

## **The South Pacific Tide Gauge Network**

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The South Pacific Tide Gauge Network is made up of contributions from an array of tide gauges that have been maintained by NTF Australia as part of the South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) and another gauge maintained by the New Zealand National Institute of Water and Atmospheric Research (NIWA). Older contributions to the tide gauge network also include those set up by the CSIRO Division of Oceanography.

The SPSLCMP is a project designed to successfully monitor sea levels and climate in real time in the South Pacific. The primary goal of the project is to generate an accurate record of variance in the long-term sea level and selected climatic variables for the South Pacific region. The project has just completed two five-year phases and phase III has commenced for 2001.

The SPSLCMP tide gauge array is comprised of eleven SEAFRAME stations; Cook Islands, Samoa, Tonga, Tuvalu, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. A twelfth gauge is soon to be added at FSM, Pohnpei. Each station records values of sea level, wind speed, direction and gust, air and water temperature and atmospheric pressure. Two sea level sensors are deployed for each station, a primary (AQUATRAK) sensor and a backup pressure sensor in the event of any problems with the primary. Sea level is monitored at six-minute intervals while the meteorological and temperature data is recorded at hourly intervals.

Each SEAFRAME site undergoes regular surveying to ensure that all data is maintained at a consistent datum and is of high accuracy. Implementation of Phase III of the SPSLCMP will provide continuous GPS measurements at each of the SEAFRAME sites. NTF Australia in conjunction with AUSLIG will be involved in this aspect of the project. The continuous GPS data will provide a very accurate means of correcting relative sea level data at each site for vertical land movement to obtain the absolute sea level. This will enable more accurate estimates of sea level rise and trends which are very important to the South Pacific countries.

Data is transferred hourly via GMS satellite connections using the Global Transmission System network via Bureau of Meteorology, Melbourne, to NTF Australia. These are monitored daily for any problems. An alternative method of data acquisition using a modem exists where satellite transmissions may be interrupted. Incoming data is subject to automated range checking and warning emails are generated if any outliers are present. This is an effective means of monitoring the status of the SEAFRAME gauges on a daily basis.

The NTF regularly publishes data collected under the SPSLCMP. The Monthly Data Report provides time series plots of observed and derived (anomalies, trends and mean sea levels) data, along with comparisons to historical data. It also contains brief notes and comments on the data and on the operational performance of the gauges. These reports are distributed to

more than 250 mailing list addresses. Please see the following web address for the latest monthly report:

<http://www.ntf.flinders.edu.au/TEXT/PRJS/PACIFIC/MRPTS/mthrep.html>

The NTF Australia website also presents the raw SEAFRAME data (sea levels, tidal predictions, residuals, meteorological parameters and system information) graphically for the previous 24 hours at each SEAFRAME location. The web address for the on-line display is:

<http://www.ntf.flinders.edu.au/TEXT/PRJS/NRTM/nrtm.html>

All observed and derived data output from the SPSLCMP is available on the NTF Australia website database. This database is updated on a monthly basis and is easily accessible. Please see the following web address:

<http://www.ntf.flinders.edu.au/TEXT/WOCE/pacific.html>

In addition to the above services, NTF Australia provides each of the Pacific Island countries with a Real Time Display (RTD). The RTD package acquires raw data from the SEAFRAME stations and displays the data as it is recorded on a PC. This provides the Pacific Island countries with their own means to monitor the sea level and climate for their own purposes.

Research has been undertaken by NTF Australia into estimating sea level trends in the South Pacific from the SEAFRAME sea level data. The trends are updated on a monthly basis for each location as part of the processing for the monthly report. These trends estimates will not become realistic until at least 25 years of data is acquired. Hourly sea level data from locations in the South Pacific, held by the WOCE Data Centre at the University of Hawaii, with length greater than 25 years, were used by NTF Australia in estimating sea level trends in the following paper. The relative sea level trend in the South Pacific was found to be +0.8 mm/year.

Sea Level Rise in Australia and the Pacific:

<http://www.ntf.flinders.edu.au/TEXT/CONF/cook2000/papers/billdoc.pdf>

The tide gauge at Jackson Bay, New Zealand, is also a part of the South Pacific Tide Gauge Network. This was set up through a joint effort between NOAA, NIWA and NTF Australia. It is currently maintained and operated by NIWA and NTF Australia.

The CSIRO Division of Oceanography previously maintained an array of sea level stations in Papua New Guinea (Port Moresby, Alotau, Lae, Madang, Wewak, Manus Island and Kavieng) and the Indian Ocean (Cocos Island and Christmas Island). The stations all consisted of float-well systems with Leupold Stevens punched paper tape recorders. The stations were established to fulfill obligations to international monitoring programs such as TOGA and WOCE. Unfortunately, since the end of the duration of the TOGA program no funding was obtained to continue on with the maintenance and operation of the CSIRO array.

Following is a listing of the hourly sea level data sets supplied by NTF Australia to the Fast Delivery WOCE Dataset on a monthly basis.

<b>GLOSS Number</b>	<b>Station name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Project</b>	<b>Observation Periods</b>	<b>Authority responsible for tide gauge</b>
400	Manus Island, PNG	02°02'S	147°22'E	SPSLCMP	Sep 1994-	NTF Australia
066	Honiara, Solomon Islands	09°26'S	159°57'E	SPSLCMP	Float gauge 1974-; Acoustic gauge 1994-	NTF Australia
	Port Vila, Vanuatu	17°45'S	168°17'E	SPSLCMP	Acoustic gauge 1993-	NTF Australia
139	Rarotonga, Cook Islands	21°12'S	159°46'W	SPSLCMP	Float gauge 1977-; Acoustic gauge 1993-	NTF Australia
038	Nuku'alofa, Tonga	21°08'S	175°10'W	SPSLCMP	Acoustic gauge 1993-	NTF Australia
	Apia, Samoa	13°49'S	171°45'W	SPSLCMP	Acoustic gauge 1993-	NTF Australia
402	Lautoka, Fiji	17°36 S	177°26'E	SPSLCMP	1992-	NTF Australia
121	Funafuti, Tuvalu	08°23'S	179°13'E	SPSLCMP	Float gauge 1977-; Acoustic gauge 1993-	NTF Australia
113	Tarawa, Kiribati	01°22'N	172°56'E	SPSLCMP	Float gauges A: 1974-1983, B: 1983-1988, C: 1987- Acoustic gauge 1992-	NTF Australia
114	Nauru	00°32'S	166°54'E	SPSLCMP	Float gauge 1974-; Acoustic 1993-	NTF Australia
112	Majuro, Marshall Islands	07°06'N	171°22'E	SPSLCMP	Float Gauge 1975- ; Acoustic 1993-	NTF Australia
122	Suva, Fiji	18 08 S	178 26 E	Other	Float gauge 1975- 1988; Acoustic 1989	NTF Australia
403	Jackson Bay, New Zealand	43 59 S	168 37 E	Other	Acoustic 1996-	NTF Australia