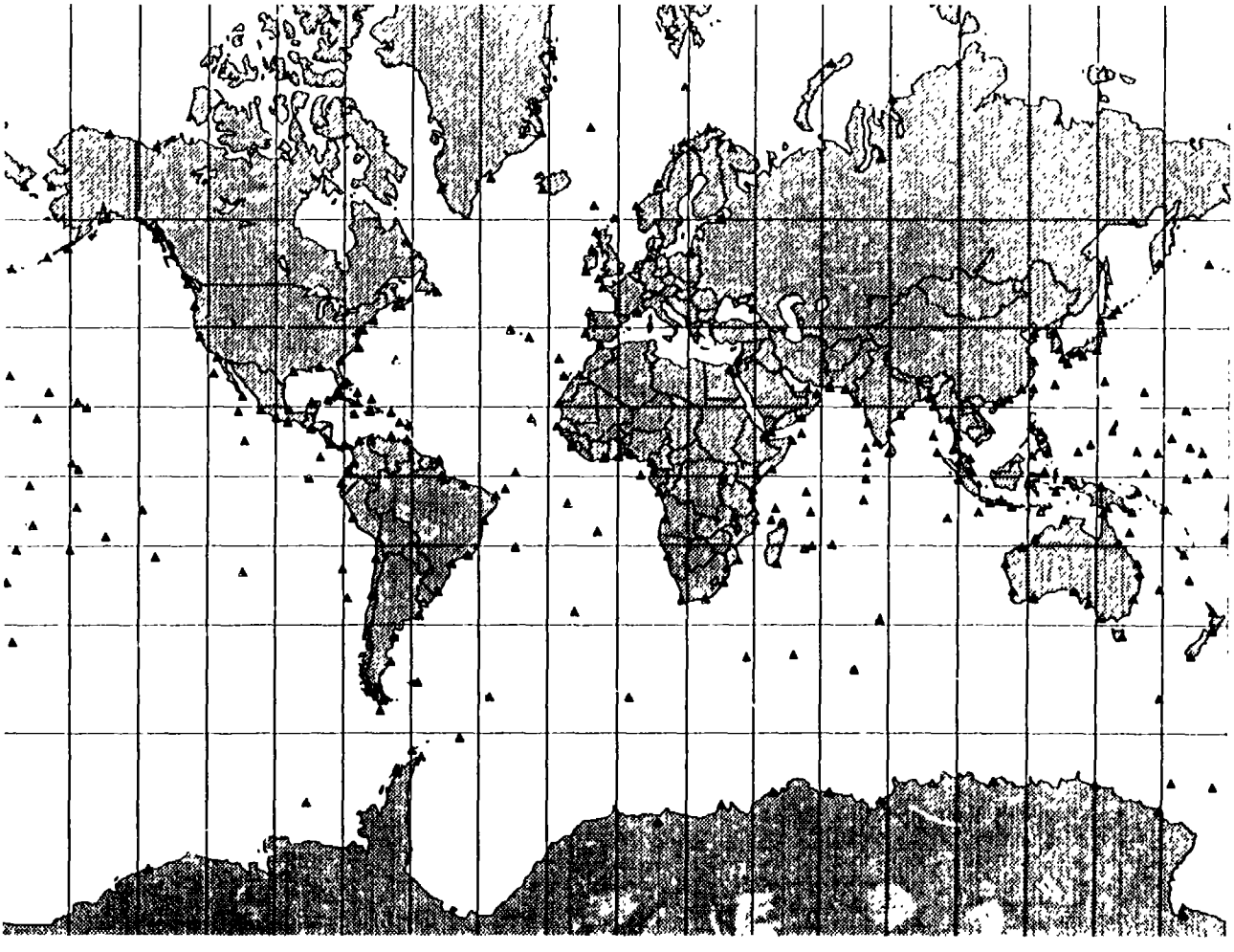
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

PERMANENT SERVICE FOR MEAN SEA LEVEL

SEA LEVEL MONITORING IN THE SMALL ISLAND DEVELOPING STATES



Global Sea Level Observing System

UNESCO

IOC/INF-954

INTERGOVERNMENTAL
OCEANOGRAPHIC
COMMISSION

PERMANENT SERVICE
FOR MEAN SEA LEVEL

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UNESCO 1994

IOC/INF-954

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This report has been prepared following a suggestion from the Secretary of the Intergovernmental Oceanographic Commission, by the Permanent Service for Mean Sea Level, as a follow-up to the United Nations Conference on Environment and Development (UNCED). The aim is to present an overview for possible use *inter alia* in connection with the First Global Conference on the Sustainable Development of Small Island Developing States in Barbados, April 1994; the Conference on Coastal Change, Bordeaux 1995, as well as other activities relevant to the follow-up to UNCED. It is the brief overview of the extent to which sea levels have been monitored by tide gauges to-date *inter alia* in countries relevant to the Barbados Conference 1994, and to relate those efforts to those made on a worldwide basis. There is now considerable interest in monitoring sea level, from the global points of view of ocean circulation studies (WOCE, 1988a,b) and climate change research (IPCC, 1990), in addition to local interests such as national coastal protection.

In this report, we first give a summary of the status of sea level monitoring on a global basis, mentioning briefly the main elements of the work. Then, the status of recording in individual countries is presented in more detail.

Global Sea Level Monitoring

The PSMSL is the global databank for long term sea level research. It was founded in 1933 at Bidston Observatory, Merseyside, UK and operates under the auspices of the International Council of Scientific Unions (ICSU). Its databank contains over 35000 station-years of sea level data in the form of monthly and annual mean values from over 1500 sites (Figure 1). A fuller description can be found in Woodworth (1991) and Spencer and Woodworth (1993).

The total PSMSL dataset is known, in PSMSL jargon, as the 'Metric' dataset, while a subset is known as the 'Revised Local Reference' (RLR) dataset. For RLR data, the continuity of datums is known in terms of land benchmarks next to the tide gauges, enabling the construction of long continuous time series of sea level change. Approximately two-thirds of PSMSL data are RLR, and many RLR time series are available from islands (Figure 2).

Many of the island records, however, are relatively short compared to those from continental coastlines. Figure 3 shows the same RLR sites as Figure 2 but with the requirement that at least 20 years of RLR data exist. At least 20 years of data are required for even a crude determination of a long term trend, and it can be seen that few island stations possess such an amount of data. Consequently, the development of tropical island tide gauge stations in the 1980s, as part of the Tropical Ocean Global Atmosphere (TOGA) programme (Figure 4), has been of considerable importance (Mitchum and Wyrtki, 1988). More recently, Bidston Observatory's programme of work has provided gauges in the South Atlantic and Southern Oceans (Spencer et al., 1993).

The relatively ad-hoc arrangements, whereby national sea level authorities have contributed data on a voluntary basis to the PSMSL, has been reinforced in recent years with the development of the Global Sea Level Observing System (GLOSS). GLOSS, which is coordinated by the Intergovernmental Oceanographic Commission (IOC), comprises a global network of approximately 300 strategic tide gauges for long term ocean circulation and climate change studies, and is over two-thirds complete (IOC, 1990; Woodworth, 1991; IOC, 1992). Figure 5 shows the locations of nominated GLOSS sites. In addition to the installation of new tide gauges, activities undertaken as part of GLOSS have included the development of the 'GLOSS Handbook', a computerised catalogue of information relevant to each GLOSS site; a number of

training courses for tide gauge operators undertaken in the English, French, Chinese, Spanish and Portuguese languages; and two manuals on tide gauge measurements and interpretation (IOC, 1985, 1993). Details regarding participation of Member State in GLOSS are described in the GLOSS Implementation Plan (IOC Technical Series No. 35, UNESCO 1990).

The World Ocean Circulation Experiment (WOCE) includes much of the physical oceanography community's research activities during the 1990s. During WOCE, sea levels will be monitored by a number of radar altimeter satellites (e.g. TOPEX/Poseidon, see Fu and Lefebvre, 1991) with tide gauge sea level data, particularly from islands, providing essential in-situ validation. Tide gauges will also be especially important in monitoring the flows through straits such as the Drake Passage. To a great extent the 'WOCE sea level dataset' can be considered an 'island subset' of GLOSS (Figure 6). A WOCE Sea Level Centre has been established on two sites. The first will concentrate on quasi-real time data for comparison to altimeter data, and is based at the University of Hawaii alongside the TOGA Sea Level Centre. The second will be responsible for the fully quality controlled final WOCE dataset, and is based at the British Oceanographic Data Centre (BODC) at Bidston alongside the PSMSL (WOCE, 1993).

Data from Countries at this Conference

Table 1 provides a list of countries potentially represented at the Barbados Conference, 1994, for each of which is summarised the sea level data held by the PSMSL. Figure 7 shows the locations of the various stations. The PSMSL and the IOC-GLOSS would be very interested to learn of the existence of any other historical sea level data. It is possible that some historical data may exist (e.g. in the form of original tide gauge charts) which have never been reduced to monthly mean levels, as required for PSMSL purposes. Such 'data archaeology' is extremely important, especially if it could yield datasets from regions where sea level recording has not been undertaken to a great extent. Reference is, in this context, also made to the IOC Global Oceanographic Data Archaeology and Rescue Project.

Table 1 lists the stations within each country and the amount of sea level data available in each case. For each station is shown a 6-figure station code (the first three characters of which are the country-code), station name, location (latitude and longitude), authority-code, frequency-code and, if appropriate, the corresponding GLOSS station-code. Authority and frequency codes are defined in detail in PSMSL publications (e.g. Spencer and Woodworth, 1993).

On the same line, the complete range of mean sea level data ('Metric data') available for that station is shown together with, if appropriate, the amount of data with controlled benchmark datum stability in the RLR dataset. Under the METRIC and RLR headings can be found the number of years of data, the first and last years of data, and a percentage missing flag which is the percentage of missing years of data between the first and last.

The Appendix presents a series of plots of monthly mean values for those stations in Table 1 which contain RLR data (i.e. data capable of being plotted as time series). Close inspection will in many cases show evidence for a seasonal cycle, considerable interannual variability (particular, for Pacific stations, that due to El Nino events), and long term 'secular trends'. Reviews of sea level changes can be found in the literature (e.g. Pugh, 1987; Woodworth, 1993), while the PSMSL will be pleased to provide more information (e.g. trends, statistics) on each record as appropriate.

Conclusions

This report prepared by Dr. Sally Dosell, British Oceanographic Data Centre, Prouldman Oceanographic Laboratory, Bidston Observatory, has been able only to stress:

(i) that monitoring sea level change on a global basis is an essential activity for ocean circulation, climate change and coastal engineering studies for the present and the future;

(ii) that islands will play a particularly important role in such monitoring owing to their ability to provide relatively 'open ocean' data and thus information on how sea level there varies;

(iii) that the work is far from complete, and it is to be hoped that activities such as GLOSS are given full support by nations so that overall global monitoring of sea level change is as effective as possible;

(iv) that the PSMSL and the IOC stand ready to provide advice, support and assistance in development of sea level observations and interpretations thereof; and

(v) that sea level observations carried out according to agreed norms on a scientific basis are yielding the only reliable information as regards this type of global/regional change.

For further information on the datasets described in this report, please contact:

Permanent Service for Mean Sea Level
Bidston Observatory
Birkenhead
Merseyside L43 7RA
United Kingdom

or Telephone (UK international code 44) 51-653-8633
or Fax: (UK international code 44) 51-653-6269
or Telex: 628591 OCEANB G
or Omnet: PSMSL.POL
or Internet: psmsl@ua.nbi.ac.uk

For further information regarding GLOSS development and co-ordination, please contact:

GOOS Support Office
IOC Secretariat
GLOSS Technical Secretary
UNESCO
1 rue Miollis
75732 Paris Cedex 15
France

Telephone: (33 1) 45 68 39 78
Fax: (33 1) 40 56 93 16
Telex: 204461 Paris
Omnet: GOOS.PARIS

References

Fu, L-L. and Lefebvre, M. (eds). 1991. TOPEX/Poseidon science investigations plan: prepared by TOPEX/Poseidon Science Working Team, September 1, 1991. Pasadena: California Institute of Technology, Jet Propulsion Laboratory. 176pp. (JPL Publication 91-27).

IOC (1985). Manual on sea level measurement and interpretation. Intergovernmental Oceanographic Commission of UNESCO. Manuals and Guides, No.14.

IOC (1990). Global Sea Level Observing System (GLOSS) implementation plan. Intergovernmental Oceanographic Commission, Technical Series, No.35, 90pp.

IOC (1992). IOC Group of Experts on the Global Sea-Level Observing System (GLOSS), Third Session, Paris, 13-15 October 1992. IOC Reports of Meetings of Experts and Equivalent Bodies, IOC/GE-GLOSS-III/3, 18pp. & annexes.

IOC (1993). Manual on sea level measurement and interpretation. Volume 2. Intergovernmental Oceanographic Commission of UNESCO. (In press).

Intergovernmental Panel on Climate Change (IPCC). 1990 Climate Change: the IPCC scientific assessment, edited by J.T. Houghton, G.J. Jenkins and J.J. Ephraums. Cambridge: Cambridge University Press. 365pp.

Mitchum, G.T. and Wyrtki, K. 1988. Overview of Pacific sea level variability. Marine Geodesy, 12, 235-245.

Pugh, D.T. 1987. Tides, surges and mean sea-level: a handbook for engineers and scientists. Chichester: Wiley. 472pp.

Spencer, N.E. and Woodworth, P.L. (1993). Data holdings of the Permanent Service for Mean Sea Level (November 1993). Bidston, Birkenhead: Permanent Service for Mean Sea Level, 81pp.

Spencer, R., Foden, P.R., McGarry, C., Harrison, A.J., Vassie, J.M., Baker, T.F., Smithson, M.J., Harangozo, S.A. and Woodworth, P.L. 1993. The ACCLAIM programme in the South Atlantic and Southern Oceans. International Hydrographic Review, 70, 7-21.

WOCE (1988a). World Ocean Circulation Experiment implementation plan. Volume 1: Detailed requirements. WMO World Climate Research Programme, WCRP-11, 63pp.

WOCE (1988b). World Ocean Circulation Experiment implementation plan. Volume 2: Scientific background. WMO World Climate Research Programme, WCRP-12, 130pp. and annexes.

WOCE (1993). WOCE Data Management. WOCE Report 104/93, 40pp.

Woodworth, P.L. (1991). The Permanent Service for Mean Sea Level and the Global Sea Level Observing System. Journal of Coastal Research, 7, 699-710.

Woodworth, P.L. 1993. A review of recent sea level research. To be published in Oceanography and Marine Biology.

Table 1: Catalogue of data held by the PSMSL for small island developing states represented at this conference

265 MALTA

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
265001	VALLETTA	35 54 N	14 31 E	E3	24		2 1990-1991	

315 CYPRUS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
315001	FAMAGUSTA	35 07 N	33 57 E	C4	24		3 1938-1940	3 1938-1940

380 PORTUGAL (CAPE VERDE ISLANDS)

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
380001	PORTO GRANDE (ST VINCENT)		16 52 N	24 59 W		92	24	2544 1947-1950
380002	PORTO GRANDE	16 52 N	24 59 W	41	24	254	1 1990-1990	

438 COMORO ISLANDS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
438001	DZAOUDZI	12 47 S	45 15 E	18	24	96	5 1985-1991 28 6	

442 SEYCHELLES, REPUBLIC OF

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
442001	PORT VICTORIA	04 37 S	55 28 E	66	24	273	10 1962-1982 52.4	
442002	PORT VICTORIA-B	04 37 S	55 28 E	F5	24	273	6 1986-1991	
442011	PRASLIN	04 21 S	55 46 E	F5	24		3 1987-1989	

450 MAURITIUS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
450001	GRAND PORT	20 22 S	57 45 E	01	24		3 1958-1960	3 1958-1960
450011	PORT LOUIS	20 09 S	57 30 E	F7	24	18	19 1942-1965 20 8	19 1942-1965 20 8
450012	PORT LOUIS II	20 09 S	57 30 E	F7	24	18	5 1986 1990	5 1986-1990
450021	RODRIGUES	19 40 S	63 25 E	F7	24	19	7 1986-1992	

454 MALDIVE ISLANDS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
454001	GAN I	00 31 S	73 13 E	10	24	27	2 1962-1963	
454002	GAN II	00 41 S	73 09 E	F7	24	27	6 1987-1992	
454011	MALE-B, HULULE	04 11 N	73 32 E	F8	24	28	4 1989-1992	
454012	MALE-C	04 11 N	73 31 E	F9	24	28	2 1988-1989	
454021	HANIMAADHOO	06 46 N	73 10 E	F8	24		2 1991-1992	

555 SINGAPORE

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
555001	VICTORIA DOCK	01 16 N	103 51 E	36	24	44	16 1966-1981	16 1966-1981
555002	TANJONG PAGAR	01 16 N	103 51 E	36	24		1 1989-1989	
555003	KEPPEL HARBOUR	01 16 N	103 49 E	36	24	44	9 1981-1989	9 1981-1989
555011	RAFFLES LIGHT HOUSE	01 10 N	103 45 E	36	24		16 1973-1991 15 8	16 1973-1991 15 8

555021	SULTAN SHOAL	01 14 N	103 39 E	36	24		23	1969-1991	23	1969-1991
555031	JURONG	01 18 N	103 43 E	36	24		22	1970-1991	22	1970-1991
555051	SEMBAWANG	01 28 N	103 50 E	36	24		28	1954-1991 26.3	28	1954-1991 26.3
555071	ANGLER BANK	01 21 N	104 02 E	36	24		18	1974-1991		

670 PAPUA NEW GUINEA

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC		RLR	
670001	DREGER HARBOUR	06 39 S	147 53 E	78	24		2	1946-1947		
670002	LAE	06 44 S	147 00 E	39	02		7	1984-1990	7	1984-1990
670003	LAE II	06 44 S	146 59 E	G1	24		7	1984-1990		
670006	ALOTAU	10 19 S	150 27 E	39	02	63	6	1984-1990 14.3		
670007	ALOTAU II	09 29 S	147 09 E	G1	24		6	1984-1990 14.3		
670011	PORT MORESBY	09 29 S	147 08 E	39	02		41	1939-1979 73.2	3	1957-1959
670012	PORT MORESBY II	09 29 S	147 09 E	39	02		7	1984-1990	7	1984-1990
670013	PORT MORESBY II-	09 29 S	147 08 E	G1	24		9	1970-1986 47.1		
670014	PORT MORESBY IV	09 29 S	147 09 E	G1	24		7	1984-1990		
670021	RABAUL	04 12 S	152 11 E	97	C	65	18	1975-1992	16	1975-1990
670022	RABAUL II	04 12 S	152 11 E	G1	24		11	1966-1978 15.4		
670026	ANEWA BAY	06 11 S	155 53 E	G4	24		10	1968-1977		
670031	KAVIENG	02 35 S	150 48 E	39	02		7	1984-1990	7	1984-1990
670032	KAVIENG II	02 35 S	150 48 E	G1	24		7	1984-1990		
670041	MANUS	02 00 S	147 16 E	39	02		6	1984-1990 14.3	6	1984-1990 14.3
670042	MANUS II	02 01 S	147 16 E	G1	24		6	1984-1990 14.3		
670051	WEWAK	03 34 S	143 39 E	39	02		7	1984-1990	7	1984-1990
670052	WEWAK II	03 34 S	143 39 E	G1	24		7	1984-1990		
670061	MADANG	05 09 S	145 49 E	39	02		7	1984-1990	7	1984-1990
670062	MADANG II	05 12 S	145 48 E	G1	24		7	1984-1990		

710 CAROLINE ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC		RLR	
710001	TRUK, MOEN ISLAND	07 27 N	151 51 E	52	24	116	44	1947-1990	44	1947-1990
710011	YAP	09 31 N	138 08 E	97	C	119	21	1969-1991	17	1974-1990
710021	MALAKAL	07 20 N	134 28 E	97	C	120	24	1969-1992	17	1974-1990
710026	KAPINGAMARANGI	01 06 N	154 47 E	97	C	117	15	1978-1992	13	1978-1990
710030	POHNPEI-A	06 59 N	158 14 E	85	24	115	2	1969-1970		
710031	POHNPEI-B	06 59 N	158 14 E	97	C	115	19	1974-1992	18	1974-1991

715 NAURU

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC		RLR	
715001	NAURU*	00 32 S	166 54 E	97	C	114	18	1974-1991	17	1974-1990

720 MARSHALL ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC		RLR	
720001	ENIWETOK	11 22 N	162 21 E	52	24	110	22	1951-1972	22	1951-1972
720002	ENIWETOK-B	11 26 N	162 23 E	97	C	110	6	1974-1979		
720011	KWAJALEIN	08 43 N	167 44 E	52	24	111	45	1946-1990	45	1946-1990
720015	MAJURO-A	07 06 N	171 22 E	85	24	112	3	1968-1970		
720016	MAJURO-B	07 06 N	171 22 E	97	C	112	19	1974-1992	18	1974-1991
720021	WAKE ISLAND	19 17 N	166 37 E	52	24	105	39	1950-1990 4.9	39	1950-1990 4.9

730 GILBERT ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC		RLR	
730001	OCEAN ISLAND	00 53 S	169 35 E	85	24		3	1957-1959		
730006	TARAWA-A,BETIO	01 22 N	172 56 E	97	C	113	10	1974-1983	10	1974-1983
730007	TARAWA-B,BAIRIKI	01 20 N	173 01 E	97	C	113	6	1983-1988	6	1983-1988
730008	TARAWA-C,BETIO	01 22 N	172 56 E	97	C	113	5	1988-1992	4	1988-1991
730011	ARORAE	02 37 S	176 50 E	85	24		2	1957-1958		

732 TUVALU

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
732011	FUNAFUTI	08 32 S	179 13 E	97	C	121	16 1977-1992	15 1977-1991

734 SOLOMON ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
734001	HONIARA	09 28 S	159 57 E	10	8	66	4 1957-1961 20.0	
734002	HONIARA II	09 26 S	159 57 E	97	C	66	19 1974-1992	18 1974-1991
734003	HONIARA III	09 25 S	159 58 E	G1	24		3 1985-1987	

742 FIJI ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
742011	SUVA	18 08 S	178 26 E	80	24	122	3 1960-1964 40.0	
742012	SUVA-A	18 08 S	178 26 E	97	C	122	17 1975-1991	

744 TONGA

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
744001	NUKU'ALOFA	21 08 S	175 12 W	G3	24		3 1990-1992	

745 AMERICAN SAMOA

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
745001	PAGO PAGO	14 17 S	170 41 W	52	24	144	41 1948-1990 4.7	41 1948-1990 4.7

750 PHOENIX ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
750001	HULL	04 29 S	172 10 W	85	24		1 1957-1957	
750011	CANTON ISLAND	02 48 S	171 43 W	52	24	148	22 1949-1974 15.4	22 1949-1974 15.4
750012	KANTON ISLAND-B	02 49 S	171 43 W	97	C	148	21 1972-1992	16 1975-1990

770 LINE ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
770001	PALMYRA ISLAND	05 52 N	162 06 W	85	24		1 1957-1957	
770011	FANNING ISLAND	03 54 N	159 21 W	85	24	147	1 1957-1957	
770012	FANNING-B	03 54 N	159 23 W	97	C	147	15 1973-1987	13 1975-1987
770013	FANNING-C	03 51 N	159 22 W	97	C	147	3 1988-1990	
770021	CHRISTMAS ISLAND	01 59 N	157 28 W	52	24	146	17 1956-1972	17 1956-1972
770022	CHRISTMAS ISLAND II	01 59 N	157 29 W	97	C	146	19 1974 1992	17 1975-1991

775 PENRHYN ISLAND

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
775001	PENRHYN	09 01 S	158 01 W	97	C	143	16 1977-1992	13 1977-1989

785 COOK ISLANDS

Code	Station Name	Lat	Lon	AC	TC	GLO	METRIC	RLR
785001	RAROTONGA	21 12 S	159 46 W	97	C	139	16 1977-1992	14 1977-1990

890 TRINIDAD & TOBAGO

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
890001	PORT OF SPAIN	10 39 N	61 31 W	A2	24	203	15 1937-1990 72 2	8 1983-1990
890021	POINT FORTIN	10 11 N	61 42 W	A2	24		4 1987-1990	
890041	SCARBOROUGH	11 11 N	60 44 W	A2	24		1 1987-1987	

910 BARBADOS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
910001	ST JAMES	13 11 N	59 39 W	01	24		4 1957-1960	
910021	COAST GUARD	13 10 N	59 30 W	D8	24		2 1990-1991	

930 CUBA

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
930001	LOS ARROYOS	22 21 N	84 23 W	84	III		2 1950-1951	
930011	LA COLOMA	22 14 N	83 34 W	84	III		2 1949-1950	
930016	SIBONEY	23 05 N	82 28 W	B7	24	215	27 1966-1992	
930021	HAVANA	23 09 N	82 20 W	84	24		10 1947-1956	
930031	GIBARA	21 07 N	76 07 W	B7	24	276	31 1949-1992 29.5	
930041	BARACOA	20 21 N	74 30 W	84	III		3 1949-1951	
930051	GUANTANAMO BAY	19 54 N	75 09 W	52	24		31 1937-1968 31	31 1937-1968 31
930061	CASILDA	21 45 N	79 59 W	84	24		8 1949-1956	
930071	CABO SAN ANTONIO	21 54 N	84 54 W	B7	24	214	22 1971-1992	

932 JAMAICA

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
932011	PORT ROYAL	17 56 N	76 51 W	52	24	210	16 1954-1969	16 1954-1969

936 DOMINICAN REPUBLIC

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
936001	CIUDAD TRUJILLO	18 27 N	69 53 W	52	24		6 1949-1954	
936011	BARAHONA	18 12 N	71 05 W	52	24		11 1954-1969 31 3	11 1954-1969 31.3
936021	PUERTO PLATA	19 49 N	70 42 W	52	24		16 1949-1969 23 8	16 1949-1969 23 8

939 VIRGIN ISLANDS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
939001	CHARLOTTE AMALIE	18 20 N	64 55 W	52	24		10 1975-1990 37 5	10 1975-1990 37 5
939011	LIME TREE BAY, ST CROIX	17 42 N	64 46 W	52	24		2 1987-1988	

941 BAHAMAS

Code	Station Name	Lat	Lon	AC	FC	GLO	METRIC	RLR
941001	SETTLEMENT POINT	26 42 N	79 01 W	52	24	211	6 1985-1990	6 1985-1990
941021	LEE STOCKING ISLAND, EXUMA CAYS	23 47 N	76 06 W	G2	24	12	2 1992-1993	

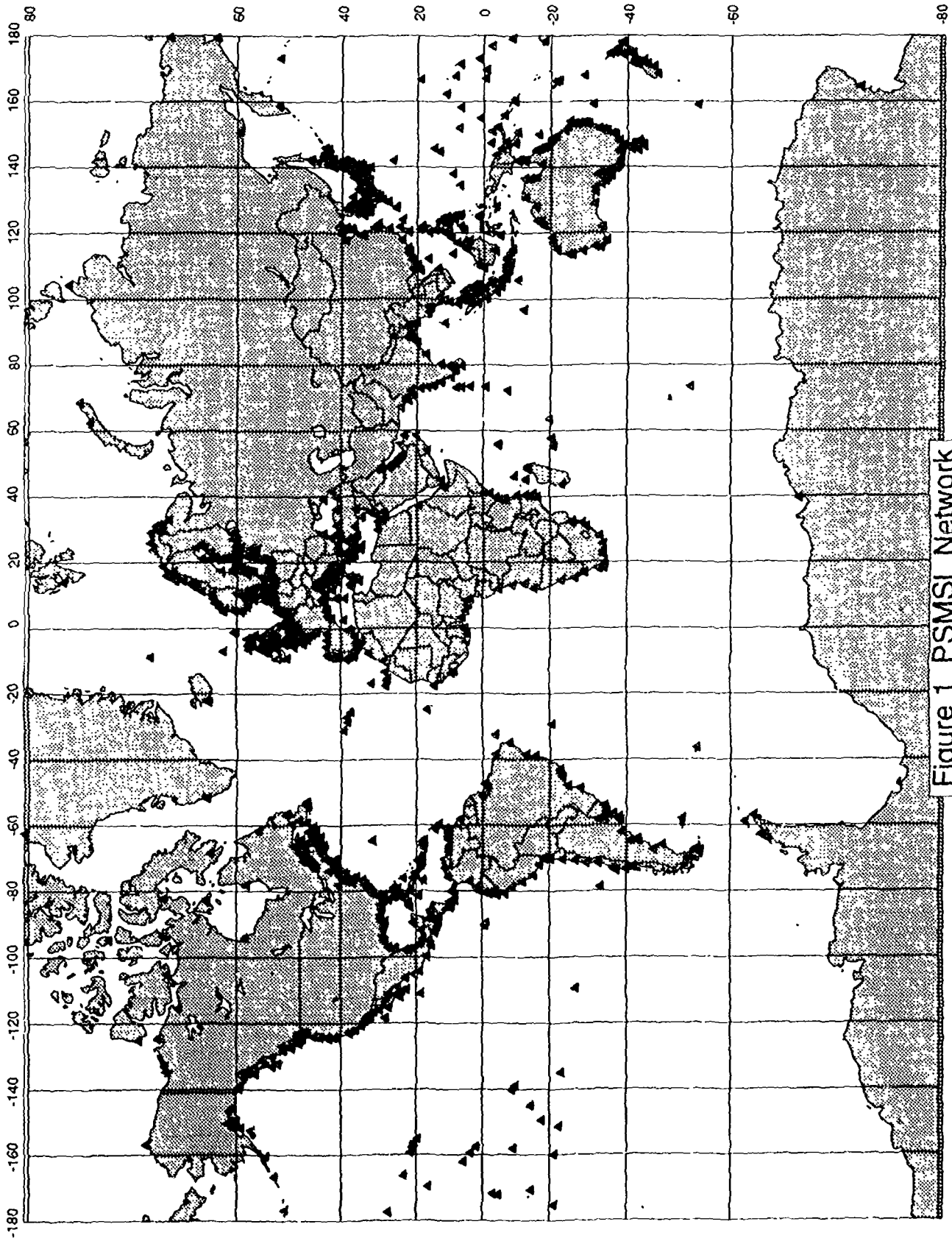


Figure 1 PSMSL Network

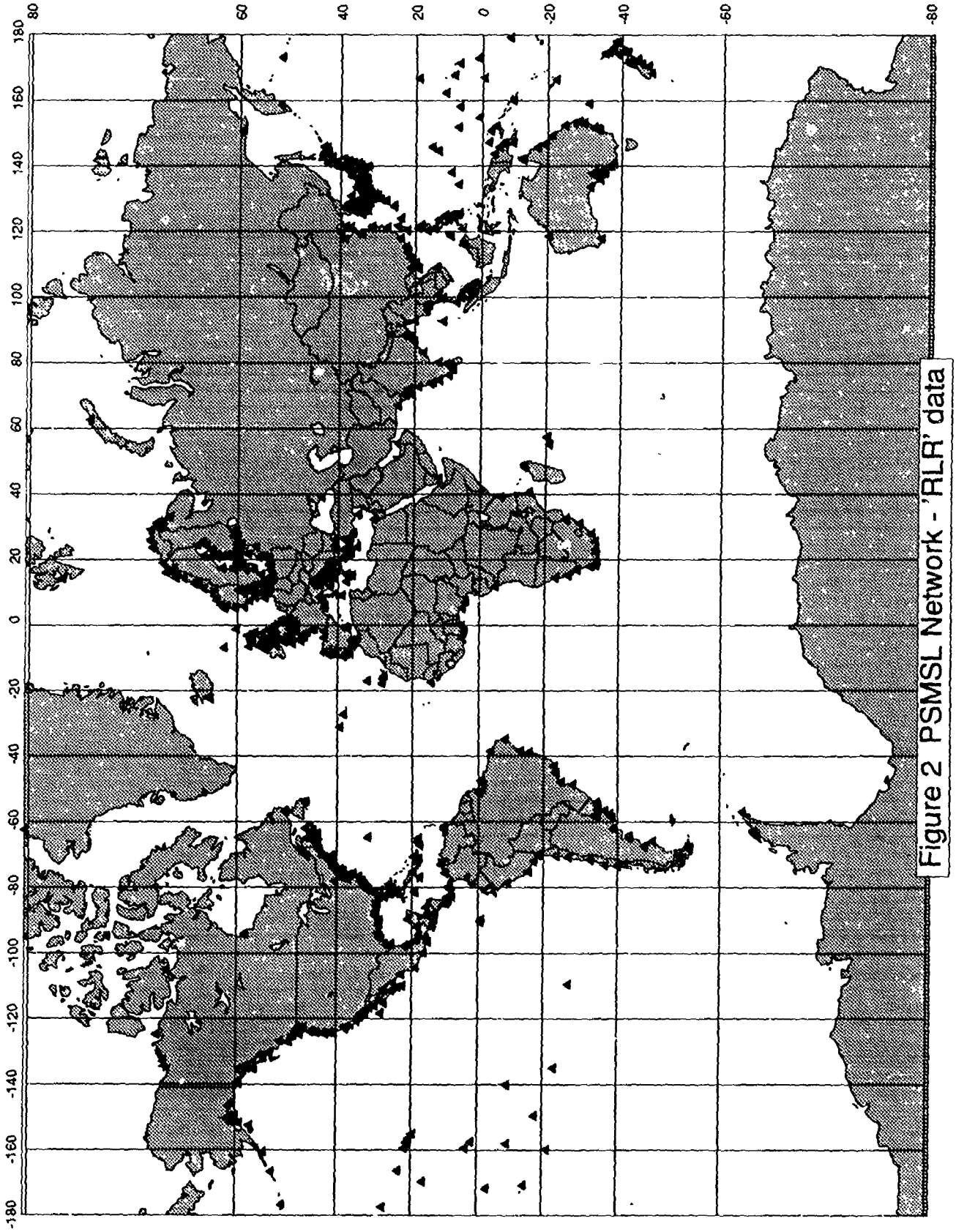


Figure 2 PSMSL Network - 'RLR' data

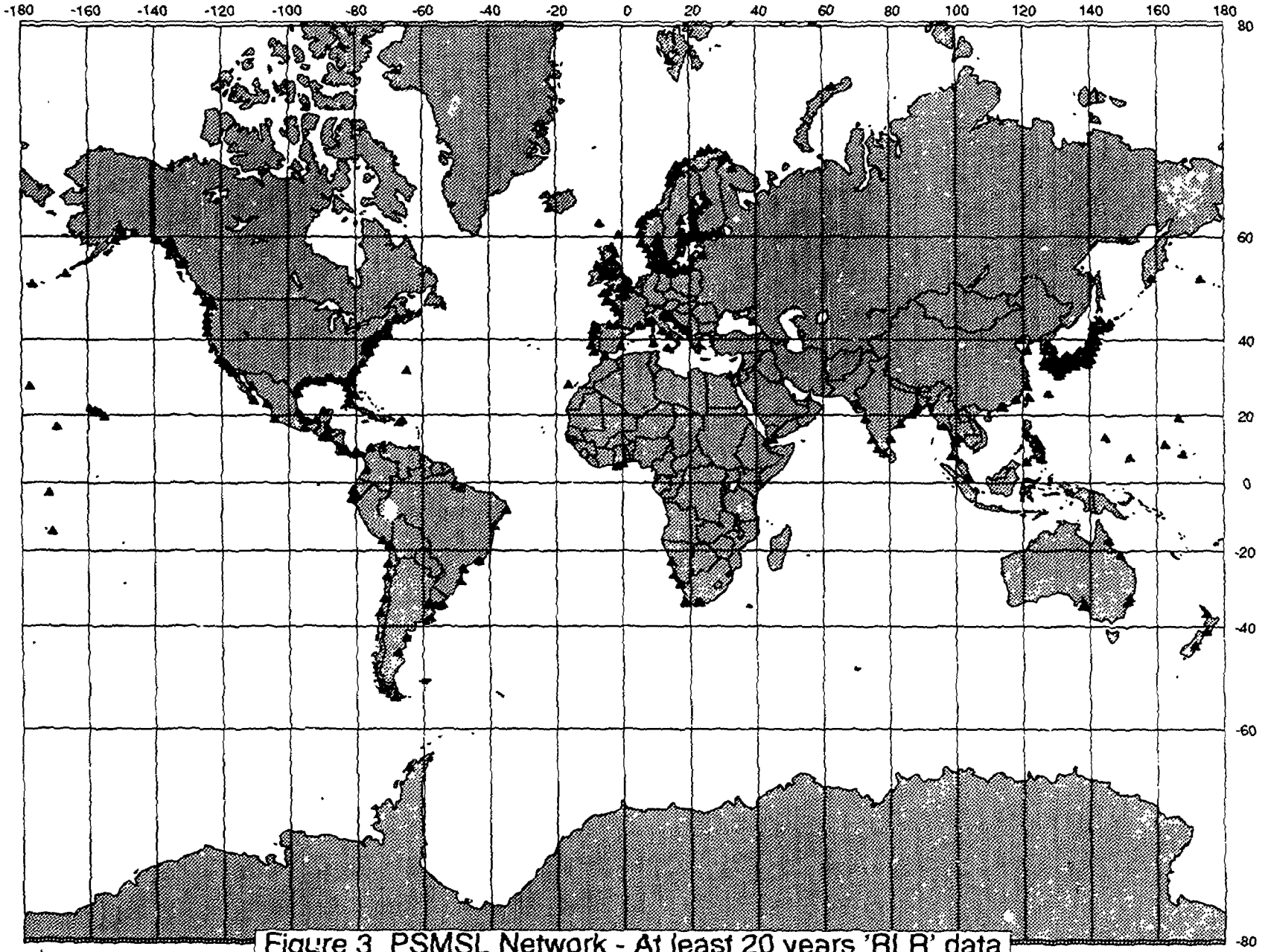


Figure 3 PSMSL Network - At least 20 years 'RLR' data

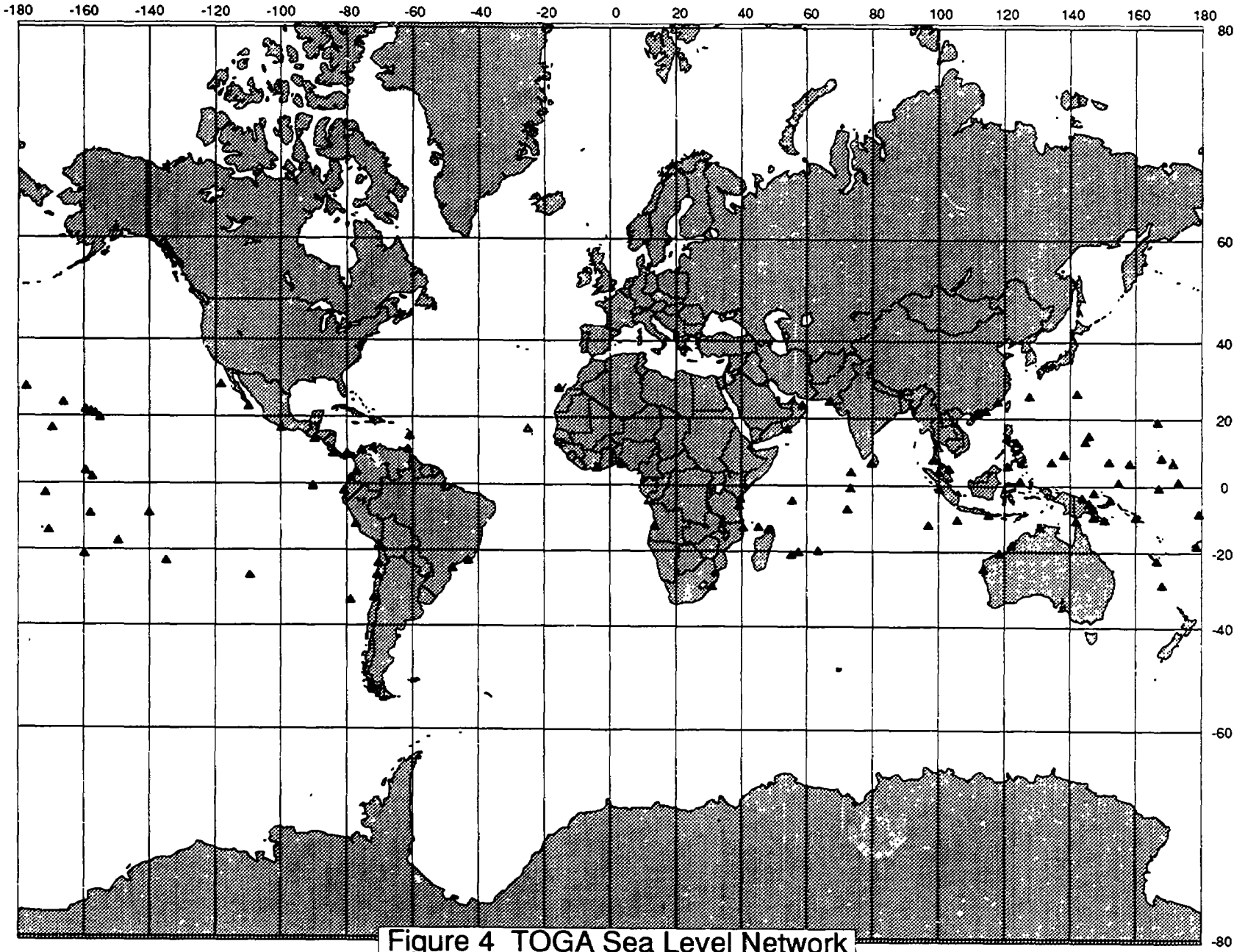


Figure 4 TOGA Sea Level Network

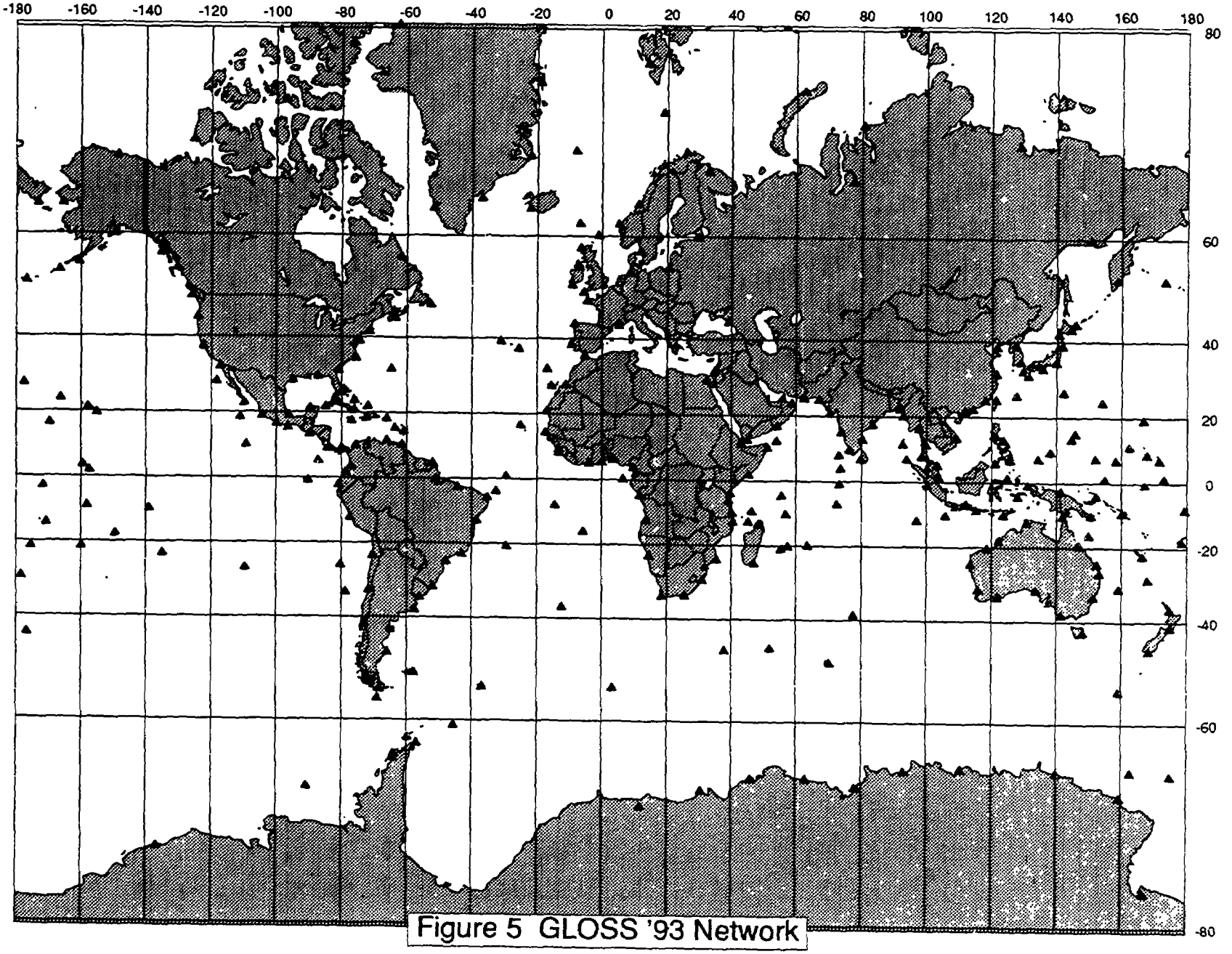


Figure 5 GLOSS '93 Network

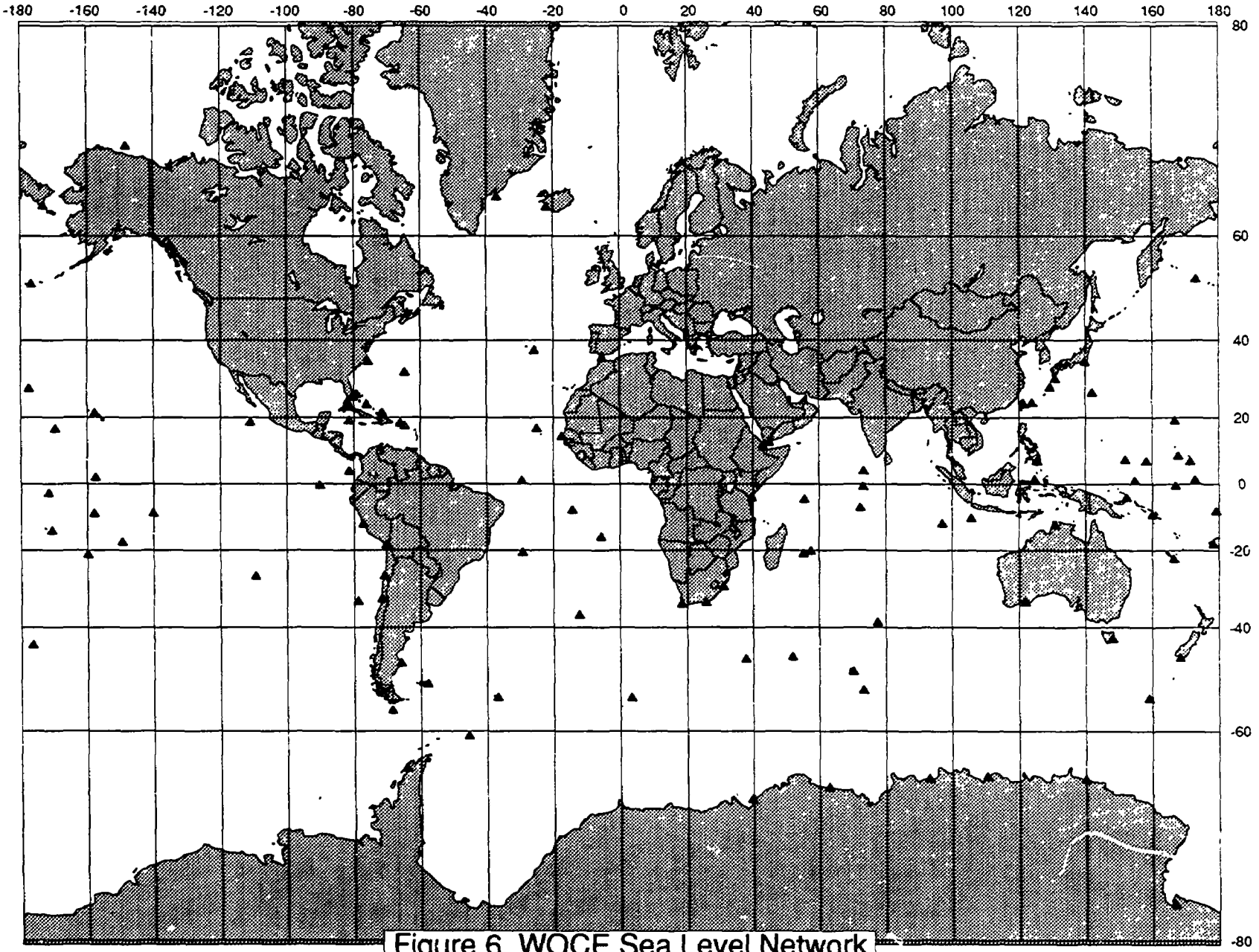


Figure 6 WOCE Sea Level Network

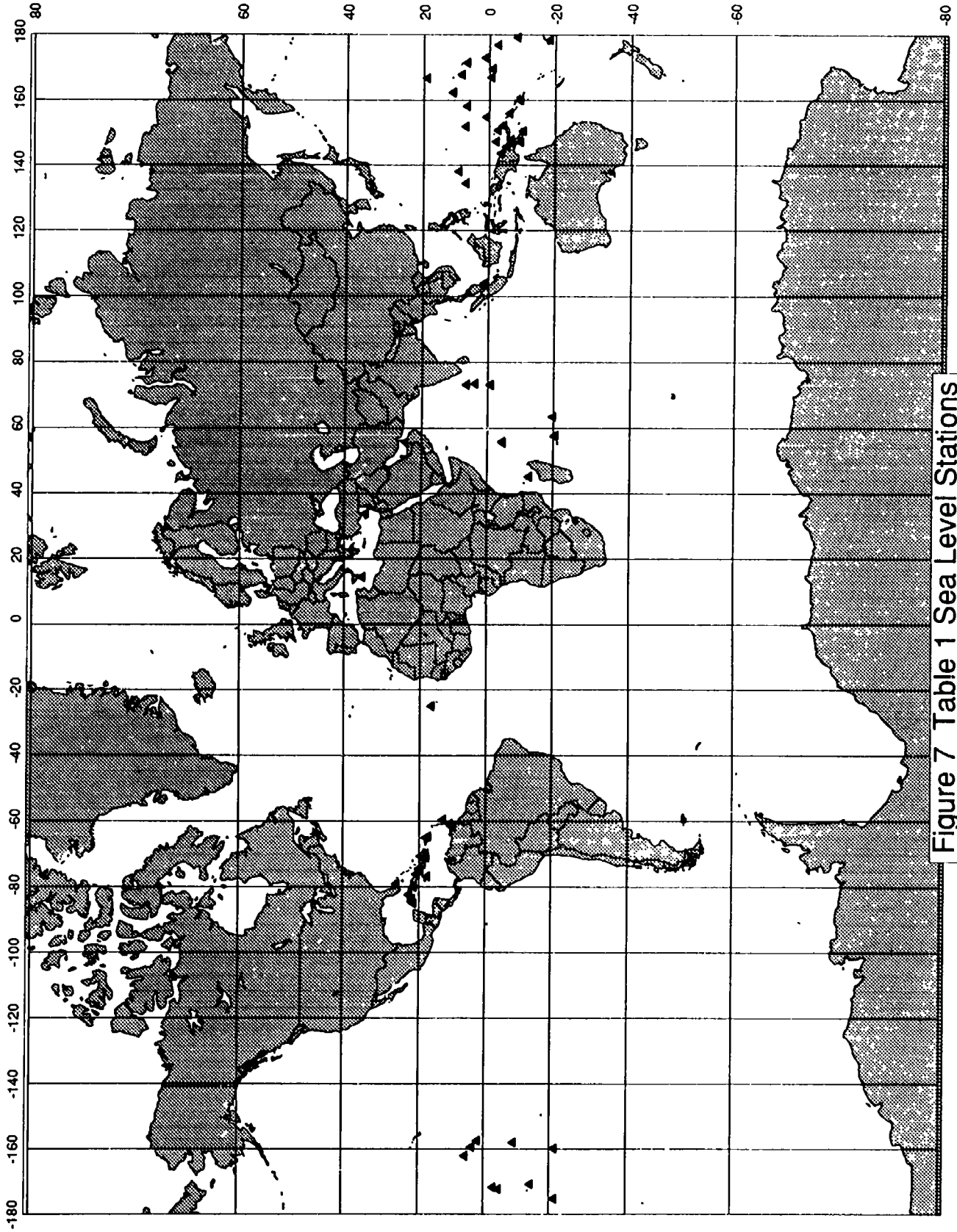
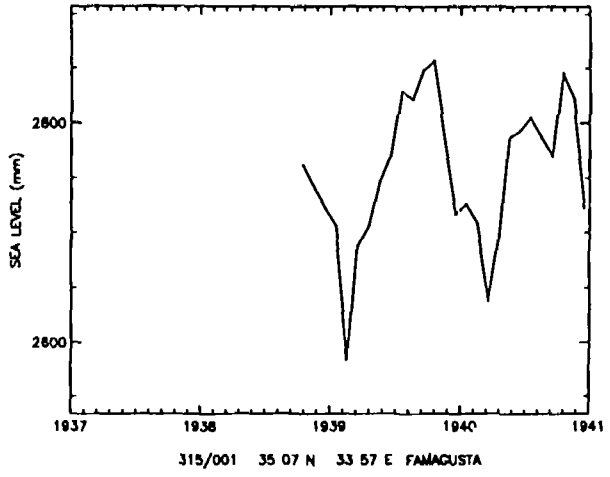


Figure 7 Table 1 Sea Level Stations

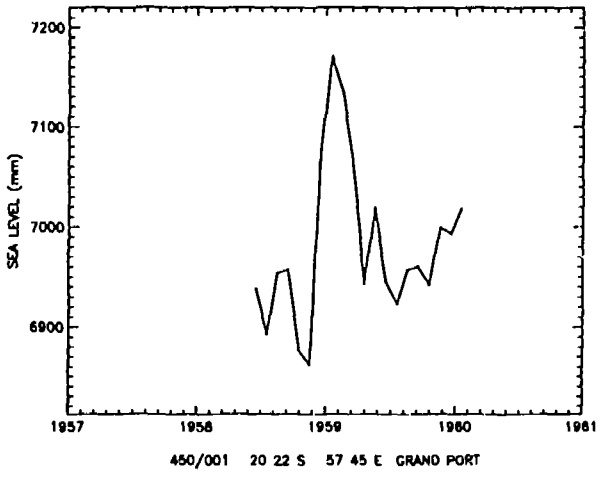
APPENDIX

Plots of monthly mean sea level values for those stations in Table 1 which contain RLR data (i.e. data capable of being plotted as a time series).

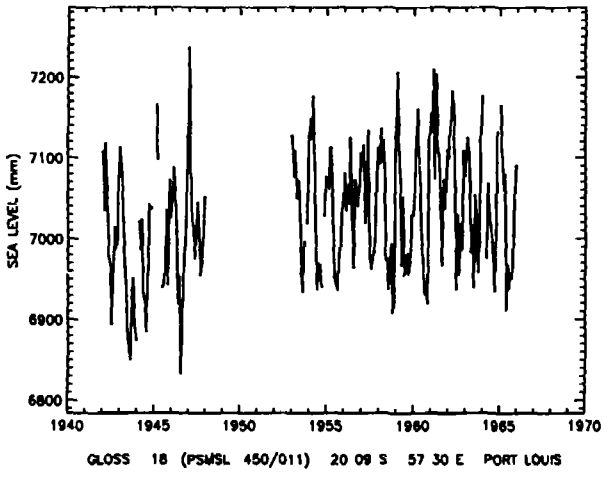
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



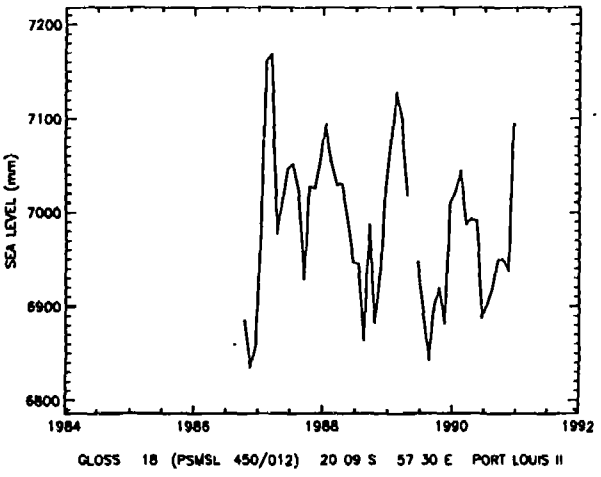
315/001 35 07 N 33 57 E FAMAGUSTA



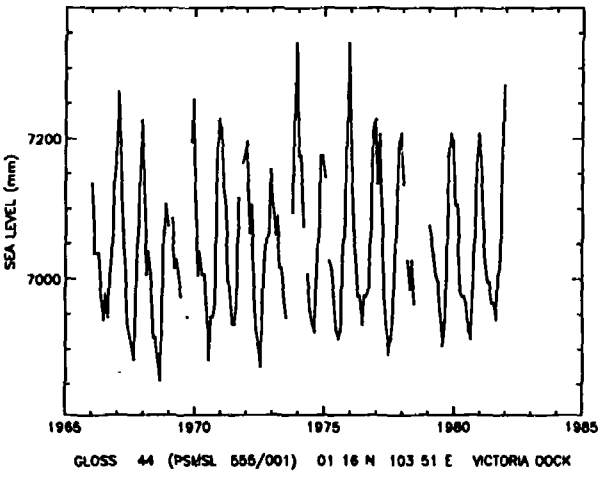
450/001 20 22 S 57 45 E GRAND PORT



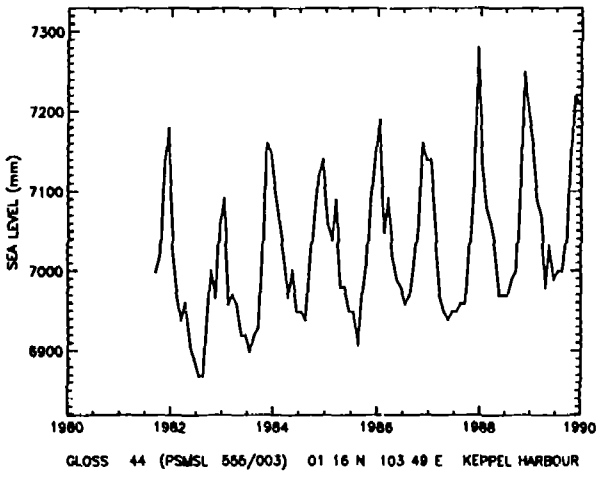
GLOSS 18 (PSMSL 450/011) 20 09 S 57 30 E PORT LOUIS



GLOSS 18 (PSMSL 450/012) 20 09 S 57 30 E PORT LOUIS II

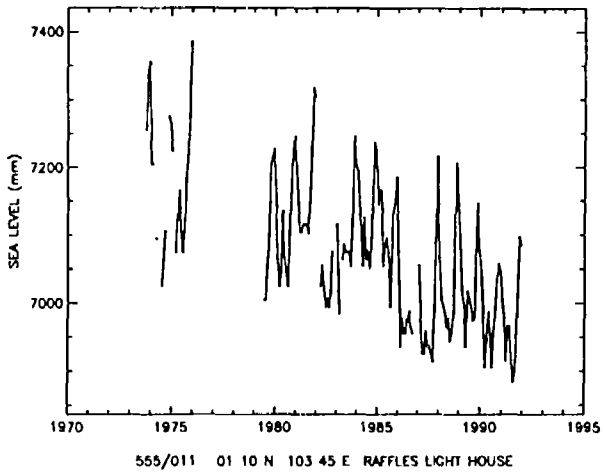


GLOSS 44 (PSMSL 556/001) 01 16 N 103 51 E VICTORIA DOCK

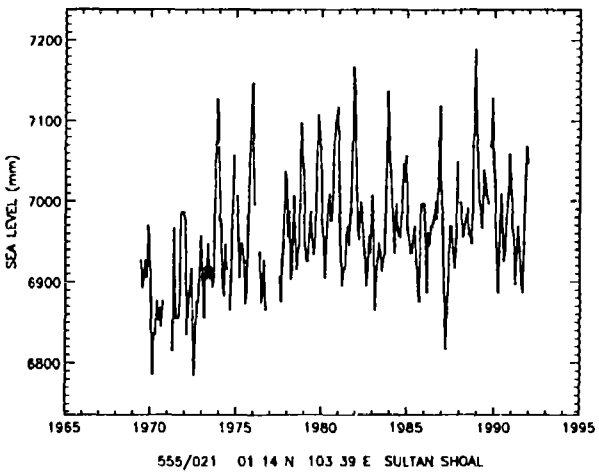


GLOSS 44 (PSMSL 556/003) 01 16 N 103 49 E KEPPEL HARBOUR

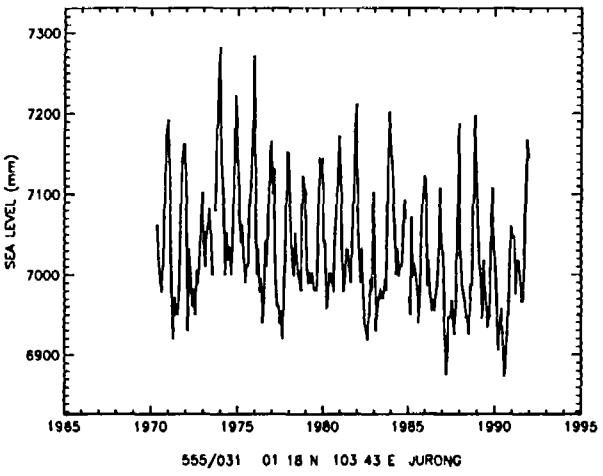
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



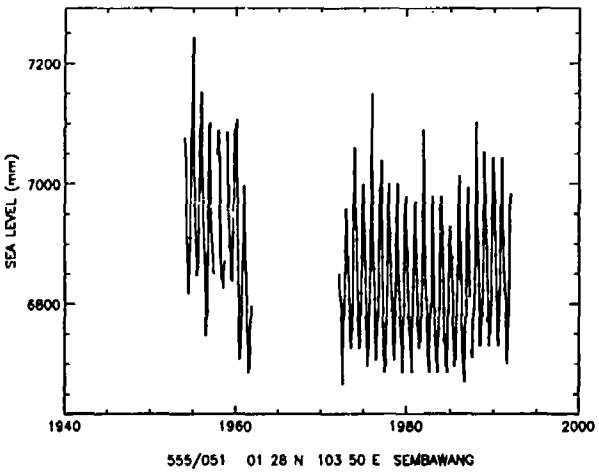
555/011 01 10 N 103 45 E RAFFLES LIGHT HOUSE



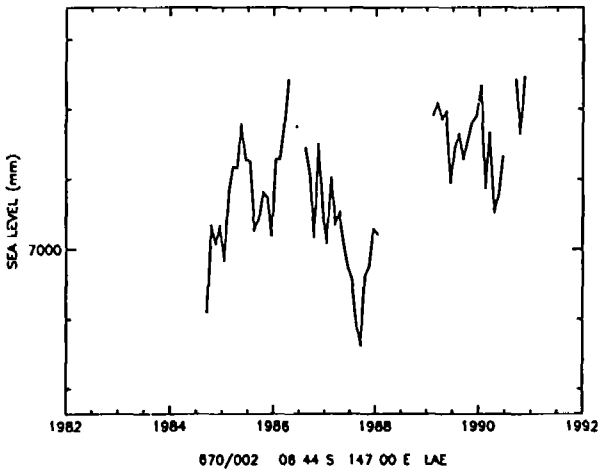
555/021 01 14 N 103 39 E SULTAN SHOAL



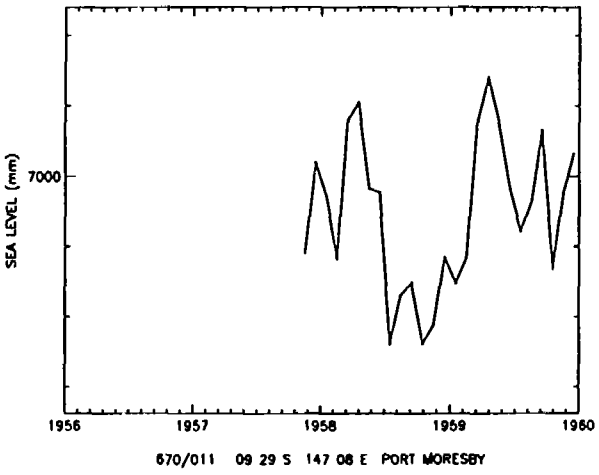
555/031 01 18 N 103 43 E JURONG



555/051 01 28 N 103 50 E SEMBAWANG

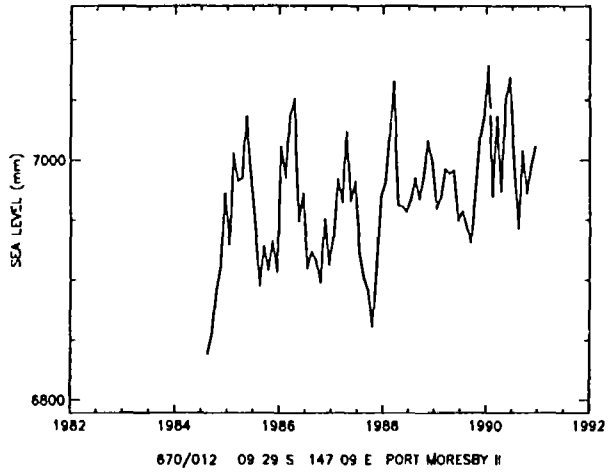


670/002 08 44 S 147 00 E LAE

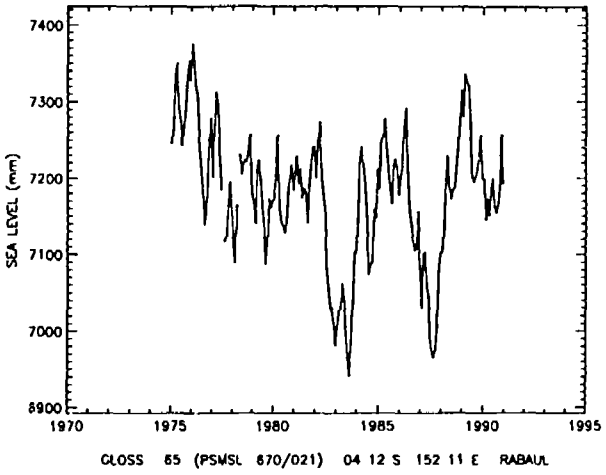


670/011 09 29 S 147 08 E PORT MORESBY

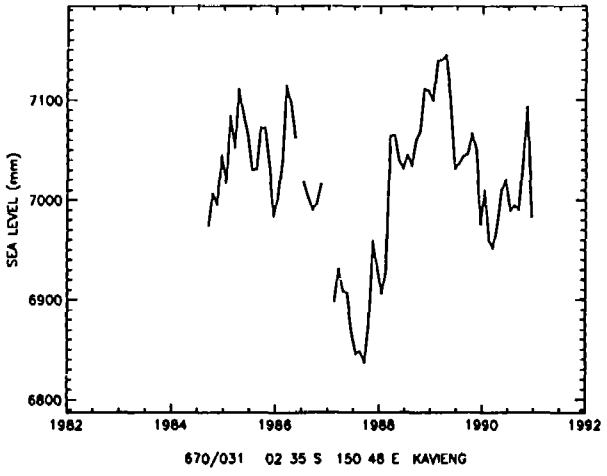
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



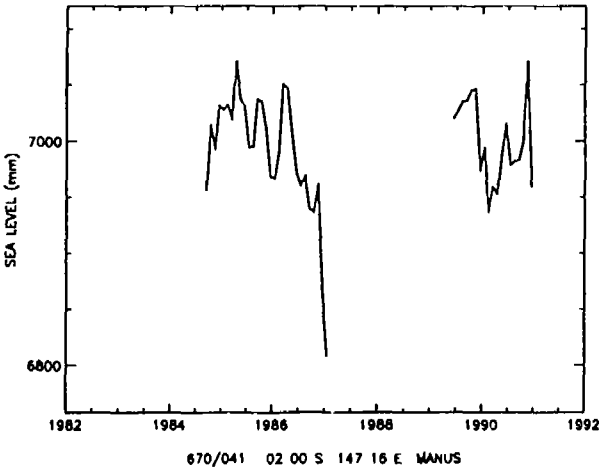
670/012 09 29 S 147 09 E PORT MORESBY II



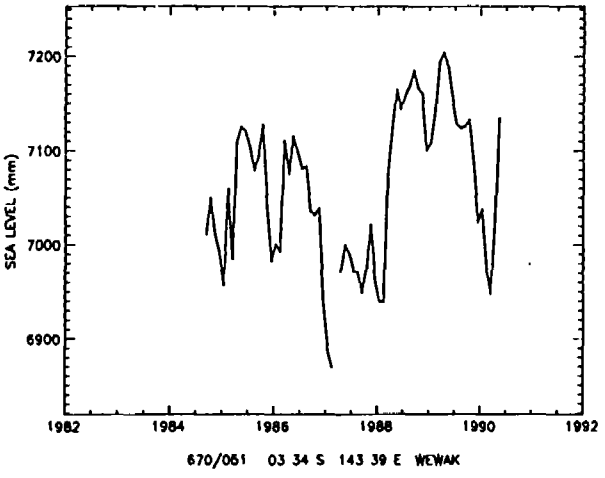
GLOSS 65 (PSMSL 670/021) 04 12 S 152 11 E RABAUL



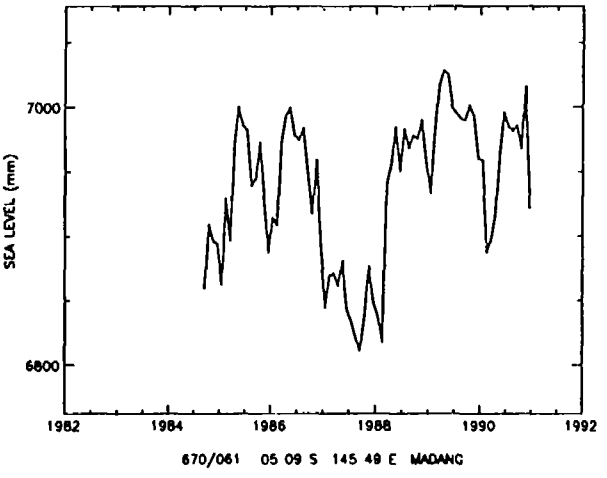
670/031 02 35 S 150 48 E KAVIENG



670/041 02 00 S 147 16 E MANUS

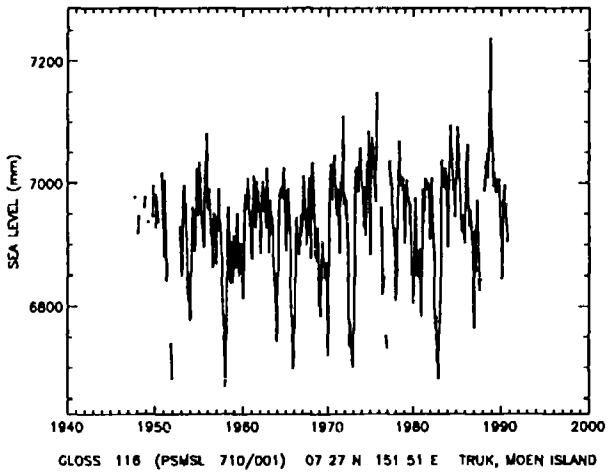


670/051 03 34 S 143 39 E WEWAK

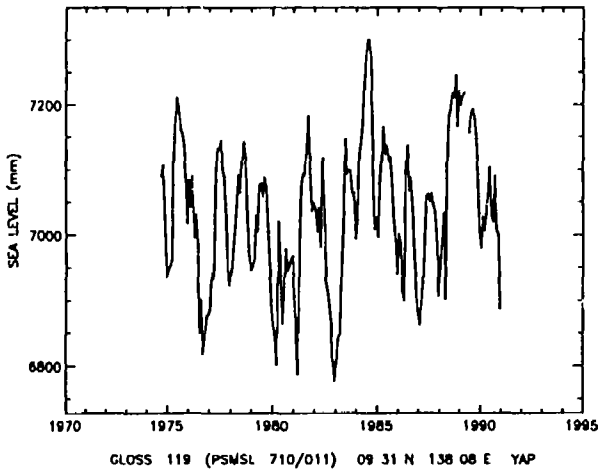


670/061 05 09 S 145 49 E MADANG

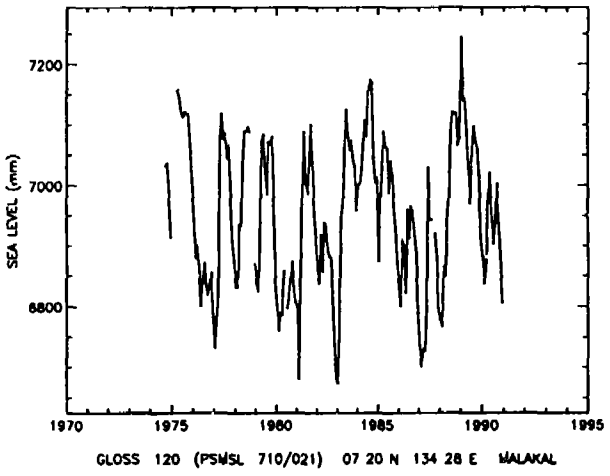
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



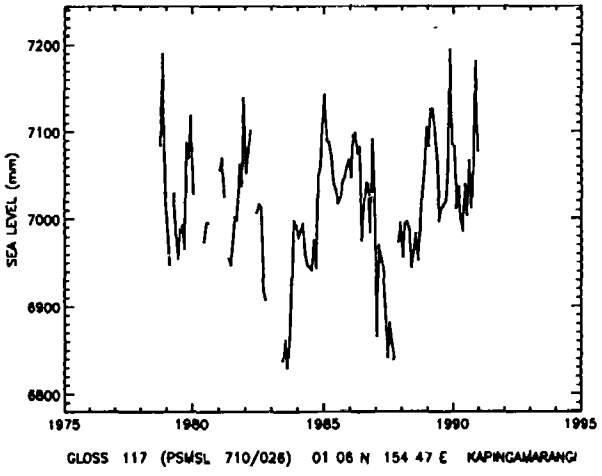
GLOSS 116 (PSMSL 710/001) 07 27 N 151 51 E TRUK, MOEN ISLAND



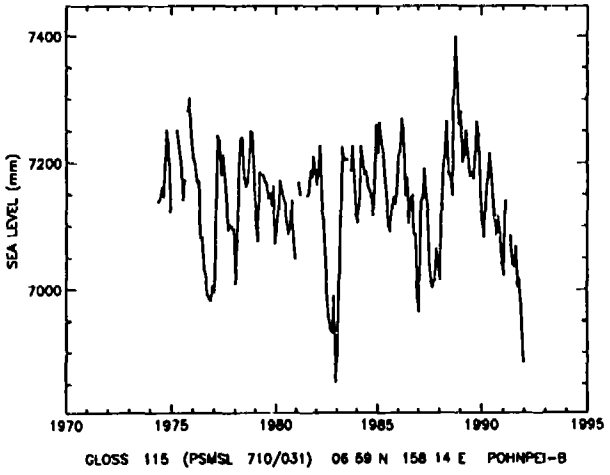
GLOSS 119 (PSMSL 710/011) 09 31 N 138 08 E YAP



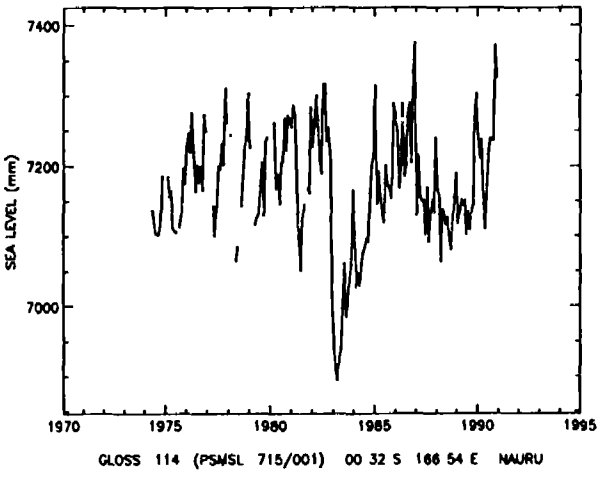
GLOSS 120 (PSMSL 710/021) 07 20 N 134 28 E MALAKAL



GLOSS 117 (PSMSL 710/026) 01 06 N 154 47 E KAPINGAMARANGI

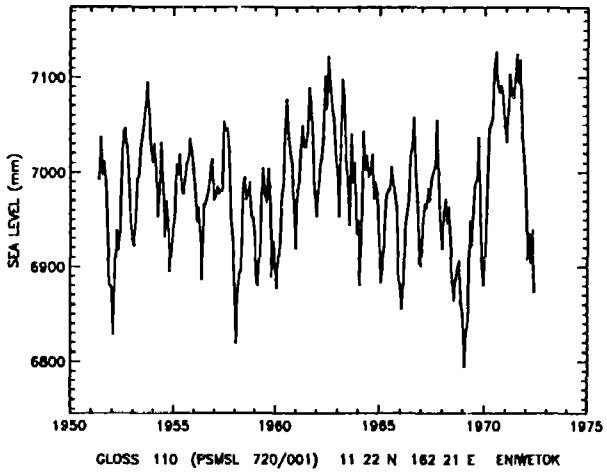


GLOSS 115 (PSMSL 710/031) 06 59 N 158 14 E POHNPEI-B

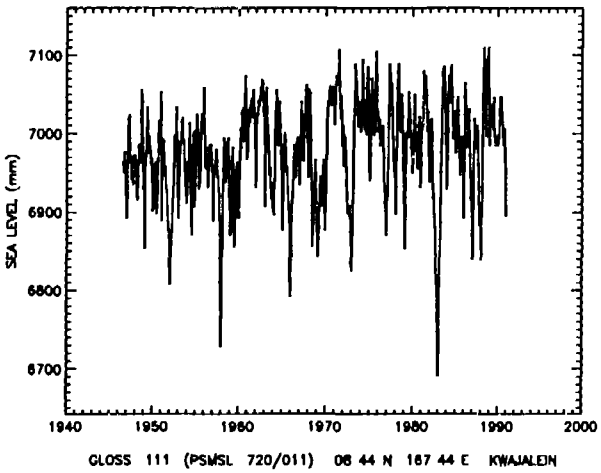


GLOSS 114 (PSMSL 715/001) 00 32 S 166 54 E NAURU

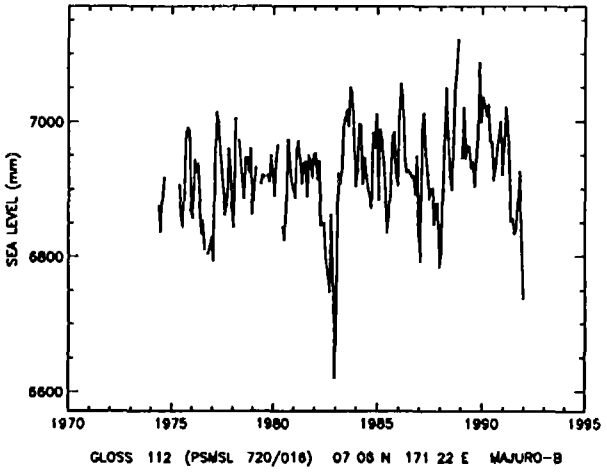
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



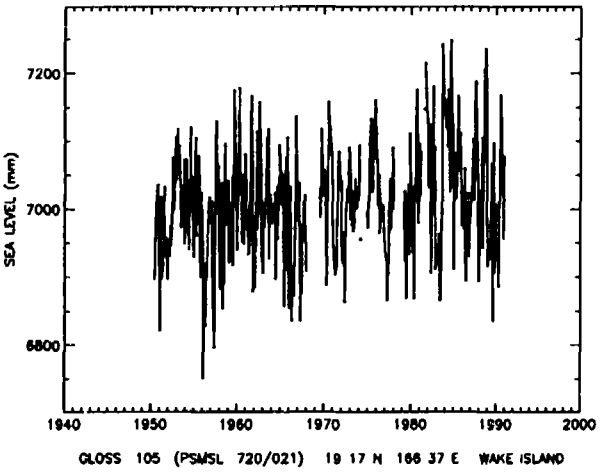
GLOSS 110 (PSMSL 720/001) 11 22 N 162 21 E ENIWETOK



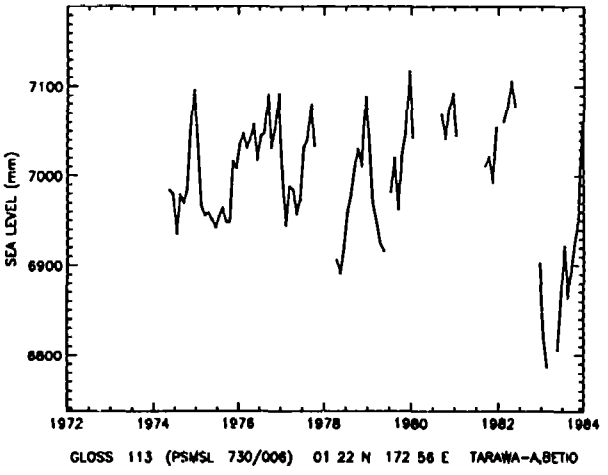
GLOSS 111 (PSMSL 720/011) 08 44 N 167 44 E KWAJALEIN



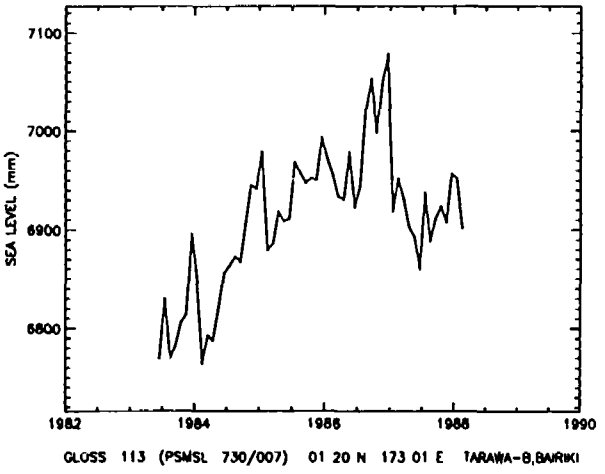
GLOSS 112 (PSMSL 720/016) 07 08 N 171 22 E MAJURO-B



GLOSS 105 (PSMSL 720/021) 19 17 N 166 37 E WAKE ISLAND

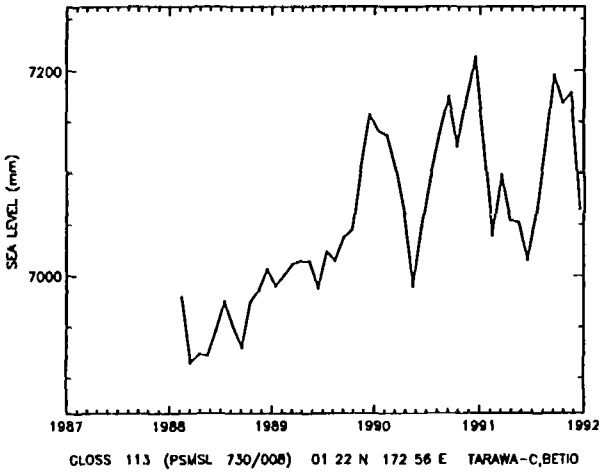


GLOSS 113 (PSMSL 730/006) 01 22 N 172 56 E TARAWA-A,BETIO

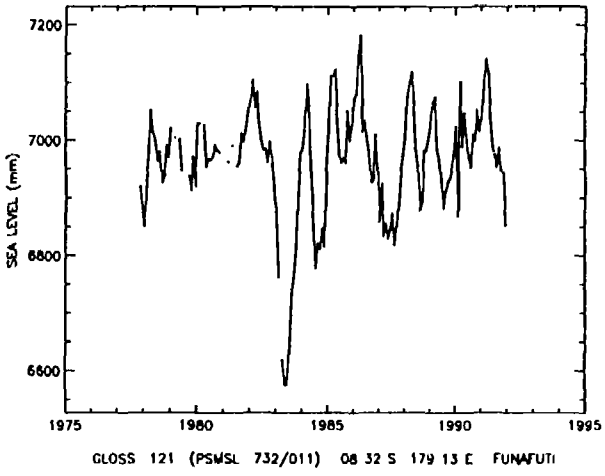


GLOSS 113 (PSMSL 730/007) 01 20 N 173 01 E TARAWA-B,BAIRIKI

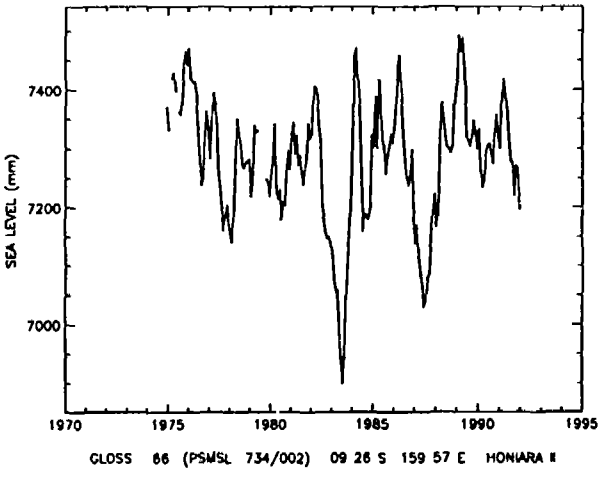
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



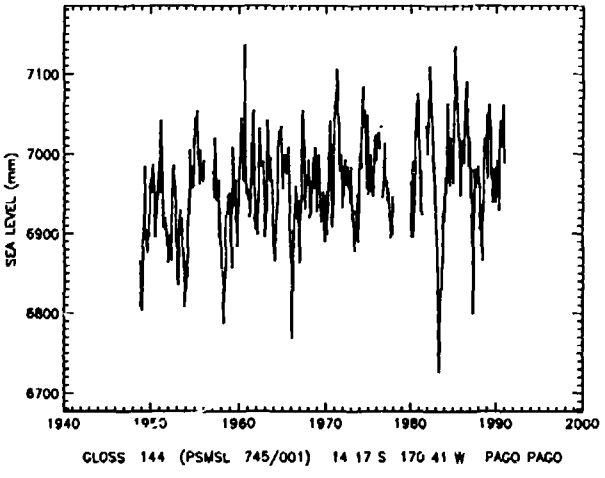
GLOSS 113 (PSMSL 730/008) 01 22 N 172 56 E TARAWA-C,BETIO



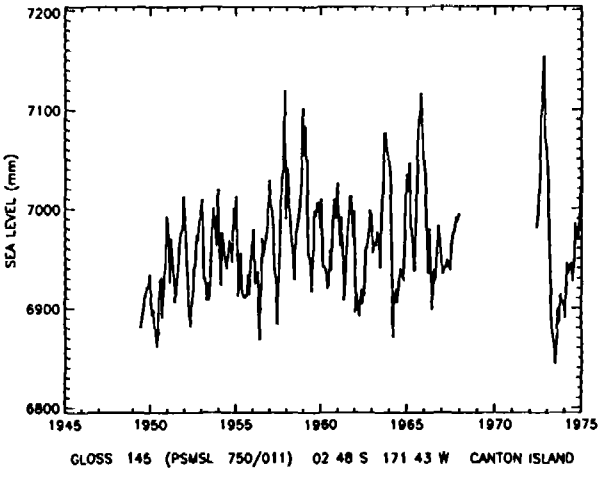
GLOSS 121 (PSMSL 732/011) 08 32 S 179 13 E FUNAFUTI



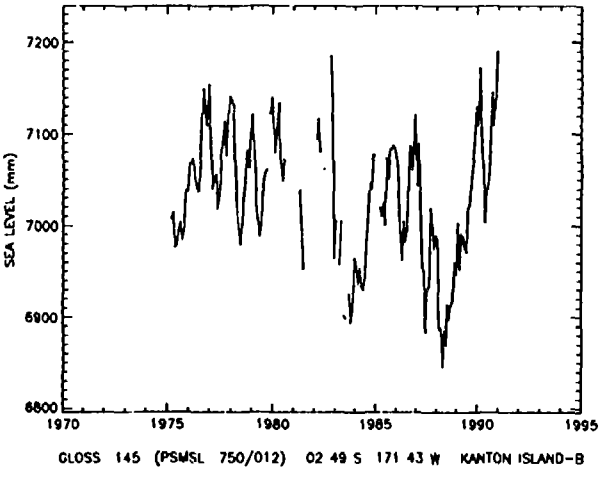
GLOSS 66 (PSMSL 734/002) 09 26 S 159 57 E HONIARA II



GLOSS 144 (PSMSL 745/001) 14 17 S 170 41 W PAGO PAGO

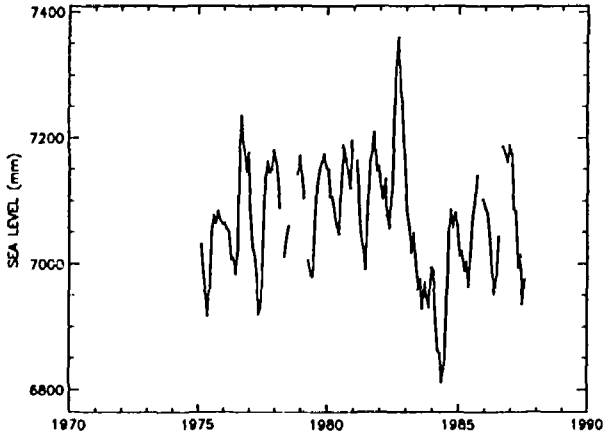


GLOSS 145 (PSMSL 750/011) 02 48 S 171 43 W CANTON ISLAND

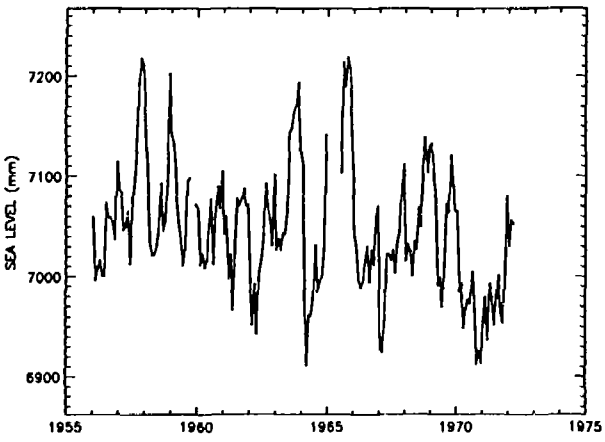


GLOSS 145 (PSMSL 750/012) 02 49 S 171 43 W KANTON ISLAND-B

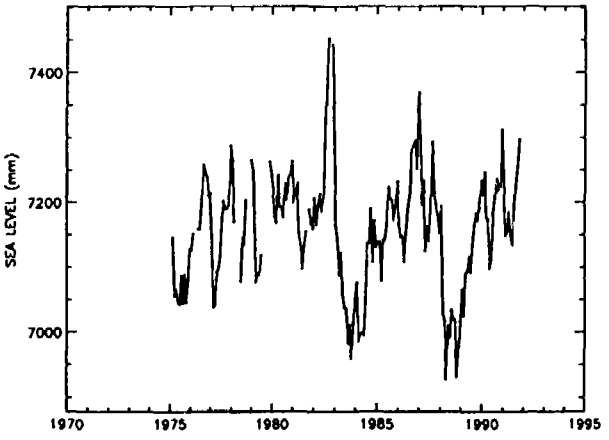
PLOTS OF MONTHLY MEAN SEA LEVEL VALUES



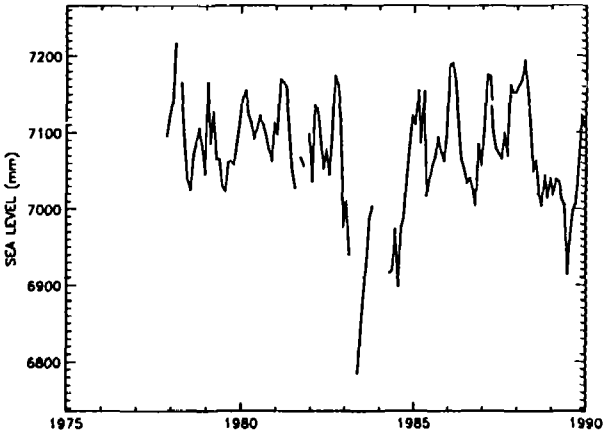
GLOSS 147 (PSMSL 770/012) 03 54 N 159 23 W FANNING-B



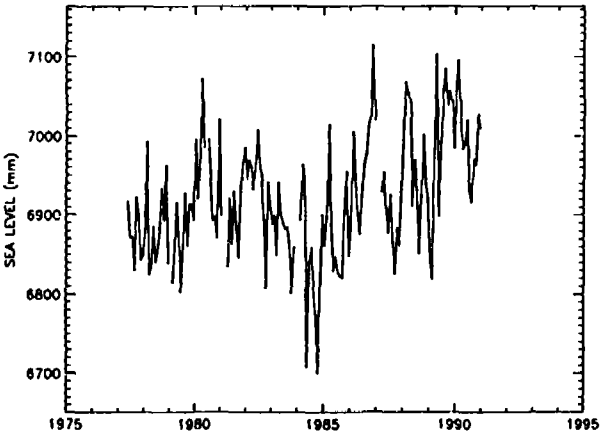
GLOSS 148 (PSMSL 770/021) 01 59 N 157 28 W CHRISTMAS ISLAND



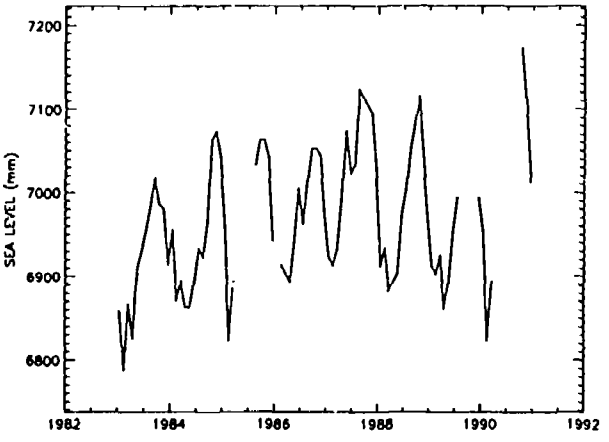
GLOSS 146 (PSMSL 770/022) 01 59 N 157 29 W CHRISTMAS ISLAND II



GLOSS 143 (PSMSL 775/001) 09 01 S 158 04 W PENRHYN



GLOSS 139 (PSMSL 785/001) 21 12 S 159 46 W RAROTONGA



GLOSS 203 (PSMSL 890/001) 10 39 N 61 31 W PORT OF SPAIN

PLOTS OF MONTHLY MEAN SEA LEVEL VALUES