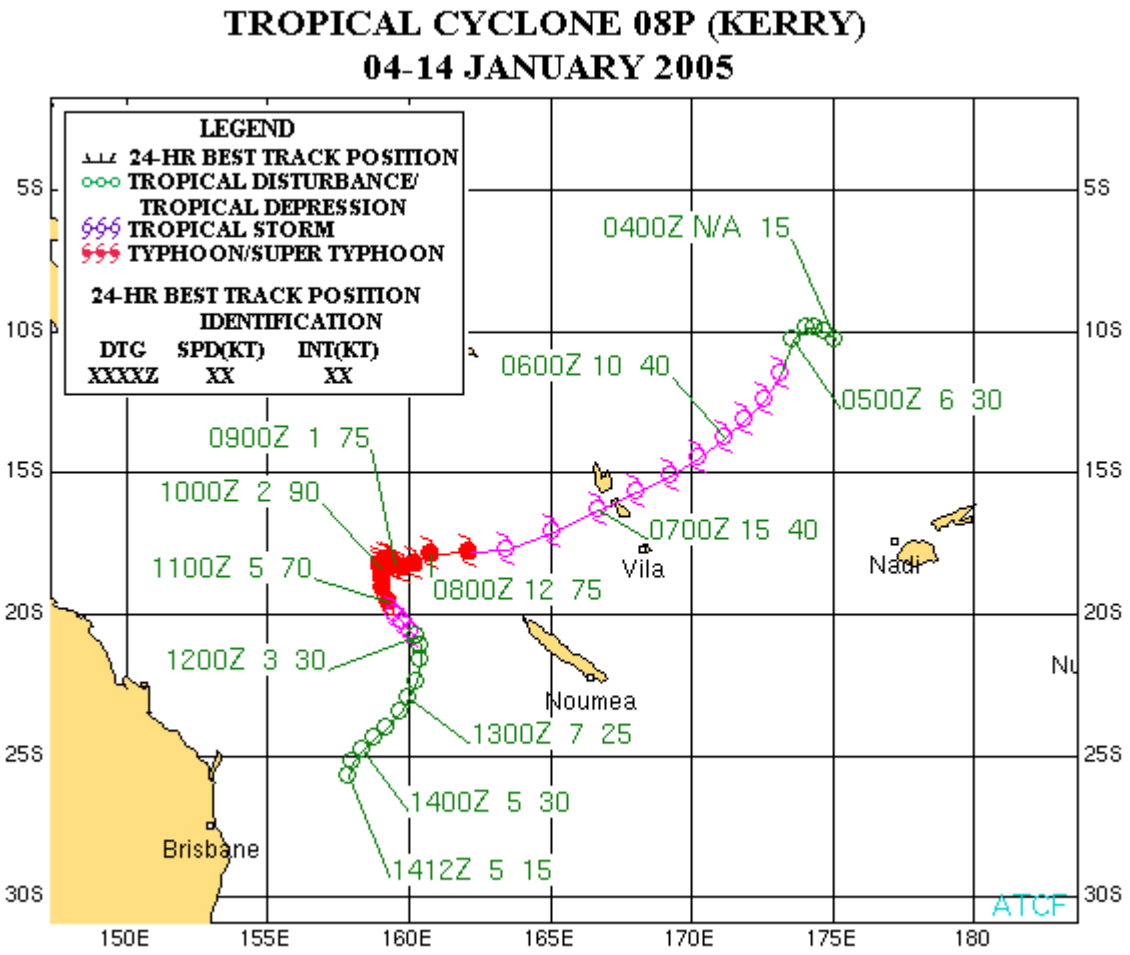
First Poor : 1800Z 30 Dec 04
First Fair : 1000Z 31 Dec 04
First TCFA : 1730Z 31 Dec 04
First Warning : 1800Z 31 Dec 04
Last Warning : 0600Z 03 Jan 05
Max Intensity : 50 kts, gusts to 65 kts
Total Warnings : 6

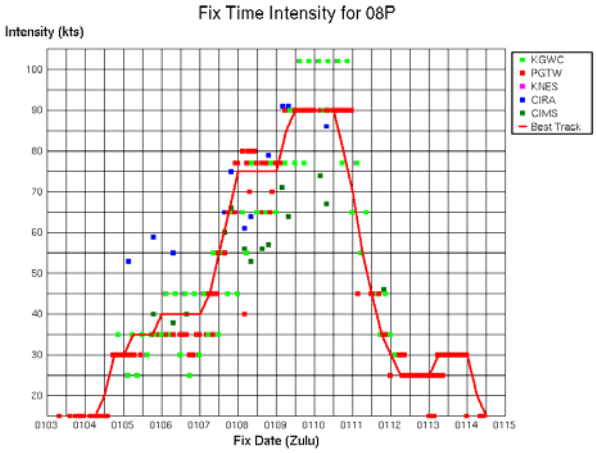




Tropical Cyclone (TC) 08P (Kerry)

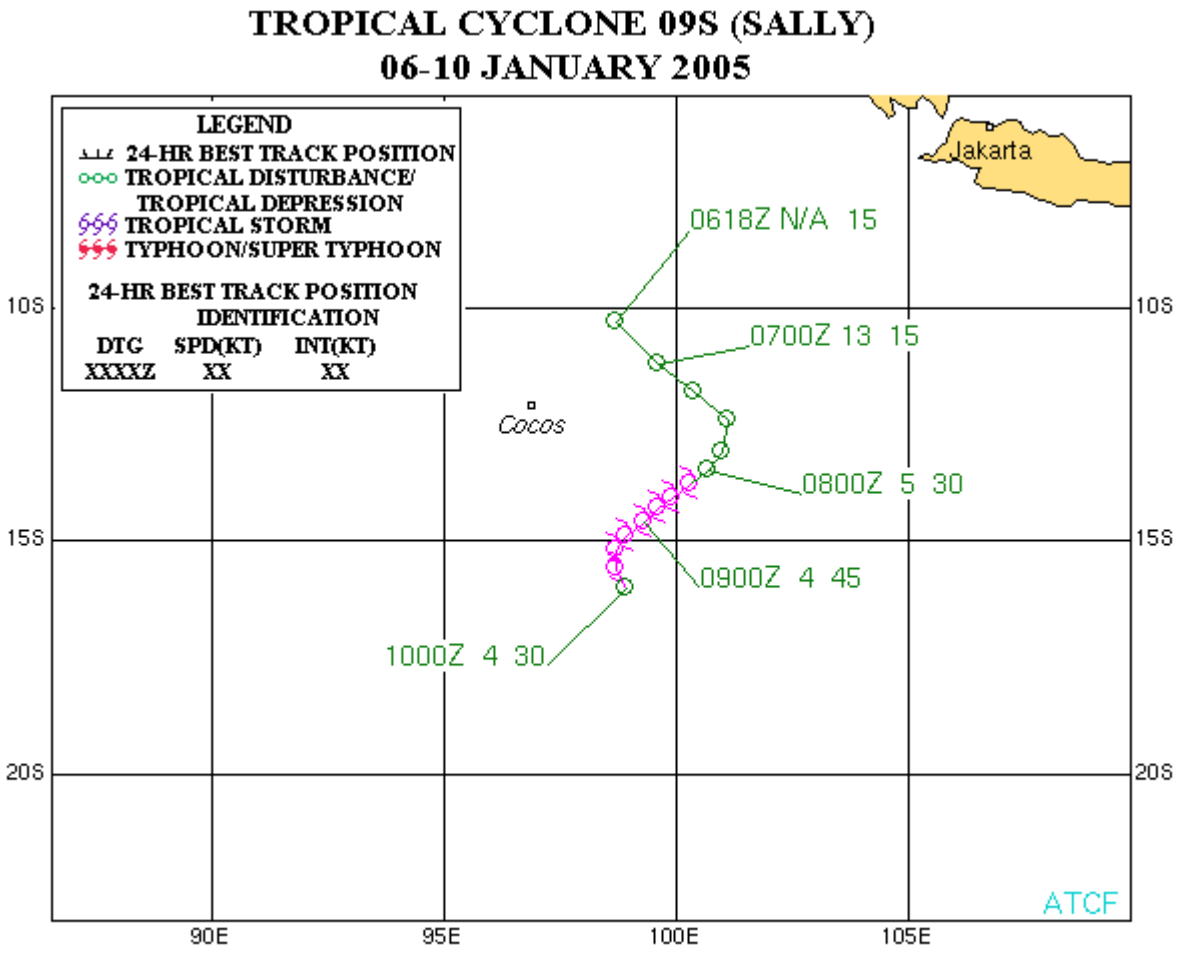
First Poor : 0600Z 04 Jan 05
First Fair : 1830Z 04 Jan 05
First TCFA : 2100Z 04 Jan 05
First Warning : 0000Z 05 Jan 05
Last Warning : 0000Z 12 Jan 05
Max Intensity : 90 kts, gusts to 110 kts
Total Warnings : 15

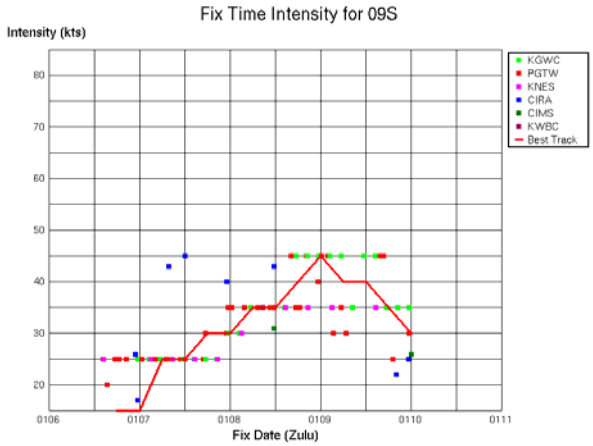




Tropical Cyclone (TC) 09S (Sally)

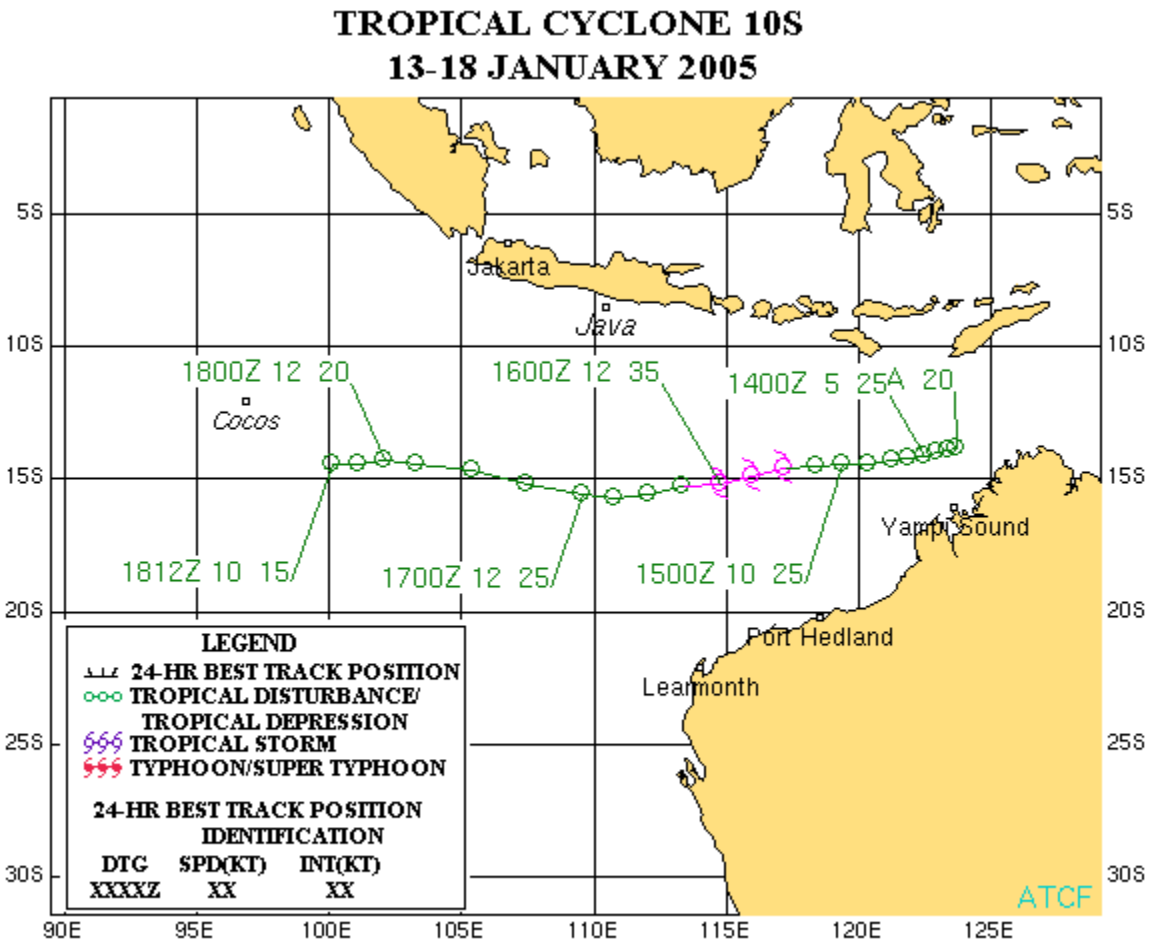
First Poor : N/A
First Fair : 1800Z 06 Jan 05
First TCFA : 2130Z 07 Jan 05
First Warning : 0600Z 08 Jan 05
Last Warning : 0600Z 10 Jan 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 5

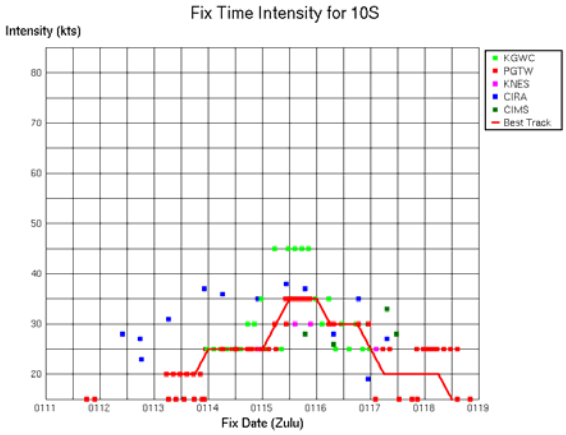




Tropical Cyclone (TC) 10S

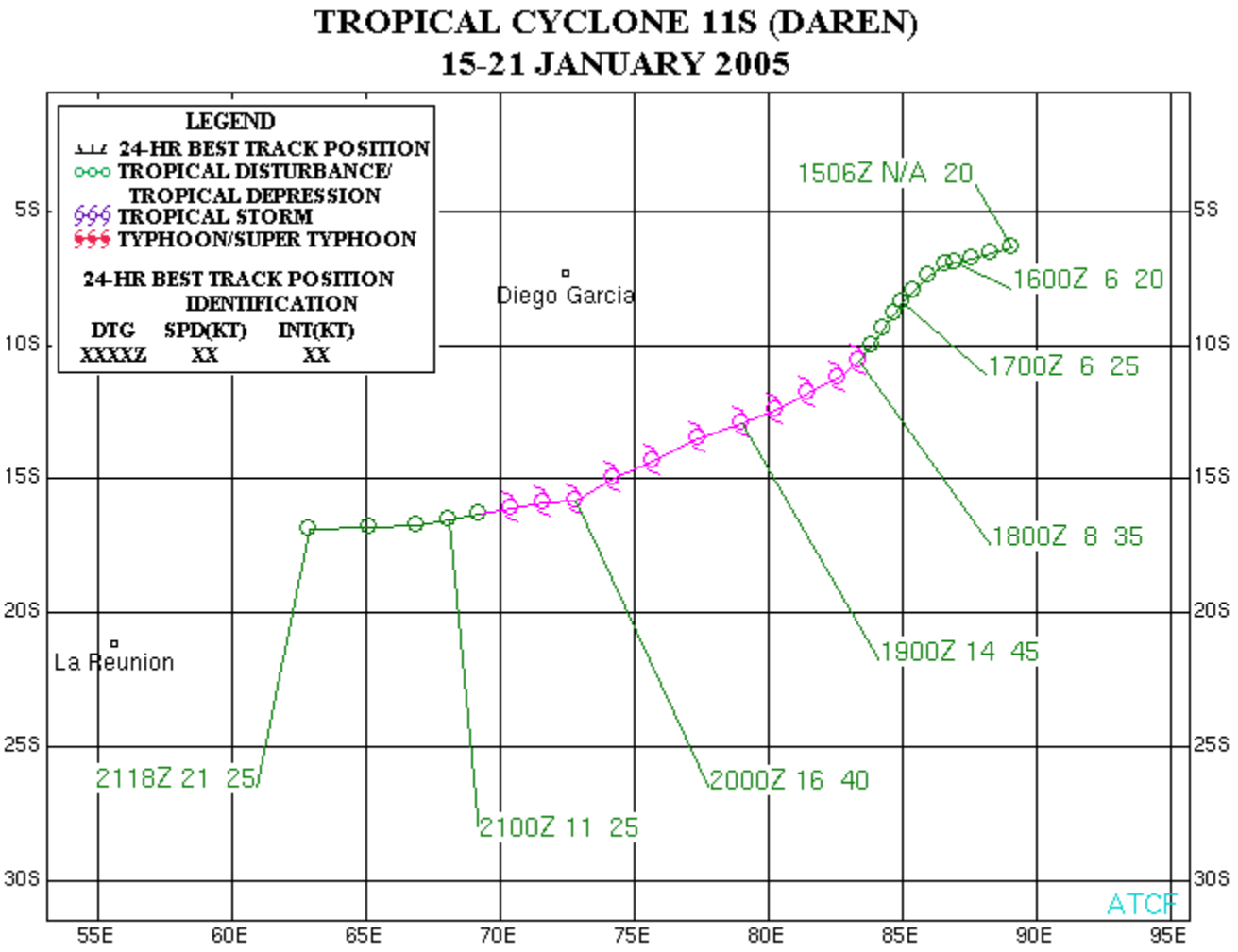
First Poor : N/A
First Fair : 0200Z 12 Jan 05
First TCFA : 1500Z 15 Jan 05
First Warning : 1800Z 15 Jan 05
Last Warning : 0600Z 17 Jan 05
Max Intensity : 55 kts, gusts to 70 kts
Total Warnings : 4

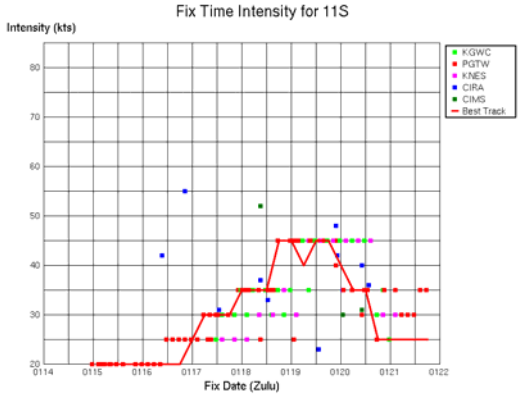




Tropical Cyclone (TC) 11S (Daren)

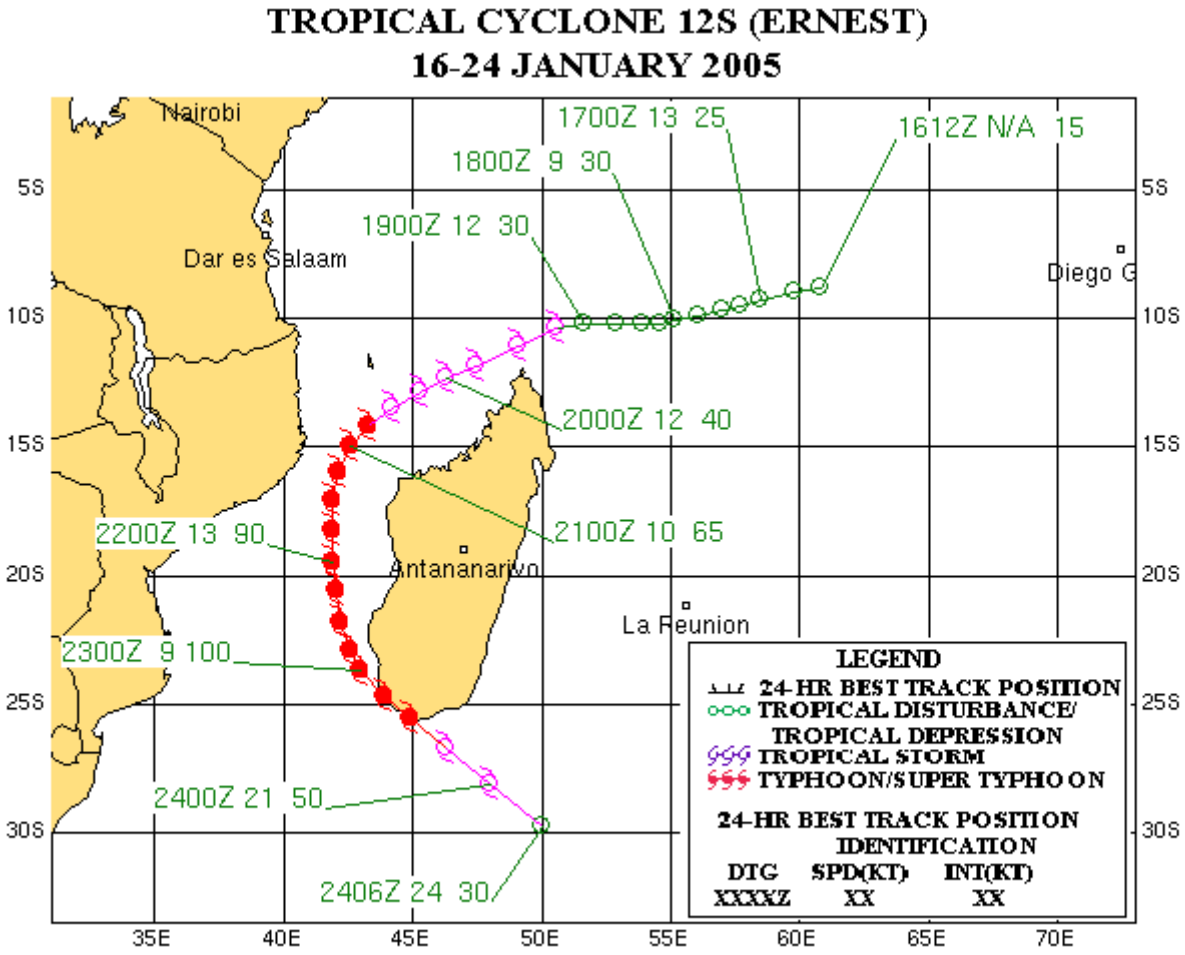
First Poor : 1600Z 13 Jan 05
First Fair : 1200Z 16 Jan 05
First TCFA : 0930Z 17 Jan 05
First Warning : 0000Z 18 Jan 05
Last Warning : 1800Z 20 Jan 05
Max Intensity : 45 kts, gusts to 55 kts
Total Warnings : 7

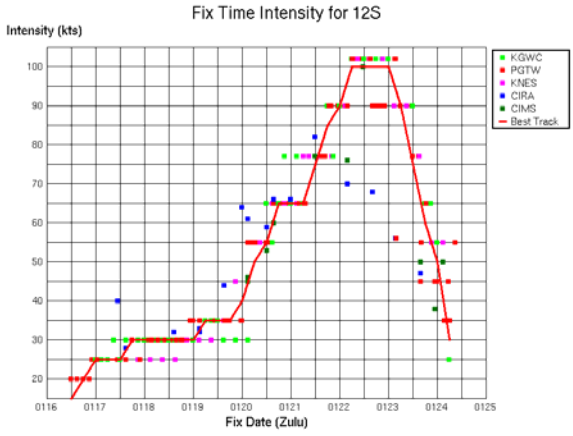




Tropical Cyclone (TC) 12S (Ernest)

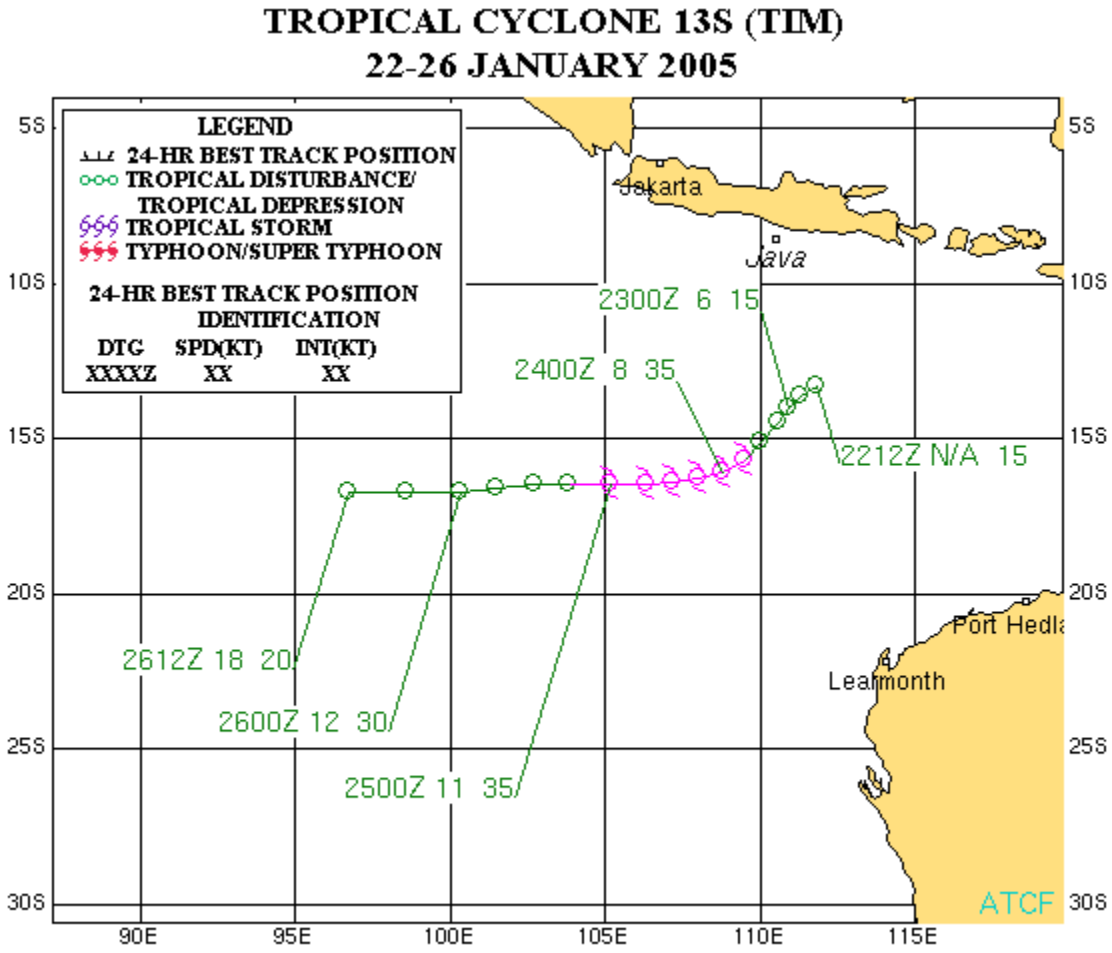
First Poor : 1200Z 16 Jan 05
First Fair : 1000Z 17 Jan 05
First TCFA : 2030Z 17 Jan 05
First Warning : 0600Z 19 Jan 05
Last Warning : 1800Z 23 Jan 05
Max Intensity : 100 kts, gusts to 125 kts
Total Warnings : 8

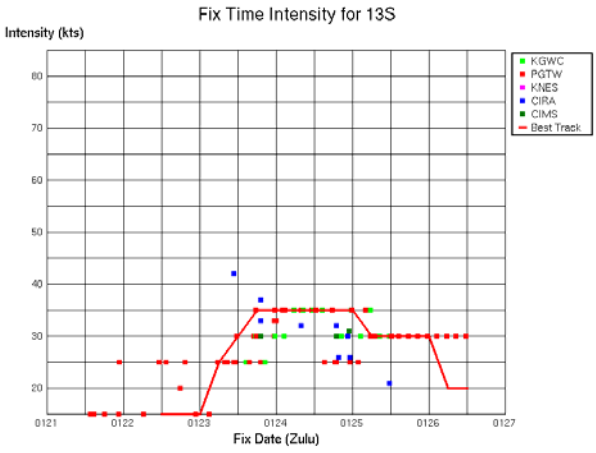




Tropical Cyclone (TC) 13S (Tim)

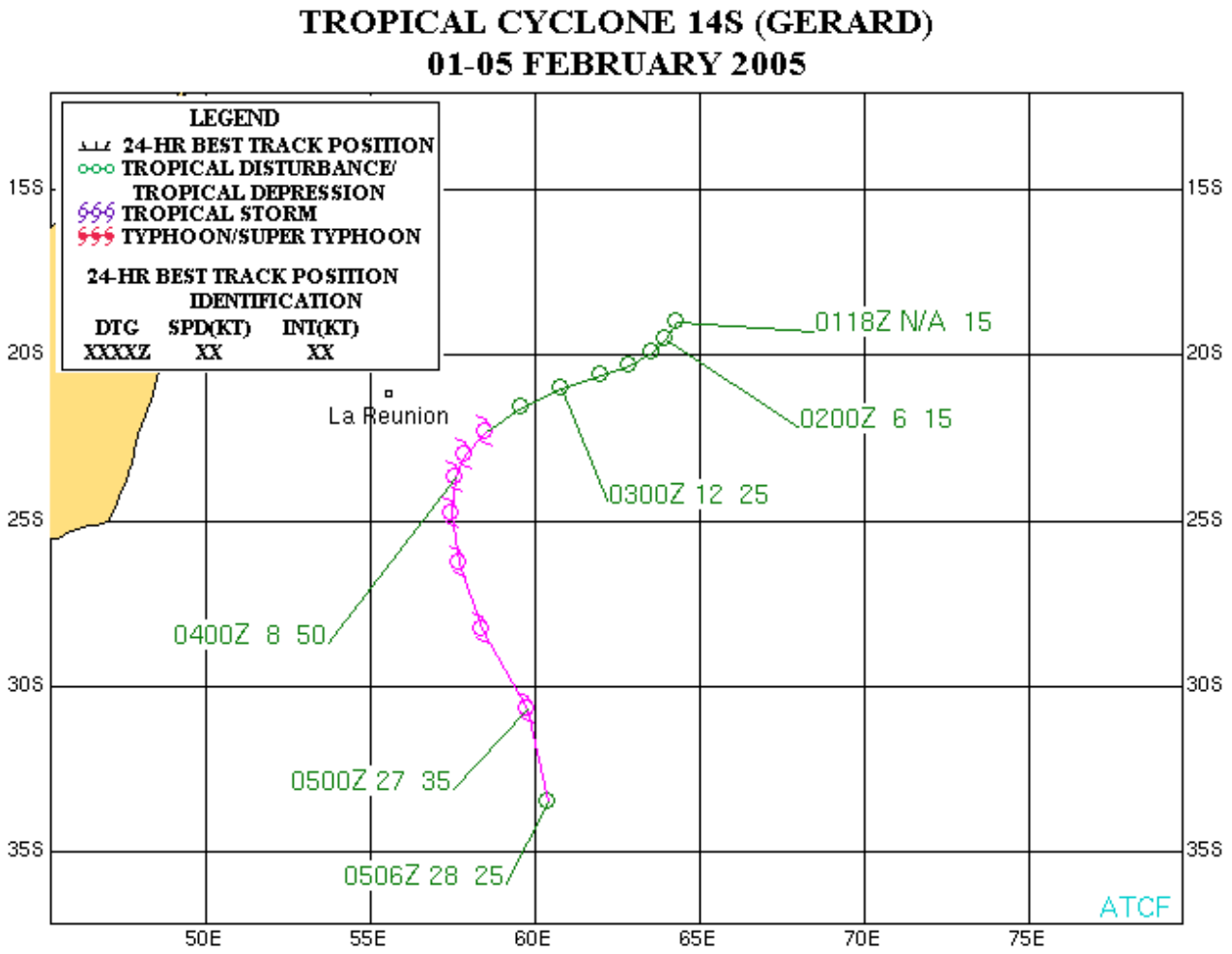
First Poor : 1800Z 22 Jan 05
First Fair : N/A
First TCFA : 1400Z 23 Jan 05
First Warning : 1800Z 23 Jan 05
Last Warning : 0600Z 25 Jan 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 4

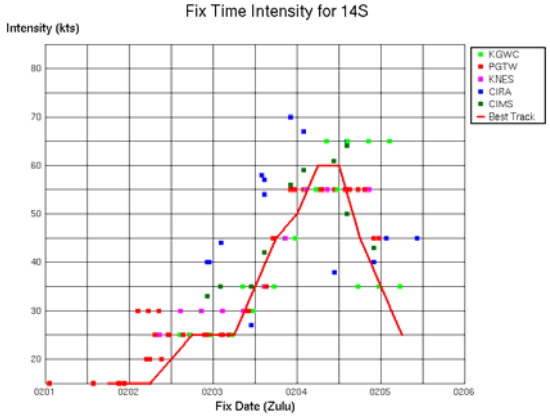




Tropical Cyclone (TC) 14S (Gerard)

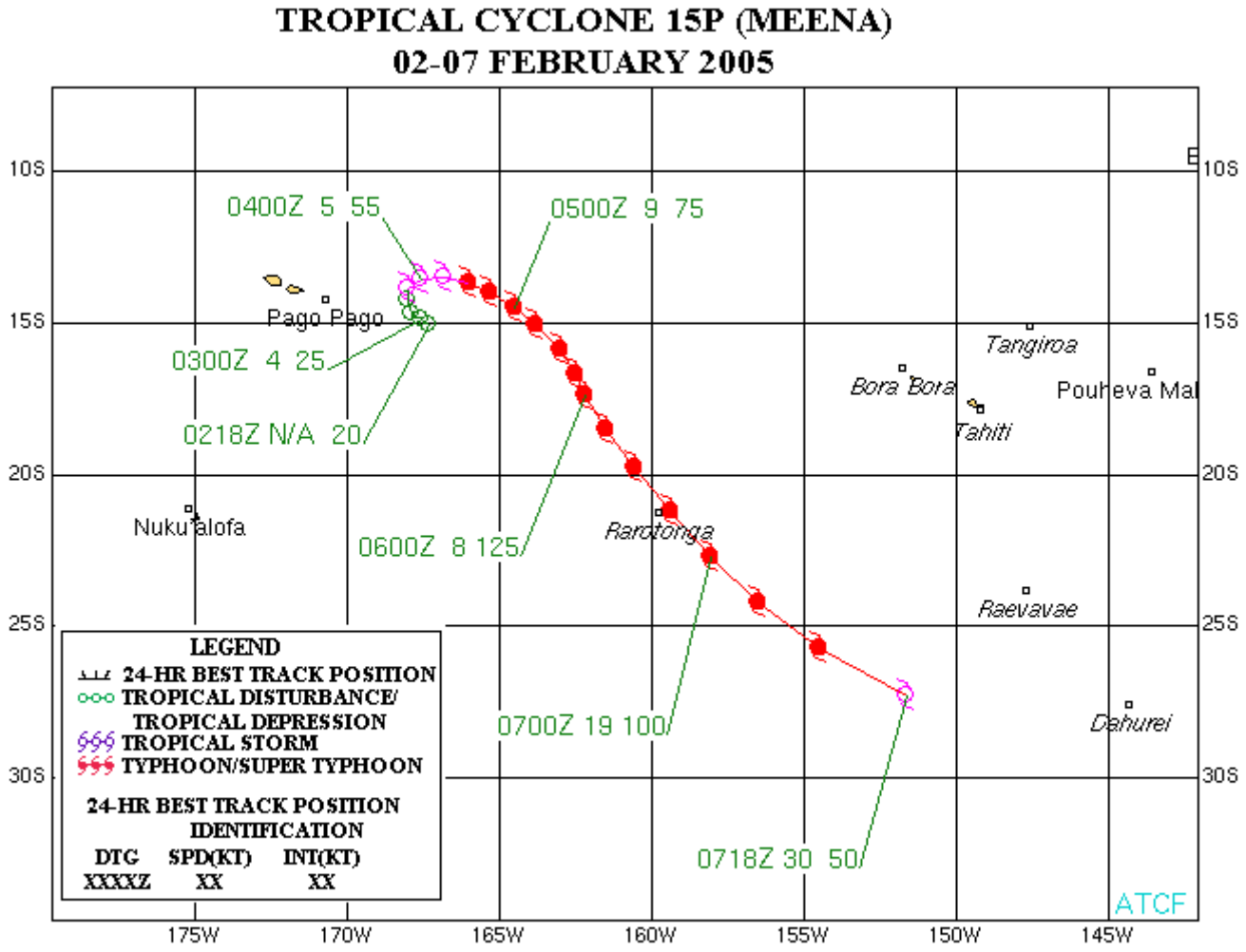
First Poor : 0330Z 02 Feb 05
First Fair : 1800Z 02 Feb 05
First TCFA : 1430Z 03 Feb 05
First Warning : 1800Z 03 Feb 05
Last Warning : 0600Z 05 Feb 05
Max Intensity : 60 kts, gusts to 75 kts
Total Warnings : 4

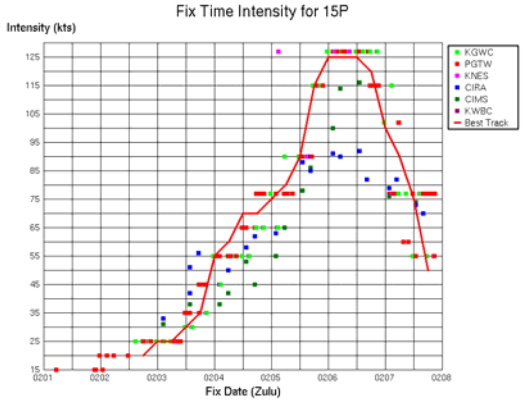




Tropical Cyclone (TC) 15P (Meena)

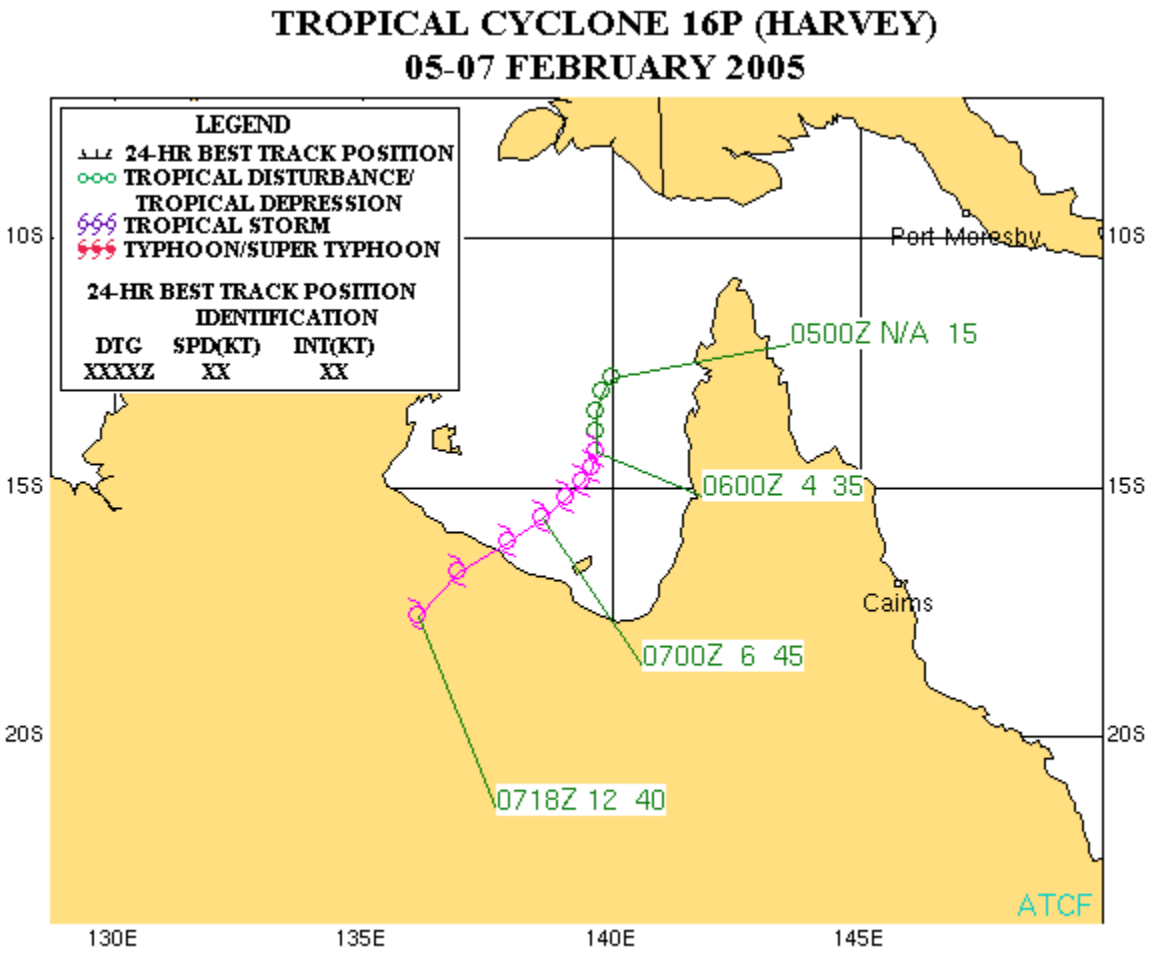
First Poor : 0600Z 02 Feb 05
First Fair : 1500Z 02 Feb 05
First TCFA : 1400Z 03 Feb 05
First Warning : 1800Z 03 Feb 05
Last Warning : 1800Z 07 Feb 05
Max Intensity : 125 kts, gusts to 150 kts
Total Warnings : 9

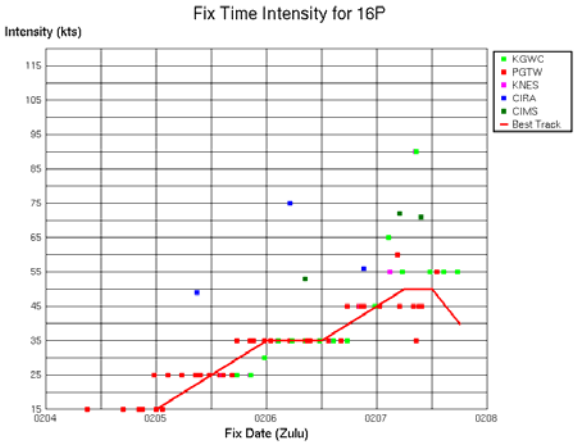




Tropical Cyclone (TC) 16P (Harvey)

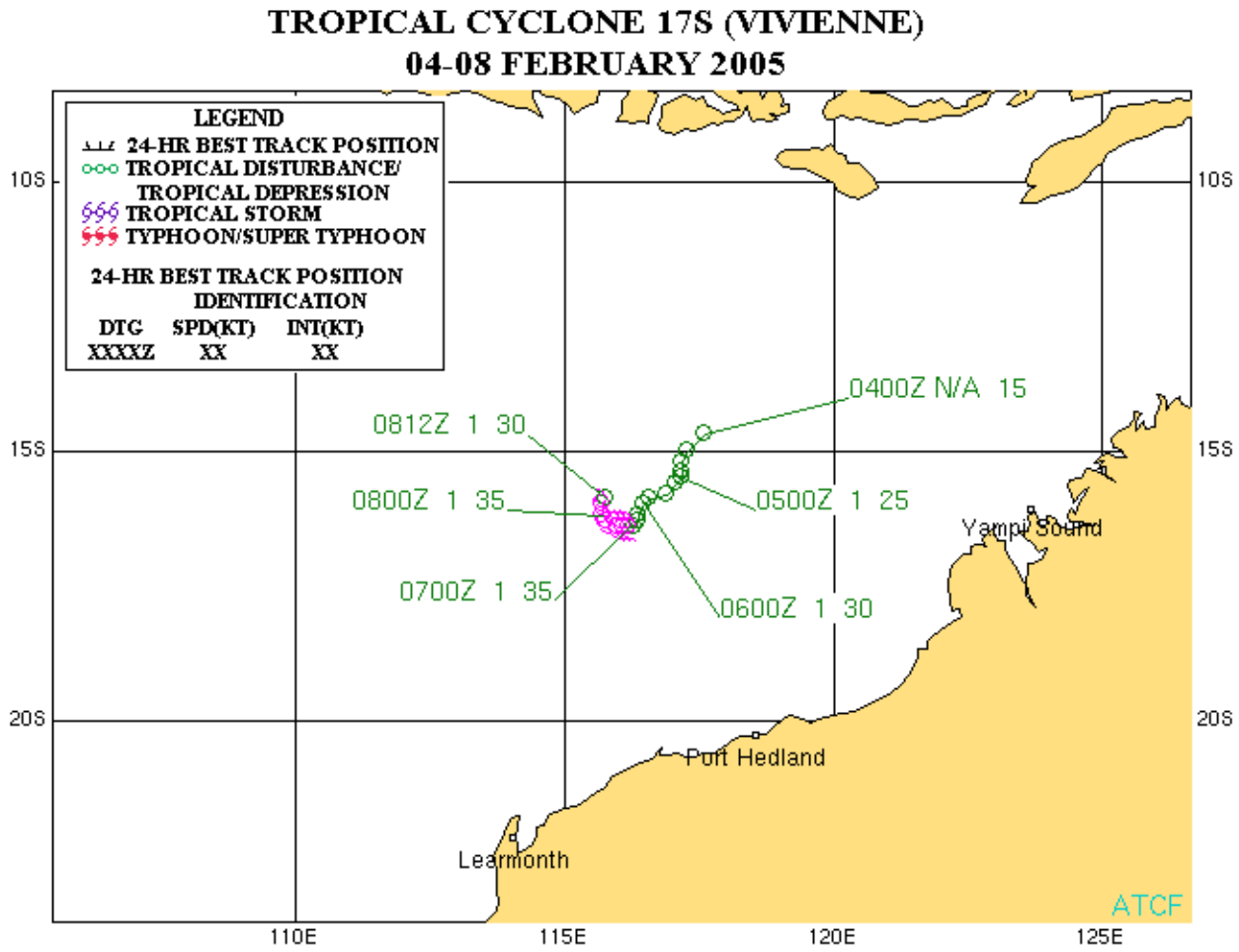
First Poor : 0600Z 05 Feb 05
First Fair : N/A
First TCFA : 1830Z 05 Feb 05
First Warning : 0000Z 06 Feb 05
Last Warning : 1200Z 07 Feb 05
Max Intensity : 50 kts, gusts to 65 kts
Total Warnings : 4

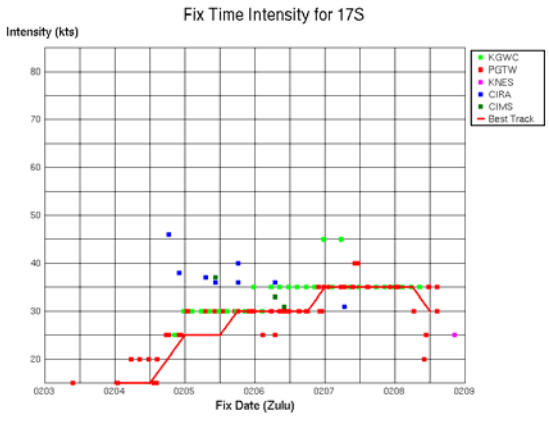




Tropical Cyclone (TC) 17S (Vivienne)

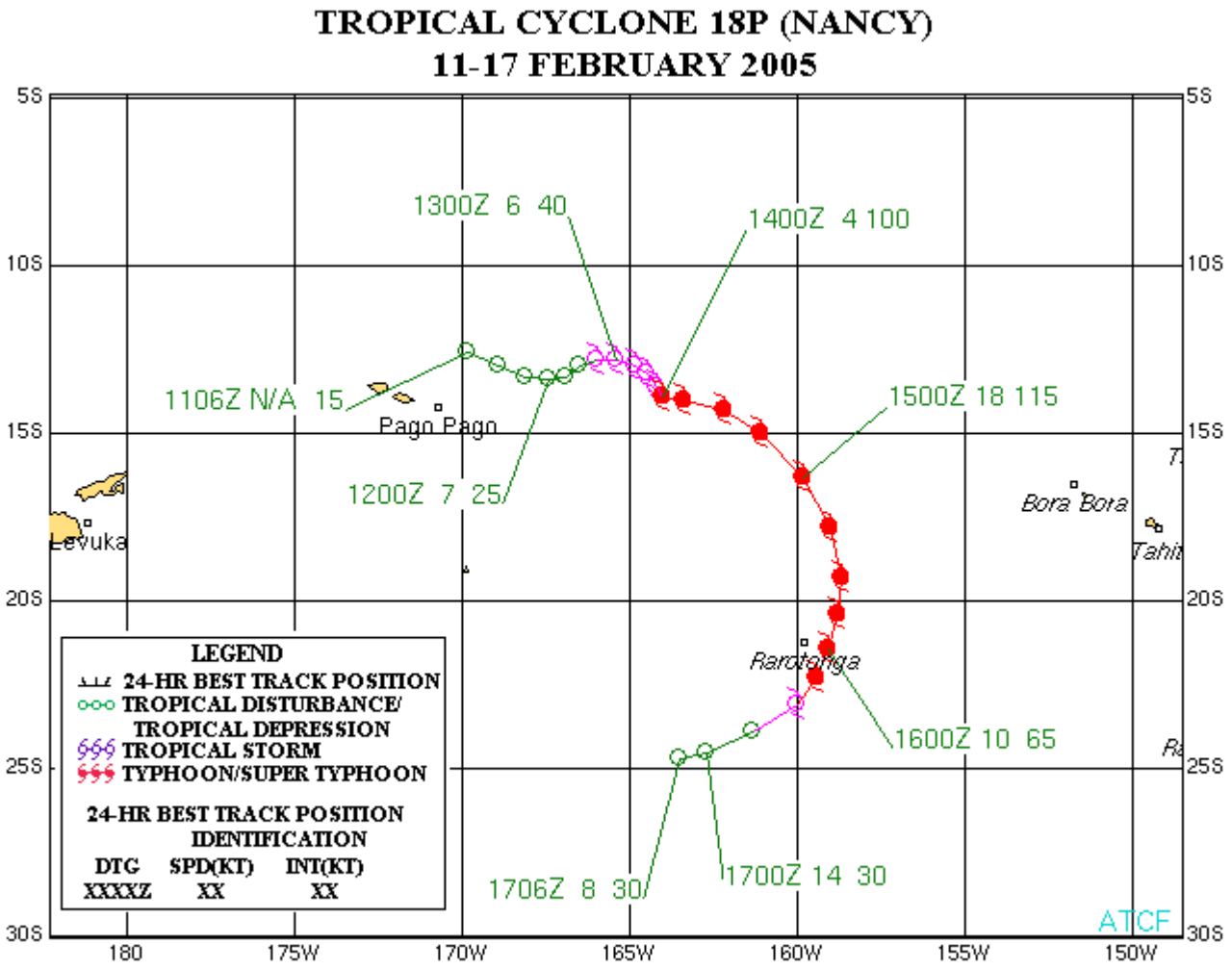
First Poor : 0200Z 04 Feb 05
First Fair : 1800Z 04 Feb 05
First TCFA : 1800Z 05 Feb 05
First Warning : 0000Z 07 Feb 05
Last Warning : 1200Z 08 Feb 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 4

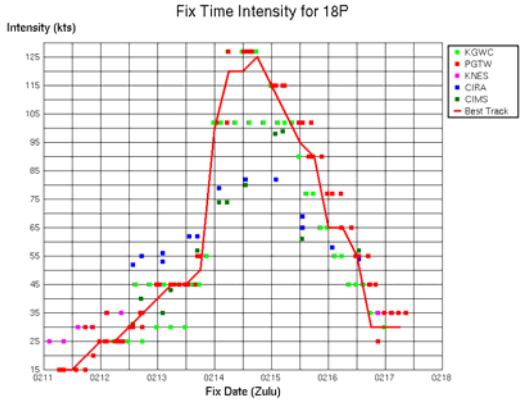




Tropical Cyclone (TC) 18P (Nancy)

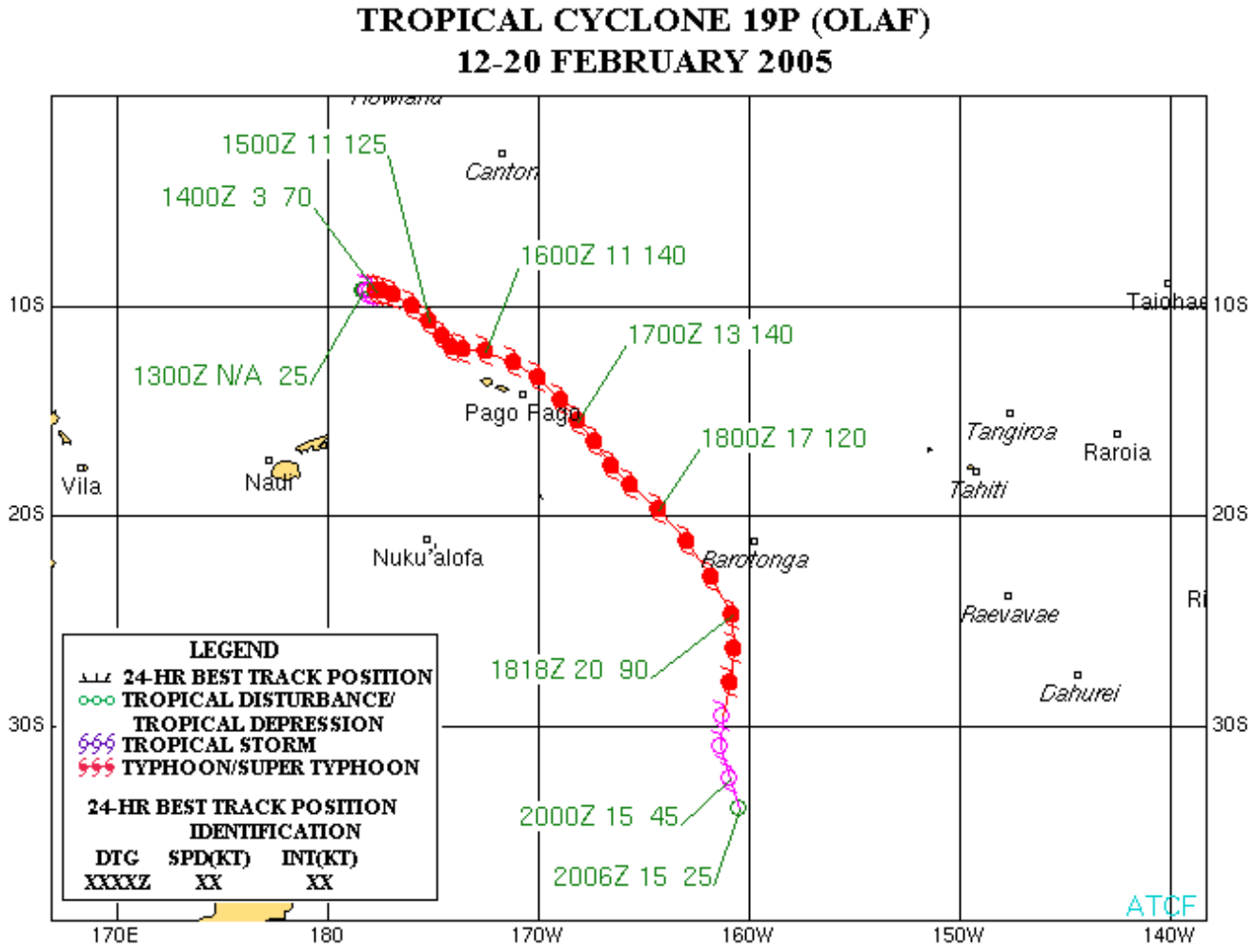
First Poor : 2230Z 11 Feb 05
First Fair : 0600Z 12 Feb 05
First TCFA : 2200Z 12 Feb 05
First Warning : 0600Z 13 Feb 05
Last Warning : 1800Z 16 Feb 05
Max Intensity : 125 kts, gusts to 150 kts
Total Warnings : 8

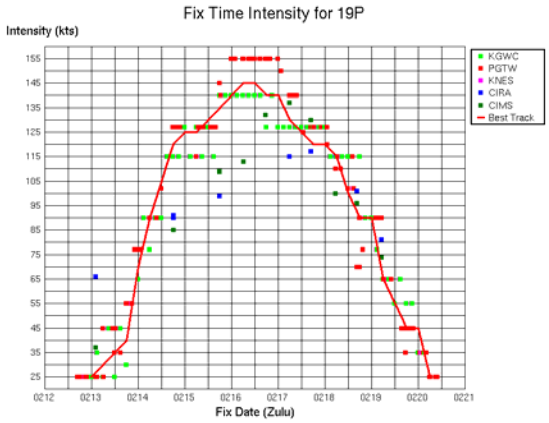




Tropical Cyclone (TC) 19P (Olaf)

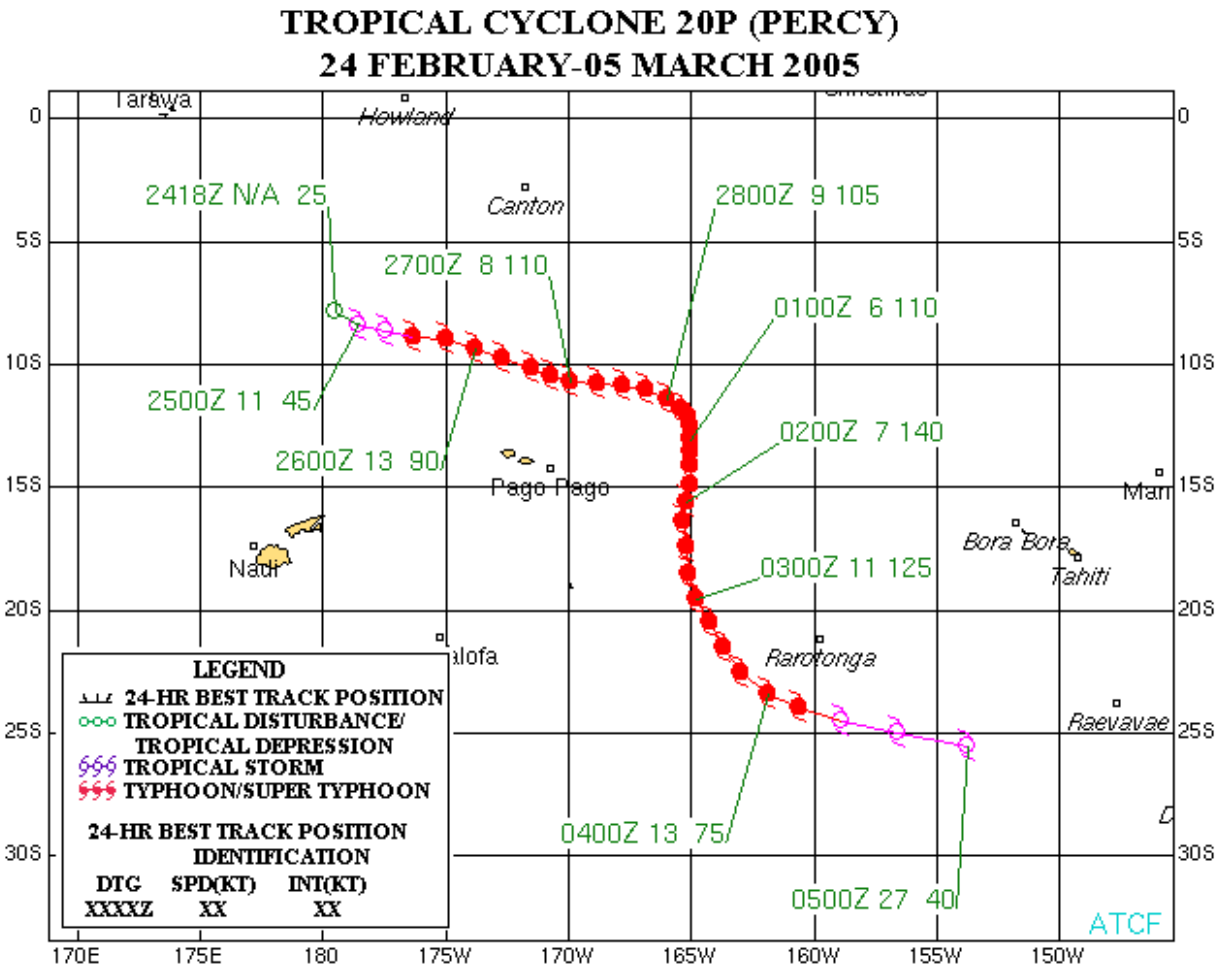
First Poor : 2230Z 12 Feb 05
First Fair : 0600Z 13 Feb 05
First TCFA : 1030Z 13 Feb 05
First Warning : 1200Z 13 Feb 05
Last Warning : 0600Z 22 Feb 05
Max Intensity : 145 kts, gusts to 175 kts
Total Warnings : 22

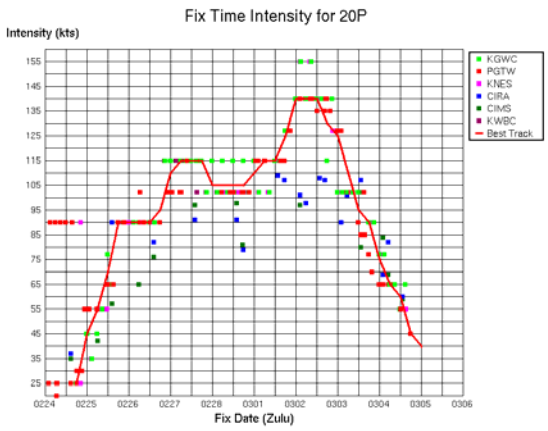




Tropical Cyclone (TC) 20P (Percy)

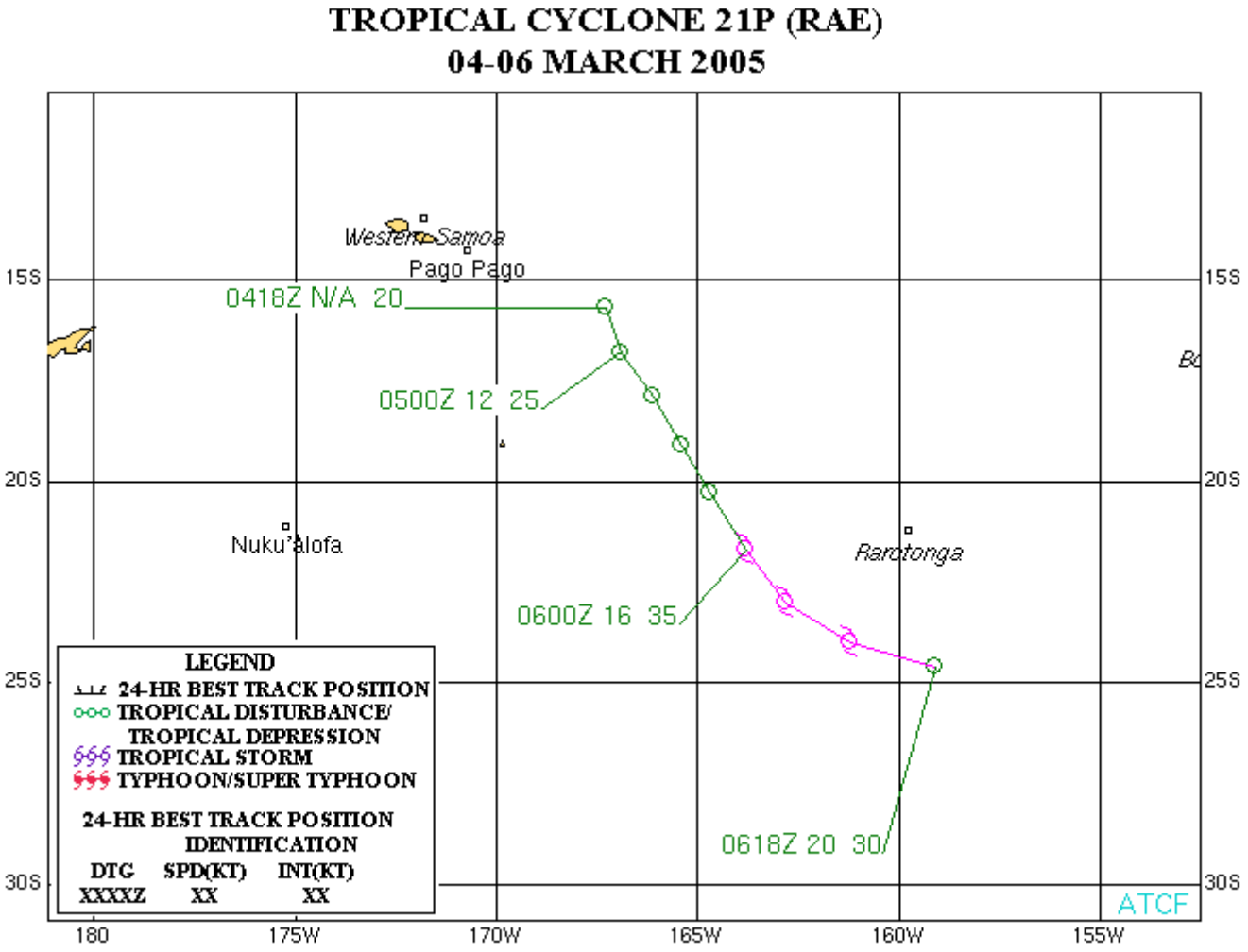
First Poor : 1730Z 24 Feb 05
First Fair : N/A
First TCFA : 2100Z 24 Feb 05
First Warning : 0000Z 25 Feb 05
Last Warning : 1800Z 04 Mar 05
Max Intensity : 140 kts, gusts to 170 kts
Total Warnings : 24

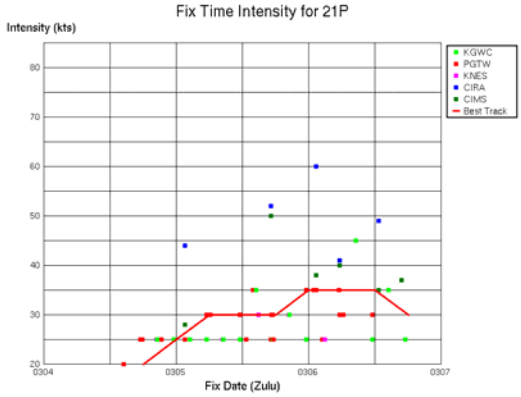




Tropical Cyclone (TC) 21P (Rae)

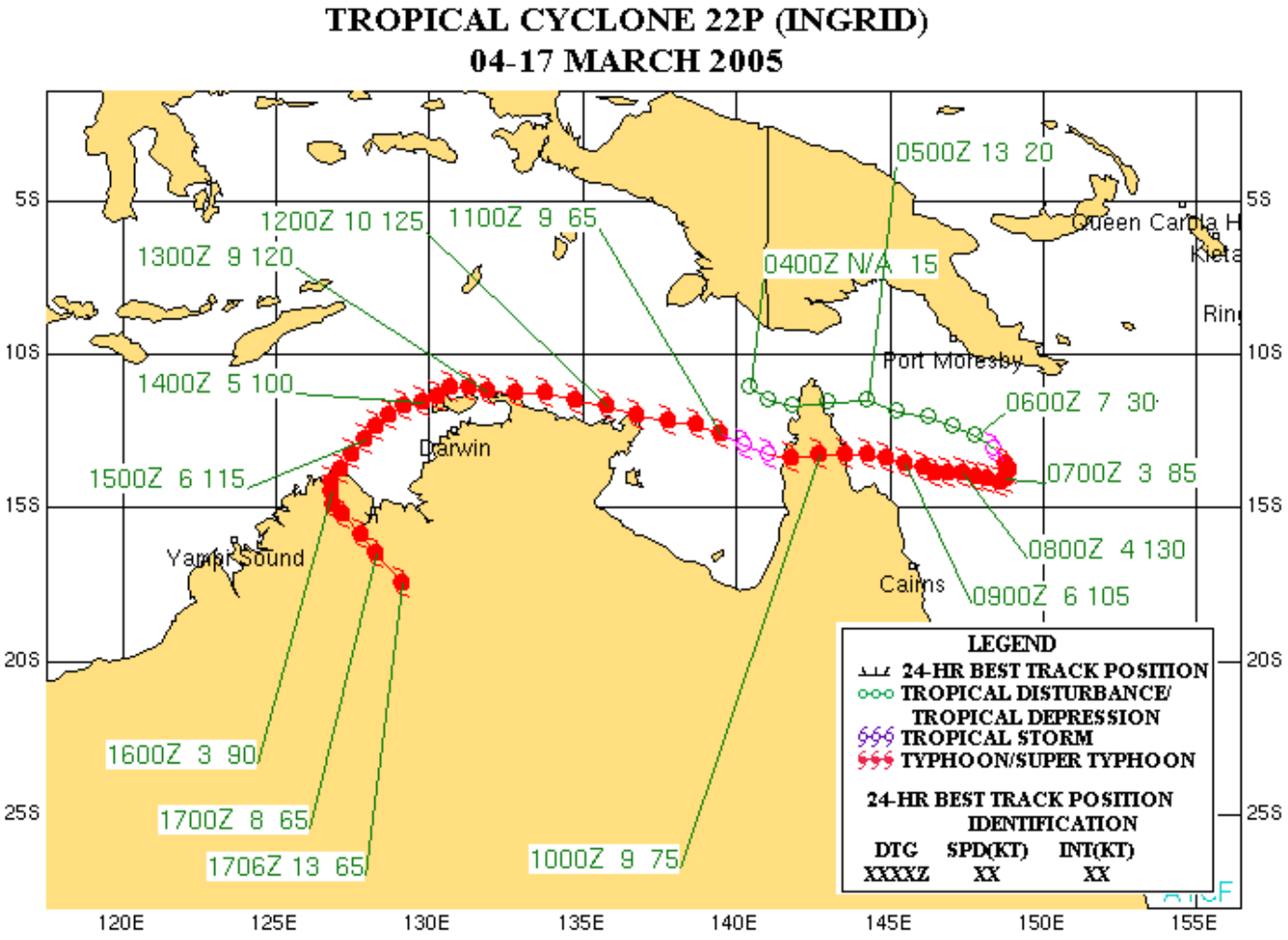
First Poor : N/A
First Fair : 2130Z 04 Mar 05
First TCFA : 0600Z 05 Mar 05
First Warning : 0000Z 06 Mar 05
Last Warning : 1800Z 06 Mar 05
Max Intensity : 35 kts, gusts to 45 kts
Total Warnings : 3

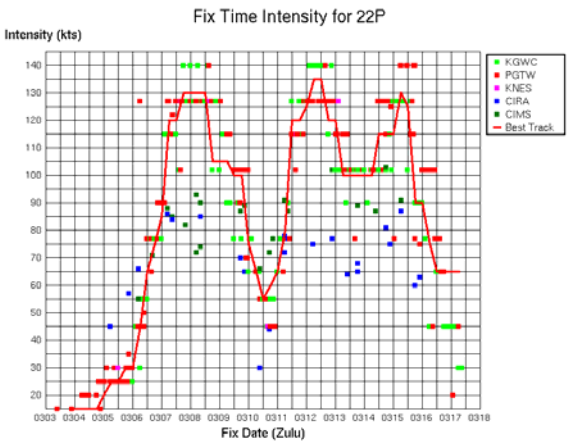




Tropical Cyclone (TC) 22P (Ingrid)

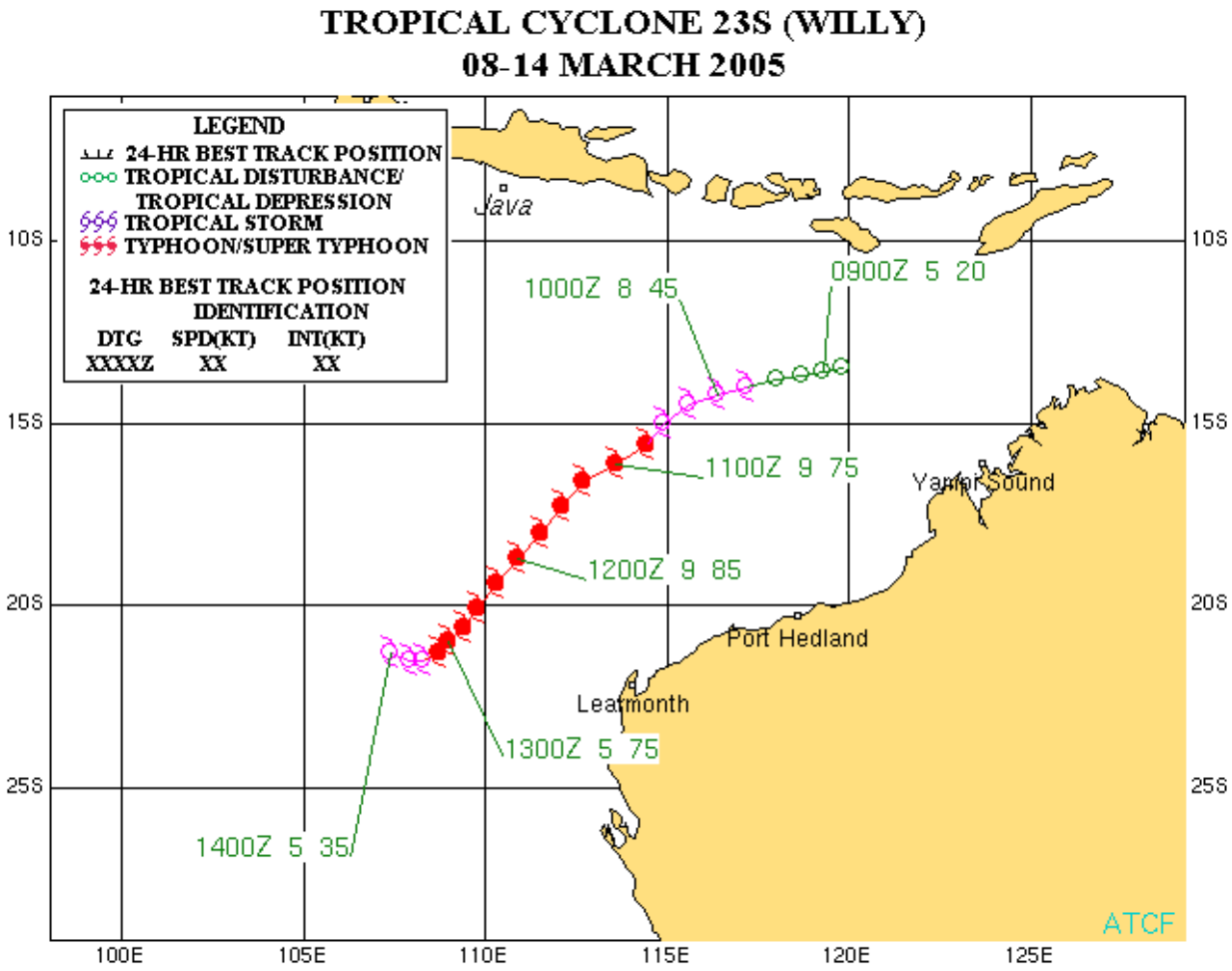
First Poor : 0600Z 04 Mar 05
First Fair : 0600Z 05 Mar 05
First TCFA : 2100Z 05 Mar 05
First Warning : 0600Z 06 Mar 05
Last Warning : 1800Z 15 Mar 05
Max Intensity : 135 kts, gusts to 165 kts
Total Warnings : 21

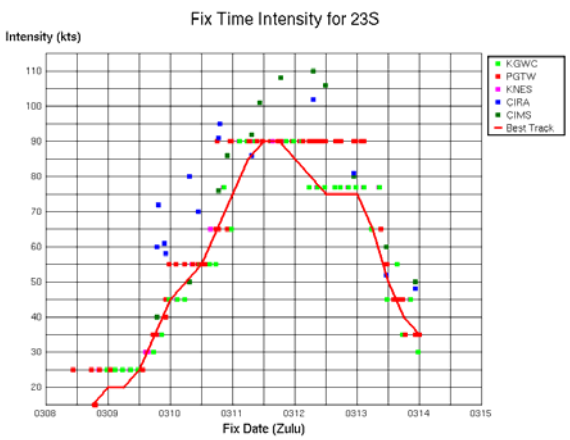




Tropical Cyclone (TC) 23S (Willy)

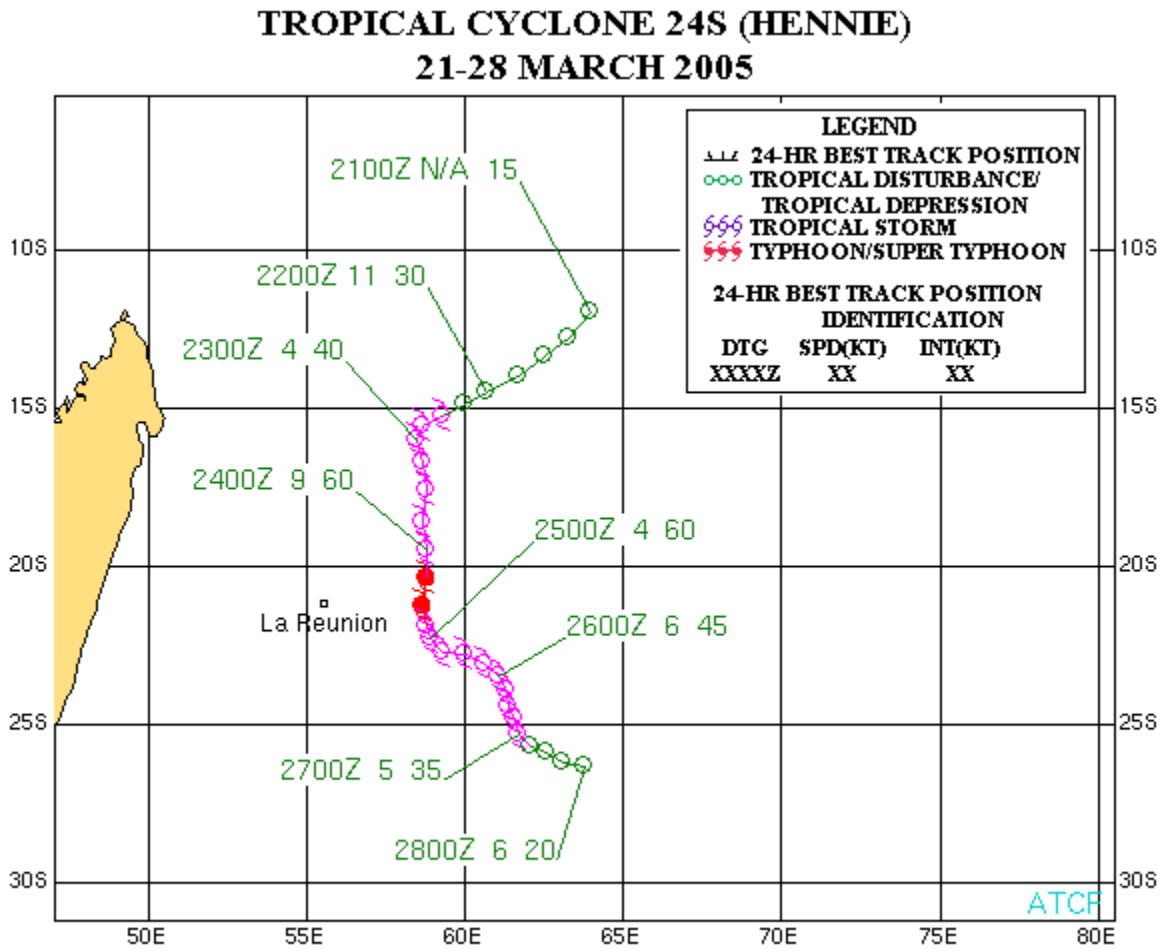
First Poor : 1800Z 08 Mar 05
First Fair : 0530Z 09 Mar 05
First TCFA : 1230Z 09 Mar 05
First Warning : 1800Z 09 Mar 05
Last Warning : 0000Z 14 Mar 05
Max Intensity : 90 kts, gusts to 110 kts
Total Warnings : 12

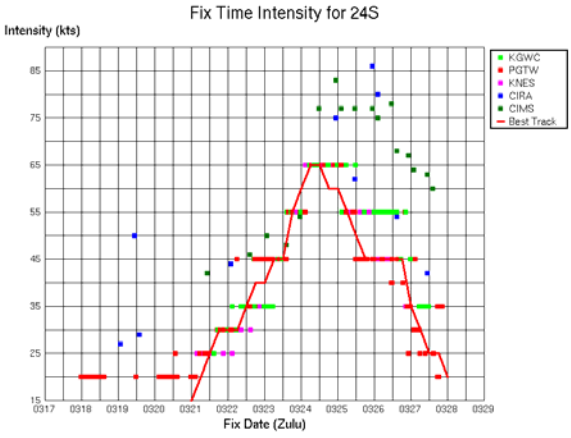




Tropical Cyclone (TC) 24S (Hennie)

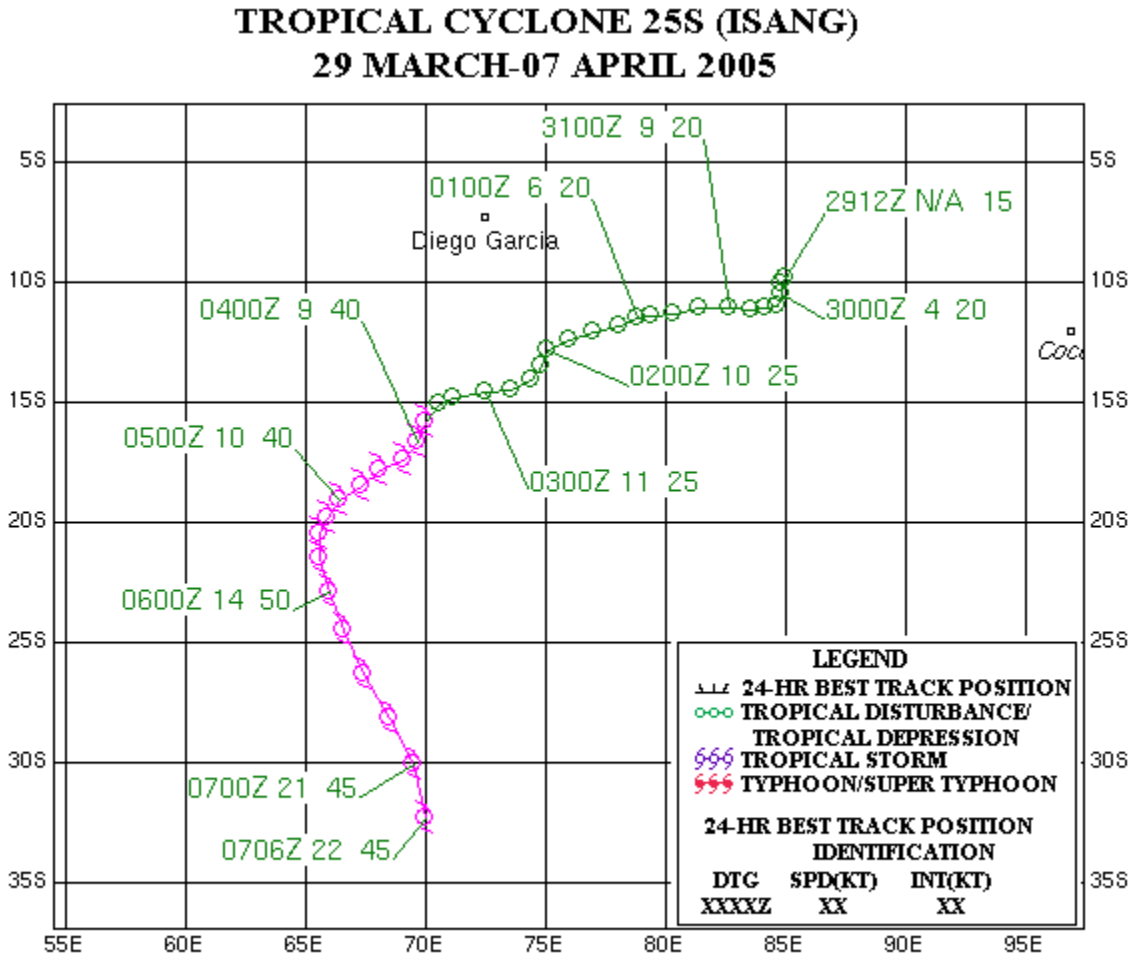
First Poor : 0830Z 19 Mar 05
First Fair : 0230Z 21 Mar 05
First TCFA : 0900Z 21 Mar 05
First Warning : 1800Z 21 Mar 05
Last Warning : 0600Z 27 Mar 05
Max Intensity : 65 kts, gusts to 80 kts
Total Warnings : 12

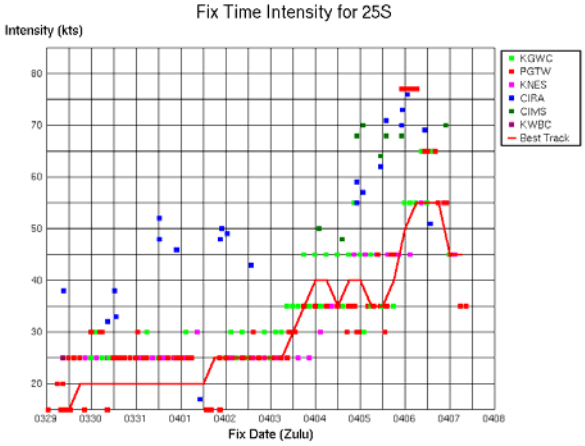




Tropical Cyclone (TC) 25S (Isang)

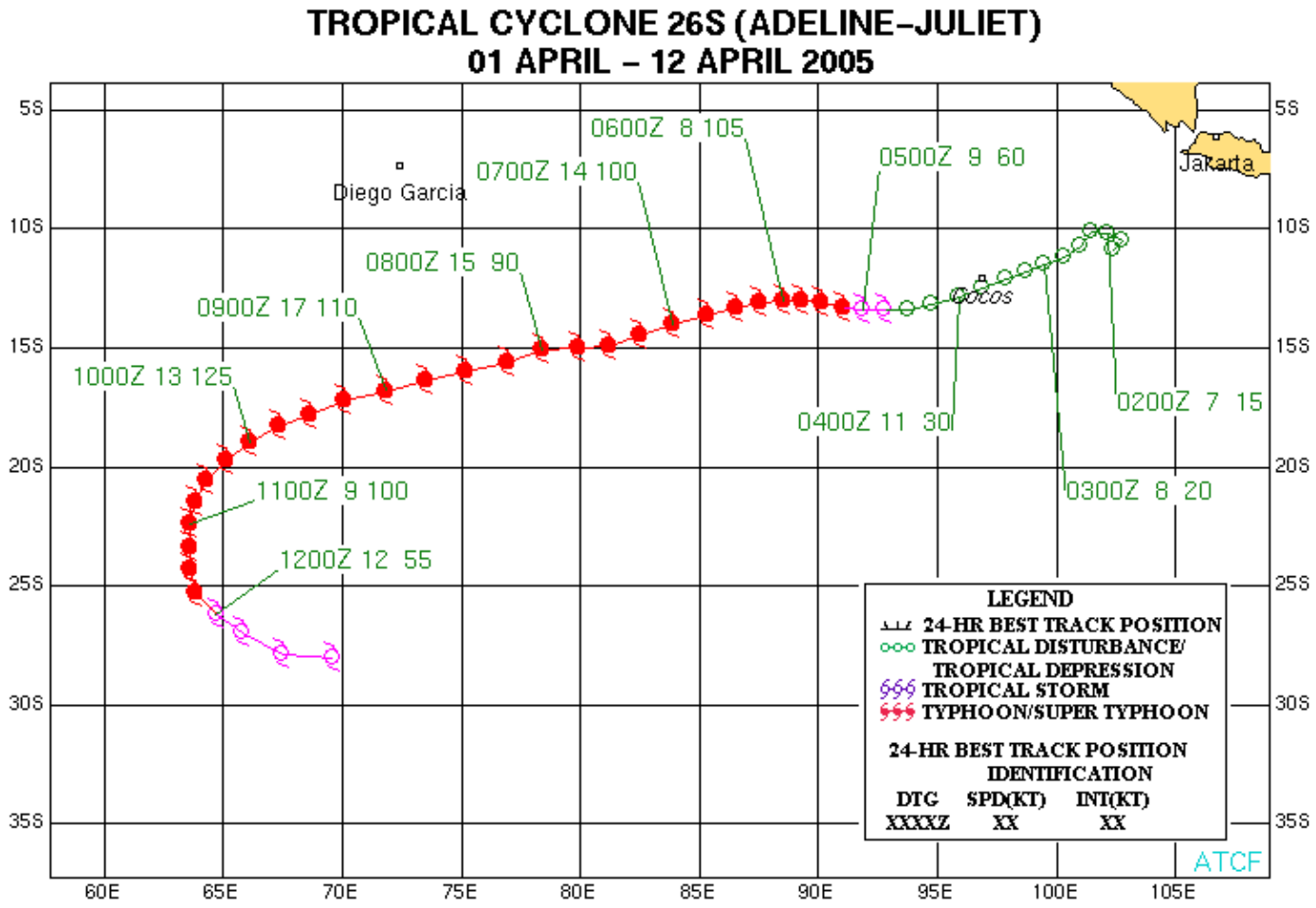
First Poor : 0300Z 29 Mar 05
First Fair : 1800Z 29 Mar 05
First TCFA : 0200Z 30 Mar 05
First Warning : 1800Z 03 Apr 05
Last Warning : 1800Z 06 Apr 05
Max Intensity : 55 kts, gusts to 70 kts
Total Warnings : 7

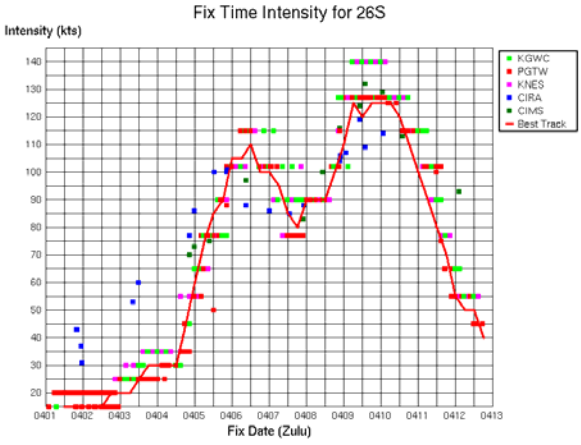




Tropical Cyclone (TC) 26S (Adeline-Juliet)

First Poor : 1800Z 01 Apr 05
First Fair : 0700Z 03 Apr 05
First TCFA : 1430Z 03 Apr 05
First Warning : 1800Z 04 Apr 05
Last Warning : 0600Z 12 Apr 05
Max Intensity : 130 kts, gusts to 160 kts
Total Warnings : 16





3. TROPICAL CYCLONE FIX DATA

3.1 2005 SEASON

Tables 3-1 to 3-3 list the number of tropical cyclone center "fixes", or locations, made using satellite (visible, infrared, and microwave), radar, and synoptic data. Fixes made by the DOD tropical cyclone reconnaissance network sites are included in the tables as well as those fixes received from other sources (e.g., Japanese Meteorological Agency, Australian Bureau of Meteorology, and U.S. National Weather Service National Environmental Satellite Data and Information Service). Table 3-4 lists the total fixes by basin.

TABLE 3-1 WESTERN NORTH PACIFIC OCEAN FIX SUMMARY FOR 2005

Tropical Cyclone		Satellite	Radar	Synoptic	Total
TY 01W	Kulap	203	0	0	203
TY 02W	Roke	192	0	0	192
TY 03W	Sonca	273	0	0	273
TY 04W	Nesat	513	0	0	513
TY 05W	Haitang	367	27	0	394
TY 06W	Nalgae	221	0	0	221
TY 07W	Banyan	269	38	0	307
TY 08W	Washi	101	0	0	101
TY 09W	Matsa	277	47	0	324
TY 10W	Sanvu	142	27	0	169
TY 11W	Mawar	346	40	0	386
TY 12W	Guchol	236	0	0	236
TY 13W	Talim	275	83	0	358
TY 14W	Nabi	353	122	0	475
TY 15W	Khanun	271	61	0	332
TY 16W	Vicente	145	0	0	145
TY 17W	Damrey	302	34	0	336
TY 18W	Saola	298	17	0	315
TY 19W	Longwang	319	95	0	414
TY 20W	No Name	48	0	0	48
TY 21W	Kirogi	395	6	0	401
TY 22W	Kai-Tak	241	0	0	241
TY 23W	Tembin	189	0	0	189
TY 24W	Bolaven	287	0	0	287

TY 25W	-	144	0	0	144
-	Totals	6407	597	0	7004
Percentage Of Total		91.48	8.52	0	100

TABLE 3-2 NORTHERN INDIAN OCEAN FIX SUMMARY FOR 2005

Tropical Cyclone		Satellite	Radar	Synoptic	Total
TC 01B	-	68	0	0	68
TC 02B	Hibaru	159	0	0	159
TC 03B	-	82	0	0	82
TC 04B	-	88	0	0	88
TC 05B	Baaz	204	0	0	204
TC 06B	Fanoos	217	0	0	217
TC 07B	-	222	0	0	222
-	Totals	1040	0	0	1040
Percentage of Total		98.83	0	0	100

TABLE 3-3 SOUTH PACIFIC & SOUTH INDIAN OCEAN FIX SUMMARY FOR 2005

Tropical Cyclone		Satellite	Radar	Synoptic	Total
TC 01S	Phoebe	142	0	0	142
TC 02S	-	125	0	0	125
TC 03S	Arola	216	0	0	216
TC 04S	Bento	374	0	0	374
TC 05S	-	74	0	0	74
TC 06S	Chambo	336	0	0	336
TC 07S	Raymond	97	0	0	97
TC 08P	Kerry	342	0	0	342
TC 09S	Sally	16	0	0	106
TC 10S	-	126	0	0	126
TC 11S	Daren	158	0	0	158
TC 12S	Ernest	253	0	0	253
TC 13S	Tim	101	0	0	101
TC 14S	Gerard	108	0	0	108
TC 15P	Meena	218	0	0	218
TC 16P	Harvey	88	1	0	89
TC 17S	Vivienne	143	0	0	143
TC 18P	Nancy	225	0	0	225
TC 19P	Olaf	312	0	0	312
TC 20P	Percy	343	0	0	343

TC 21P	Rae	73	0	0	73
TC 22P	Ingrid	392	0	0	392
TC 23S	Willy	181	0	0	181
TC 24S	Hennie	235	0	0	235
TC 25S	Isang	282	0	0	282
TC 26S	Adeline-Juliet	378	0	0	378
-	Totals	5428	1	0	5429
Percentage of Total		99.8	0.02	0.0	100

TABLE 3-4 FIXES BY OCEANIC BASIN FOR 2005

Oceanic Basin	Total Fixes
Northwest Pacific	7004
Southern Hemisphere	5429
Northern Indian Ocean	1040
Total	13473

4. SUMMARY OF FORECAST VERIFICATION

4.1 ANNUAL FORECAST VERIFICATION

Verification of warning positions and intensities at initial, 12-, 24-, 48-, and 72-hour forecast periods are made against the final best track. The (scalar) track forecast, along-track and cross-track errors (illustrated in 4-1) were calculated for each verifying JTWC forecast. These data, in addition to a detailed summary for each tropical cyclone, are included in this chapter. This section summarizes verification data this year and contrasts it with annual verification statistics from previous years.

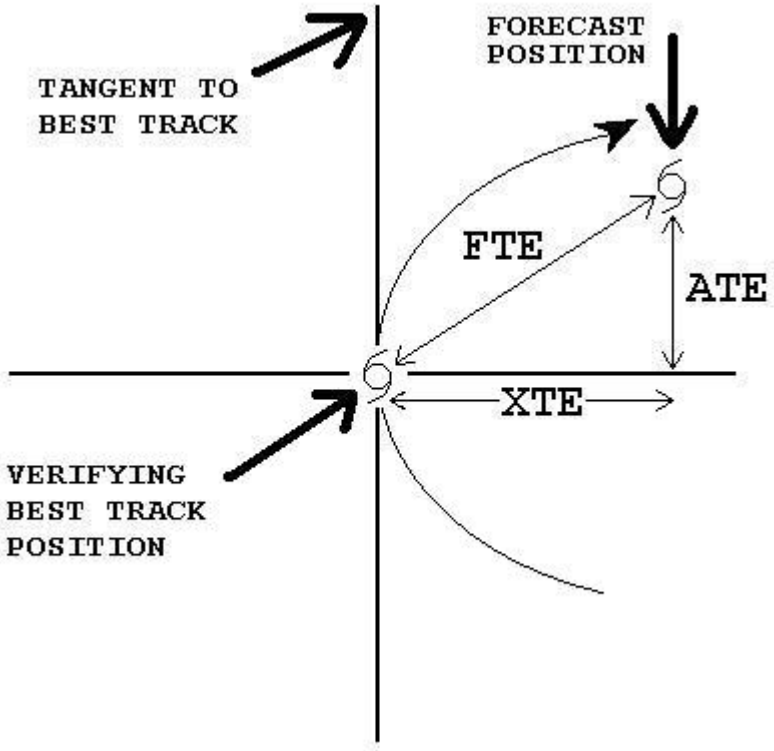


Figure 4-1. Definition of cross-track error (XTE), along-track error (ATE), and forecast track error (FTE). In this example, the forecast position is ahead of and to the right of the verifying best track position. Therefore, the XTE is positive (to the right of the best track) and the ATE is positive (ahead or faster than the best track). Adapted from Tsui and Miller, 1988.

4.1.1 WESTERN NORTH PACIFIC OCEAN

Table 4-1 includes mean track, along-track and cross-track errors from 1959, when JTWC was founded, until the present. Figure 4-2 shows mean track errors and a 5-year running mean of track errors at 24-, 48- and 72-hours since 1974.

Table 4-1 MEAN FORECAST TRACK ERRORS (NM) FOR WESTERN NORTH PACIFIC (TROPICAL CYCLONES FROM 1959-2006

	24-HOUR				48-HOUR				72-HOUR			
YEAR (Notes)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)
1959	117*				267*							
1960	177*				354*							
1961	136				274							
1962	144				287				476			
1963	127				246				374			
1964	133				284				429			
1965	151				303				418			
1966	136				280				432			
1967	125				276				414			
1968	105				229				337			
1969	111				237				349			
1970	98	104			181	190			272	279		
1971	99	111	64		203	212	118		308	317	177	
1972	116	117	72		245	245	146		382	381	210	
1973	102	108	74		193	197	134		245	253	162	
1974	114	120	78		218	226	157		357	348	245	
1975	129	138	84		279	288	181		442	450	290	
1976	117	117	71		232	230	132		336	338	202	
1977	140	148	83		266	283	157		390	407	228	
1978	120	127	71	87	241	271	151	194	459	410	218	296
1979	113	124	76	81	219	226	138	146	319	316	182	214
1980	116	126	76	86	221	243	147	165	362	389	230	266
1981	117	124	77	80	215	221	131	146	342	334	219	206
1982	114	113	70	74	229	238	142	162	337	342	211	223
1983	110	117	73	76	247	260	164	169	384	407	263	259
1984	110	117	64	84	228	232	131	163	361	363	216	238
1985	112	117	68	80	228	231	138	153	355	367	227	230
1986	117	126	70	85	261	261	151	183	403	394	227	276
1987	101	107	64	71	211	204	127	134	318	303	186	198
1988	107	114	58	85	222	216	103	170	327	315	159	244

1989	107	120	69	83	214	231	127	162	325	350	177	265
1990	98	103	60	72	191	203	110	148	299	310	168	225
1991	93	96	53	69	187	185	97	137	298	287	146	229
1992	97	107	59	77	194	205	116	143	295	305	172	210
1993	102	112	63	79	205	212	117	151	320	321	173	226
1994	96	105	56	76	172	186	105	131	244	258	152	176
1995	105	123	67	89	200	215	117	159	311	325	167	240
1996	85	105	56	76	157	178	89	134	252	272	137	203
1997	86	93	55	76	159	164	87	134	251	245	120	202
1998	127	124	58	98	263	239	127	178	392	370	201	274
1999	88	106	59	74	150	176	102	119	225	234	139	155
2000	75	81	45	57	136	142	80	98	205	209	118	144
2001	67	73	42	50	115	122	75	79	176	180	111	121
2002	47	66	45	39	87	115	78	70	131	163	109	100
2003	59	73	41	52	119	128	68	94	186	186	89	147
2004	52	70	41	48	94	122	69	84	180	173	95	121
2005	41	61	38	38	81	102	59	72	138	156	79	120
2006	45	62	39	40	85	104	61	73	133	151	77	112
Averages (1978-2006)	93	103	59	72	184	194	110	137	287	291	164	205

1. Track errors were calculated for typhoons when intensities were at least 65kts at warning times

2. Cross-track and along-track errors were adopted by the JTWC in 1986. Right angle errors (used prior to 1986) were recomputed as cross-track errors after-the fact to extend the data base. See Figure 3-1 for the definitions of cross-track and along-track.

3. Mean forecast errors for all warned systems in Northwest Pacific.

*Forecast positions north of 35 degrees North latitude were not verified.

**1994 statistics were recalculated to resolve earlier Along and Cross-Track discrepancies.

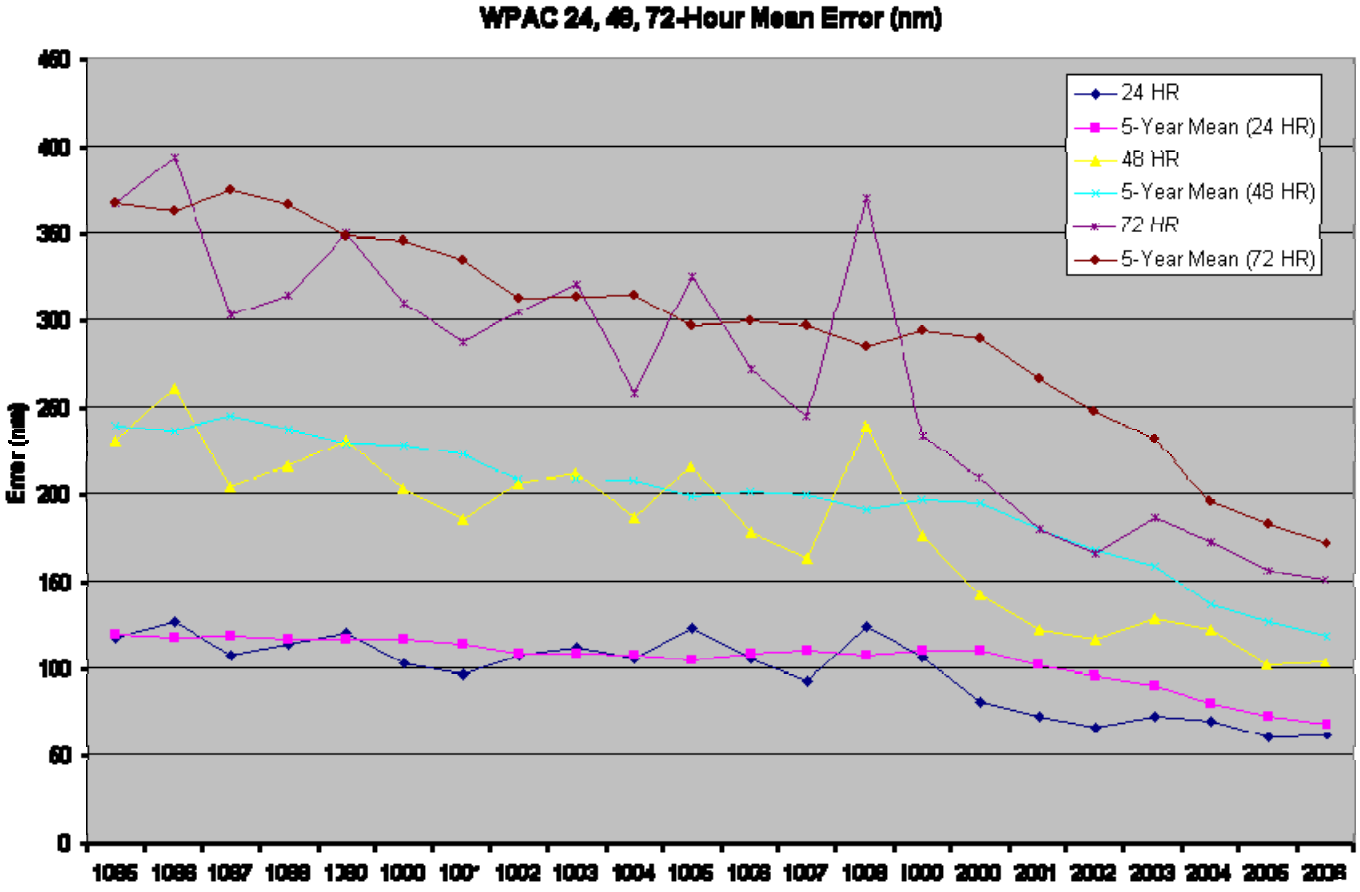


Figure 4-2. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for Western North Pacific Ocean tropical cyclones from 1985-2006.

Table 4-2 MEAN FORECAST TRACK ERRORS (NM) FOR NORTH INDIAN OCEAN (TROPICAL CYCLONES FROM 1985-2006

	24-HOUR				48-HOUR				72-HOUR			
YEAR (Notes)	Cases	Track	CROSS TRACK	ALONG TRACK	Cases	Track	CROSS TRACK	ALONG TRACK	Cases	Track	CROSS TRACK	ALONG TRACK
1985	30	122	102	53	8	242	119	194	0			
1986	16	134	118	53	7	168	131	80	5	269	189	180
1987	54	144	97	100	25	205	125	140	21	305	219	188
1988	30	120	89	63	18	219	112	176	12	409	227	303
1989	33	88	62	50	17	146	94	86	12	216	164	11
1990	36	101	85	43	24	146	117	67	17	185	130	104
1991	43	129	107	54	27	235	200	89	14	450	356	178
1992	149	128	73	86	100	244	141	166	62	398	276	218
1993	28	125	87	79	20	198	171	74	12	231	176	116
1994	44	97	80	44	28	153	124	63	13	213	177	92

1995	47	138	119	58	32	262	247	77	20	342	304	109
1996	123	134	94	80	85	238	181	127	58	311	172	237
1997	42	119	87	49	29	201	168	92	17	228	195	110
1998	55	106	84	51	34	198	135	106	17	262	188	144
1999	41	79	59	38	22	184	130	116	10	374	309	177
2000	24	61	47	26	16	85	69	37	1	401	399	38
2001	41	61	40	37	31	115	71	71	22	166	44	154
2002	30	84	41	63	18	137	92	83	10	185	92	133
2003	37	108	66	69	31	196	115	132	7	354	210	252
2004	46	81	53	52	36	140	95	85	9	173	144	86
2005	67	62	41	40	49	116	71	73	18	118	35	109
2006	19	64	37	44	13	92	58	60	0			
Averages (1985-2006)	47	104	55	77	30	177	98	126	18	277	141	204

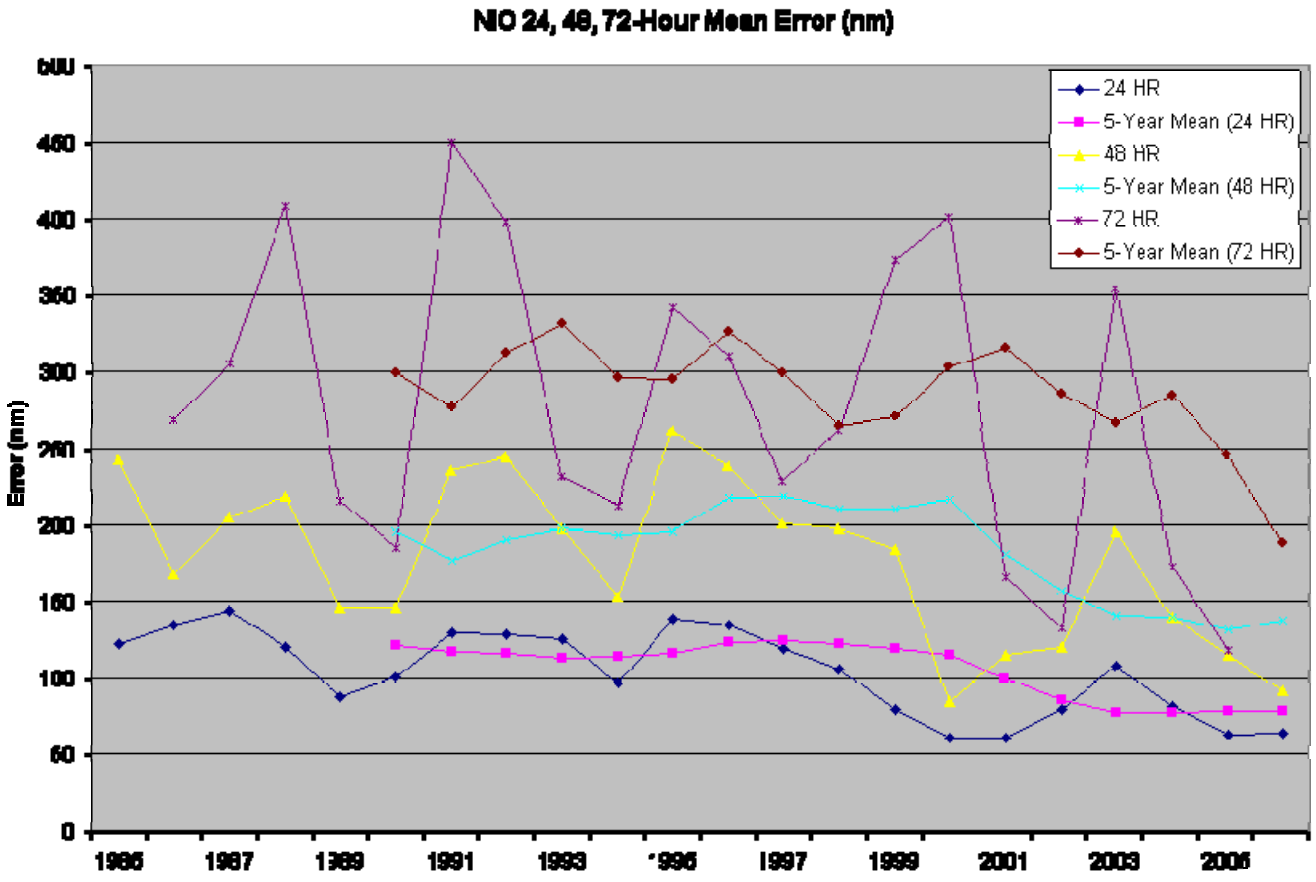


Figure 4-3. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for North Indian Ocean Tropical Cyclones from 1985-2006.

Table 4-3 MEAN FORECAST TRACK ERRORS (NM) FOR SOUTHERN HEMISPHERE (TROPICAL CYCLONES FROM 1985-2006

	24-HOUR				48-HOUR				72-HOUR			
YEAR (Notes)	Cases	Track	CROSS TRACK	ALONG TRACK	Cases	Track	CROSS TRACK	ALONG TRACK	Cases	Track	CROSS TRACK	ALONG TRACK
1985	257	134	92	79	193	236	169	132				
1986	227	129	86	77	171	262	169	164				
1987	138	145	94	90	101	280	153	138				
1988	99	146	98	83	48	290	246	144				
1989	242	124	84	73	186	240	166	136				
1990	228	143	105	74	177	263	178	152				
1991	231	115	75	69	185	220	152	129				
1992	230	124	91	64	208	240	177	129				
1993	225	102	74	57	176	199	142	114				
1994	345	115	77	68	282	224	147	134				
1995	222	108	82	55	175	198	144	108	53	291	169	190
1996	298	125	90	67	237	240	174	129	46	277	221	133
1997	499	109	82	72	442	210	163	135	150	288	248	175
1998	305	111	85	52	245	219	169	108	81	349	261	171
1999	322	113	80	64	245	226	159	132	59	286	198	164
2000	313	72	47	45	245	135	84	86	58	180	94	139
2001	147	84	61	44	113	148	105	86	11	248	132	197
2002	200	82	60	43	146	133	93	75	5	102	91	41
2003	279	74	57	37	221	127	90	68	37	123	99	54
2004	277	77	52	45	233	142	92	89	47	210	162	102
2005	214	70	44	44	170	116	77	72	41	199	117	136
2006	191	65	37	46	140	116	69	79	32	201	101	151
Averages (1985-2006)	250	108	61	76	197	203	115	142	52	230	132	164

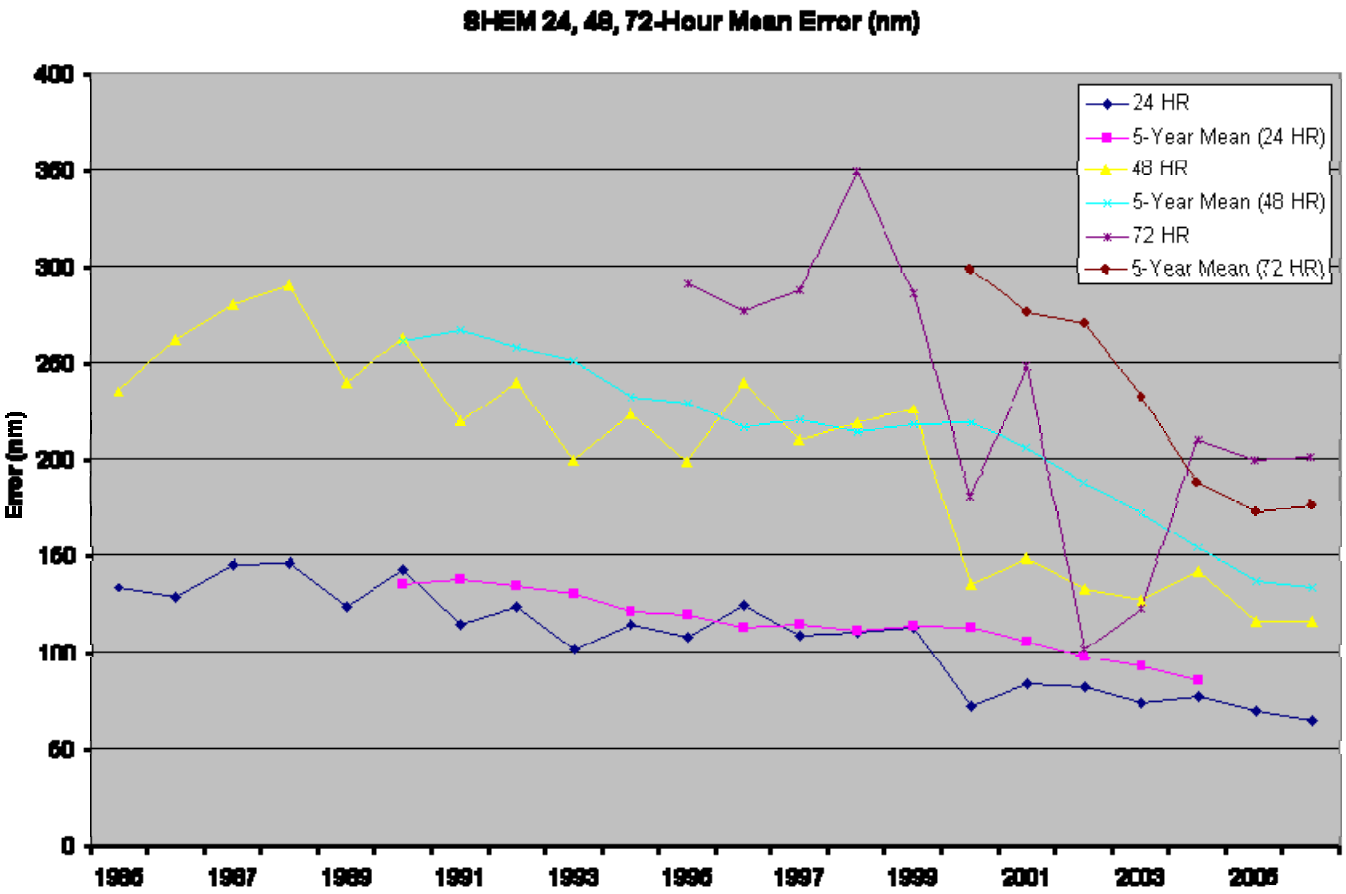


Figure 4-4. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for Southern Hemisphere Ocean Tropical Cyclones from 1985-2006.

4.2 TESTING AND RESULTS

A comparison of selected techniques is included in Table 4-4 for all western North Pacific tropical cyclones, Table 4-5 for North Indian Ocean tropical cyclones, and Table 4-6 for Southern Hemisphere tropical cyclones.

For example, in Table 4-4 for the homogeneous comparison of the 12-hour mean forecast error between JTWC and CONW, 542 cases were available. The average forecast error at 12 hours was 36 nm for CONW and 40 nm for JTWC. The difference of -4 nm is shown in the lower right. Due to computational round-off, differences are not always exact.

Table 4-4 Error Statistics for Selected Objective Techniques Western North Pacific Ocean

12-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	543	40																						
	40	0																						
CONW	542	40	573	38																				
	36	-4	38	0																				
AFWI	381	36	388	34	388	45																		
	45	9	45	11	45	0																		
AVNI	468	37	468	35	369	44	468	37																
	37	0	37	2	36	-8	37	0																
COWI	465	37	471	35	357	44	438	37	471	45														
	44	7	45	10	42	-2	44	7	45	0														
EGRI	440	40	457	37	320	44	387	37	394	45	457	47												
	46	6	47	10	44	0	44	7	44	-1	47	0												
GFNI	469	37	479	34	378	45	450	37	435	43	393	44	479	47										
	44	7	47	13	45	0	44	7	43	0	45	1	47	0										
JGSI	409	34	409	31	324	42	386	35	378	42	353	42	390	42	409	38								
	38	4	38	7	38	-4	38	3	37	-5	37	-5	38	-4	38	0								
JTYI	409	34	409	31	332	43	391	34	377	41	349	42	399	42	372	37	409	38						
	38	4	38	7	37	-6	37	3	37	-4	37	-5	38	-4	37	0	38	0						
NGPI	518	39	535	37	383	45	467	37	470	45	435	46	473	46	403	38	405	38	535	44				

	43	4	44	7	40	-5	42	5	43	-2	43	-3	41	-5	39	1	39	1	44	0				
TCLI	351	34	351	32	289	44	344	35	333	41	296	41	345	42	321	36	314	36	350	40	351	45		
	45	11	45	13	45	1	45	10	44	3	45	4	45	3	44	8	44	8	45	5	45	0		
WBAI	529	40	556	37	375	45	455	38	456	45	446	47	467	47	396	38	396	38	520	44	341	44	557	50
	49	9	50	13	48	3	48	10	47	2	51	4	48	1	44	6	43	5	49	5	45	1	50	0

24-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFDI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	503	61																						
	61	0																						
CONW	502	60	532	57																				
	55	-5	57	0																				
AFWI	345	55	352	53	352	79																		
	78	23	79	26	79	0																		
AVNI	430	56	430	53	334	78	430	61																
	61	5	61	8	61	-17	61	0																
COWI	433	56	439	54	328	78	407	61	439	79														
	78	22	79	25	74	-4	76	15	79	0														
EGRI	417	59	434	56	299	76	364	59	374	78	434	77												
	76	17	77	21	74	-2	73	14	74	-4	77	0												
GFNI	431	56	440	53	344	78	414	61	405	76	371	74	440	79										
	74	18	79	26	75	-3	73	12	72	-4	75	1	79	0										
JGSI	381	53	381	49	297	76	358	58	354	76	333	70	364	72	381	61								
	61	8	61	12	63	-13	61	3	60	-16	58	-12	61	-11	61	0								
JTYI	378	53	378	49	302	76	360	57	352	74	329	70	370	73	346	60	378	61						
	61	8	61	12	62	-14	60	3	60	-14	60	-10	61	-12	60	0	61	0						
NGPI	478	59	494	56	347	78	429	61	438	79	412	75	434	77	375	61	374	61	494	71				
	70	11	71	15	66	-12	69	8	69	-10	67	-8	67	-10	65	4	64	3	71	0				
TCLI	321	54	321	50	261	79	315	58	306	76	277	71	317	71	298	59	291	60	320	66	321	78		
	78	24	78	28	80	1	78	20	78	2	80	9	78	7	78	19	79	19	78	12	78	0		
WBAI	492	60	518	56	342	78	420	62	427	78	424	77	431	79	371	61	368	62	482	71	314	78	519	85
	83	23	85	29	85	7	83	21	81	3	85	8	83	4	78	17	76	14	84	13	80	2	85	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	452	81																						
	81	0																						
CONW	451	81	483	75																				
	73	-8	75	0																				
AFWI	302	75	311	72	311	117																		
	115	40	117	45	117	0																		
AVNI	379	76	382	72	293	117	382	85																
	85	9	85	13	87	-30	85	0																
COWI	389	77	398	73	293	117	366	84	398	119														
	118	41	119	46	114	-3	117	33	119	0														
EGRI	383	79	401	74	272	114	332	83	347	116	401	109												
	108	29	109	35	108	-6	106	23	107	-9	109	0												
GFNI	381	76	391	72	303	117	366	85	364	117	338	106	391	109										
	103	27	109	37	106	-11	102	17	102	-15	106	0	109	0										
JGSI	342	73	344	69	266	116	321	81	322	118	307	104	327	102	344	80								
	80	7	80	11	84	-32	80	-1	80	-38	78	-26	80	-22	80	0								
JTYI	334	73	336	69	267	116	318	81	317	117	300	106	328	103	312	78	336	83						
	84	11	83	14	86	-30	83	2	82	-35	82	-24	83	-20	82	4	83	0						
NGPI	427	79	446	75	306	117	381	84	397	119	380	106	386	107	338	80	332	83	446	97				
	96	17	97	22	93	-24	96	12	95	-24	93	-13	94	-13	91	11	91	8	97	0				
TCLI	281	74	282	70	228	118	276	81	272	120	251	104	278	101	267	80	257	82	281	92	282	117		
	117	43	117	47	118	0	117	36	116	-4	118	14	117	16	115	35	117	35	117	25	117	0		
WBAI	442	81	470	74	302	116	373	85	387	118	391	107	383	109	335	80	327	83	435	97	275	115	471	119
	117	36	119	45	122	6	117	32	114	-4	119	12	118	9	111	31	110	27	118	21	116	1	119	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVN1		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	403	102																						
	102	0																						

CONW	402	102	435	96																				
	94	-8	96	0																				
AFWI	265	101	273	95	273	158																		
	156	55	158	63	158	0																		
AVNI	328	99	332	95	254	159	332	115																
	115	16	115	20	118	-41	115	0																
COWI	341	100	351	96	254	158	317	113	351	163														
	161	61	163	67	158	0	163	50	163	0														
EGRI	346	101	366	93	248	154	296	113	316	158	366	139												
	139	38	139	46	139	-15	138	25	136	-22	139	0												
GFNI	327	99	338	95	265	157	313	115	314	163	302	137	338	138										
	130	31	138	43	135	-22	127	12	130	-33	137	0	138	0										
JGSI	294	94	298	90	228	154	275	113	278	165	275	138	279	130	298	99								
	99	5	99	9	103	-51	101	-12	100	-65	96	-42	102	-28	99	0								
JTYI	289	95	292	91	232	155	274	113	275	164	269	139	284	131	270	100	292	113						
	113	18	113	22	120	-35	113	0	112	-52	114	-25	113	-18	111	11	113	0						
NGPI	377	102	397	97	268	157	331	114	350	163	344	136	333	136	292	100	288	114	397	119				
	119	17	119	22	118	-39	118	4	119	-44	115	-21	117	-19	115	15	115	1	119	0				
TCLI	228	95	231	93	185	156	225	109	225	165	216	132	226	130	216	98	211	112	230	114	231	162		
	158	63	162	69	161	5	162	53	162	-3	157	25	162	32	158	60	162	50	161	47	162	0		
WBAI	394	102	423	95	265	158	324	114	341	163	357	136	331	138	290	99	284	111	387	119	226	161	424	156
	154	52	156	61	166	8	156	42	153	-10	156	20	158	20	148	49	150	39	157	38	154	-7	156	0

72-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	312	156																						
	156	0																						
CONW	311	156	340	143																				
	142	-14	143	0																				

AFWI	190	162	197	146	197	276																		
	279	117	276	130	276	0																		
AVNI	235	156	236	144	174	278	236	191																
	191	35	191	47	196	-82	191	0																
COWI	255	155	262	144	183	280	223	191	262	255														
	255	100	255	111	243	-37	255	64	255	0														
EGRI	254	150	271	142	169	278	201	192	228	256	271	210												
	211	61	210	68	206	-72	206	14	206	-50	210	0												
GFNI	237	156	239	144	184	277	216	192	225	257	205	213	239	207										
	204	48	207	63	204	-73	200	8	200	-57	207	-6	207	0										
JGSI	219	150	220	136	161	276	190	193	203	253	203	207	194	200	220	141								
	141	-9	141	5	142	-134	134	-59	145	-108	136	-71	144	-56	141	0								
JTYI	213	152	213	138	160	278	187	190	200	256	193	214	198	203	196	141	213	171						
	171	19	171	33	185	-93	167	-23	169	-87	165	-49	173	-30	164	23	171	0						
NGPI	284	159	300	145	191	280	233	191	259	255	251	208	234	209	212	141	207	171	300	181				
	182	23	181	36	180	-100	180	-11	179	-76	180	-28	182	-27	182	41	181	10	181	0				
TCLI	137	157	137	140	105	286	128	185	133	246	131	189	131	205	127	122	123	154	136	177	137	246		
	246	89	246	106	254	-32	244	59	250	4	245	56	249	44	235	113	245	91	247	70	246	0		
WBAI	299	154	324	139	186	274	229	188	247	248	260	204	227	207	209	130	201	165	285	180	131	244	326	233
	228	74	232	93	256	-18	232	44	226	-22	235	31	234	27	221	91	221	56	232	52	228	-16	233	0

96-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AVNI		EGRI		GFNI		JGSI		NGPI		TCLI									
JTWC	176	231																						
	231	0																						
CONW	176	231	235	209																				
	207	-24	209	0																				
AVNI	150	220	160	199	160	293																		
	296	76	293	94	293	0																		

EGRI	145	219	179	203	128	294	181	253																
	252	33	251	48	240	-54	253	0																
GFNI	155	232	165	204	146	290	132	255	165	296														
	287	55	296	92	276	-14	301	46	296	0														
JGSI	4	113	4	121	2	66	4	223	4	186	4	234												
	234	121	234	113	101	35	234	11	234	48	234	0												
NGPI	175	231	216	207	158	290	168	249	162	296	4	234	217	274										
	278	47	274	67	267	-23	274	25	284	-12	151	-83	274	0										
TCLI	2	850	2	180	2	731	2	208	2	456	0	0	2	229	2	253								
	253	-597	253	73	253	-478	253	45	253	-203	0	0	253	24	253	0								>

120-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AVNI		EGRI		GFNI		NGPI		TCLI											
JTWC	119	284																						
	284	0																						
CONW	118	286	158	272																				
	272	-14	272	0																				
AVNI	97	280	101	269	101	394																		
	393	113	394	125	394	0																		
EGRI	89	295	109	266	75	361	111	308																
	306	11	307	41	288	-73	308	0																
GFNI	101	287	106	266	91	385	77	315	106	381														
	381	94	381	115	366	-19	385	70	381	0														
NGPI	114	291	141	267	98	375	100	304	100	387	142	352												
	360	69	354	87	348	-27	351	47	376	-11	352	0												
TCLI	2	1264	2	387	2	994	2	229	2	924	2	511	2	275										
	275	-989	275	-112	275	-719	275	46	275	-649	275	-236	275	0										

Table 4-5 Error Statistics for Selected Objective Techniques North Indian Ocean

12-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NPGI		TCLI		WBAI		CLIP	
JTWC	49	44																		
	44	0																		
CONW	47	44	88	49																
	45	1	49	0																
AFWI	21	46	41	41	41	54														
	51	5	54	13	54	0														
AVNI	10	67	19	55	10	47	19	55												
	64	-3	55	0	61	14	55	0												
EGRI	31	46	61	47	32	52	17	54	61	46										
	44	-2	46	-1	41	-11	48	-6	46	0										
GFNI	35	45	63	46	37	51	19	55	43	45	64	55								
	57	12	54	8	49	-2	57	2	52	7	55	0								
NGPI	26	51	52	52	31	51	19	55	38	48	42	53	53	57						
	55	4	57	5	48	-3	64	9	57	9	56	3	57	0						
TCLI	16	46	32	48	21	49	7	46	23	41	32	55	20	59	32	58				
	60	14	58	10	41	-8	114	68	50	9	58	3	68	9	58	0				
WBAI	48	43	88	49	41	54	19	55	61	46	63	54	52	57	32	58	98	67		
	62	19	69	20	61	7	83	28	66	20	64	10	75	18	70	12	67	0		
CLIP	49	44	88	49	41	54	19	55	61	46	64	55	53	57	32	58	98	67	102	60
	59	15	58	9	47	-7	56	1	55	9	49	-6	56	-1	49	-9	59	-8	60	0

24-HOUR MEAN FORECAST ERROR (NM)

	JTWC	CONW	AFWI	AVNI	EGRI	GFNI	NPGI	TCLI	WBAI	CLIP

JTWC	41	73																		
	73	0																		
CONW	39	73	82	82																
	79	6	82	0																
AFWI	19	72	41	73	41	101														
	99	27	101	28	101	0														
AVNI	10	96	19	90	10	93	19	91												
	106	10	91	1	108	15	91	0												
EGRI	29	77	59	80	32	99	17	94	59	74										
	73	-4	74	-6	68	-31	81	-13	74	0										
GFNI	30	71	60	76	37	94	19	91	42	73	61	83								
	83	12	82	6	75	-19	74	-17	81	8	83	0								
NGPI	24	85	52	88	31	91	19	91	38	79	42	80	53	100						
	102	17	101	13	93	2	107	16	101	22	99	19	100	0						
TCLI	14	72	30	79	21	88	7	67	23	71	30	89	20	108	30	97				
	93	21	97	18	72	-16	203	136	90	19	97	8	119	11	97	0				
WBAI	40	72	82	82	41	101	19	91	59	74	60	82	52	101	30	97	90	135		
	130	58	139	57	132	31	171	80	134	60	132	50	153	52	138	41	135	0		
CLIP	41	73	82	82	41	101	19	91	59	74	61	83	53	100	30	97	90	135	94	109
	103	30	103	21	80	-21	83	-8	102	28	84	1	94	-6	76	-21	108	-27	109	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NPGI		TCLI		WBAI		CLIP	
JTWC	32	107																		
	107	0																		
CONW	31	110	75	121																
	118	8	121	0																
AFWI	17	108	40	116	40	155														
	163	55	155	39	155	0														

AVNI	9	142	18	140	9	149	18	125												
	140	-2	125	-15	155	6	125	0												
EGRI	26	113	55	114	31	153	16	128	55	99										
	100	-13	99	-15	105	-48	122	-6	99	0										
GFNI	24	108	55	117	36	145	18	125	40	98	56	118								
	112	4	115	-2	107	-38	96	-29	109	11	118	0								
NGPI	21	121	51	131	30	142	18	125	37	112	41	111	52	152						
	144	23	153	22	153	11	176	51	149	37	154	43	152	0						
TCLI	13	104	29	115	20	131	6	86	22	97	29	130	19	159	29	142				
	140	36	142	27	106	-25	303	217	133	36	142	12	169	10	142	0				
WBAI	32	107	75	121	40	155	18	125	55	99	55	115	51	153	29	142	83	219		
	209	102	227	106	223	68	299	174	215	116	229	114	253	100	225	83	219	0		
CLIP	32	107	75	121	40	155	18	125	55	99	56	118	52	152	29	142	83	219	86	158
	142	35	148	27	123	-32	119	-6	144	45	120	2	136	-16	117	-25	158	-61	158	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NPGI		TCLI		WBAI		CLIP	
JTWC	27	147																		
	147	0																		
CONW	25	156	67	161																
	149	-7	161	0																
AFWI	14	143	35	157	35	211														
	214	71	211	54	211	0														
AVNI	7	193	16	197	7	252	16	163												
	177	-16	163	-34	210	-42	163	0												
EGRI	21	157	47	146	25	216	13	172	47	119										
	107	-50	119	-27	124	-92	155	-17	119	0										
GFNI	17	146	44	159	30	200	13	155	29	102	44	164								
	141	-5	164	5	159	-41	145	-10	147	45	164	0								

NGPI	18	157	45	178	24	206	16	163	30	134	30	160	46	205						
	192	35	207	29	211	5	263	100	199	65	228	68	205	0						
TCLI	11	134	28	158	19	178	6	115	18	109	28	180	17	230	28	187				
	173	39	187	29	153	-25	344	229	172	63	187	7	222	-8	187	0				
WBAI	27	147	67	161	35	211	16	163	47	119	44	164	45	207	28	187	74	308		
	297	150	327	166	322	111	474	311	305	186	347	183	373	166	346	159	308	0		
CLIP	27	147	67	161	35	211	16	163	47	119	44	164	46	205	28	187	74	308	75	211
	178	31	190	29	171	-40	157	-6	186	67	156	-8	184	-21	162	-25	211	-97	211	0

72-HOUR MEAN FORECAST ERROR (NM)

	CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP			
CONW	53	213																		
	213	0																		
AFWI	25	197	25	286																
	286	89	286	0																
AVNI	10	300	1	569	10	188														
	188	-112	248	-321	188	0														
EGRI	37	194	16	285	8	188	37	161												
	161	-33	144	-141	186	-2	161	0												
GFDN	26	221	16	319	7	175	18	146	26	214										
	214	-7	234	-85	164	-11	204	58	214	0										
NGPI	29	232	13	285	10	188	21	185	16	175	29	335								
	335	103	318	33	426	238	333	148	389	214	335	0								
TCLI	21	246	14	261	5	169	13	156	16	260	11	405	21	252						
	252	6	221	-40	347	178	238	82	265	5	246	-159	252	0						
WBAI	53	213	25	286	10	188	37	161	26	214	29	335	21	252	58	515				
	545	332	531	245	998	810	518	357	655	441	658	323	701	449	515	0				
CLIP	53	213	25	286	10	188	37	161	26	214	29	335	21	252	58	515	59	267		
	252	39	256	-30	195	7	253	92	211	-3	237	-98	232	-20	269	-246	267	0		

96-HOUR MEAN FORECAST ERROR (NM)

	CONW		AVNI		EGRI		GFNI		NGPI											
CONW	21	226																		
	226	0																		
AVNI	4	303	4	225																
	225	-78	225	0																
EGRI	13	165	2	260	18	251														
	278	113	368	108	251	0														
GFNI	8	179	1	187	6	273	10	242												
	218	39	313	126	234	-39	242	0												
NGPI	15	252	4	225	9	310	5	203	18	391										
	377	125	425	200	249	-61	376	173	391	0										

120-HOUR MEAN FORECAST ERROR (NM)

	CONW		AVNI		EGRI		GFNI		NGPI											
CONW	12	300																		
	300	0																		
AVNI	3	356	3	379																
	379	23	379	0																
EGRI	4	233	0	0	12	324														
	323	90	0	0	324	0														
GFNI	1	174	0	0	1	232	2	411												
	413	239	0	0	413	181	411	0												
NGPI	7	316	2	442	3	354	0	0	9	356										
	387	71	381	-61	376	22	0	0	356	0										

Table 4-6 Error Statistics for Selected Objective Techniques Southern Hemisphere

12-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP	
JTWC	240	42																		
	42	0																		
CONW	238	41	471	43																
	40	-1	43	0																
AFWI	119	38	197	38	197	57														
	58	20	57	19	57	0														
AVNI	181	39	315	39	190	57	315	44												
	44	5	44	5	44	-13	44	0												
EGRI	99	43	188	42	83	54	142	42	188	48										
	45	2	48	6	42	-12	44	2	48	0										
GFNI	202	41	390	43	192	58	305	44	158	46	390	54								
	51	10	54	11	46	-12	48	4	52	6	54	0								
NGPI	191	40	364	41	180	57	288	43	152	45	337	53	364	48						
	46	6	48	7	43	-14	43	0	46	1	48	-5	48	0						
TCLI	73	37	117	38	73	54	95	47	56	35	97	46	96	43	118	50				
	52	15	49	11	51	-3	50	3	46	11	50	4	52	9	50	0				
WBAI	237	42	467	42	194	56	311	44	186	48	386	54	361	47	115	49	470	56		
	55	13	56	14	58	2	56	12	56	8	56	2	54	7	57	8	56	0		
CLIP	238	42	467	42	193	56	311	44	188	48	386	54	360	48	116	48	467	56	484	229
	262	220	231	189	336	280	247	203	290	242	245	191	247	199	135	87	229	173	229	0

24-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP	
JTWC	214	70																		
	70	0																		
CONW	212	69	433	72																

	67	-2	72	0																
AFWI	104	65	179	64	179	99														
	103	38	99	35	99	0														
AVNI	159	66	283	65	172	97	283	77												
	75	9	77	12	80	-17	77	0												
EGRI	91	67	171	71	77	93	129	73	171	82										
	75	8	82	11	70	-23	76	3	82	0										
GFNI	180	70	357	73	174	99	275	78	145	80	357	96								
	90	20	96	23	80	-19	84	6	94	14	96	0								
NGPI	169	68	333	71	165	98	260	77	138	80	307	93	333	86						
	81	13	86	15	75	-23	76	-1	86	6	86	-7	86	0						
TCLI	67	61	107	62	66	92	85	80	53	55	87	80	87	74	108	86				
	90	29	86	24	95	3	87	7	85	30	88	8	91	17	86	0				
WBAI	213	70	432	72	179	99	282	78	170	82	356	96	332	86	106	85	435	110		
	109	39	109	37	120	21	113	35	107	25	113	17	109	23	113	28	110	0		
CLIP	214	70	432	72	178	99	282	77	170	81	356	96	332	86	107	86	434	110	449	297
	338	268	298	226	396	297	312	235	344	263	314	218	313	227	200	114	297	187	297	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP	
JTWC	193	93																		
	93	0																		
CONW	191	92	392	102																
	95	3	102	0																
AFWI	96	85	165	88	165	134														
	137	52	134	46	134	0														
AVNI	144	86	254	91	158	132	254	113												
	111	25	113	22	123	-9	113	0												
EGRI	80	85	154	96	72	133	117	103	154	109										

	96	11	109	13	97	-36	103	0	109	0										
GFNI	165	91	326	101	160	133	249	114	131	107	326	134								
	125	34	134	33	115	-18	121	7	128	21	134	0								
NGPI	152	90	301	100	155	135	235	113	124	106	280	131	301	127						
	120	30	127	27	112	-23	114	1	124	18	126	-5	127	0						
TCLI	62	83	99	88	62	127	78	117	49	78	80	118	81	111	100	127				
	133	50	127	39	142	15	128	11	132	54	130	12	133	22	127	0				
WBAI	192	93	391	102	165	134	253	113	153	109	325	134	300	126	98	127	394	165		
	165	72	165	63	185	51	172	59	159	50	171	37	166	40	168	41	165	0		
CLIP	193	93	392	102	165	134	254	113	154	109	326	134	301	127	99	127	394	165	409	362
	406	313	364	262	444	310	373	260	404	295	375	241	372	245	277	150	362	197	362	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP	
JTWC	170	116																		
	116	0																		
CONW	168	115	347	128																
	118	3	128	0																
AFWI	86	105	148	107	148	168														
	176	71	168	61	168	0														
AVNI	127	107	222	112	140	165	222	150												
	147	40	150	38	165	0	150	0												
EGRI	70	109	132	120	62	174	101	131	132	150										
	137	28	150	30	134	-40	149	18	150	0										
GFNI	143	111	284	125	141	167	215	151	109	149	284	162								
	150	39	162	37	141	-26	147	-4	146	-3	162	0								
NGPI	133	108	263	123	138	170	210	150	108	147	243	157	263	162						
	151	43	162	39	144	-26	148	-2	154	7	160	3	162	0						
TCLI	54	114	86	109	55	160	67	164	41	109	71	153	69	134	86	148				

	148	34	148	39	164	4	146	-18	148	39	150	-3	149	15	148	0				
WBAI	169	116	346	128	148	168	221	150	131	150	283	161	262	161	85	147	349	216		
	212	96	216	88	249	81	226	76	198	48	223	62	219	58	218	71	216	0		
CLIP	170	116	347	128	148	168	222	150	132	150	284	162	263	162	86	148	349	216	363	412
	459	343	415	287	463	295	415	265	444	294	422	260	415	253	322	174	413	197	412	0

72-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		EGRI		GFNI		NGPI		TCLI		WBAI		CLIP	
JTWC	41	199																		
	199	0																		
CONW	41	199	267	172																
	207	8	172	0																
AFWI	19	165	113	147	113	252														
	274	109	252	105	252	0														
AVNI	30	206	169	158	106	254	169	222												
	223	17	222	64	246	-8	222	0												
EGRI	20	174	104	173	47	253	74	186	104	225										
	259	85	225	52	221	-32	236	50	225	0										
GFNI	32	207	208	173	105	256	162	221	82	235	208	208								
	210	3	208	35	188	-68	189	-32	192	-43	208	0								
NGPI	33	200	197	170	103	262	158	220	83	233	177	197	197	231						
	242	42	231	61	197	-65	210	-10	233	0	231	34	231	0						
TCLI	9	206	54	127	30	173	43	220	24	150	44	183	42	177	54	241				
	338	132	241	114	214	41	239	19	253	103	236	53	244	67	241	0				
WBAI	41	199	266	172	113	252	168	223	103	227	207	208	196	230	53	240	269	343		
	321	122	343	171	441	189	384	161	316	89	352	144	371	141	317	77	343	0		
CLIP	41	199	267	172	113	252	169	222	104	225	208	208	197	231	54	241	269	343	279	471
	616	417	468	296	480	228	448	226	459	234	468	260	466	235	440	199	467	124	471	0

96-HOUR MEAN FORECAST ERROR (NM)

	CONW		AVNI		EGRI		GFNI		NGPI											
CONW	197	252																		
	252	0																		
AVNI	125	249	125	309																
	309	60	309	0																
EGRI	85	247	60	273	85	326														
	326	79	359	86	326	0														
GFNI	151	259	118	306	67	354	151	282												
	282	23	281	-25	294	-60	282	0												
NGPI	145	249	116	302	70	341	124	279	148	329										
	331	82	310	8	329	-12	341	62	329	0										

120-HOUR MEAN FORECAST ERROR (NM)

	CONW		AVNI		EGRI		GFNI		NGPI											
CONW	146	299																		
	299	0																		
AVNI	94	312	94	392																
	392	80	392	0																
EGRI	57	310	37	417	58	384														
	383	73	432	15	384	0														
GFNI	108	322	83	404	43	417	109	378												
	379	57	397	-7	420	3	378	0												
NGPI	102	308	79	392	41	432	85	364	104	415										
	416	108	403	11	457	25	442	78	415	0										

Table 4-7 Acronym Reference Guide

JTWC	Joint Typhoon Warning Center

AFWI	AFWA MM5 Vortex Tracker (NHC interpolator)	
AVNI	NCEP GFS (AVN) Vortex Tracker (NHC interpolator)	
COWI	Navy COAMPS Vortex Tracker (NHC interpolator)	
EGRI	UK-MET Office Vortex Tracker (NHC interpolator)	
GFNI	Navy GFDN Vortex Tracker (NHC interpolator)	
JGSI	JMA Global Spectral Model Vortex Tracker (NHC interpolator)	
JTYI	JMA Typhoon Model Vortex Tracker (NHC interpolator)	
NGPI	FNMOC NOGAPS Vortex Tracker (NHC interpolator)	
TCLI	Australia Bureau of Meteorology (ABM) TCLAPS Vortex Tracker (NHC interpolator)	
WBAI	Harry Weber model (NHC interpolator)	
CLIP	Climatology and Persistence	