

**THE AUSTRALIAN BASELINE SEA LEVEL  
MONITORING PROJECT**

**MONTHLY DATA REPORT**

**NOVEMBER 2004**



**Australian Government**

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**Bureau of Meteorology**

This report was prepared under the Australian Greenhouse Science Program for the Australian Greenhouse Office, supported by the National Tidal Centre, Bureau of Meteorology.



**Australian Government**

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**Quality Certification:**

I authorise the issue of this Australian Baseline Sea Level Monitoring Project Monthly Data Report for November 2004 in accordance with National Tidal Centre Quality Assurance procedures.

William Mitchell  
Manager - National Tidal Centre

# The Australian Baseline Sea Level Monitoring Project

## Monthly Data Report

NOVEMBER 2004

### INTRODUCTION

The mission of this project is to operate and maintain a national array of high-resolution sea level gauges and associated meteorological instruments, in order to acquire observations that are quality controlled and processed to build a national database of information that is accessible by the scientific and wider communities.

The Baseline Array, and a similar array in the South Pacific, have been widely acknowledged in the global science community as two of the most accurate and reliable sources for information on sea level and climate change anywhere in the world.

The visualisation techniques included in this report, and the comments provided, are for the purposes of quality control analysis. Interpretation of the sea level record for trends or climatic episodes is not the purpose of these reports. Provisional interpretation may be undertaken from time to time for reporting purposes and may be found in other publications.

Readers are cautioned against drawing any conclusions from short duration records, particularly when used in isolation from other phenomena. The sea level record includes natural variability, such as El Niño events and the effects of atmospheric, oceanographic and geological processes. Vertical movement of the instrumentation relative to local topography is monitored and the results are listed on the Geoscience Australia web site. Movement of each station relative to the International Terrestrial Reference Frame is not monitored. It is important to note that as the sea level record becomes longer, the short-term trend estimate becomes more stable and reliable.

### NOTES ON THE DATA FOR NOVEMBER 2004

Sea level data return (Figures 1 and 17) in November was excellent for all stations.

The residuals (Figures 2 and 3), the 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).

Wind speed and wind gust data from Stony Point remained intermittently erroneous during November. These values and the corresponding incident wind directions have been removed (Figures 4, 5 and 6).

Figure 10 compares the mean, maximum and minimum values for air temperature, water temperature and barometric pressure for the current month with the long-term November values. Note that the long-term ranges are calculated using the historical sets of November data for each station *excluding* the current month of data.

The air temperatures for November 2004 were generally consistent with the long term November air temperatures for most sites. Maximum air temperatures of 34.8°C at Darwin, and 37.7°C at Thevenard were above previous maxima recorded in November.

The water temperatures for November 2004 were generally consistent with the long term November water temperatures for all sites.

The barometric pressures for November 2004 were generally consistent with the long-term November barometric pressures for most sites. Maximum barometric pressures of 1028.9hPa at Thevenard, 1029.8hPa at Port Stanvac and 1031.5hPa at Portland exceeded the previous November maxima.

Figure 11 shows the monthly mean sea levels with respect to an arbitrary fixed offset from the zero of the tide gauge. The mean sea level plot shows seasonal variations in sea level, in contrast to the sea level anomalies plot (Figure 12), which has the seasonal signal removed from the data.

The sea level anomalies (Figure 12) continued to be negative at most stations in November with the exception of Cocos Islands, Hillarys, Port Stanvac and Rosslyn Bay where they changed from being negative to slightly positive.

Figure 13 shows the evolution of the short-term sea level trends for each site 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 13) and the change in trend with respect to the analysis of the previous month.

The barometric pressure anomalies (Figure 14) changed from positive to negative at Spring Bay and Burnie and from negative to positive at Cape Ferguson, Broome, Hillarys and Rosslyn Bay. At Esperance and Port Kembla the barometric pressure anomalies remained negative and continued to be positive at the remaining sites in November.

It is difficult to relate the water and air temperature anomalies (Figures 15 and 16) directly to those of barometric pressure and sea level without considering other effects, such as localised currents, wind speeds and directions. The anomalies are primarily used to quality check the water and air temperature data.

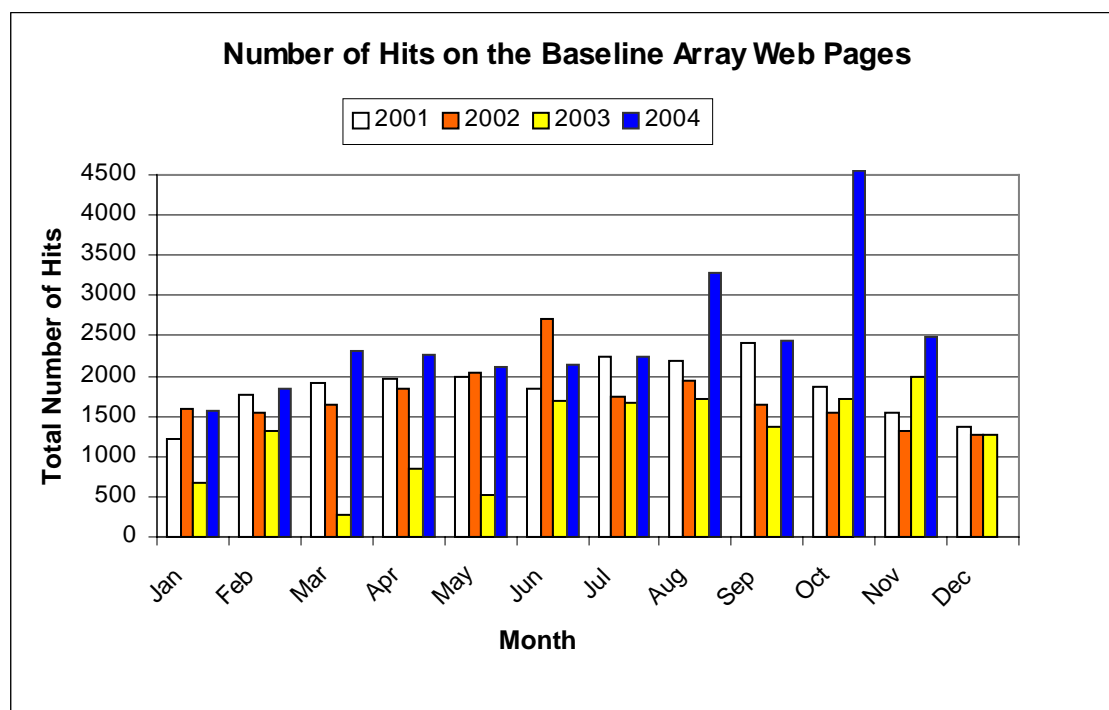
The number of hits to the Australian Baseline Sea Level Monitoring project web pages from 2001 to November 2004 is given in Table 2.

*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.*

**Table 1: Tide gauge installation dates, short-term sea level trends and change in trend from the previous month for the Australian Baseline array through November 2004.**

Location	Installation Date	Sea Level Trend (mm/yr)	Change from previous month
Cocos Islands	Sep 1992	+11.1	+0.1
Groote Eylandt	Sep 1993	+10.2	-0.6
Darwin	May 1990	+9.4	-0.2
Broome	Nov 1991	+11.8	-0.2
Hillarys	Nov 1991	+9.1	0.0
Esperance	Mar 1992	+6.3	0.0
Thevenard	Mar 1992	+5.0	0.0
Port Stanvac	Jun 1992	+6.3	0.0
Portland	Jul 1991	+2.8	0.0
Lorne	Jan 1993	+2.2	0.0
Stony Point	Jan 1993	+1.8	0.0
Burnie	Sep 1992	+3.0	0.0
Spring Bay	May 1991	+3.4	0.0
Port Kembla	Jul 1991	+4.5	-0.1
Rosslyn Bay	Jun 1992	+3.0	+0.1
Cape Ferguson	Sep 1991	+4.3	0.0

**Table 2: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2001 to November 2004.**



The *Monthly Data Report* is prepared by the NTC, Bureau of Meteorology for Environment Australia. Staff members produce the text, plots and tables.

Further information on the *Monthly Data Report* and other projects conducted by the NTC, Bureau of Meteorology can be obtained from the following address.

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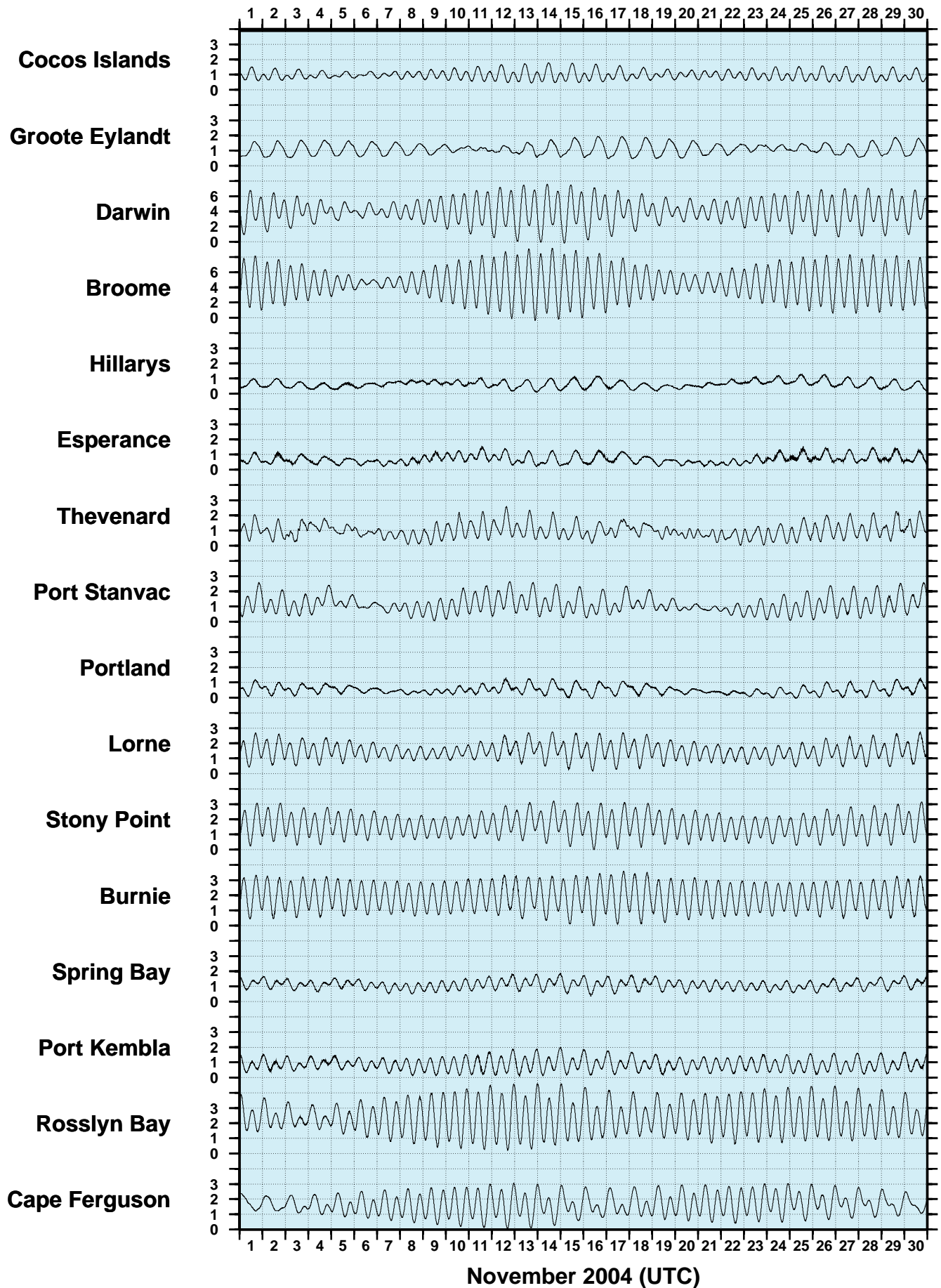
Please note the following:

While all care has been taken in the collection, analysis and compilation of the data, it is supplied on the condition that neither the *Commonwealth of Australia* nor the NTC, Bureau of Meteorology shall be liable for any loss or injury whatsoever arising from the use of the data. The Commonwealth of Australia holds copyright for material contained in this document.

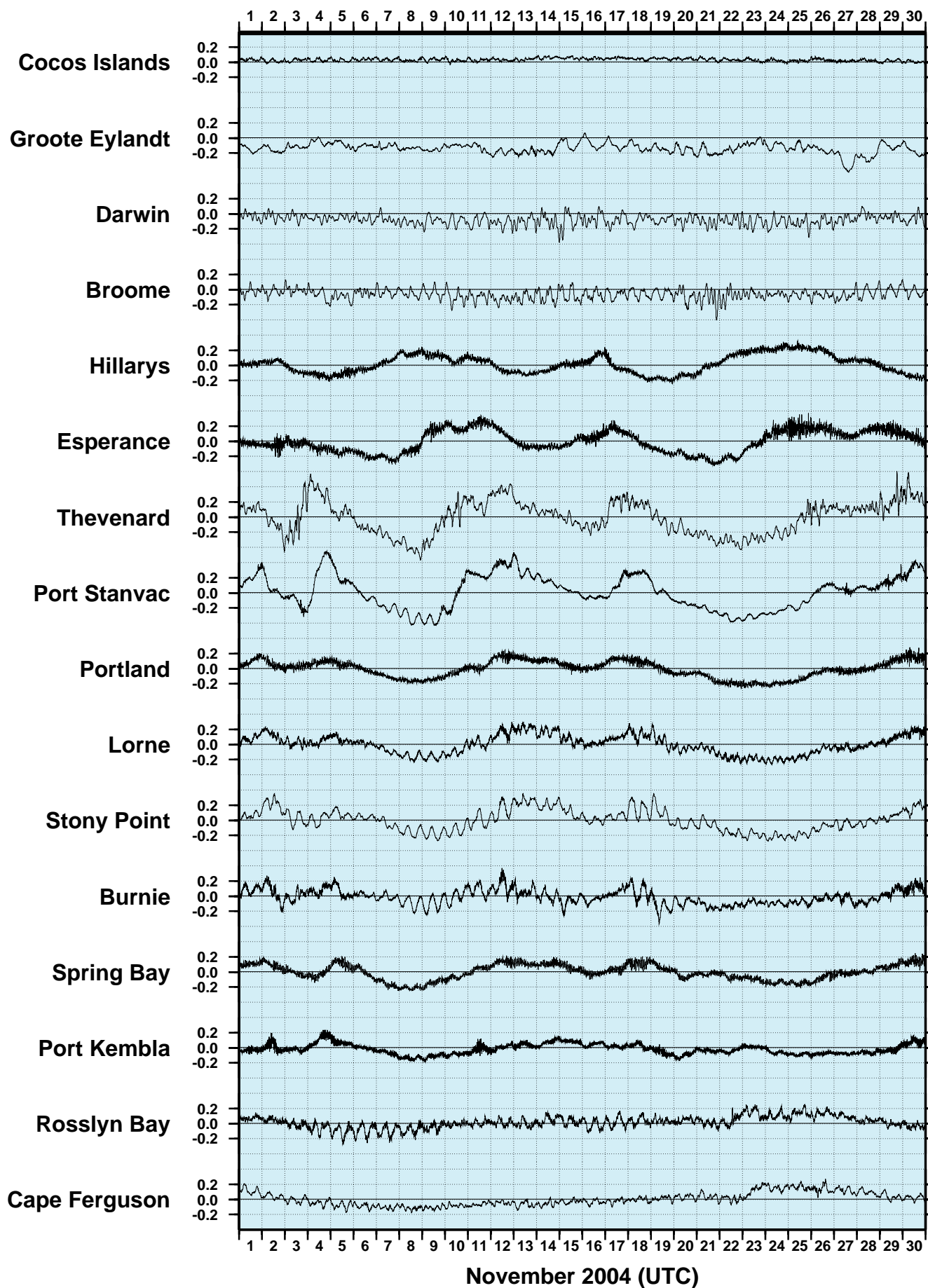
Individuals and organisations are advised that quality controlled six-minute or hourly data from these stations are available on request from the NTC, Bureau of Meteorology. Some handling fees may be charged. For commercial agencies requesting data, some additional costs may be levied.

**Figure 1**

**NOVEMBER 2004  
SIX MINUTE SEA LEVEL OBSERVATIONS (m)**



**Figure 2**  
**NOVEMBER 2004**  
**SIX MINUTE RESIDUAL WATER LEVELS (m)**





**Figure 3**  
**NOVEMBER 2004**  
**SIX MINUTE RESIDUALS**  
**ADJUSTED FOR ATMOSPHERIC PRESSURE (m)**

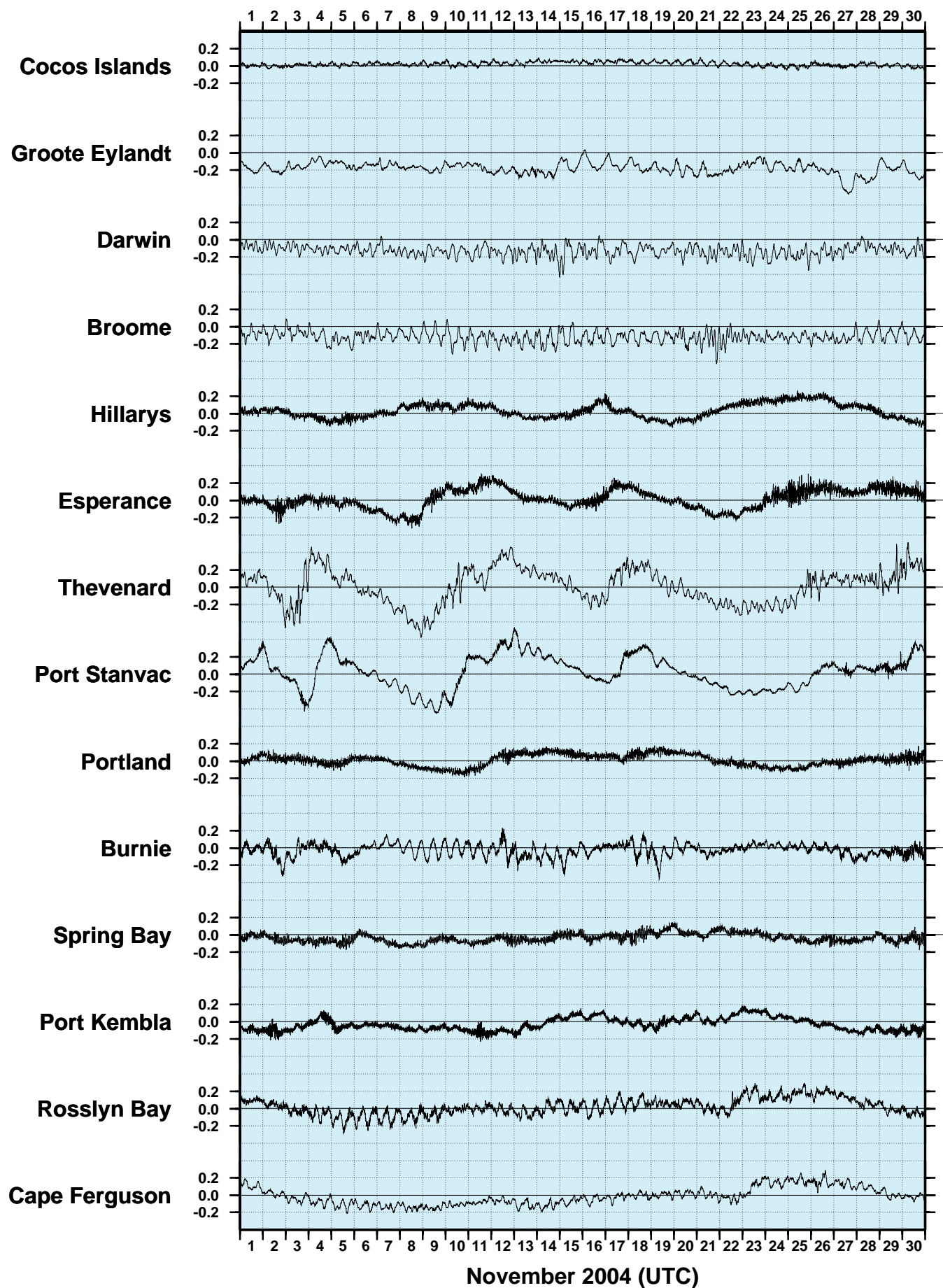


Figure 4

**NOVEMBER 2004  
HOURLY WIND SPEEDS (m/s)**

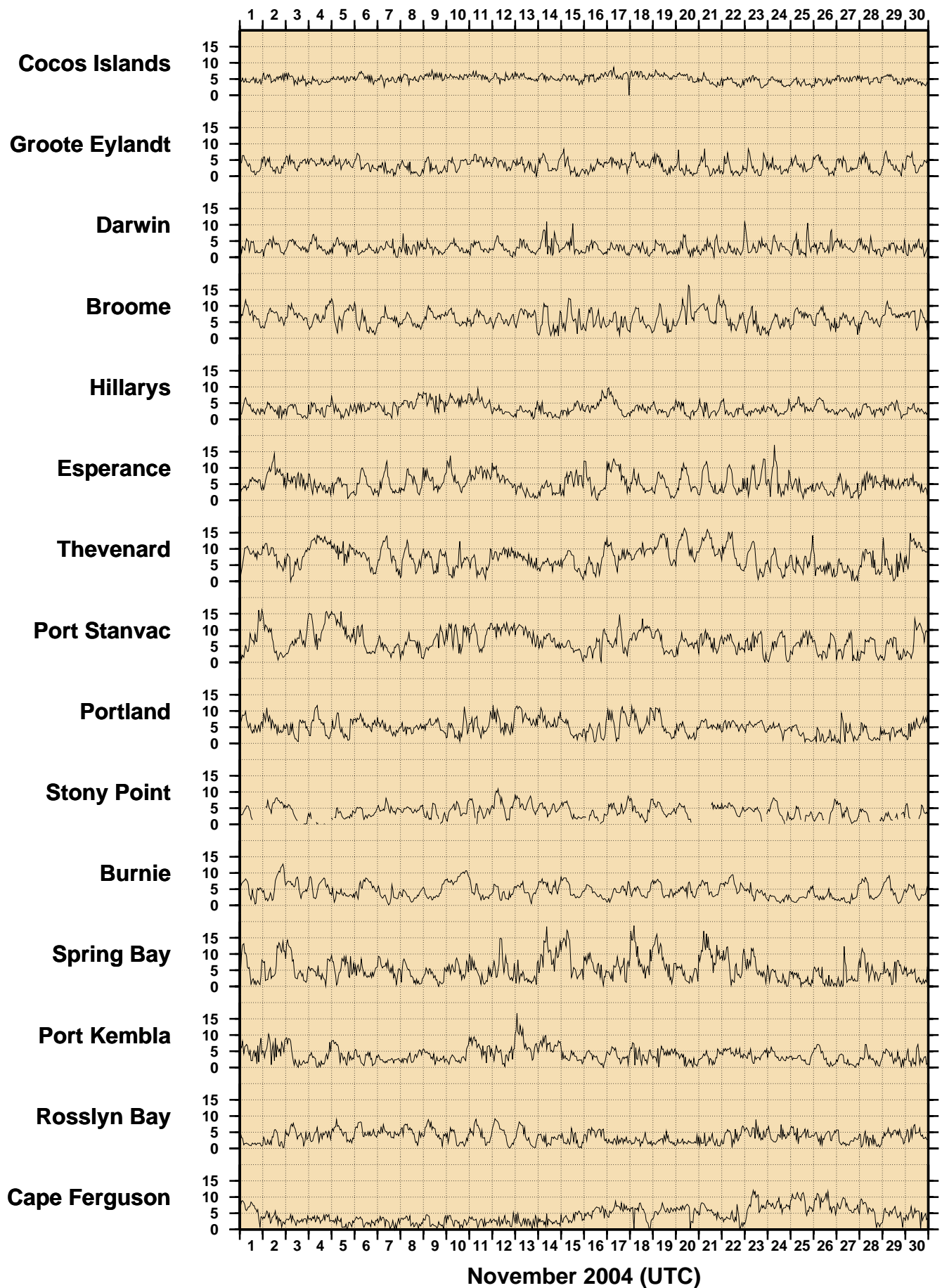


Figure 5

NOVEMBER 2004  
HOURLY INCIDENT WINDS (m/s, deg True)

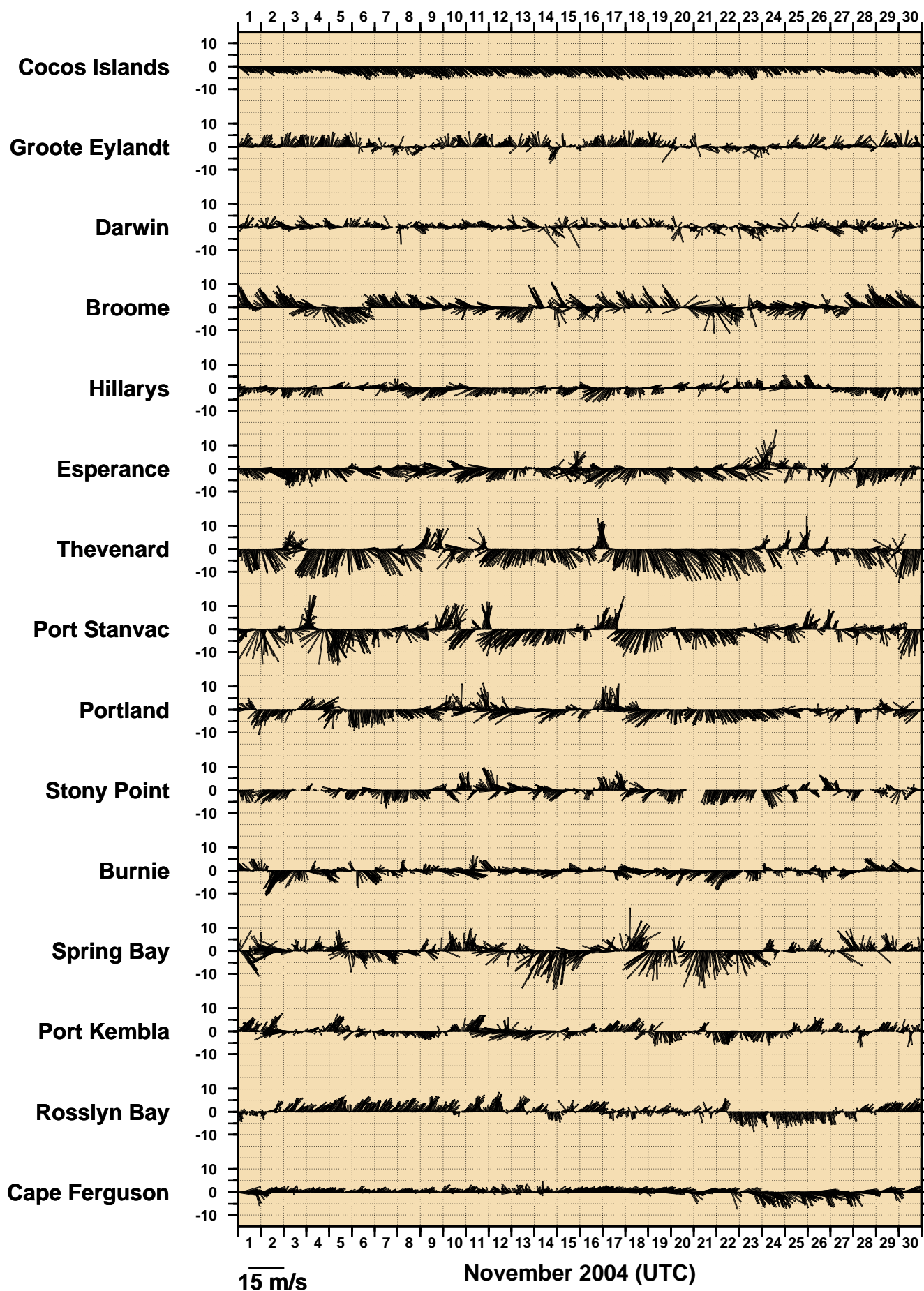


Figure 6

**NOVEMBER 2004**  
**HOURLY MAXIMUM WIND GUSTS (m/s)**

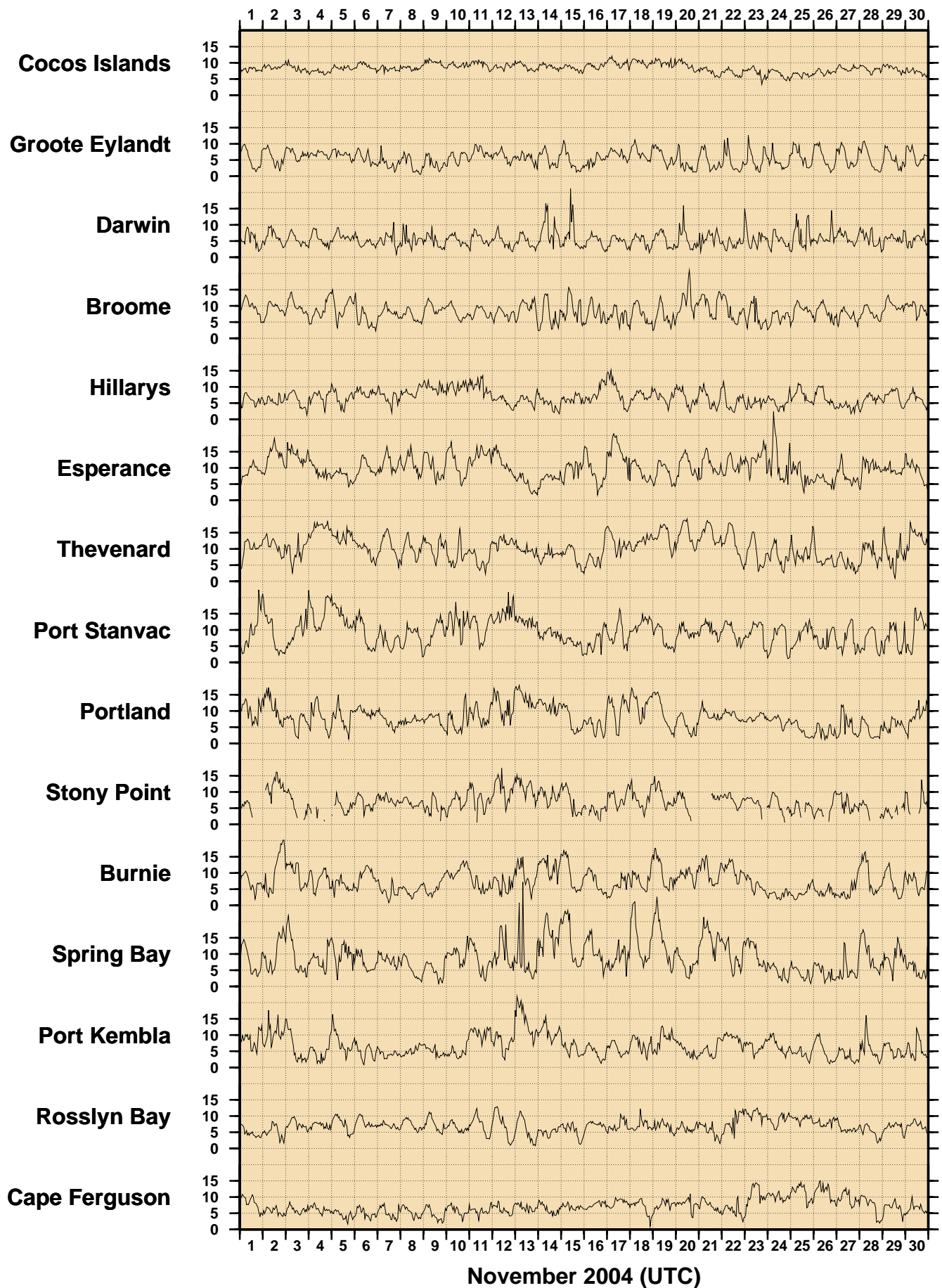




Figure 7

**NOVEMBER 2004**  
**HOURLY AIR TEMPERATURES (°C)**

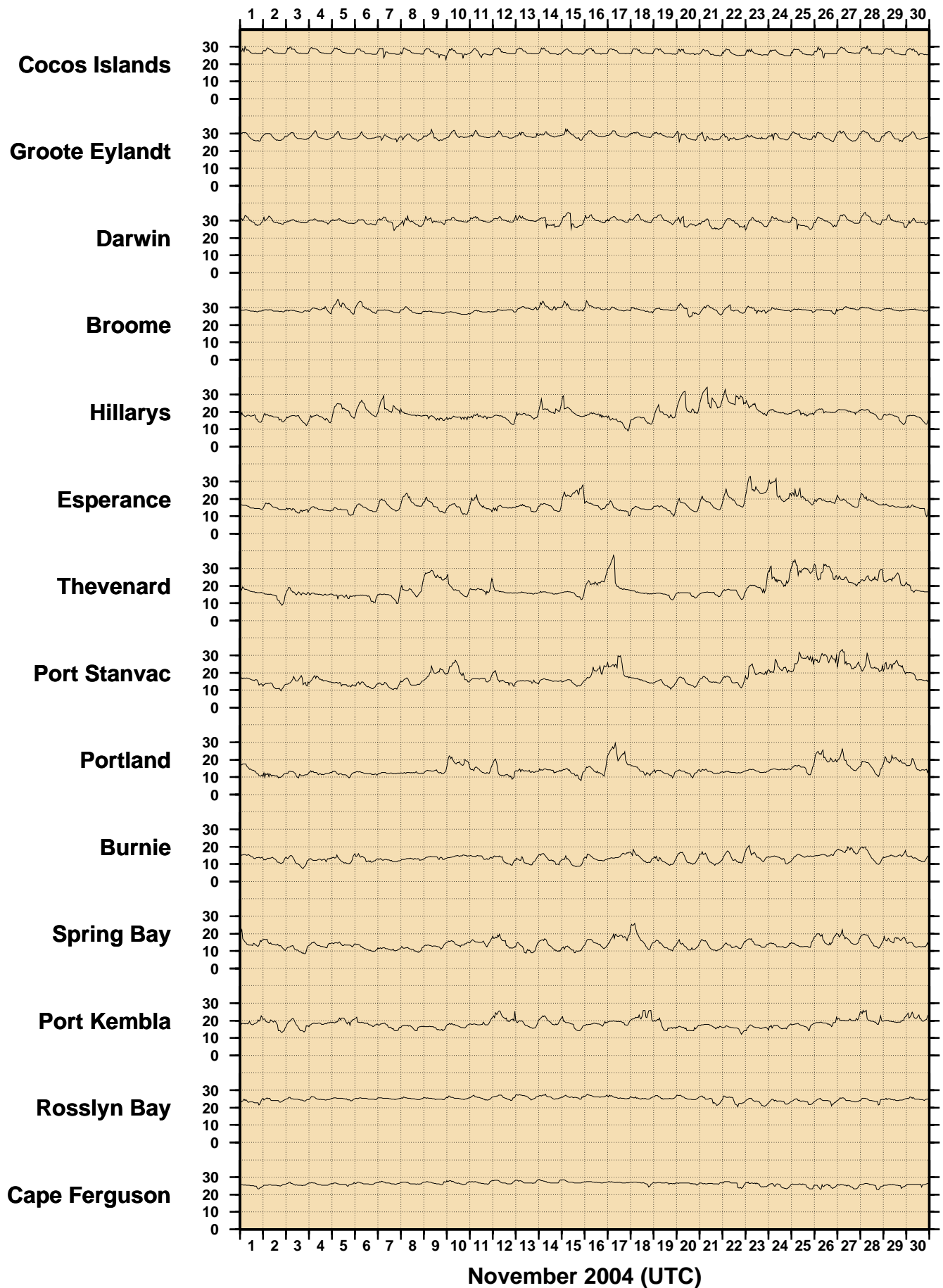


Figure 8

NOVEMBER 2004  
HOURLY WATER TEMPERATURES (°C)

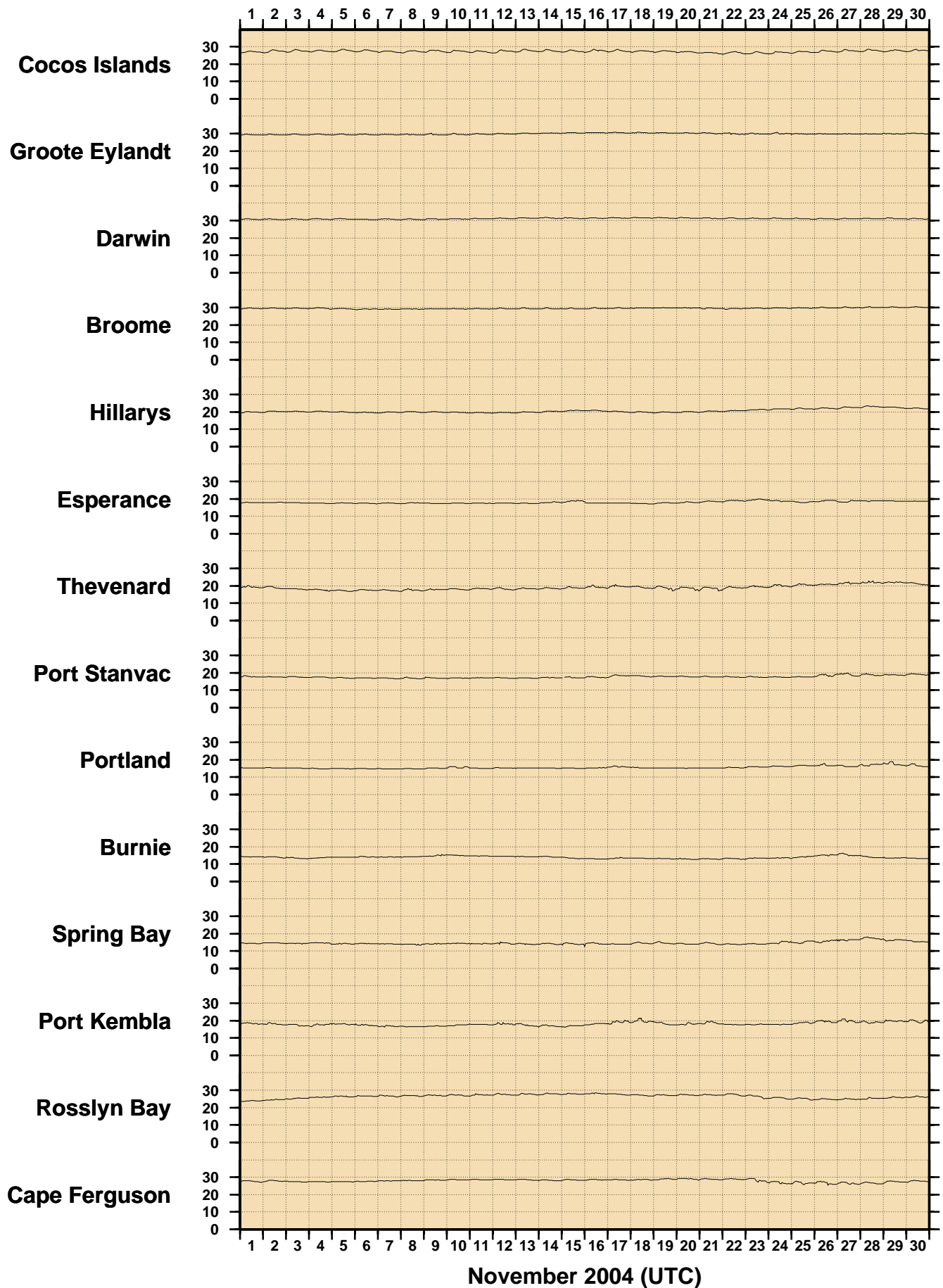
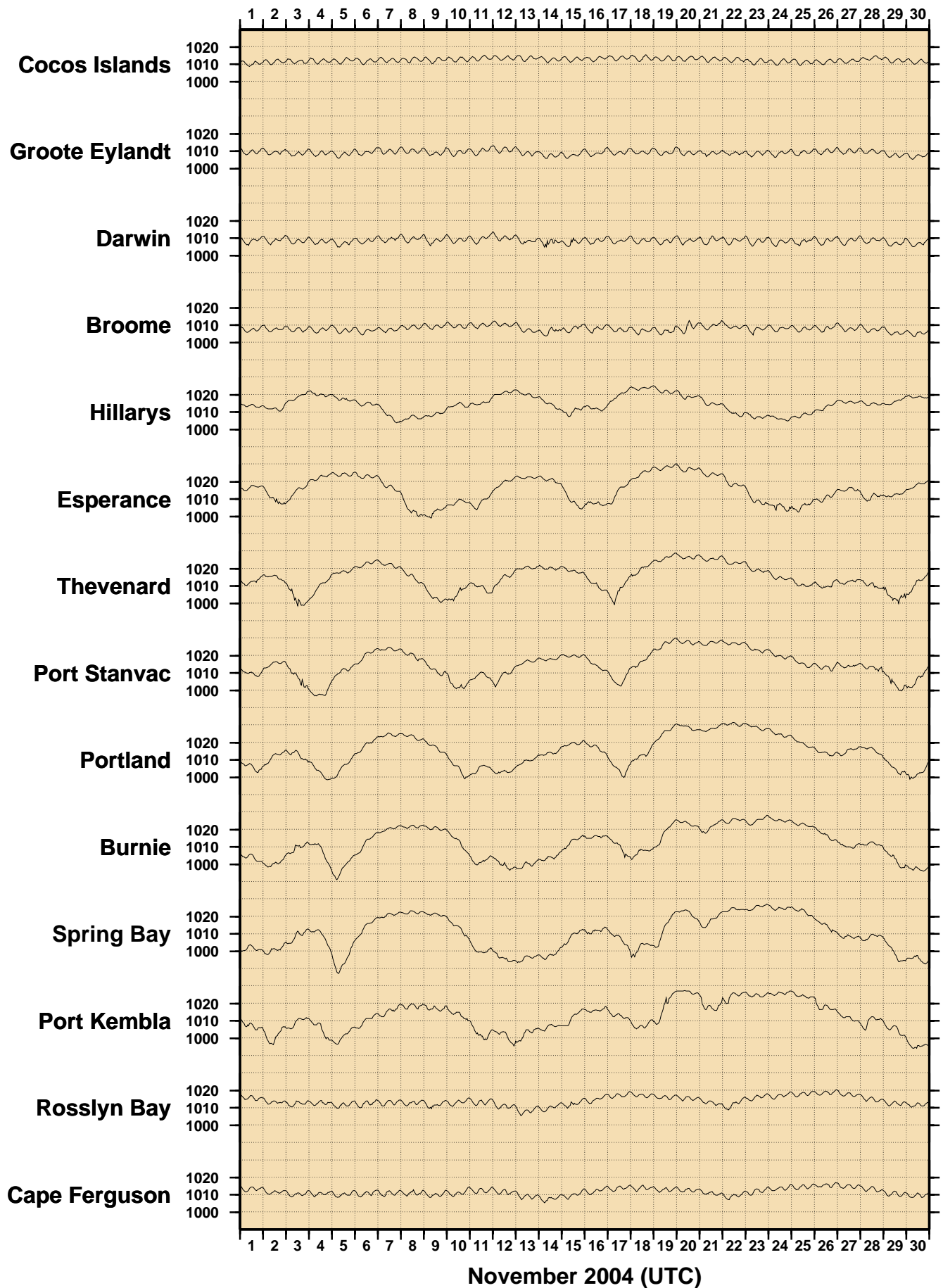
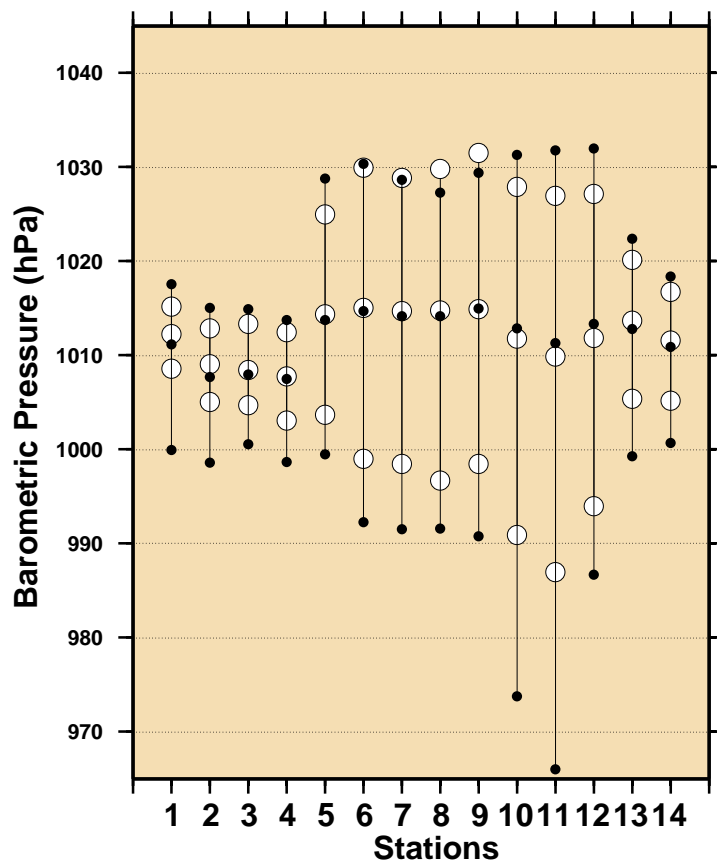
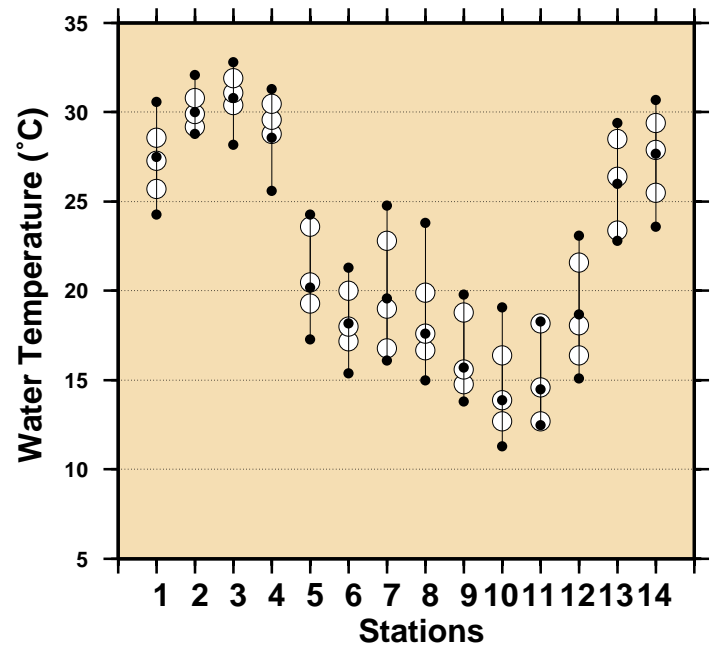
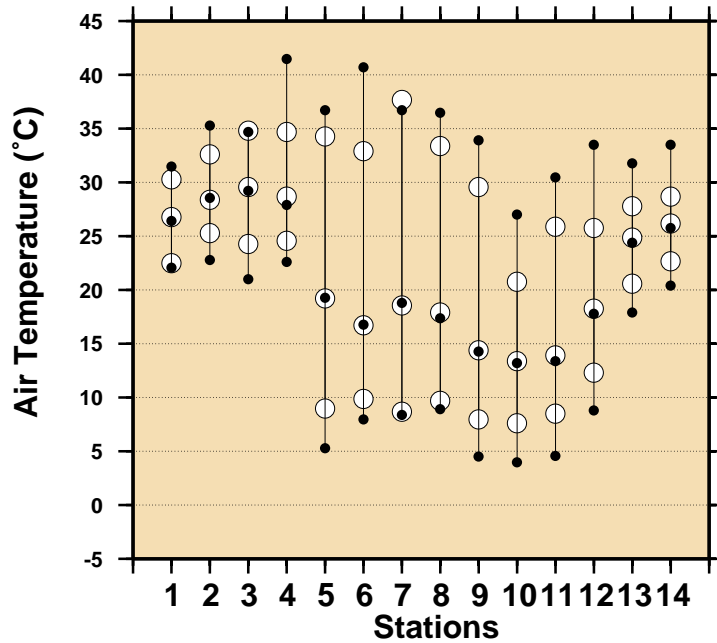


Figure 9

**NOVEMBER 2004  
HOURLY ATMOSPHERIC PRESSURE (hPa)**



**Figure 10**  
**Comparison of November 2004 Max, Min & Mean with**  
**Long Term November Values.**



### 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

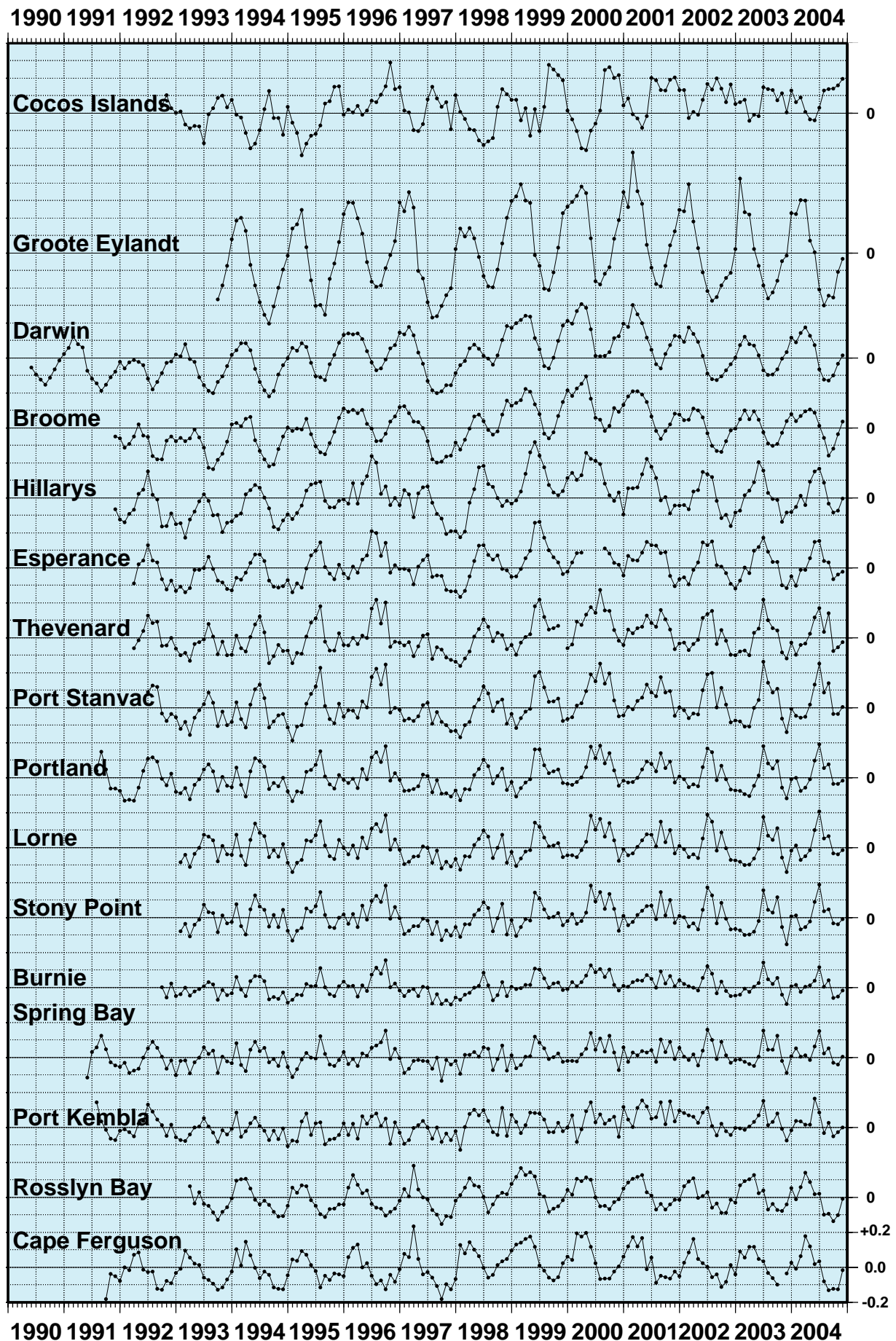
- November 2004 Maximum
- November 2004 Mean
- November 2004 Minimum
- Long Term November Maximum
- Long Term November Mean
- Long Term November Minimum



**Figure 11**

**MONTHLY MEAN SEA LEVELS TO NOVEMBER 2004 (m)**

The zero line represents an arbitrary fixed offset from the zero of the tide gauge.



**Figure 12**  
**SEA LEVEL ANOMALIES THROUGH NOVEMBER 2004 (m)**

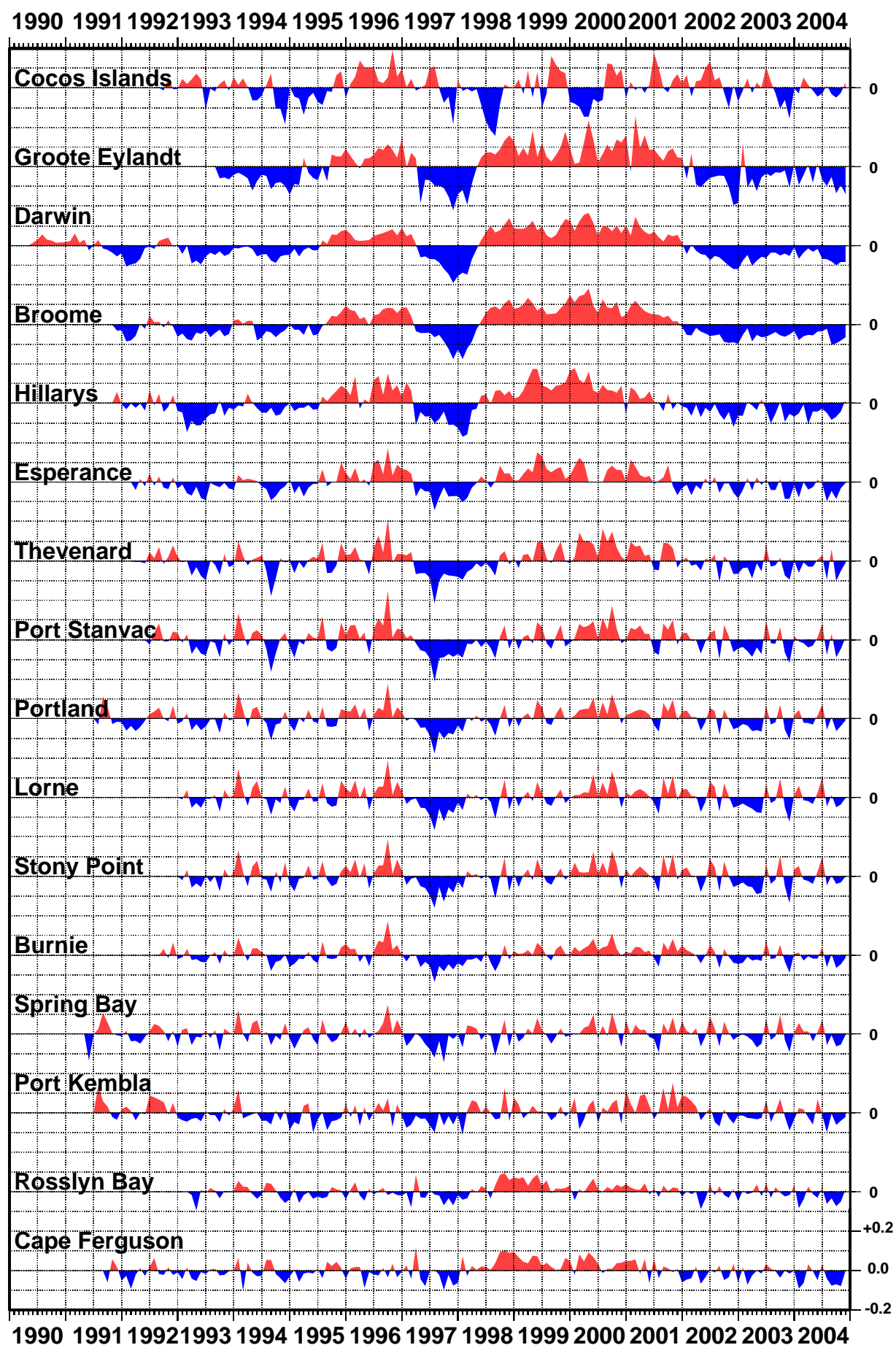


Figure 13

SEA LEVEL TRENDS THROUGH NOVEMBER 2004 (mm/year)

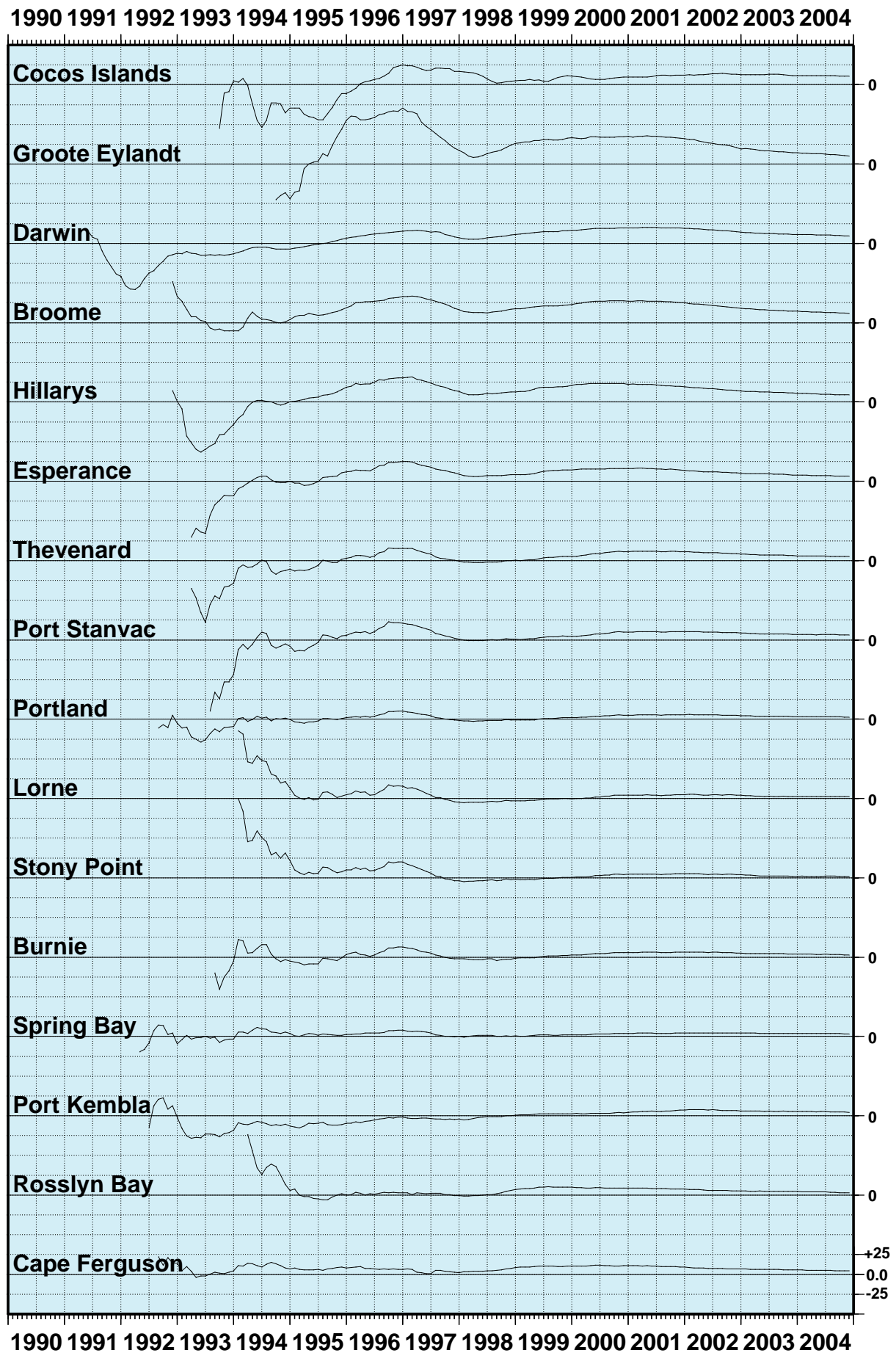


Figure 14

# BAROMETRIC PRESSURE ANOMALIES THROUGH NOVEMBER 2004 (hPa)

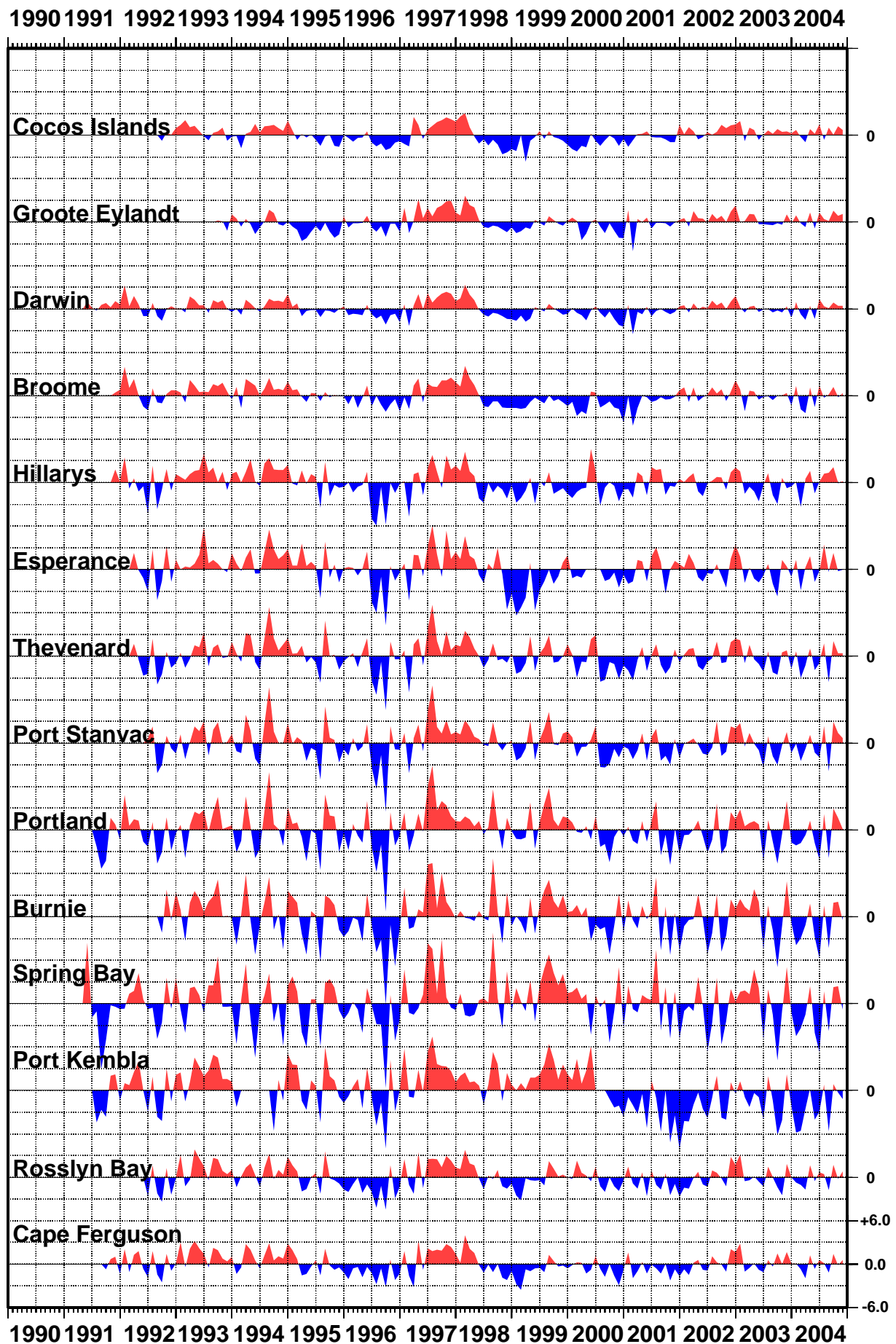
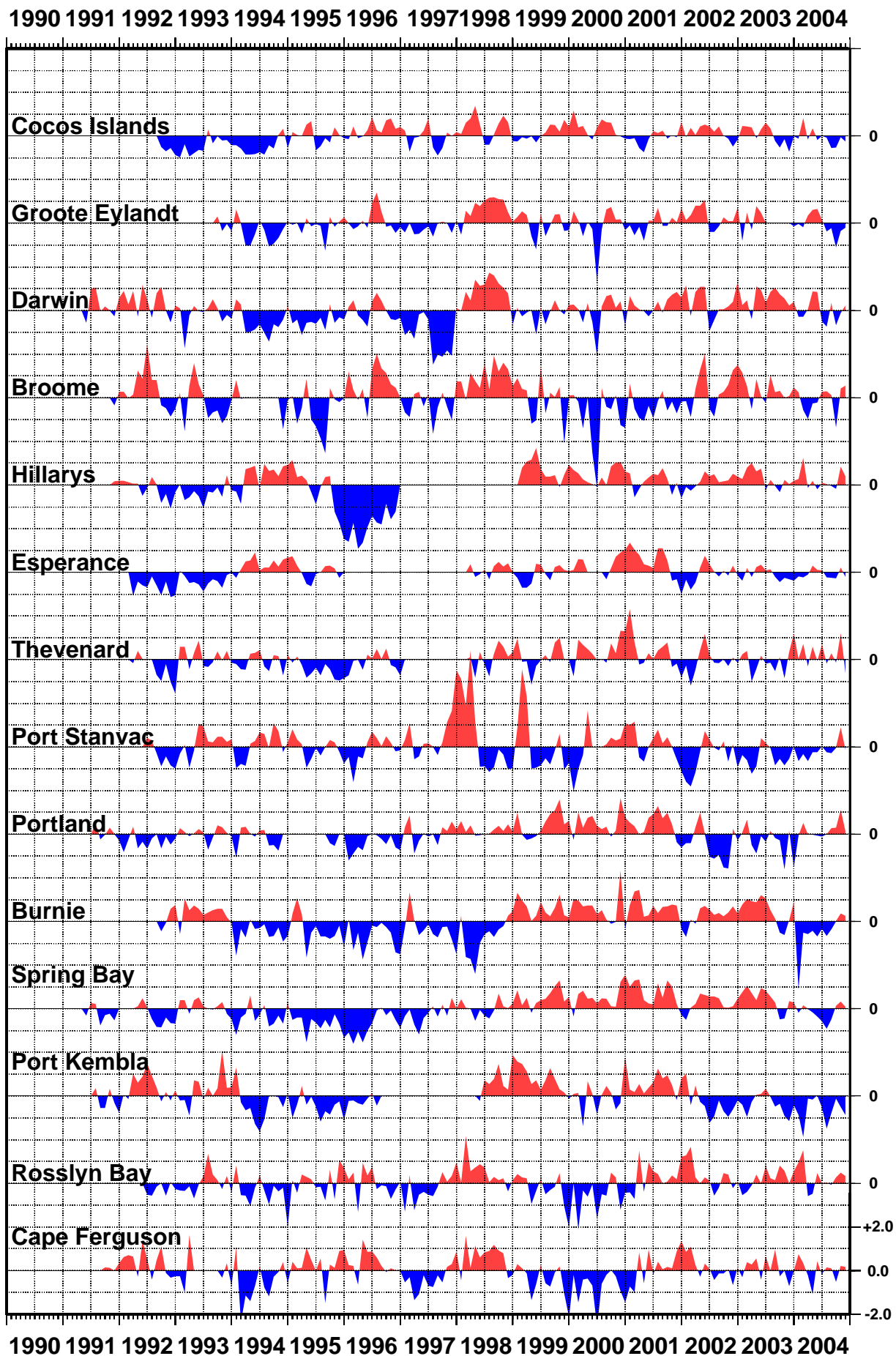
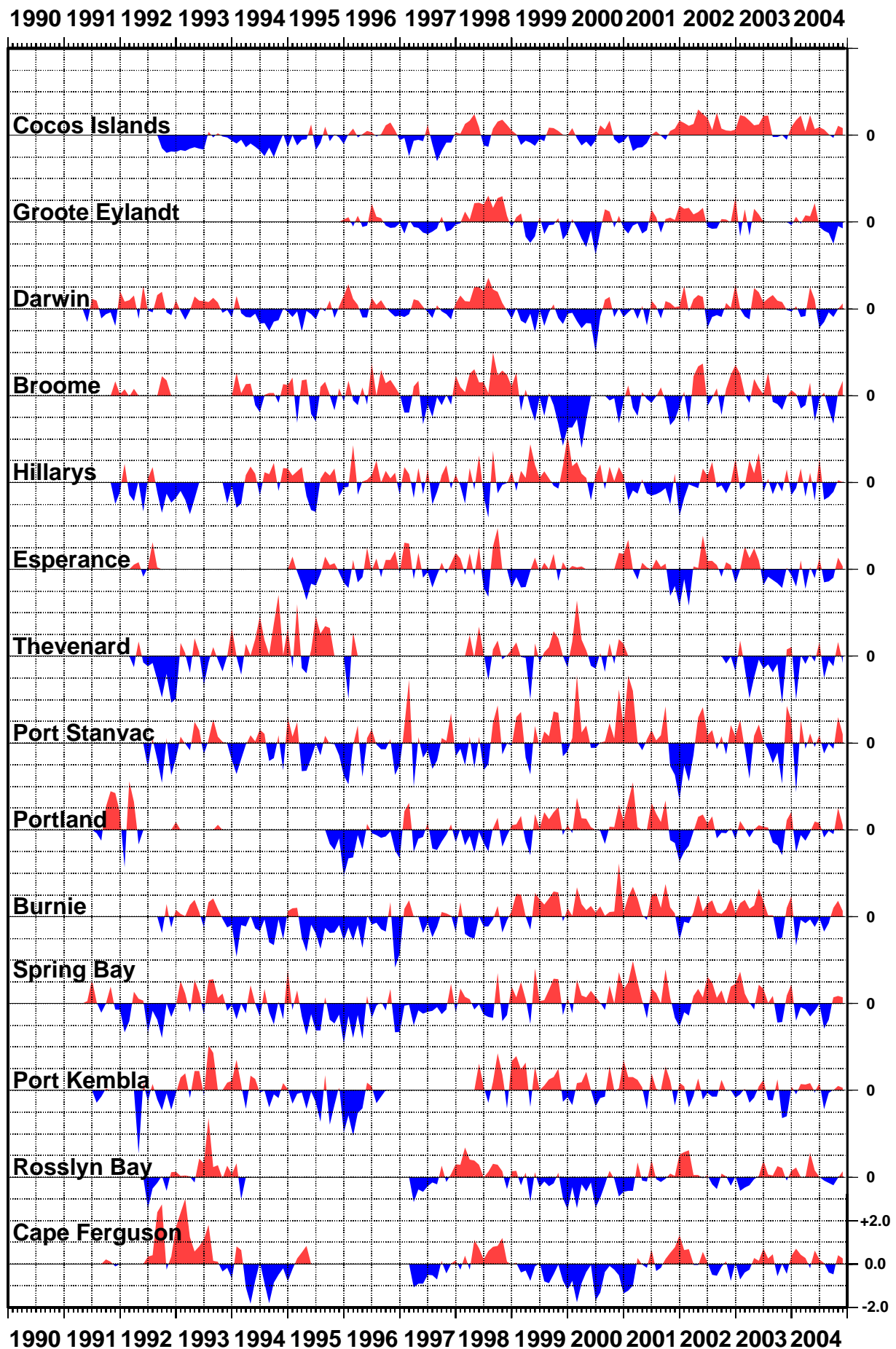


Figure 15

# WATER TEMPERATURE ANOMALIES THROUGH NOVEMBER 2004 (°C)



**Figure 16**  
**AIR TEMPERATURE ANOMALIES**  
**THROUGH NOVEMBER 2004 (°C)**



# Figure 17 SEA LEVEL DATA RETURN

THE NUMBER OF DAYS OF MISSING DATA ARE INDICATED  
GAPS INCLUDE TRANSMISSION, POWER AND LOGGER FAILURE

\* Patchy record

