
PCTMSL NEWS—August 2004

Australian Baseline Sea Level Monitoring Stations

Calibration and Maintenance

Due to the uncertainty in the closure date of the National Tidal Facility Australia (NTFA), it was difficult for staff to plan scheduled service visits.

A scheduled visit to Port Kembla, Rosslyn Bay and Cape Ferguson was deferred on the advice that the Cape Ferguson installation, where NTFA shares the instrumentation housing with the Queensland Department of the Environment, was to be refurbished. This required the whole structure to be decommissioned and dismantled. The refurbishment was completed late October and the site was visited between 3rd and 7th November 2003 for reinstallation and full calibration. Rosslyn Bay and Port Kembla were not visited due to organizational change time constraints. Groote Eylandt, Darwin and Broome were visited between 7th and 19th December for full calibration and maintenance services.

Port Kembla and Rosslyn Bay stations were visited in April 2004 for full calibration and maintenance services. During these visits satellite antenna were installed in preparation for the anticipated approval by JMA to allow hourly satellite data transmissions from all Baseline stations. A problem with the backup sensor reported in August was rectified by replacement and relocation of the backup pressure sensor.

The stations at Esperance, Cocos Keeling Islands and Hillarys were visited in late May—early June for scheduled servicing. Again satellite antennas were installed at Esperance and Hillarys in preparation for satellite data transmissions.

The problem of the lack of wind speed data reported at Cocos in September was resolved with the replacement of the wind monitor propeller, which had been destroyed by vandals.

Surveying

During the reporting period, levelling surveys of the Australian Baseline Sea Level Monitoring Array have been undertaken at Hillarys, Darwin, Groote Eylandt and Cape Ferguson. Final results for Hillarys, Darwin and Groote Eylandt are available at <http://www.ga.gov.au/nmd/geodesy/abslma> and final results for Cape Ferguson will be available later in 2004.

Data Management and Reports

Data from the SEAFRAME gauges continued to be downloaded on a daily basis, then quality controlled and archived. The level of data return for the project was excellent with 11 of the 16 stations having unbroken records. The major exception was the Cape Ferguson gauge, which was decommissioned for 59 days (see calibration and maintenance section above) by the Queensland Department of the Environment. There were four other sites with data gaps of less than five days due to on-site technical problems.

Key Findings

The key findings of the project for the twelve months to June 2004 are as follows:

- All fourteen SEAFRAME stations and associated infrastructure have continued to perform effectively. Data continues to be supplied by two privately owned gauges.
- The time-series of data on the national database for the earlier conventional stations are now on average around 40 years in length. With respect to trends in sea level, much of the 'instability' of transient phenomena can be negated by this length of record. However, the sea level observations are 'relative sea level' only (vertical movement with respect to the adjacent land mass) and the trend is not that of 'absolute sea level' (related to the International Terrestrial Reference Frame) (ITRF). With that qualification, the average relative trend in sea level is +1.2 mm per year.

Sea level rise in the 100 years previous to this project has been of the order of +1 to +2 mm per year. At this magnitude any acceleration is imperceptible and the trend is nearly linear. The increase in trend appearing in the last 20 years indicates the emergence of acceleration in the trend, but the data collected so far is too variable to delineate the acceleration with any confidence.

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South Pacific Sea Level and Climate Monitoring Project

Seven Pacific stations were visited in this period (September 2003 to date). Cook Is, Samoa and Tonga were visited between 1st and 15th September and Papua New Guinea between 13th and 19th October. Lautoka, Suva and Tuvalu were visited between 10th and 23rd of March.

During the visit to Samoa it was found that the problems associated with the failure of the temperature probes and the backup system were caused by contractors damaging the signal cable conduit (and failing to report this to the local authorities), which allowed the ingress of water. This in turn caused corrosion and shorting of the wiring. Temporary splicing was required as suitable cable replacement was not available locally. This cable damage also contributed to the electronic failure of the backup recorder. Due to a lack of prior knowledge of this problem, a replacement recorder was unavailable and the fault was not repairable on site, so there is not a backup system in place.

Apart from a cancelled flight due to aircraft maintenance problem, no major problems were encountered in the calibration and maintenance visit to Papua New Guinea. It was, however, found that the hard disk of the new project PC had suffered a failure that required it to be shipped back to the agent in Fiji for repair.

The air temperature probe at Majuro in the Marshall Islands is still recording abnormally high temperatures. This fault was due for rectification during Quarter 2 of 2004, but due to delays in the fabrication of a protective barrier for FSM, the installation of which was to be undertaken during the same trip, this site visit has now been deferred until Quarter 4 of 2004. The telephone line problem previously reported at Marshall Islands has now been resolved.

Problems with satellite transmissions from Nauru in January meant that we had to rely on the telephone modem for data downloads. The telephone line became unusable in late March. Up to the end of this reporting period all attempts to have the telephone line fixed have proved fruitless.

Data Management and Reports

The data collected from the SEAFRAME gauges continues to be quality controlled and archived monthly and the data and analysis is distributed to the Pacific forum countries on a quarterly basis. The format of the disk distributed to the participants was updated in this period to reflect the look of the project web site (<http://www.pacificsealevel.org/>), with the web site colours reflected in the html pages and tables.

Key Findings

The key findings during the November 2003 – April 2004 period include:

- Sea level trends began to show regional coherence, supporting the utility of these high-quality observations for regional sea level analysis and determining sea level response to climate variations and climate change.

- The tropical Pacific endured large variability in atmospheric conditions, but near-neutral El Niño conditions and corresponding sea levels prevailed.
- Ocean temperatures in response to the neutral El Niño conditions returned to near normal after a weak warming.
- Sea level variations associated with two tsunamis and storm surges associated with two tropical cyclones were observed.
- For the South Pacific Sea Level and Climate Monitoring Project (SPSLCMP), it is still too early to draw conclusions on any long-term trend in rising sea level as a result of climate change, due to the relatively short duration of the data record from the SEAFRAME stations. The observations continue to be more indicative of decadal trends related to climate variability. However, the sea level records for all stations, when corrected for local land movement and the inverted barometer effect, are beginning to demonstrate coherence in sea level trends. These are in-line with trends observed by the conventional tide gauges, satellite altimeters and sea level rise predicted by the latest computer models of the climate system.
- It remains the aim of the SPSLCMP that the high-quality sea level observations will be able to provide the required confirmation of sea level trends in the region, especially as the length of record increases.

* * *

Southern Ocean Sea Level Centre

The Southern Ocean Sea Level Centre (SOSLC) has received further data since July 2003. The current state of Australian Antarctic Division (AAD) data analysed by the SOSLC is as follows: Casey to June 2003, Macquarie Island to September 2003 and Davis and Mawson data to October 2003.

The SOSLC has received further data (via AAD) from the People's Republic of China station at Zhong Shan in November 2003. All data to November 2003 has been analysed following the establishment of regular downloads of barometric pressure. The establishment of an automated download system through the Australian Bureau of Meteorology's Tasmania and Antarctica Regional Office followed links initially established with the Chinese Meteorological Administration.

All data analysed thus far is available via the SOSLC database (<http://www.ntf.flinders.edu.au/TEXT/WOCE/sodata.html>). The data held by the SOSLC for the active gauge sites (to June 2004) is currently being prepared for distribution to AAD via CD-ROM. The first CD-ROM of Southern Ocean data was sent to AAD in September 2003. On completion the updated CD-ROM will be forwarded

to Mr Henk Broolsma, AAD Mapping Officer. This CD will include a data report that includes a full description of the tide gauge data status and graphical presentation of the sea level and barometric pressure anomalies, sea level means and the short-term sea level trends.

Following the updating of SOSLC web pages in 2003, further evolution is underway to reflect the establishment of the National Tidal Centre (NTC). This will also include access to the data report mentioned above.

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Association of Australian Port and Marine Authorities/National Tidal Facility Australia Tidal Contract

The production of tidal information under the previous contract between the former NTFA and Association of Australian Port and Marine Authorities (AAPMA) is being continued by the NTC, whilst the contract is being renegotiated. Further to **PCTMSL NEWS—November 2003**, the NTC has received 2003 sea level observations from the 64 operating tide gauges of the 79 ports currently covered by the contract.

All of these data sets have been checked and feedback has been supplied to the relevant Port Authorities. The basis of the 2006 predictions has been completed for each location listed in the former AAPMA/NTFA Tidal Contract. The 2006 tide predictions will be computed and supplied to the relevant Port Authorities late in 2004.

For further details please refer to the Tide Predictions section of the NTC web site <http://www.ntf.flinders.edu.au> or contact the NTC Tidal Analysis Group on (08) 8201 7532.

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News from the National Tidal Facility Australia / National Tidal Centre

Organisational Change

The Flinders University of South Australia (FUSA) withdrew support for the National Tidal Facility Australia (NTFA) on 31 December 2003. Following a lengthy process of negotiation with stakeholders, the Australian Bureau of Meteorology established the National Tidal Centre (NTC) on 01 January in place of the NTFA. Most of the staff of the former NTFA has been re-employed by the Bureau. The manager of the NTC is Mr Bill Mitchell.

The services provided by the NTC are an important element of the Bureau's new Oceanographic Services Program, whose aim in general is to support Australia's social, economic, cultural and environmental goals in the public interest. More particularly, these services support climate monitoring, defence, navigation, and shipping in

Australian and nearby waters, and assist persons and authorities engaged in recreation, marine resource related industries, trade and commerce.

Current contact details for the NTC are:

National Tidal Centre
Australian Bureau of Meteorology
PO Box 421
KENT TOWN SA 5071
Email: ntc@bom.gov.au
Telephone: (08) 8201 7532
Facsimile: (08) 8201 7523
Web site: www.ntf.flinders.edu.au

Please note the web site is currently being redesigned and will be accessible via the Bureau's web site in the near future (<http://www.bom.gov.au>).

Meetings

Mr W. Mitchell attended the following:

2003

PCTMSL Meeting, Sydney
Pacific Forum Meeting, Auckland
9th Regional Meteorological Services
Director's Meeting, Vava'u, Tonga
GLOSS Group of Experts Meeting, Paris, France
AMSAT Pty Ltd, Annual General Meeting, Canberra
Heads of Marine Agencies Meeting, Canberra

2004

PCTMSL Meeting, Fremantle

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Australian Hydrographic Service

Australian National Tide Tables 2005

The compilation of the Australian National Tide Tables 2005 (ANTT), and its electronic version, Seafarer® Tides has finished. ANTT 2005 is currently at the printers and should be ready in early October.

Bass Strait Investigation

Surveys by the hydrographic ships in the area of the Main Shipping Route and Flinders Island have been completed.

Great Barrier Reef Investigation

The Laser Airborne Depth Sounder continues to work around Swains Reef and the Coral Sea Area.

Arnhem Land

Various surveys are under way between Darwin to North Goulburn Island. There are five tide gauges currently deployed around Cape Croker enabling hydrographic ships to carry out surveys of the area.

National Tidal Stream Inventory

Would like to thank the members who (at the last PCTMSL meeting) provided the latest input to update the inventory. New information for the inventory is always welcomed and can be sent to:

Email: tides@defence.gov.au

or

mail: Locked Bag 8801

WOLLONGONG NSW 2500

Staffing

Would like to introduce Ms Thea Collie as the new team member taking the Assistant Tidal Officer position. The Head of the Tidal and Geodetic Section, Wayne Jones has continued to be on sick leave but we are anticipating that he will be back on his feet in the office soon.

General

Activities involving tidal analysis and predictions and the provision of tidal information and connections for chart datum for industry and the general public continues.

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Regional News

Queensland

The usual tidal activities of the Queensland Port Authorities, the Environment Sciences Division of the Environmental Protection Agency, and Maritime Safety Queensland continue.

Queensland's Official Tide Tables and Boating Guide for the year 2005 and the 'Blue Book' supplementary tables used in emergency response, vessel traffic management of our shipping, various planning activities by persons in the research, commercial, and local authority spheres of activity, have been published.

In preparation for the upcoming cyclone season, the water level recorders of the Environmental Protection Agency's storm tide network are being serviced. Readings and non-tidal residuals from these gauges are available on the internet—updated daily (05:00 hours Australian Eastern Standard Time—more frequently during cyclonic events). The URL address is:

www.epa.qld.gov.au/tides

Summer time in Queensland brings with it cyclones, with the attendant risk of higher than normal sea levels due to storm surge, and the 'King', higher than average, spring tides.

The photograph below is typical of a summer 'King' tide forcing sea water into the streets. The conditions at the time were calm, with neither wind nor waves—there was no storm surge. It is easy to see how a combination of a 'King' tide and storm surge could give rise to public concern. Accordingly the dates of the 'King' tides, together with some advisory notes, are posted on the internet. The URL address is:

<http://www.msq.qld.gov.au/qldtides>



Figure 1: A 'King Tide' and water in the streets

In recognition of the role of the PCTMSL to look forward Mr G.J. Broadbent, the Maritime Safety Queensland delegate to the committee has co-authored, with M.P. Todd, and Mr R. Martin, the paper 'Infrastructure Supporting Mapping of Tidal Planes and Lines' to be presented at the Trans Tasman Survey Conference (Auckland, 13–16 October 2004).

The paper presents one way of mapping the height of chart datum, Lowest Astronomical Tide, to facilitate the reduction of the soundings from an hydrographic survey to datum. The proposal is to build on the traditional tidal reduction processes and to integrate GPS height measurements in a way which ensures that chart datum is maintained at exactly the same the height as it is when tidal measurements are used.

The process presented lends itself to the mapping of all tidal planes. This in turn leads to the ability to intersect the tidal plane with the bathymetry and topography to generate a map of the tidal lines such as the high water mark and low water mark.

Please note that the contact details for the Tidal Unit of Maritime Safety Queensland have changed. They are now:

Maritime Safety Queensland
Mineral House 41
George Street
BRISBANE QLD 4000

GPO Box 2595
BRISBANE QLD 4001
<http://www.msq.qld.gov.au/qldtides>

Contact Officer: G.J. (John) Broadbent
Telephone: (07) 3120 7433
Facsimile: (07) 3120 7430
Email: tides@msq.qld.gov.au

Western Australia

Further to the routine functions of the Tides and Waves Section of the Department for Planning and Infrastructure Western Australia (WA), we have been involved with the following activities:

Data Collection/Instrumentation

The State tide and wave monitoring network has been operating satisfactorily. This years annual tide gauge service and maintain program is almost complete with the exception of Derby and Broome tide gauges. Our technical staff just completed a 4000 kilometre round trip travelling from Perth to Port Hedland servicing and calibrating the tide gauges along the way. Derby and Broome will be serviced in the following months in conjunction with another project.

The Department has recently purchased its first new directional wave-rider (DWR), a Datawell DWR MkIII in a 0.7 m diameter hull. The new 0.7 m DWR is technically the same as the standard 0.9 m DWR with the same instrumentation and produces the same results. The battery holding capacity of the 0.7 m DWR is less, however still providing an operational period of 13 months, which satisfies our deployment and servicing requirements. The 0.7 m DWR also provides some significant benefits such as, initial costs, servicing, deployment and calibration requirements can be carried out using existing resources as done with our non-directional buoys. The new DWR will replace our non-directional buoy at Rottnest Island, which is scheduled for early September. The DWR will compliment our existing wave monitoring network and substantially enhance the information necessary to manage our coastal zone.

The results from a recent reconnaissance hydrographic survey at Adolphus Island (Cambridge Gulf) prompted a proposal to proceed with a further detail hydrographic survey of this area. In support of this survey, the collection of more accurate on-site tide data was required. Given the dynamic tidal

movements, the dangerous crocodile infested waters and the lack of resources in this remote area, the deployment of a bottom mounted or standard tide gauge was not favourable. As such, a Valeport 740 pressure transducer tide recorder was purchase for this application.

The Valeport 740 was deployed at Adolphus Island for approximately three weeks during May 2004 and the tide data collected was used to process the recent Cambridge Gulf hydrographic survey. The results met the required accuracy criteria, proving the success of this recently purchased unit. It will now be used as a temporary on-site tide gauge to supplement hydrographic surveys in other areas of the State where no tide information is available.

The Nortek—Acoustic Wave and Current (AWAC) instruments are providing some excellent results measuring waves, wave direction, current profiles and tides. Currently deployed at Ledge Point (approximately 100 kilometres north of Perth), the data collected has provided valuable information for the investigation of a proposed boat harbour and coastal protection works in this area. Future deployments have been planned for Broome in mid September, which should provide some interesting current information.

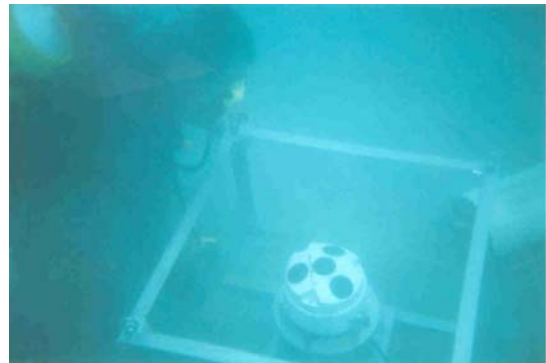


Figure 2: Deploying the Nortek—Acoustic Wave and Current instrument at Ledge Point

Staff

Alison Kohout, Oceanographic Officer has resigned from the Tides and Waves Section, after being successful in her application for PhD studies in New Zealand. She will be leaving in early December this year.

We are now proceeding with the recruitment action for an Oceanographic Officer. The main function of this position will be as follows:

- Assist the Coordinator Tides and Waves with the collection, analysis and processing of the State's tide and wave data.
- Assist other areas within Commercial and Asset Services with the maintenance and enhancing of specialist processing systems associated with Tide and Wave data.

The position (No 20030003) should be advertised in the near future and information will also be available at www.dpi.wa.gov.au/hr, <http://jobs.wa.gov.au/> or contact me direct as per details below.

For further information please contact:

Tony Lamberto
 Coordinator Tides and Waves
 Department for Planning and Infrastructure
 1 Essex Street
 FREMANTLE WA 6160
 Telephone: (+618) 9216 8825
 Facsimile: (+618) 9216 8981
 Email: tony.lamberto@dpi.wa.gov.au
 Web: www.coastaldata.transport.wa.gov.au

Australian Antarctic Division

The last year has been very busy with the National Tidal Facility (now the National Tidal Centre—BoM) processing all tidal data recorded by the Australian Antarctic Division from 1993 to 2002 being processed, documented and relevant metadata records being completed. The information is available on the web at:

<http://www.aad.gov.au/default.asp?casid=3786>

Go to the metadata heading on the left of the page, then to free text search and search on tide and gauge. The metadata record shows all the relevant links to documentation on the tide gauges, details on conversion of raw data, available data, the National Tidal Centre and level connections to Geoscience Australia GPS base stations.

The main challenge in operating tide gauges in Antarctica is dealing with ice and the provision of power and communications to the tide gauges. Tide gauges cannot be installed on any freestanding structures such as jetties or pylons as the ice would destroy them. Ice also limits the method by which power and communications can be supplied to the bottom mounted gauges. Surface cables from the bottom-mounted gauge would be destroyed by the rafting of ice every winter with environmental considerations prohibiting the construction of trenches to bury the cables.

To overcome these problems the bottom-mounted tide gauges were installed in 600 kg concrete blocks about six to eight metres below sea level so that the annual formation and retreat of the sea ice would not destroy the installations. In ten years of operation one 600 kg block was overturned by a 'bergy bit' scouring a trench in the ocean floor in the process.

As power cannot be provided externally to the tide gauge a bank of Lithium batteries in the base of the gauge housing provides the necessary power. A communications coil lowered over the gauge allows downloading of the gauge. The gauge can store data for two years after which time it starts to write

over the stored data. The bottom-mounted installations have been very successful but problems in determining the stability of the gauge and maintaining datum when the batteries need replacing have been very difficult to overcome. Traditional methods for calibrating the gauges such as tide staff readings and running a second gauge in tandem have been used but these methods do not give us the accuracy nor the indication whether the mooring is stable or not.

The most recent and most accurate method to determine whether the mooring is stable and transfer the gauge datum to the tide gauge bench marks at the same time has been to use dual frequency GPS units, with one unit being set over the tide gauge bench marks and the other either floating over the tide gauge or set on a tripod when the sea ice is in. This method was first used by Chris Watson at the University of Tasmania for calibrating the TOPEX Poseidon satellite, which passes over Bass Strait in the vicinity of Burnie and for calibrating the Burnie tide gauge. It has been used successfully at Davis station and Macquarie Island where tide staffs have been destroyed by the large quantities of kelp adjacent to the shoreline.

Work completed 2003/04

Casey

Pipe for the installation of a tide gauges to be installed in the new wharf successfully completed.

Bottom mounted gauge successfully replaced by the Human Impacts Research dive team.

Davis

Bottom mounted tide gauge successfully downloaded and calibrated in December 2003 by Adrian Corvino and Henk Broisma and downloaded again in June 2004 by Ben Manser (BoM meteorological officer).

Mawson

Bottom mounted tide gauge successfully downloaded.

Shore operated Aquatrak and Druck pressure tide gauges which we can interrogate from Kingston successfully downloaded.

Web based real time Mawson tide height display trialled.

Macquarie Island

Shore operated Aquatrak and Druck pressure tide gauges which can be interrogated from Kingston successfully downloaded.

Proposed work for the 2004/05 summer

Casey

Install tide gauge in wharf installation.

Calibrate bottom-mounted gauge with a floating GPS unit.

Davis

Download bottom mounted gauge and calibrate with a floating GPS unit by Geoscience Australia geodesy personnel.

Mawson

Download bottom mounted gauge and calibrate with a floating GPS unit by Geoscience Australia geodesy personnel.

For further information contact:

Mr Henk Bolsma
 Australian Antarctic Division
 KINGSTON TAS 7050
 Telephone: (03) 6232 3528
 Facsimile: (03) 6232 3415
 Email: henk.brolsma@aad.gov.au

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Conferences and Symposia

2004

13–16 October 2004. '4th Trans Tasman Surveyors Conference'. Auckland Convention Centre, Auckland, New Zealand.

www.conventions.co.nz

09–12 November 2004. 'OCEANS 2004': Kobe, Japan.

www.oceans-technocean2004.com

06–08 December 2004. 'GPS–GNSS 2004'—An international symposium on GPS/GNSS: Sydney, Australia.

www.gnss2004.org

07–10 December 2004. 'OSEA 2004'—Offshore South East Asia 2004 Conference and Exhibition: Singapore.

www.osea-asia.com

02–03 December 2004. 'IMCA 2004 Marine Seminar': Singapore.

www.imca-int.com/events

2005

29–31 March, 2005. 'U.S. Hydrographic Conference 2005': San Diego, CA, USA.

www.thsoa.org

02–05 May 2005. 'Offshore Technology Conference (OTC)': Houston, Texas, USA.

www.otcnet.org

08–10 July 2005. 'IHOCE 2005—International Hydrographic and Oceanographic Conference': Kuala Lumpur, Malaysia.

www.fr-exhibitions.com.my

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