4. SUMMARY OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

4.1 GENERAL

On 1 October 1980, JTWC's area of responsibility (AOR) was expanded to include the Southern Hemisphere from 180° longitude, westward to the coast of Africa. Details on Southern Hemisphere tropical cyclones and JTWC warnings from July 1980 through June 1982 are contained in Diercks et al. (1982), and from July 1982 through June 1984 in Wirfel and Sandgathe (1986). Information on Southern Hemisphere tropical cyclones after June 1984 can be found in the applicable Annual Tropical Cyclone Report.

The NAVPACMETOCCEN, Pearl Harbor, Hawaii issues warnings on tropical cyclones in the South Pacific which are east of 180° longitude. In accordance with CINCPACINST 3140.1W, Southern Hemisphere tropical cyclones are numbered sequentially from 1 July through 30 June. This convention is established to encompass the Southern Hemisphere tropical cyclone season, which primarily occurs from January through April. There are two Southern Hemisphere ocean basins for warning purposes - the South Indian Ocean (west of 135° East longitude) and the South Pacific (east of 135° East longitude) - which are identified by appending the suffixes "S" and "P," respectively, to the tropical cyclone number.

Intensity estimates for Southern Hemisphere tropical cyclones are derived from the interpretation of satellite imagery using the Dvorak (1984) technique and, when available, from surface observations and radar data. The Dvorak technique relates specific cloud signatures to maximum sustained one-minute average surface wind speeds. The conversion from maximum sustained winds to minimum sea-level pressure is obtained from Atkinson and Holliday (1977) (Table 4-1).

4.2 SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

The total number of significant tropical cyclones during the 1996 season (1 July 1995 - 30 June 1996; Table 4-2) was 28 which was slightly more than the overall climatological mean of 27 for the previous 16 years as shown in Table 4-3. Looking at the annual variation of Southern Hemisphere Tropical Cyclones by ocean basins (Table 4-4), it becomes apparent that tropical cyclone activity was slightly enhanced in the southern Indian Ocean and Australian regions, and slightly reduced in the South Pacific.

Table 4-1 MAXIMUM SUSTAINED 1-MINUTE MEAN SURFACE WINDS AND EQUIVALENT MINIMUM SEA-LEVEL PRESSURE RELATIONSHIP (ATKINSON AND HOLLIDAY, 1977)

WIND-KT	(M/SEC)	PRESSURE (MB)
30	(15)	1000
35	(18)	997
40	(21)	994
45	(23)	991
50	(26)	987
55	(28)	984
60	(31)	980
65	(33)	976
70	(36)	972
75	(39)	967
80	(41)	963
85	(44)	958
90	(46)	954
95	(49)	948
100	(51)	943
105	(54)	938
110	(57)	933
115	(59)	927
120	(62)	922
125	(64)	916
130	(67)	910
135	(69)	906
140	(72)	898
145	(75)	892
150	(77)	885
155	(80)	879
160	(82)	872
165	(85)	965
170	(87)	858
175	(90)	851
180	(93)	844

The JTWC warned on Southern Hemisphere tropical cyclones for 117 days of the 1996 season. This equates to roughly to 1 out of every 3 days of the 1996 Southern Hemisphere season having a tropical cyclone in active warning status. During 36 of the 117 days there were two or more Southern Hemisphere tropical cyclones in warning status at the same time. An additional 14 days of active warnings were covered by NAVPACMETOCCEN, Pearl Harbor, 3 days of which multiple tropical cyclones were in warning status.

A chronology of 1996 Southern Hemisphere tropical activity is provided in Figure 4-1. Composites of the tropical cyclone best tracks for the Southern Indian Ocean, the Australian Region, and the South Pacific Ocean, appear in Figures 4-2, 4-3, and 4-4 respectively.

Table 4-2 SOUTHERN HEMISPHERE TROPICAL CYCLONES FOR 1996

TROPICAL CYCLONE		PERIOD OF WARNING	NUMBER OF WARNINGS ISSUED	ESTIMATED MAX SURFACE WINDS KT (M/SEC)	ESTIMATED MSLP (MB)
01S	DARYL/AGNIELLE	17 NOV - 25 NOV	17	150 (77)	885
02S	EMMA*	04 DEC - 06 DEC	4	30 (15)	1000
	-	09 DEC - 12 DEC	7	40 (21)	994
	-	14 DEC - 15 DEC	3	30 (15)	1000
03S	FRANK	07 DEC - 13 DEC	24	115 (59)	927
04S	GERTIE	18 DEC - 21 DEC	14	75 (39)	967
05P	BARRY	04 JAN - 07 JAN	7	80 (41)	963
06S	BONITA	05 JAN - 15 JAN	20	135 (69)	904
07S	HUBERT/CORYNA	08 JAN - 12 JAN	9	75 (39)	967
08P	TASI♦	16 JAN - 19 JAN	0 (6)	45 (23)	991
09P	CELESTE	27 JAN - 30 JAN	7	65 (33)	976
10P	JACOB*	28 JAN - 29 JAN	4	50 (26)	987
	-	01 FEB - 07 FEB	19	90 (46)	954
11S	ISOBEL	28 JAN - 31 JAN	12	45 (23)	991
12S	-	07 FEB - 09 FEB	5	35 (18)	997
13P	DENNIS	13 FEB - 18 FEB	11	45 (23)	991
14S	DOLORESSE	15 FEB - 19 FEB	9	75 (39)	967
15S	-	16 FEB - 17 FEB	3	35 (18)	997
16S	EDWIGE*♦	22 FEB - 24 FEB	0 (6)	45 (23)	991
	-	25 FEB - 29 FEB	0(10)	95 (49)	949
17S	FLOSSY	27 FEB - 04 MAR	13	115 (59)	927
18S	KIRSTY	09 MAR - 12 MAR	13	100 (51)	943
19P	ETHEL	09 MAR - 13 MAR	10	45 (23)	991
20P	ZAKA	10 MAR - 11 MAR	3	40 (21)	994
21P	ATU	10 MAR - 13 MAR	10	55 (28)	984
22S	GUYLIANNE	20 MAR - 23 MAR	8	35 (18)	997
23P	BETI	21 MAR - 29 MAR	17	105 (54)	938
24S	HANSELLA	03 APR - 10 APR	15	95 (49)	949
25S	OLIVIA	05 APR - 11 APR	19	125 (64)	916
26S	ITELLE	08 APR - 17 APR	19	140 (72)	898
27S	-	16 APR - 19 APR	8	30 (15)	1000
28S	JENNA	01 MAY - 06 MAY	11	60 (31)	980
Grand total			321		
♦ Warnings issued by NAVPACMETOCCEN (NPMOC)			(22)		
JTWC total			343		

* Regenerated

Table 4-3 MONTHLY DISTRIBUTION OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
(1958-1977) AVERAGE*	-	-	-	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
TOTAL	5	1	5	8	24	52	96	105	76	48	15	2	437
AVERAGE (1981-1995)	0.3	0.1	0.3	0.5	1.5	3.3	5.9	6.6	4.7	2.9	0.9	0.1	27.3

* (Gray, 1978)

Table 4-4 ANNUAL VARIATION OF SOUTHERN HEMISPHERE TROPICAL CYCLONES BY OCEAN BASINS

YEAR	SOUTH INDIAN (WEST OF 105°E)	AUSTRALIAN (105°E - 165°E)	SOUTH PACIFIC (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
TOTAL	199	157	81	437
AVERAGE (1981-1995)	12.4	9.7	5.1	27.3

* (Gray,1978)

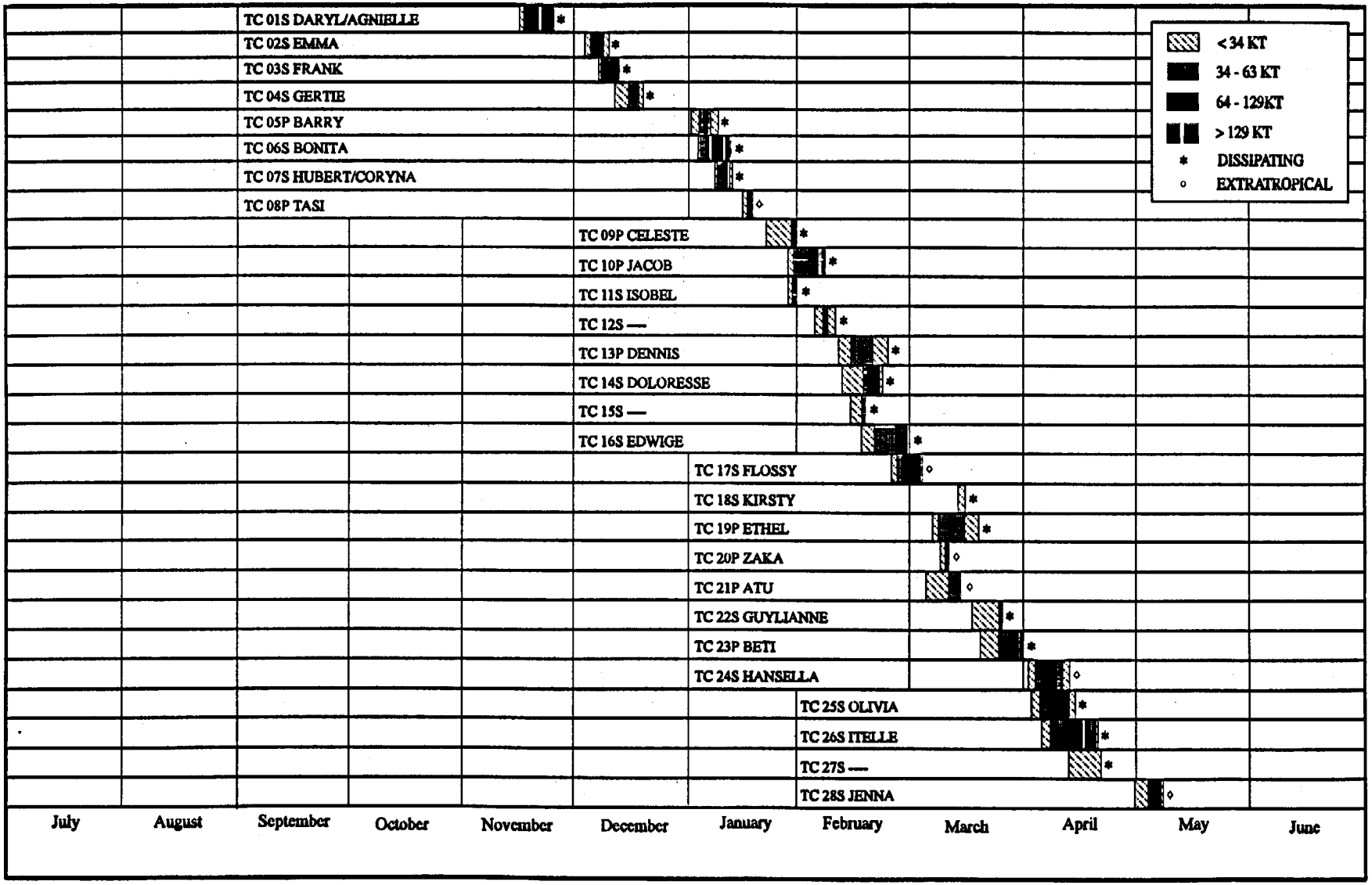

Figure 4-1 Chronology of South Pacific and South Indian Ocean tropical cyclones for 1996 (01 July 1995 - 30 June 1996).

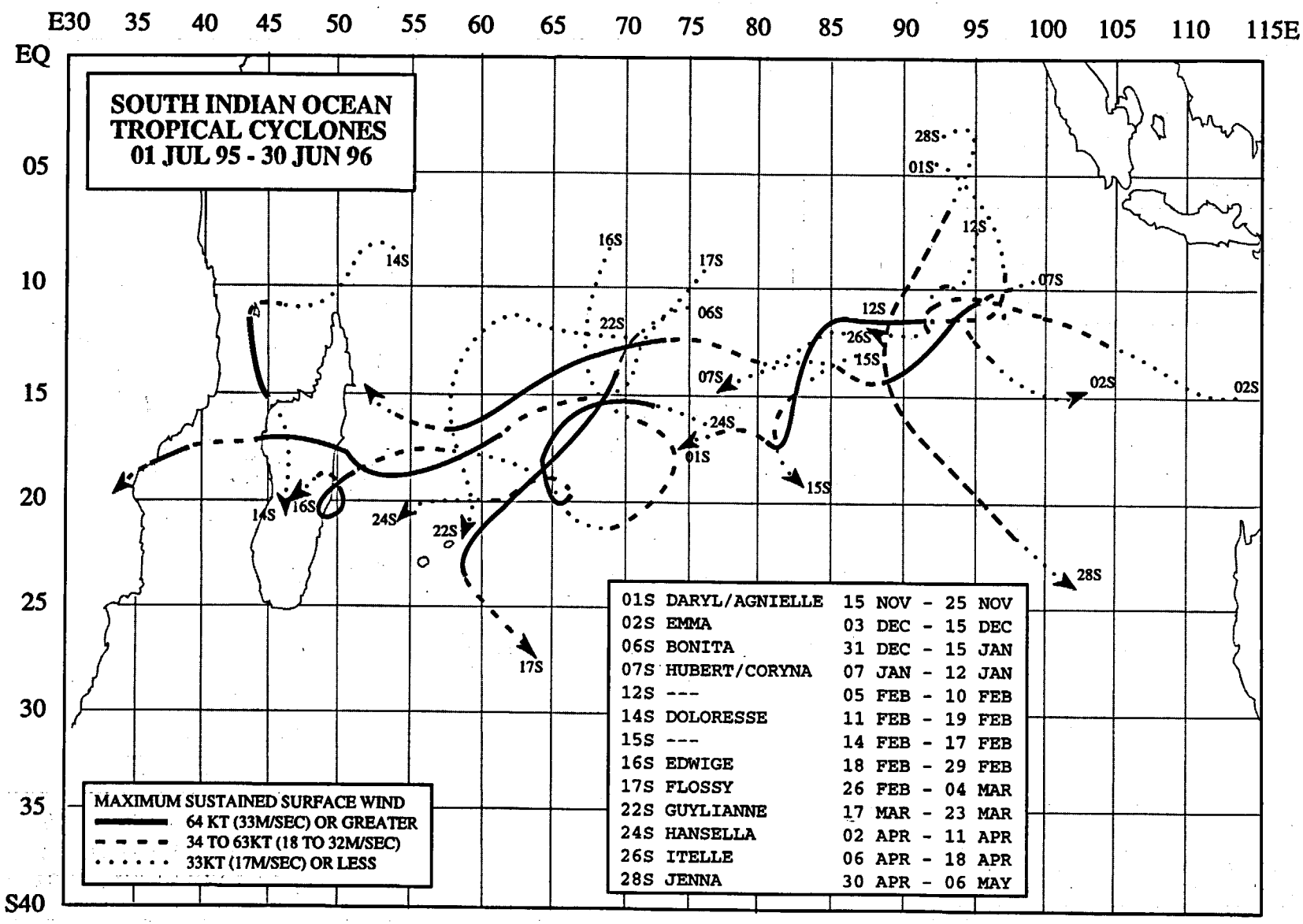

Figure 4-2 Tropical Cyclone best tracks for the South Indian Ocean

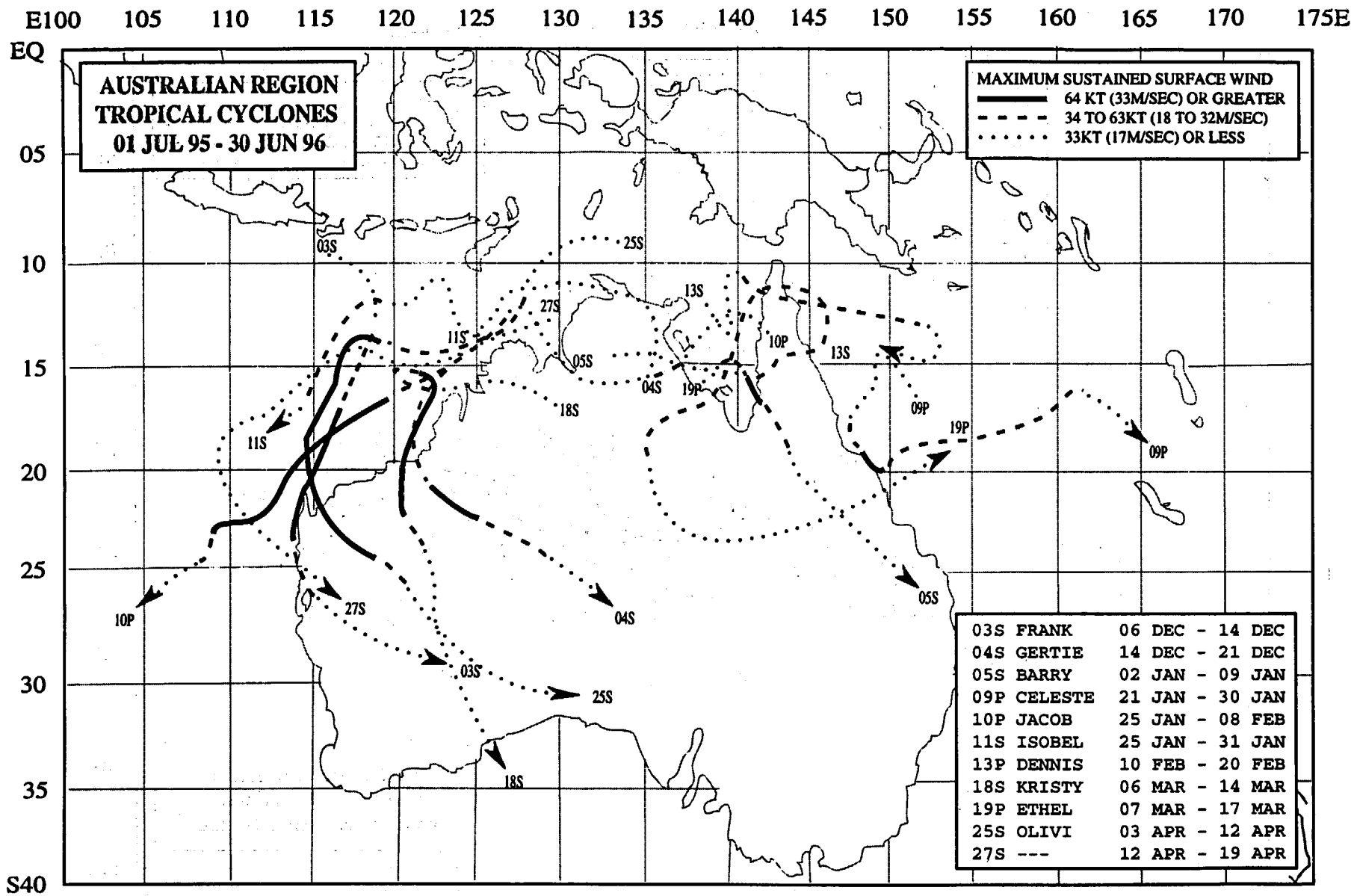

Figure 4-3 Tropical Cyclone Best Tracks for the Australian Region

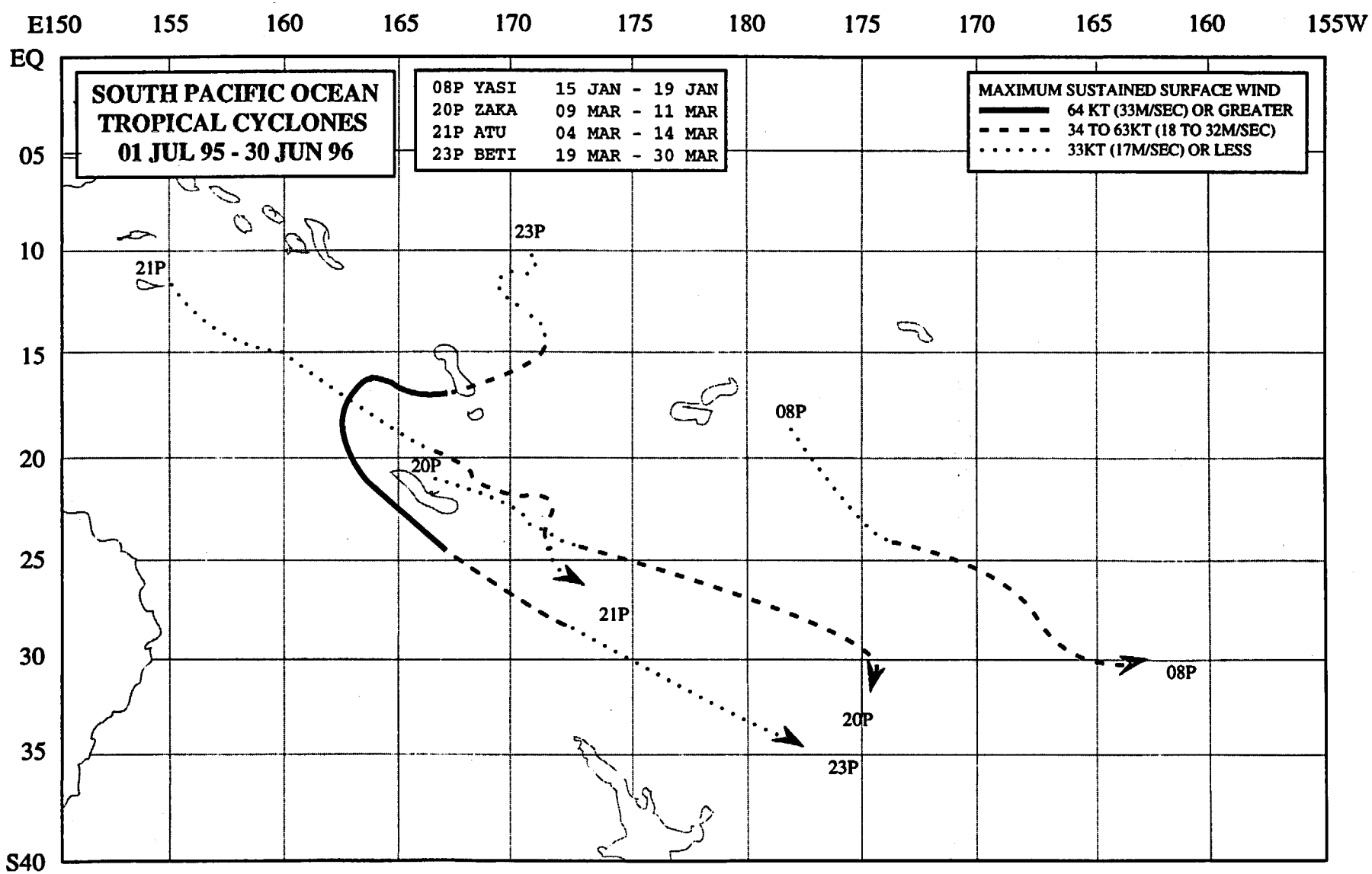

Figure 4-4 Tropical Cyclone Best Tracks for the South Pacific Ocean

Intentionally Left Blank