THE AUSTRALIAN BASELINE SEA LEVEL MONITORING PROJECT

MONTHLY DATA REPORT

DECEMBER 2001

This project was prepared under the Australian Greenhouse Science Project for the Australian Greenhouse Office, supported by NTF Australia at the Flinders University of South Australia.
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Quality Certification:

I authorise the issue of this Australian Baseline Sea Level Monitoring Project Monthly Data Report for December 2001 in accordance with National Tidal Facility Australia Quality Assurance procedures.

Wolfgang Scherer
Director - National Tidal Facility Australia
NOTES ON THE DATA FOR DECEMBER 2001

Sea level data return this month was excellent at all stations.

The Broome primary water temperature sensor remains faulty and the backup water temperature again was used. The Thevenard air temperature sensor remains faulty and the data has consequently been removed from the record.

Looking at the sea level anomalies this month (Figure 10), the majority of the stations have small anomalies and are close to zero.

Overall, the barometric pressure anomalies, presented in Figure 11, correlate reasonably well with the sea level anomalies for most stations. Strongly positive sea level anomalies correspond to strongly negative barometric pressure anomalies as would be expected. A correlation for December is difficult to discern due to the small sea level anomalies this month.

The residuals (Figures 2 and 3), or difference between the observations and the tidal predictions, are the non-tidal components of the sea level observations. The residuals are primarily the consequence of short-term meteorological effects (Figures 5 and 9) and may give the result of elevated or depressed sea level observations.

A fault was identified in the Stony Point wind speed and wind gust data logging software that resulted in zero values being recorded. The zero data were treated as erroneous and removed, resulting in the Stony Point gaps in Figures 5 and 6.

With regard to the water and air temperature anomalies in Figures 12 and 13 respectively, it must be noted that there are large gaps in the data for several stations, where the data collected appeared to be erroneous. Please note that for several stations there were no backup water temperature sensors in operation, so the quality of this data is unknown. Similarly, air temperatures are compared to the temperature recorded by a sensor located in the upper levels of the environmental housing of the tide gauge. These will not exactly agree, as in locations where the housing is in the sun, the housing temperature will be higher than the actual air temperature. The temperature fluctuations inside the housing will also be less pronounced compared to the actual temperature fluctuations. This is due to the smaller amount of ventilation within the environmental housing. So although this can be used as a rough gauge in determining the quality of air temperature data, it is not an exact measure, and so is not used to fill the gaps.
It is difficult to relate the water and air temperature anomalies directly to those of barometric pressure and sea level without considering other effects, such as localised currents, wind speeds and directions. However, the anomalies are very useful in controlling the quality of the water and air temperature data at the Baseline stations.

Figure 16 compares the mean, maximum and minimum values for air temperature, water temperature and barometric pressure for the current month with the long-term December values. Please remember that the long-term ranges are calculated using the historical sets of December data for each station excluding the current month of data.

The mean air temperature for December 2001 was consistent with the long term December means. A record maximum air temperature of 33.5 was recorded at Cocos Islands this month. Failure of the sensor at Thevenard meant that no comparison could be made.

The water temperatures recorded at all sites for December 2001 were quite consistent with the long-term values. No comparison was possible for Broome as a result of the sensor failure.

The barometric pressures were quite consistent with the long-term values at all sites for December 2001.

Figure 14 shows the short-term sea level trends for each SEAFRAME location included in the Australian Baseline Sea Level Monitoring Project. Table 1 lists the commencement of operation, the sea level trend for the entire record (plotted in Figure 14) and the change in trend with respect to the previous month’s analysis.

Table 1: Installation dates and short-term sea level trends for the Baseline array.

<table>
<thead>
<tr>
<th>Station</th>
<th>Installation Date</th>
<th>Sea Level Trend (mm/yr)</th>
<th>Change from previous month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocos Islands</td>
<td>Sep 1992</td>
<td>+12.3</td>
<td>+0.1</td>
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<tr>
<td>Groote Eylandt</td>
<td>Sep 1993</td>
<td>+32.2</td>
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<tr>
<td>Darwin</td>
<td>May 1990</td>
<td>+19.0</td>
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<td>Nov 1991</td>
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<td>Hillarys</td>
<td>Nov 1991</td>
<td>+19.1</td>
<td>-0.4</td>
</tr>
<tr>
<td>Esperance</td>
<td>Mar 1992</td>
<td>+13.7</td>
<td>-0.4</td>
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<tr>
<td>Thevenard</td>
<td>Mar 1992</td>
<td>+11.1</td>
<td>-0.2</td>
</tr>
<tr>
<td>Port Stanvac</td>
<td>Jun 1992</td>
<td>+10.5</td>
<td>+0.1</td>
</tr>
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<td>Portland</td>
<td>Jul 1991</td>
<td>+5.8</td>
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<tr>
<td>Lorne</td>
<td>Jan 1993</td>
<td>+5.1</td>
<td>+0.2</td>
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<tr>
<td>Stony Point</td>
<td>Jan 1993</td>
<td>+5.1</td>
<td>+0.1</td>
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<tr>
<td>Burnie</td>
<td>Sep 1992</td>
<td>+6.5</td>
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Figure 17 shows the monthly mean sea levels with respect to an arbitrary fixed offset from the zero of the tide gauge. This plot clearly shows significant correlation in seasonal signals between stations, in contrast to the sea level anomalies plot, which has the seasonal signal removed from the data.

The following chart shows the number of hits on the Australian Baseline Sea Level Monitoring Project web pages over 1999, 2000 and 2001.

Please note:
Tide gauges at Stony Point and Lorne do not record air temperature, water temperature and barometric pressure data and are not present in Figures 3,7,8,9,11,12,13 and 16. The tide gauge at Lorne does not record wind data and is not present in Figures 4,5 and 6.

The Monthly Data Report is prepared by NTF Australia for Environment Australia. Staff members produce the text, plots and tables.

Further information on the Monthly Data Report and other projects conducted by NTF Australia can be obtained from the following address.

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Individuals and organisations are advised that quality controlled six-minute or hourly data from these stations are available on request from NTF Australia. Some handling fees may be charged. For commercial agencies requesting data, some additional costs may be levied.
Figure 1

DECEMBER 2001
SIX MINUTE OBSERVATIONS FROM SEAFRAME STATIONS (m)
Figure 2
DECEMBER 2001
RESIDUALS AT SIX MINUTE INTERVALS FROM SEAFRAME STATIONS (m)

© National Tidal Facility Australia
DECEMBER 2001

RESIDUALS AT SIX MINUTE INTERVALS FROM SEAFRAME STATIONS (m)

ADJUSTED FOR ATMOSPHERIC PRESSURE

Figure 3

© National Tidal Facility Australia
DECEMBER 2001
HOURLY WIND SPEEDS FROM SEAFRAME STATIONS (m/s)

Figure 4

© National Tidal Facility Australia
Figure 5

DECEMBER 2001
HOURLY INCIDENT WINDS FROM SEAFRAME STATIONS (m/s, deg True)

© National Tidal Facility Australia
Figure 6

DECEMBER 2001
HOURLY MAXIMUM WIND GUSTS FROM SEAFRAME STATIONS (m/s)

Cocos Islands
Groote Eylandt
Darwin
Broome
Hillarys
Esperance
Thevenard
Port Stanvac
Portland
Stony Point
Burnie
Spring Bay
Port Kembla
Rosslyn Bay
Cape Ferguson
Figure 7

DECEMBER 2001
HOURLY AIR TEMPERATURES FROM SEAFRAME STATIONS (°C)

HOURLY AIR TEMPERATURES FROM SEAFRAME STATIONS (°C)

© National Tidal Facility Australia
Figure 8

DECEMBER 2001
HOURLY WATER TEMPERATURES FROM SEAFRAME STATIONS (°C)

HOURLY WATER TEMPERATURES FROM SEAFRAME STATIONS (°C)

Cocos Islands
Groote Eylandt
Darwin
Broome
Hillarys
Esperance
Thevenard
Port Stanvac
Portland
Burnie
Spring Bay
Port Kembla
Rosslyn Bay
Cape Ferguson

December 2001 (UTC)

© National Tidal Facility Australia
Figure 9

DECEMBER 2001
HOURLY ATMOSPHERIC PRESSURE FROM SEAFRAME STATIONS (hPa)
Figure 10

SEA LEVEL ANOMALIES THROUGH DECEMBER 2001 (m)


Cocos Islands
Groote Eylandt
Darwin
Broome
Hillarys
Esperance
Thevenard
Port Stanvac
Portland
Lorne
Stony Point
Burnie
Spring Bay
Port Kembla
Rosslyn Bay

© National Tidal Facility Australia
Figure 11
BAROMETRIC PRESSURE ANOMALIES
THROUGH DECEMBER 2001 (hPa)
Figure 12
WATER TEMPERATURE ANOMALIES THROUGH DECEMBER 2001 (°C)


Cocos Islands
Groote Eylandt
Darwin
Broome
Hillarys
Esperance
Thevenard
Port Stanvac
Portland
Burnie
Spring Bay
Port Kembla
Russlyn Bay
Cape Ferguson

© National Tidal Facility Australia
Figure 13
AIR TEMPERATURE ANOMALIES
THROUGH DECEMBER 2001 (°C)
Figure 14

SEA LEVEL TRENDS THROUGH DECEMBER 2001 (mm/year)

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Figure 15
SEA LEVEL DATA RETURN
THE NUMBER OF DAYS OF MISSING DATA ARE INDICATED
GAPS INCLUDE TRANSMISSION, POWER AND LOGGER FAILURE
* Patchy record

© National Tidal Facility Australia
Figure 16
Comparison of December 2001 Max, Min & Mean with Long Term December Values.

Air Temperature (°C)

Water Temperature (°C)

Barometric Pressure (hPa)

Stations
1 - Cocos Islands
2 - Groote Eylandt
3 - Darwin
4 - Broome
5 - Hillarys
6 - Esperance
7 - Thevenard
8 - Port Stanvac
9 - Portland
10 - Burnie
11 - Spring Bay
12 - Port Kembla
13 - Rosslyn Bay
14 - Cape Ferguson

December 2001 Maximum
December 2001 Mean
December 2001 Minimum

Long Term December Maximum
Long Term December Mean
Long Term December Minimum

© National Tidal Facility Australia
Figure 17
MONTHLY MEAN SEA LEVELS TO DECEMBER 2001 (m)
The zero line represents an arbitrary fixed offset from the zero of the tide gauge.