

**THE AUSTRALIAN BASELINE SEA LEVEL  
MONITORING PROJECT**

**MONTHLY DATA REPORT**

**SEPTEMBER 2005**



**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 September 2005 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**

**SEPTEMBER 2005**

### **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 SEPTEMBER 2005**

Sea level data return (Figures 1 and 17) in September was good 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, gust and direction data from Port Stanvac was erroneous during September. These values and the corresponding incident winds have been removed.

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 September values. Note that the long-term ranges are calculated using the historical sets of September data for each station *excluding* the current month of data.

The air temperatures for September 2005 were generally consistent with the long-term September air temperatures for most sites. The minimum air temperature at Hillarys (5.6°C) was below the previous September minima.

Water temperature and barometric pressure for September 2005 were consistent with the long-term September means for all sites.

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) were negative across Northern Australia from Broome to Port Kembla and positive (near normal in the south east) at the remaining sites on the Southern seaboard.

Figure 13 shows the evolution of the short-term sea level trend for each site during the life of the Australian Baseline Sea Level Monitoring Project. Table 1 lists the commencement of operation, the latest sea level trend, and the change in trend with respect to the previous month's analysis.

Barometric pressure anomalies (Figure 14) were negative at all sites and close to normal across the Northern seaboard.

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.

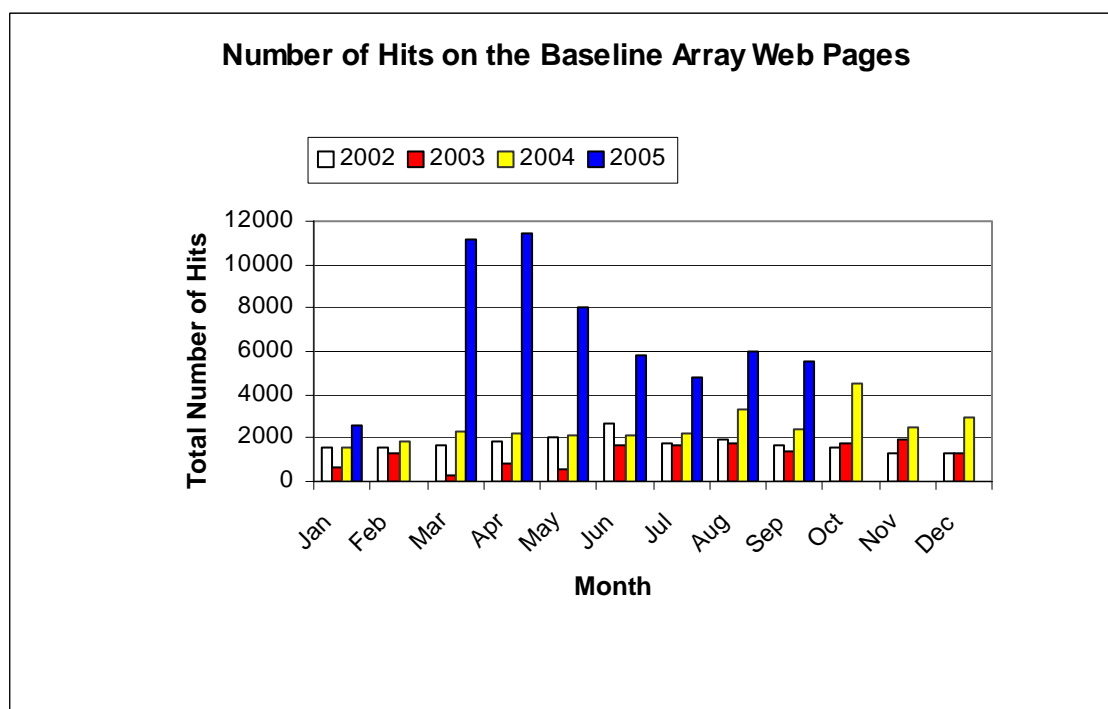
The number of hits to the Australian Baseline Sea Level Monitoring project web pages from 2002 to September 2005 is given in Table 2.

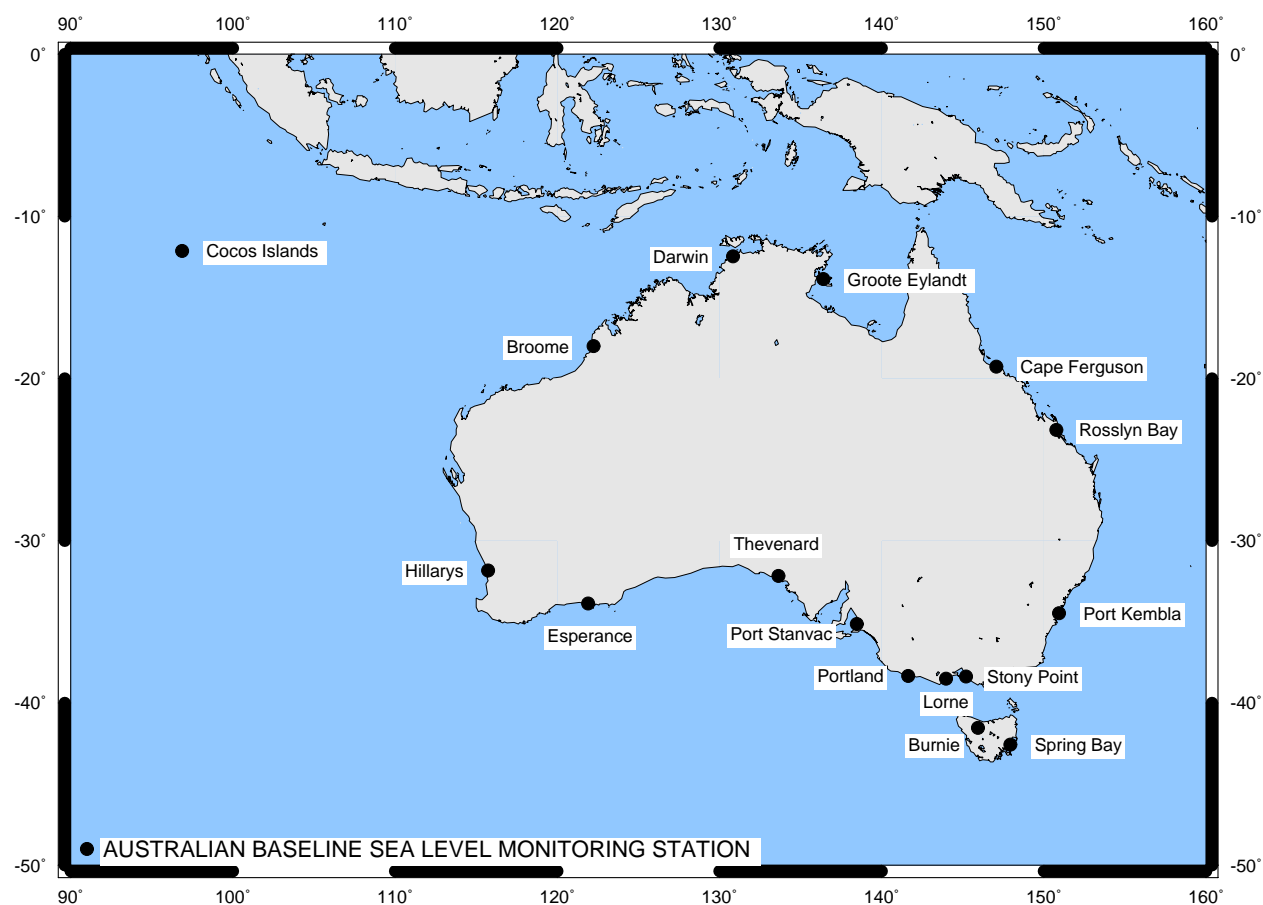
*Please note: Tide gauges at Stony Point and Lorne do not record air temperature, water temperature and barometric pressure data and are not present in Figures 3,7,8,9,11,12,13 and 16. The tide gauge at Lorne does not record wind data and is not present in Figures 4, 5 and 6.*

**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 September 2005.**

Location	Installation Date	Sea Level Trend (mm/yr)	Change from previous month
Cocos Islands	Sep 1992	+10.5	-0.2
Groote Eylandt	Sep 1993	+6.9	-0.1
Darwin	May 1990	+7.9	-0.1
Broome	Nov 1991	+10.1	-0.1
Hillarys	Nov 1991	+8.2	+0.1
Esperance	Mar 1992	+5.4	+0.2
Thevenard	Mar 1992	+4.3	+0.2
Port Stanvac	Jun 1992	+5.5	+0.2
Portland	Jul 1991	+2.6	+0.1
Lorne	Jan 1993	+2.1	+0.1
Stony Point	Jan 1993	+1.7	+0.1
Burnie	Sep 1992	+2.5	+0.1
Spring Bay	May 1991	+3.2	0.0
Port Kembla	Jul 1991	+3.8	0.0
Rosslyn Bay	Jun 1992	+2.5	-0.1
Cape Ferguson	Sep 1991	+3.3	-0.2

**Table 2: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2002 to September 2005. Note that the web hits for February 2005 are not available due to technical difficulties.**





**Figure A: Australian Baseline Sea Level Monitoring Project sites.**

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.

Contact address:

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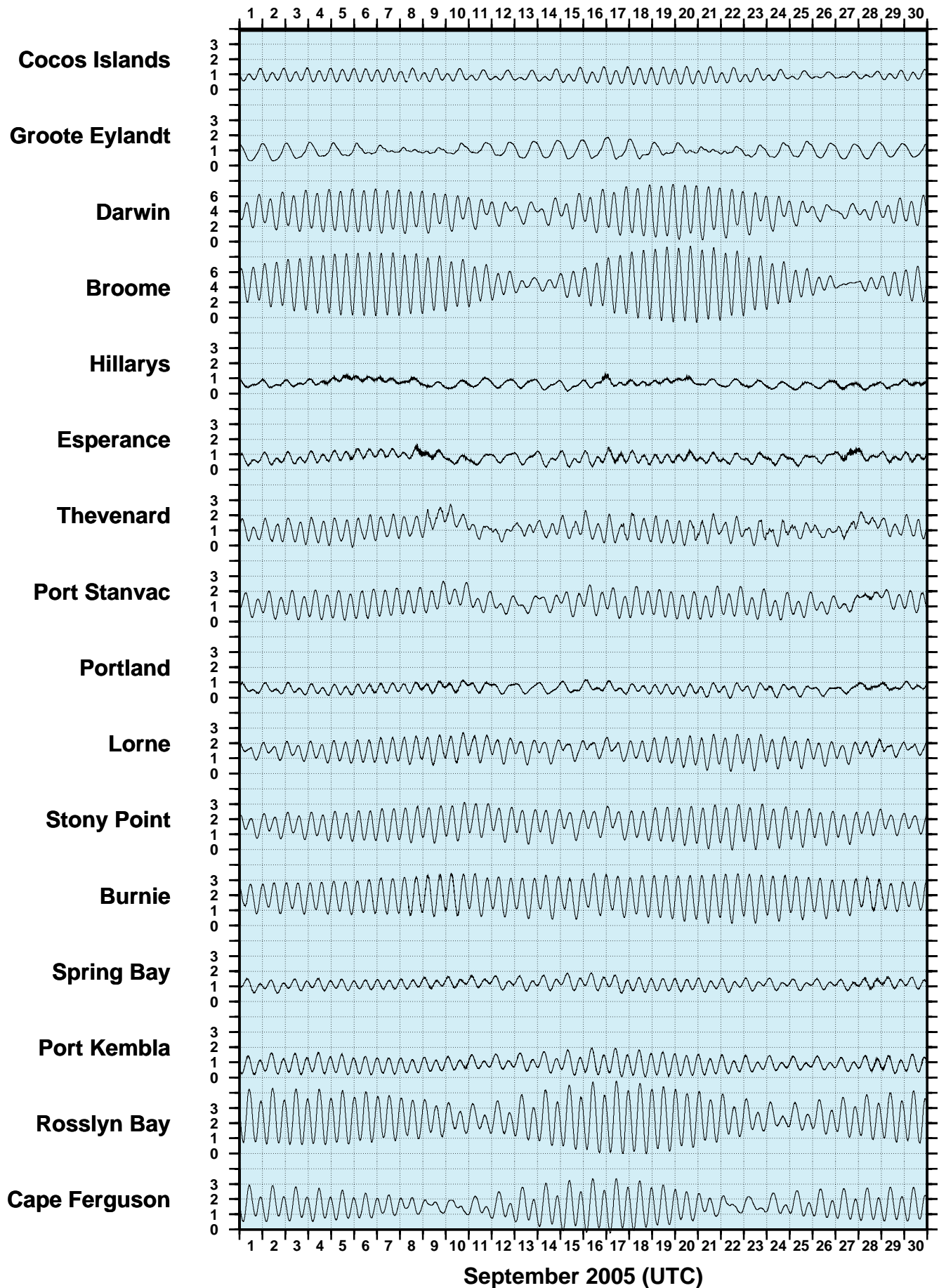
Please note the following:

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**

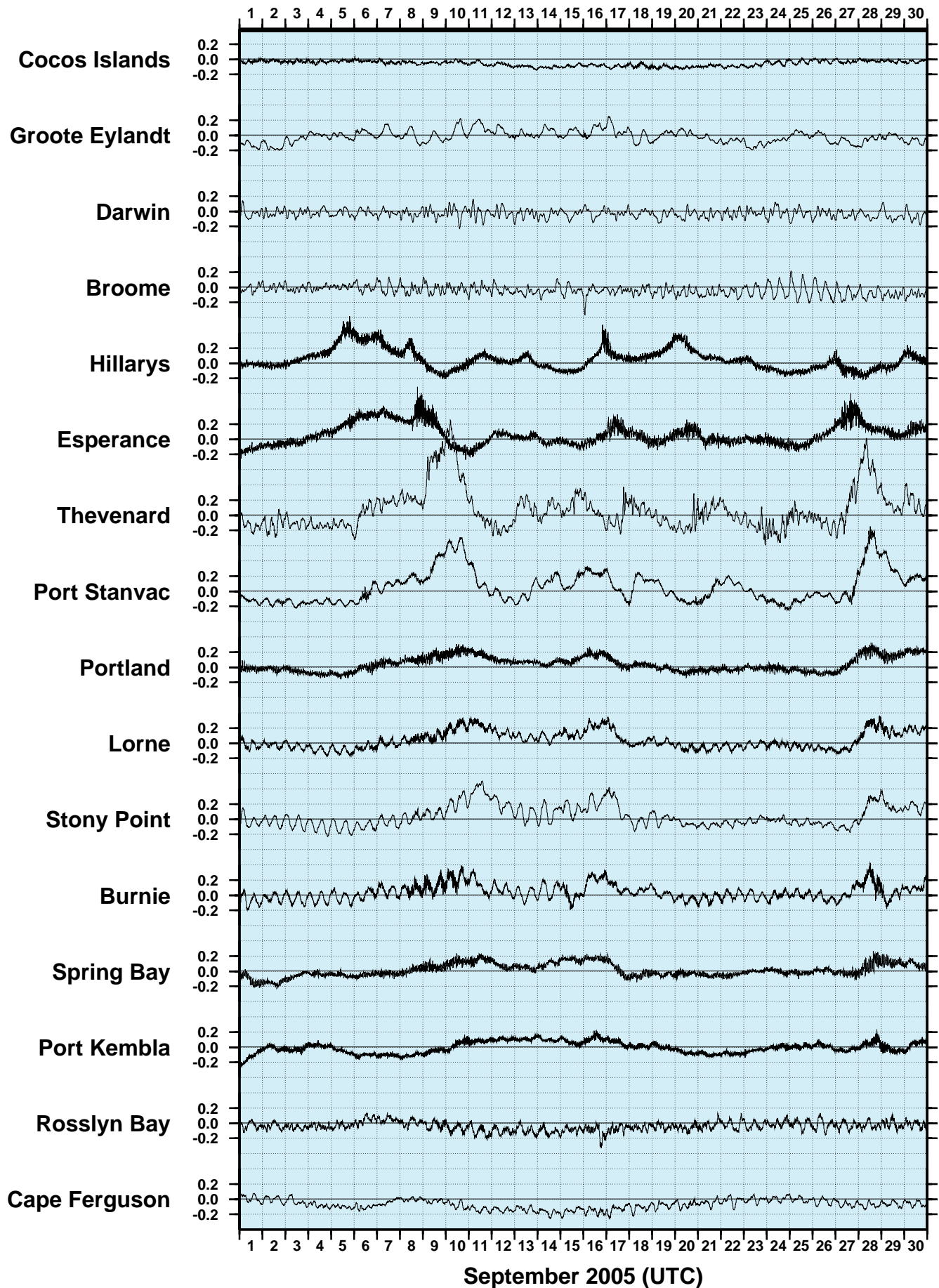
**SEPTEMBER 2005  
SIX MINUTE SEA LEVEL OBSERVATIONS (m)**





**Figure 2**

**SEPTEMBER 2005  
SIX MINUTE RESIDUAL WATER LEVELS (m)**



**Figure 3**  
**SEPTEMBER 2005**  
**SIX MINUTE RESIDUALS**  
**ADJUSTED FOR ATMOSPHERIC PRESSURE (m)**

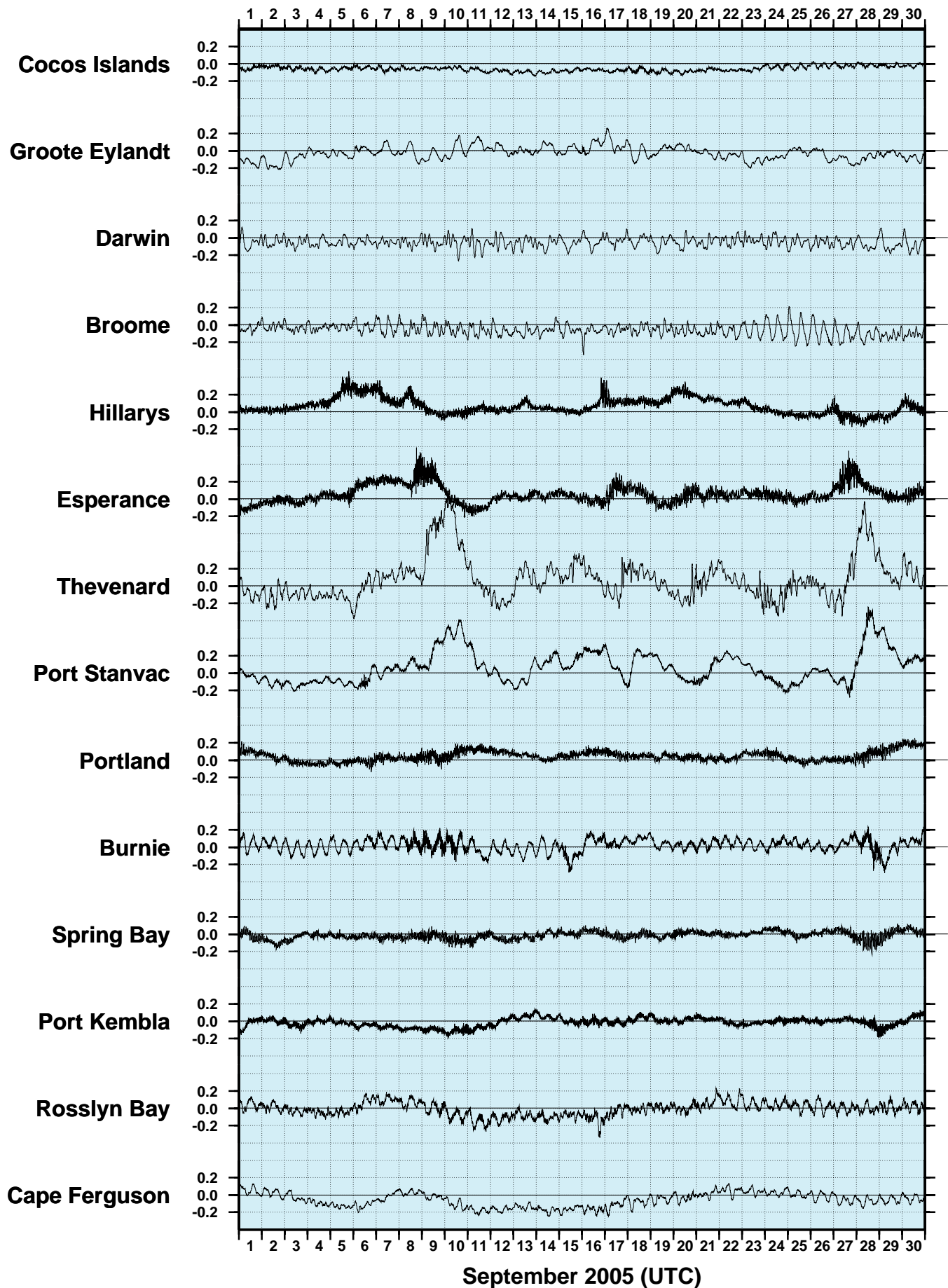


Figure 4

**SEPTEMBER 2005  
HOURLY WIND SPEEDS (m/s)**

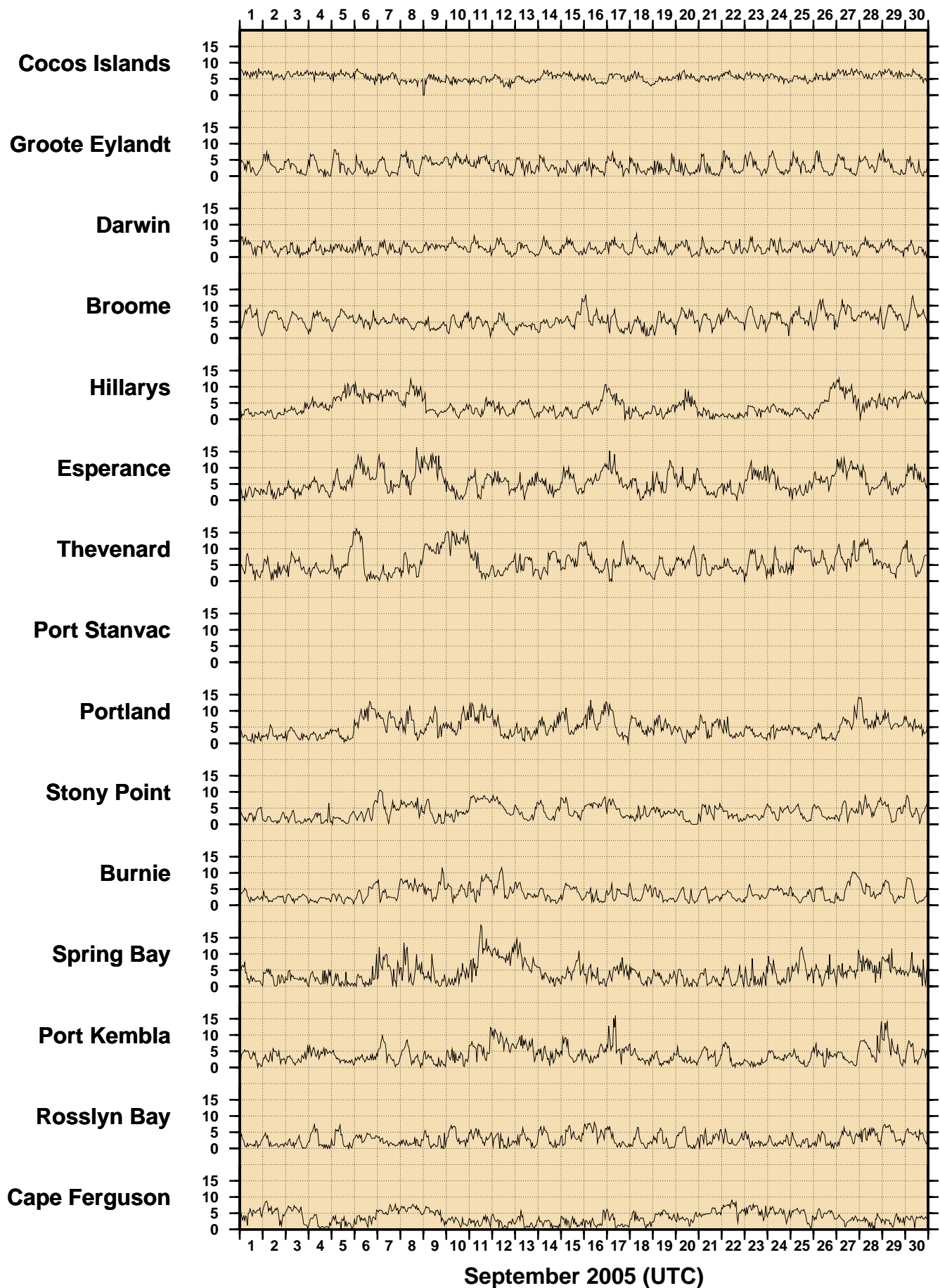


Figure 5

SEPTEMBER 2005  
HOURLY INCIDENT WINDS (m/s, deg True)

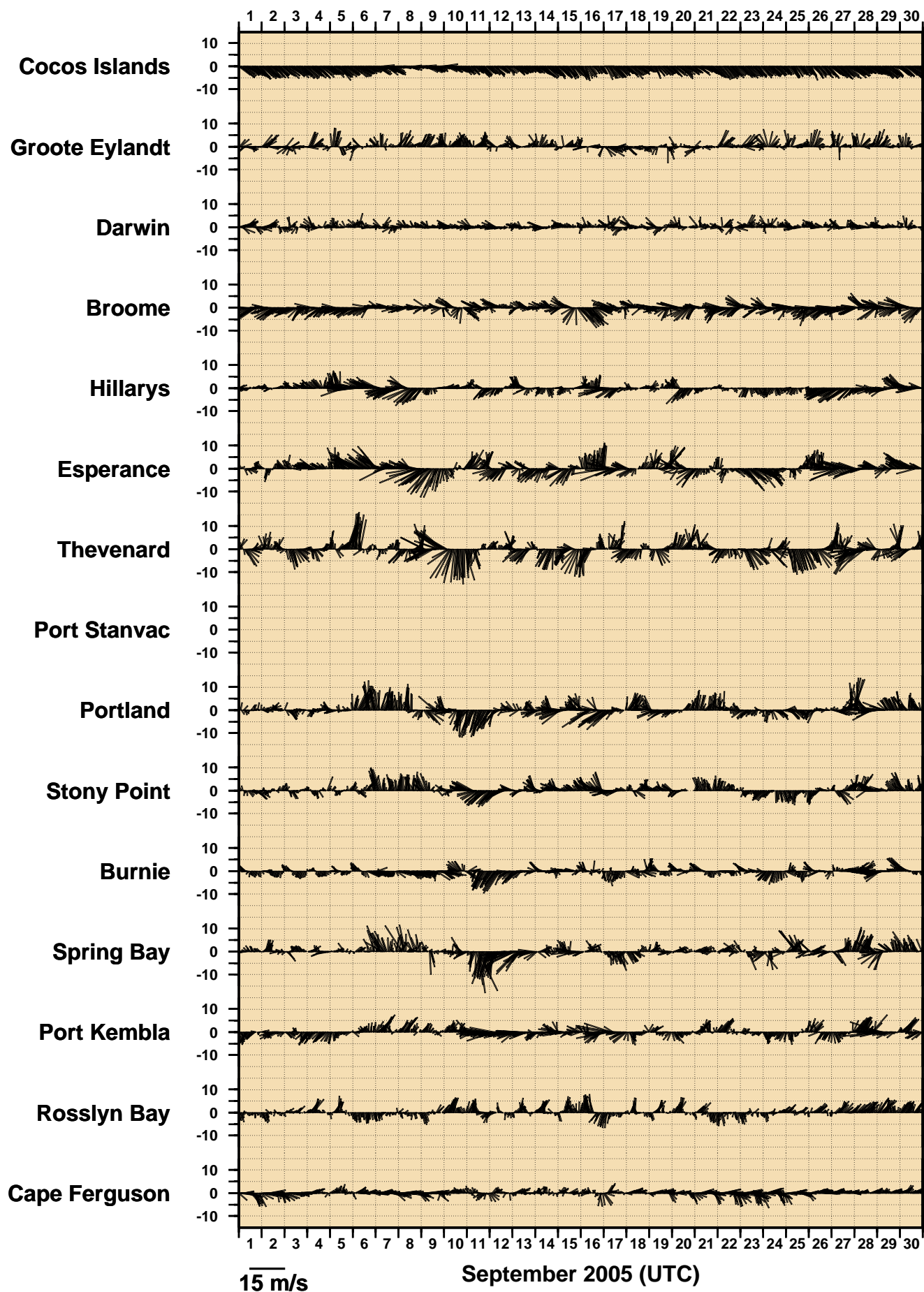


Figure 6

**SEPTEMBER 2005**  
**HOURLY MAXIMUM WIND GUSTS (m/s)**

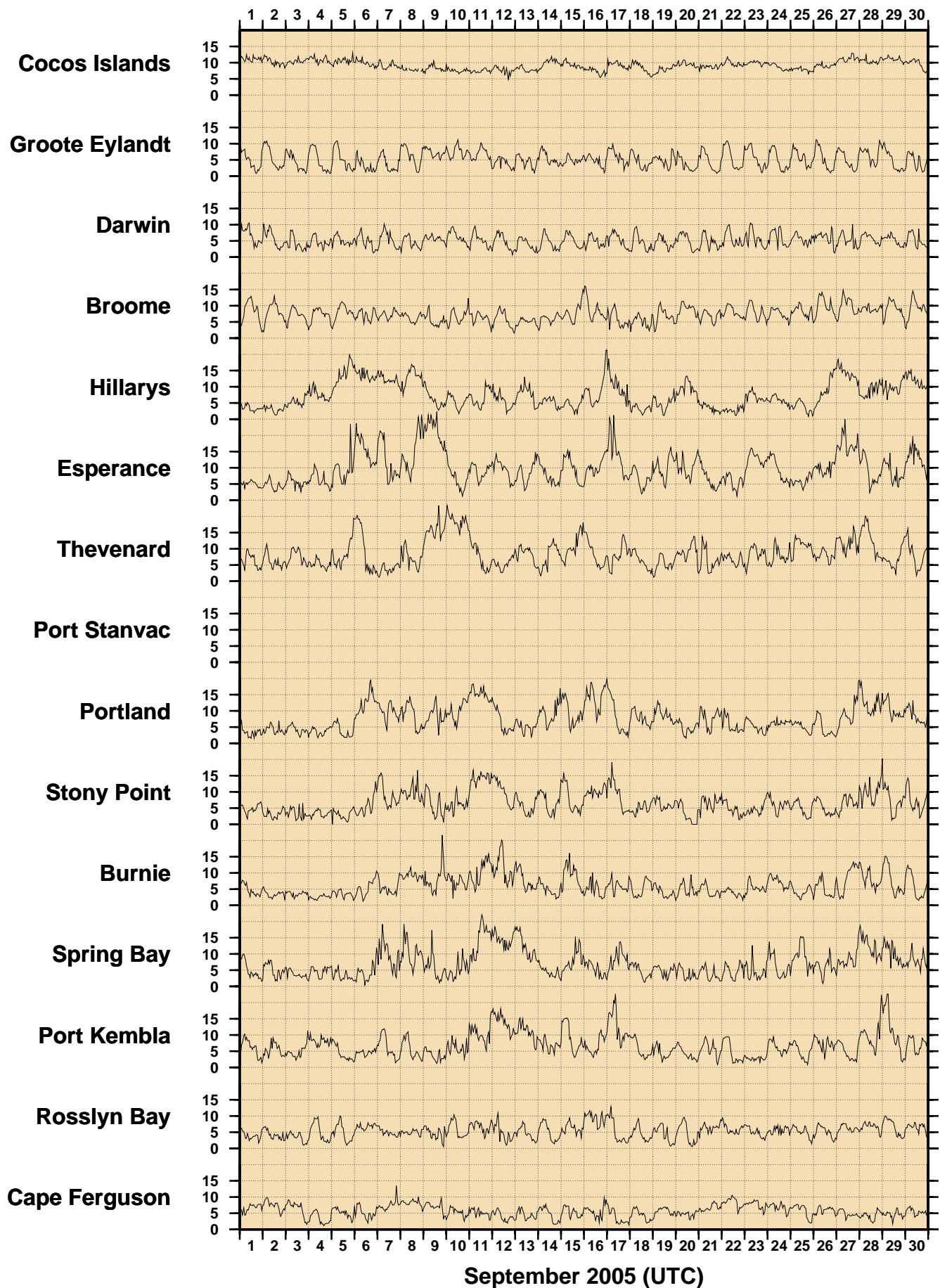




Figure 7

SEPTEMBER 2005  
HOURLY AIR TEMPERATURES (°C)

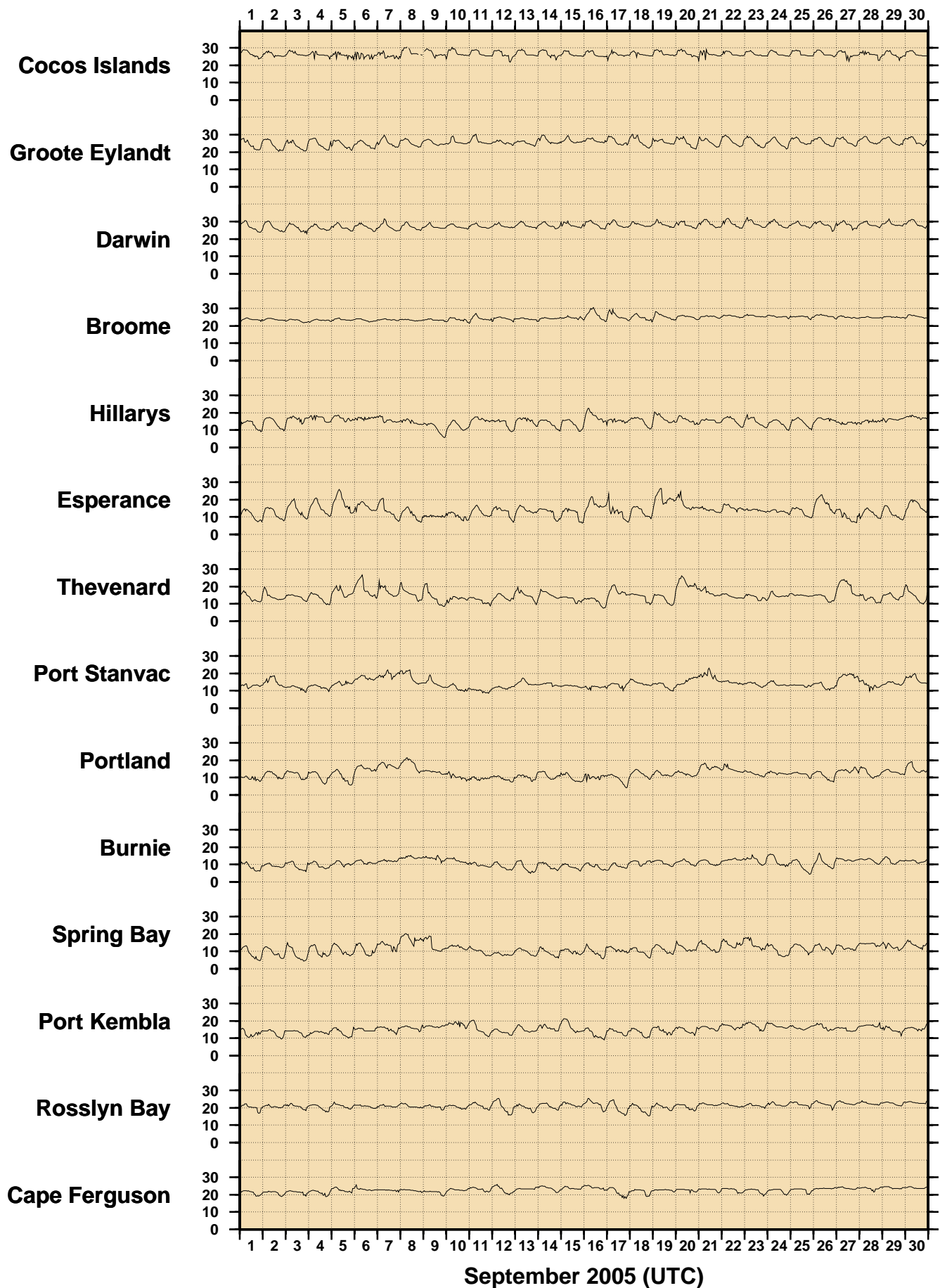


Figure 8

SEPTEMBER 2005  
HOURLY WATER TEMPERATURES (°C)

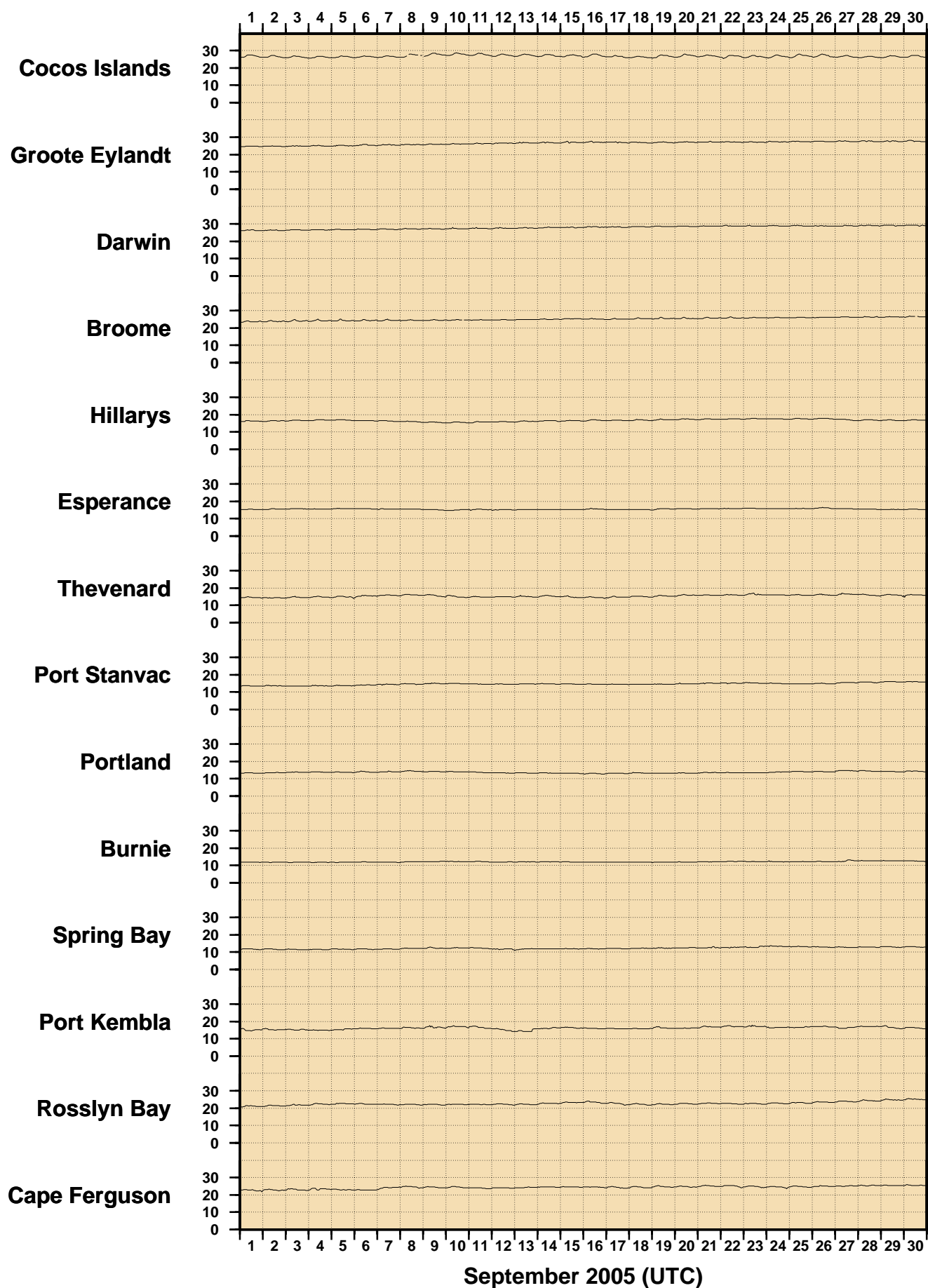
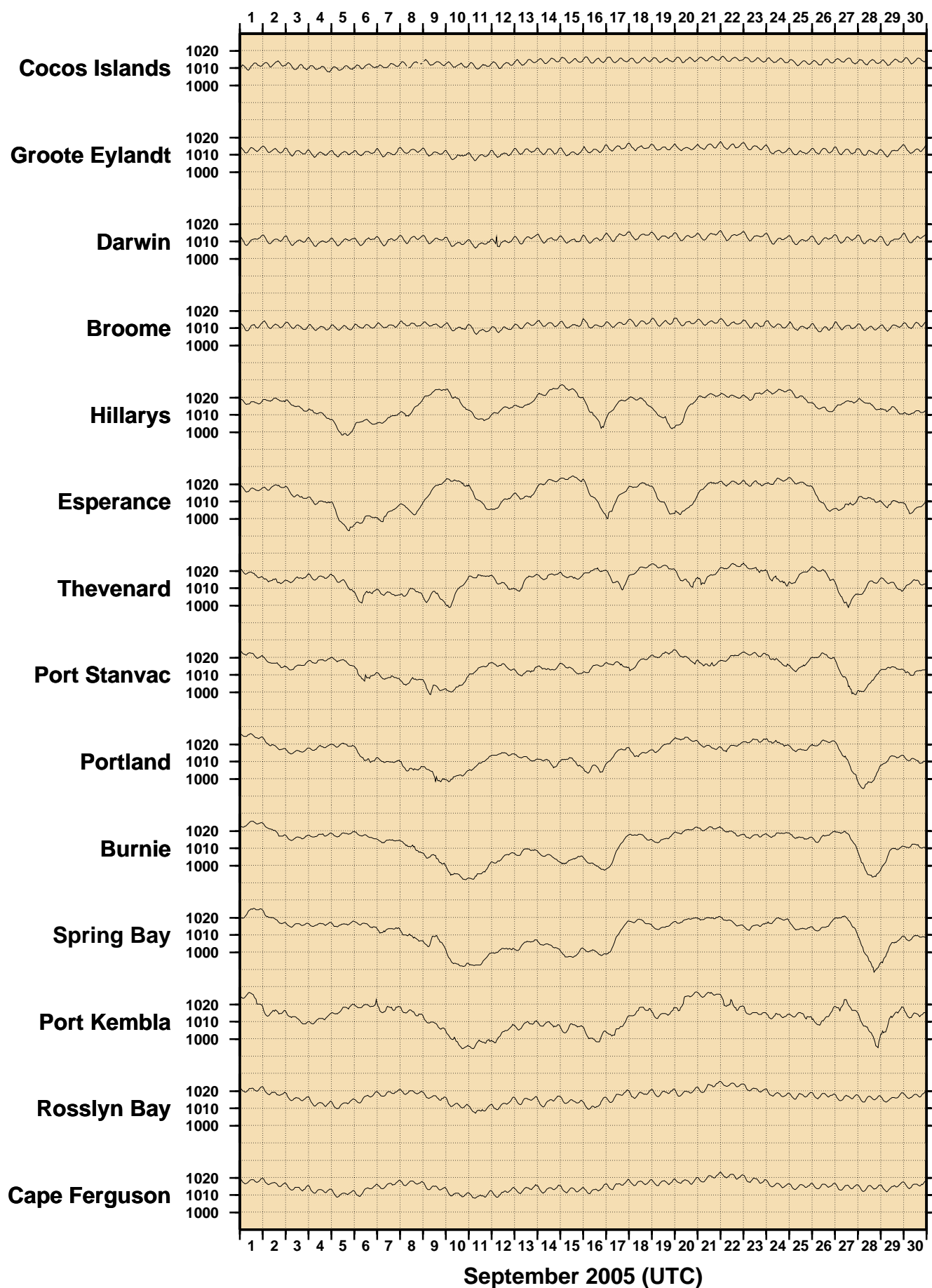


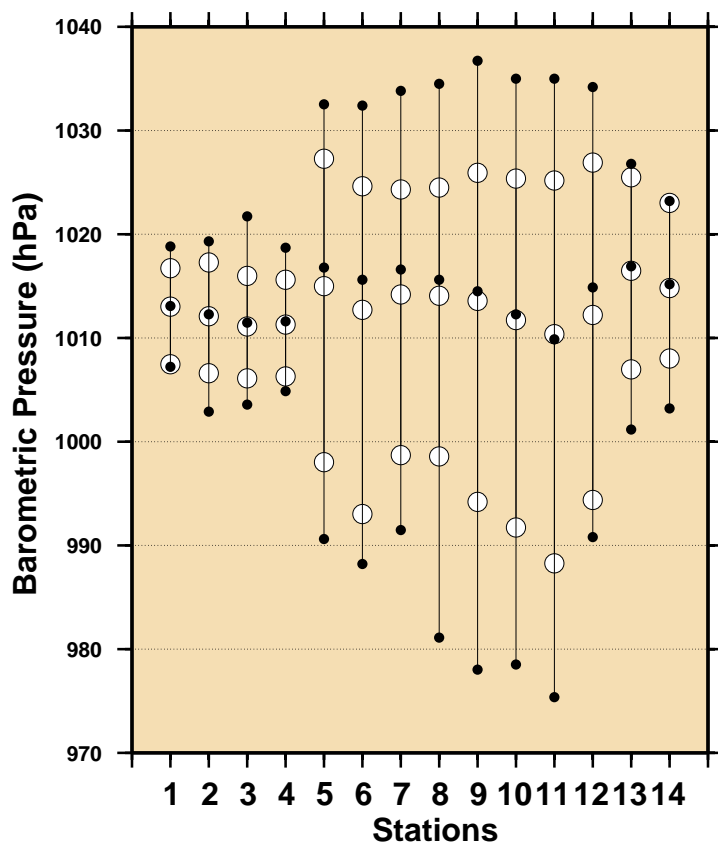
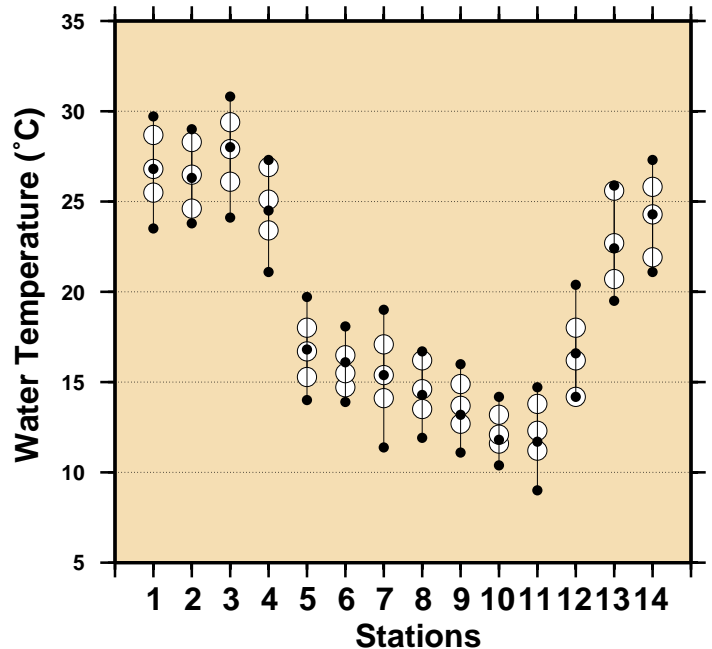
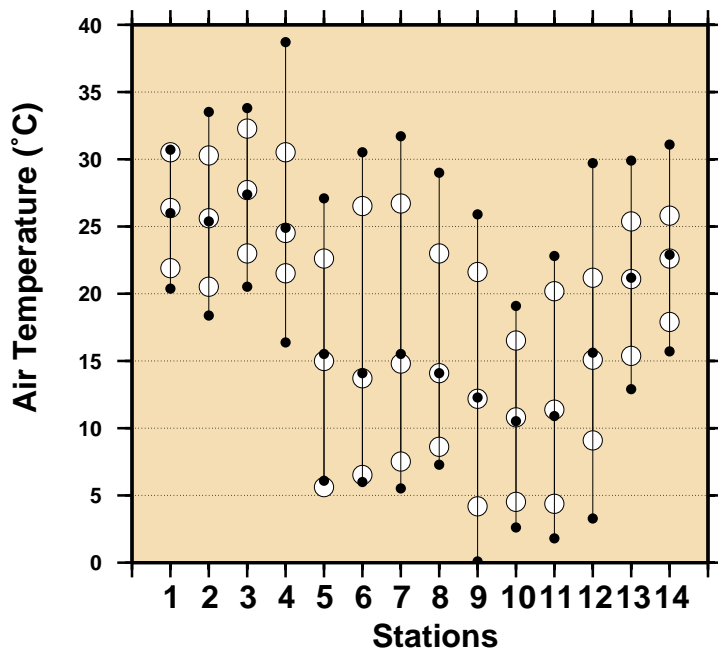
Figure 9

**SEPTEMBER 2005**  
**HOURLY ATMOSPHERIC PRESSURE (hPa)**





**Figure 10**  
**Comparison of September 2005 Max, Min & Mean with**  
**Long Term September Values.**



### Stations

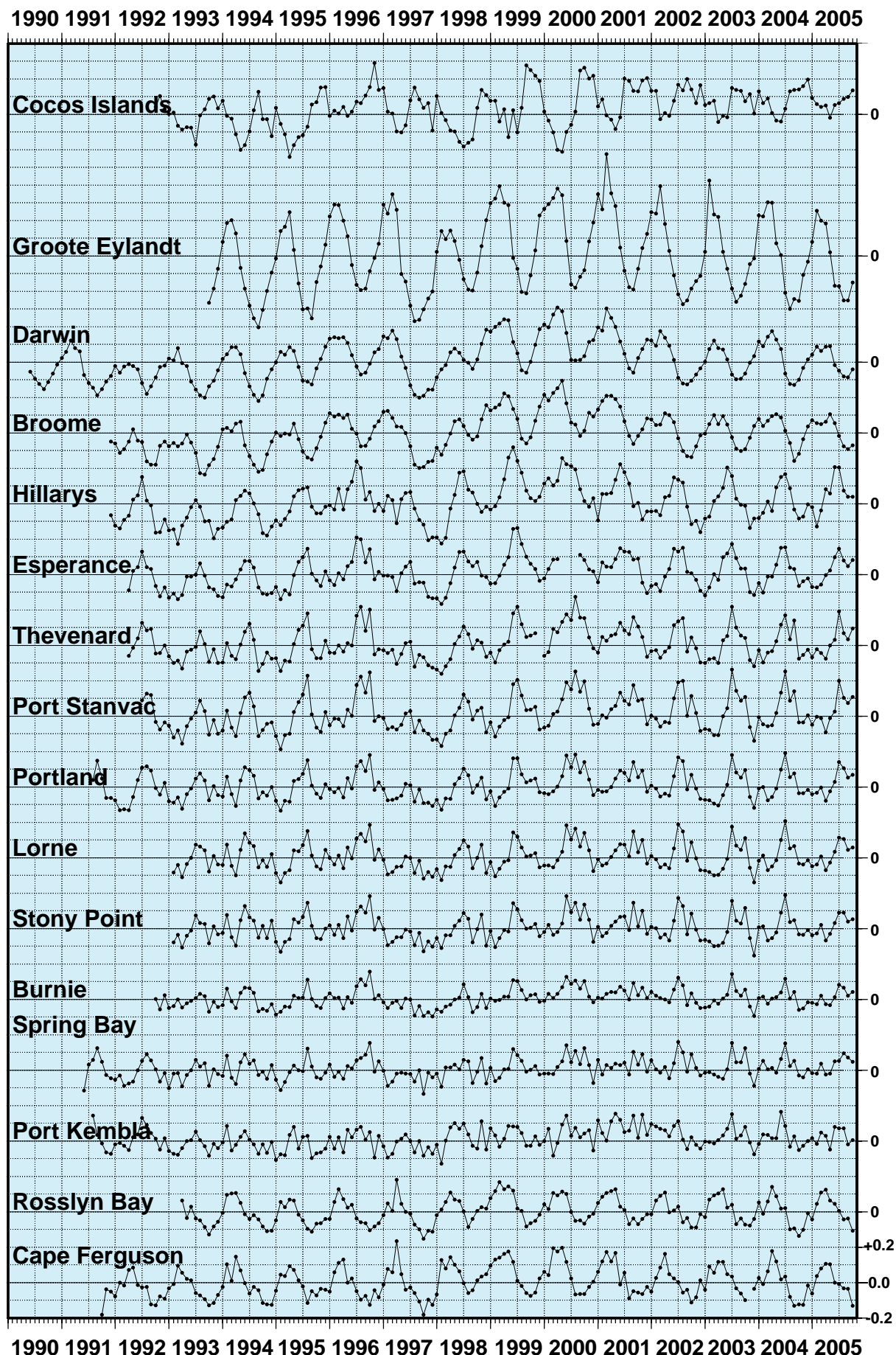
- 1 - Cocos Islands
- 2 - Groote Eylandt
- 3 - Darwin
- 4 - Broome
- 5 - Hillarys
- 6 - Esperance
- 7 - Thevenard
- 8 - Port Stanvac
- 9 - Portland
- 10 - Burnie
- 11 - Spring Bay
- 12 - Port Kembla
- 13 - Rosslyn Bay
- 14 - Cape Ferguson

- September 2005 Maximum
- September 2005 Mean
- September 2005 Minimum
- Long Term September Maximum
- Long Term September Mean
- Long Term September Minimum

# Figure 11

## MONTHLY MEAN SEA LEVELS TO SEPTEMBER 2005 (m)

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



**Figure 12**  
**SEA LEVEL ANOMALIES THROUGH SEPTEMBER 2005 (m)**

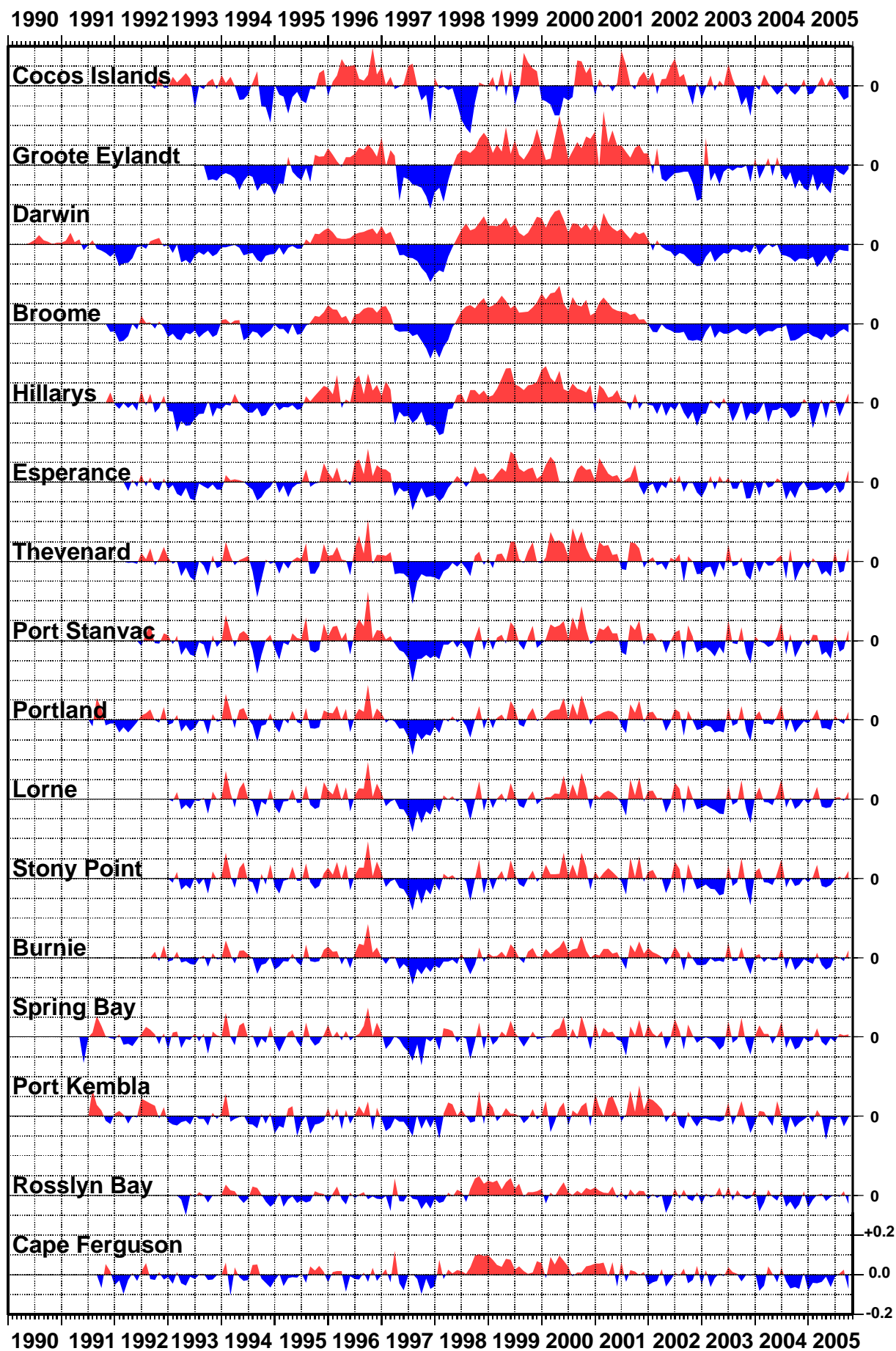


Figure 13

SEA LEVEL TRENDS THROUGH SEPTEMBER 2005 (mm/year)

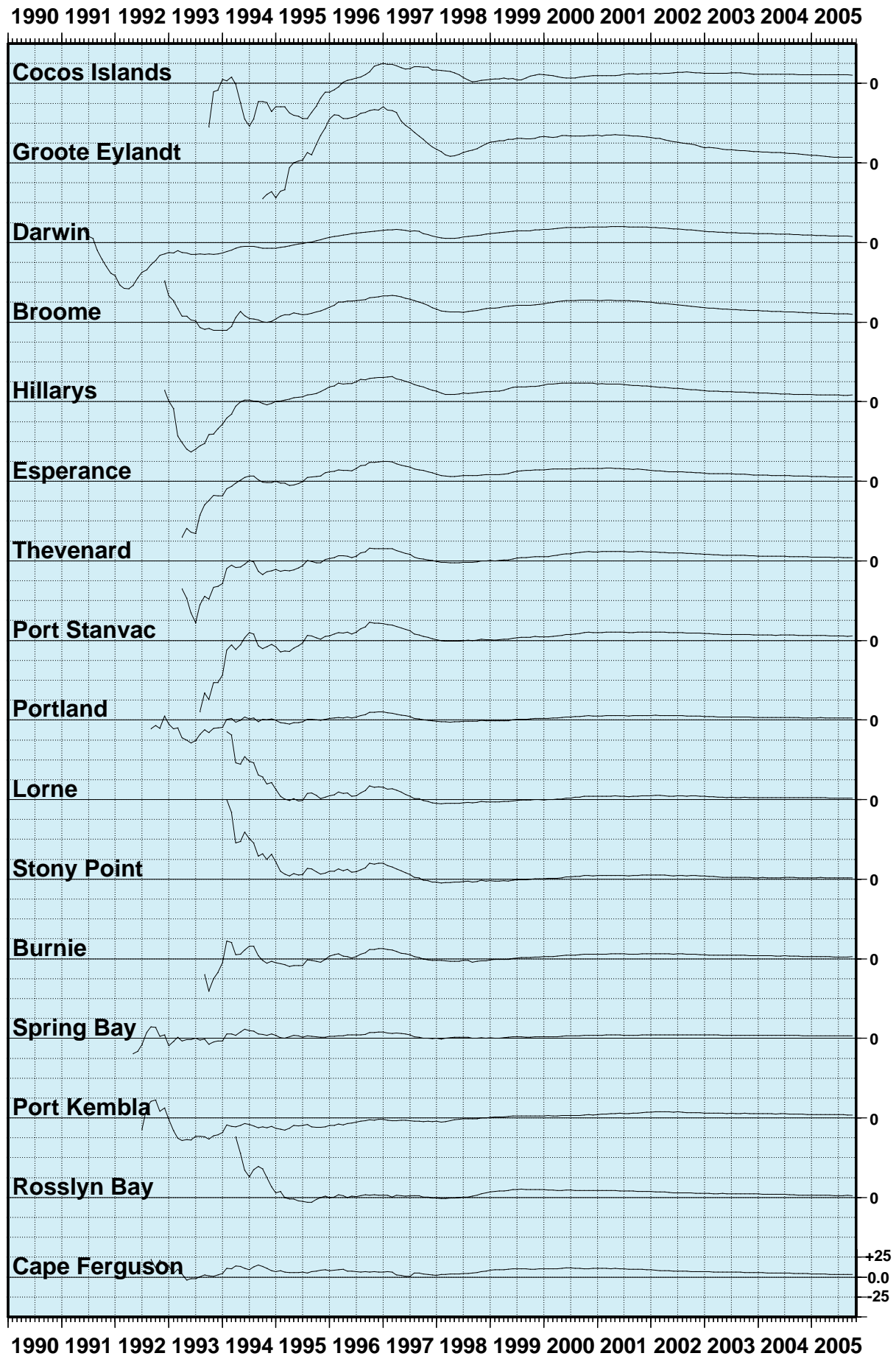


Figure 14

# BAROMETRIC PRESSURE ANOMALIES THROUGH SEPTEMBER 2005 (hPa)

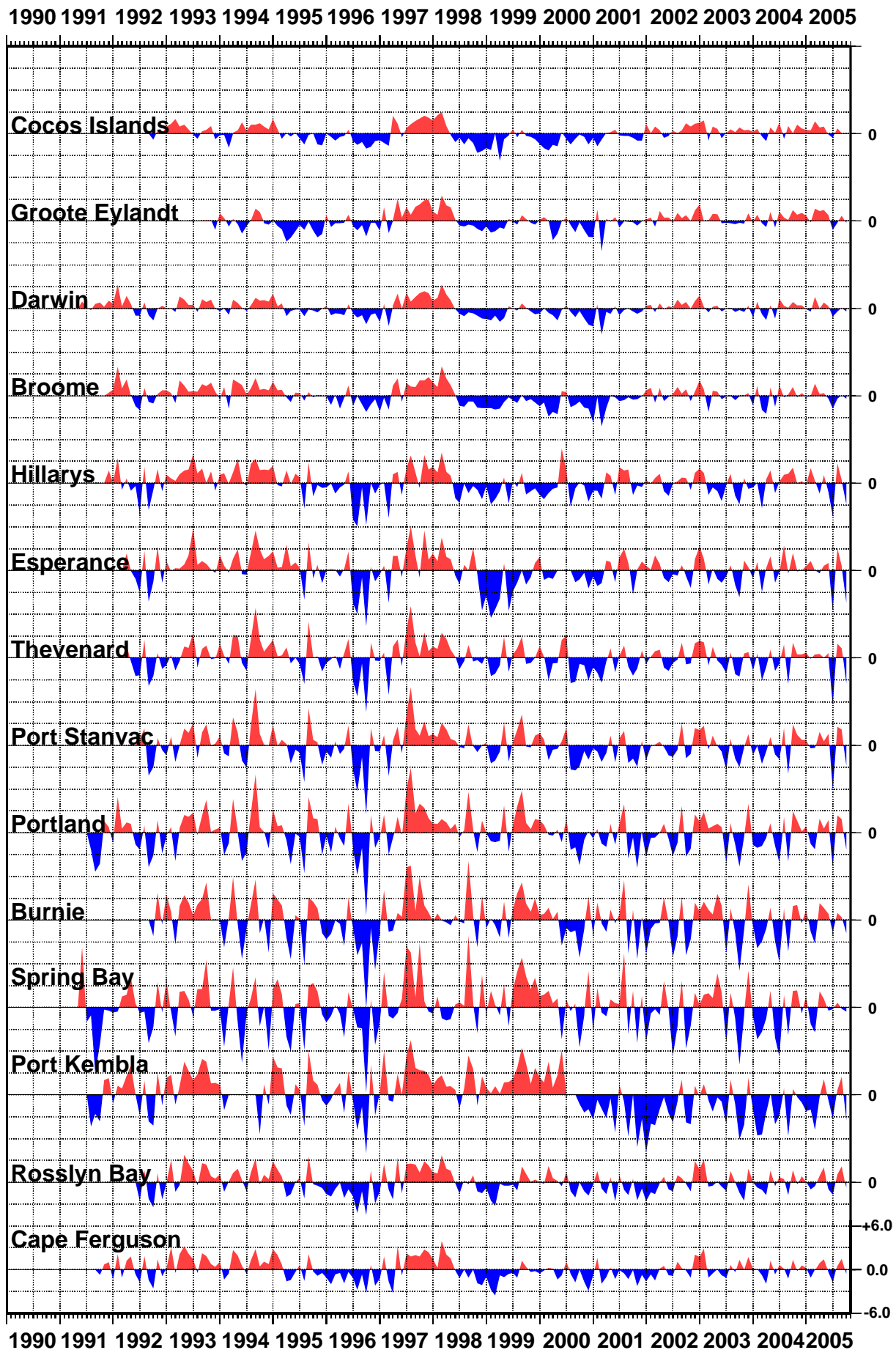


Figure 15

## WATER TEMPERATURE ANOMALIES THROUGH SEPTEMBER 2005 (°C)

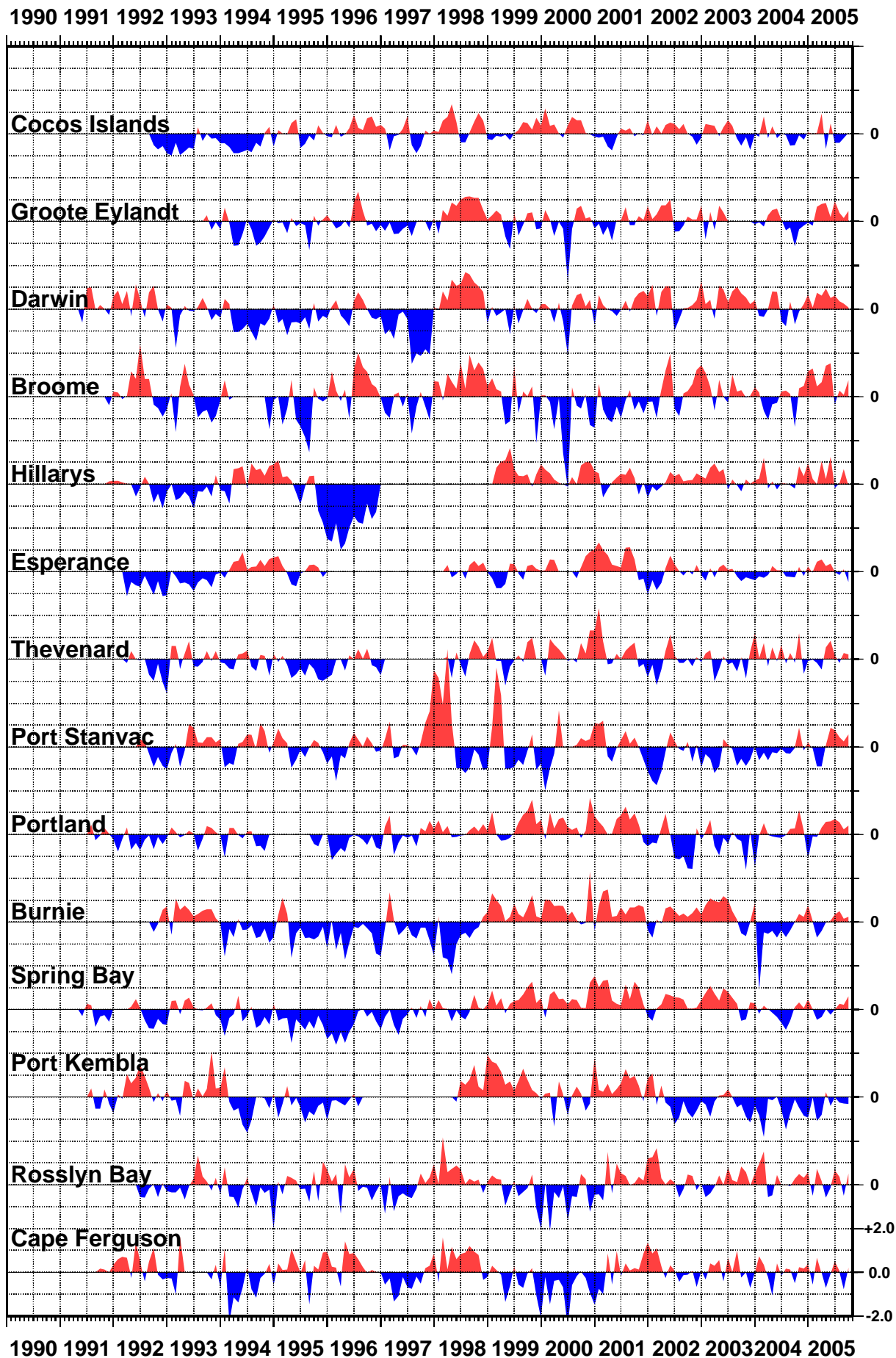
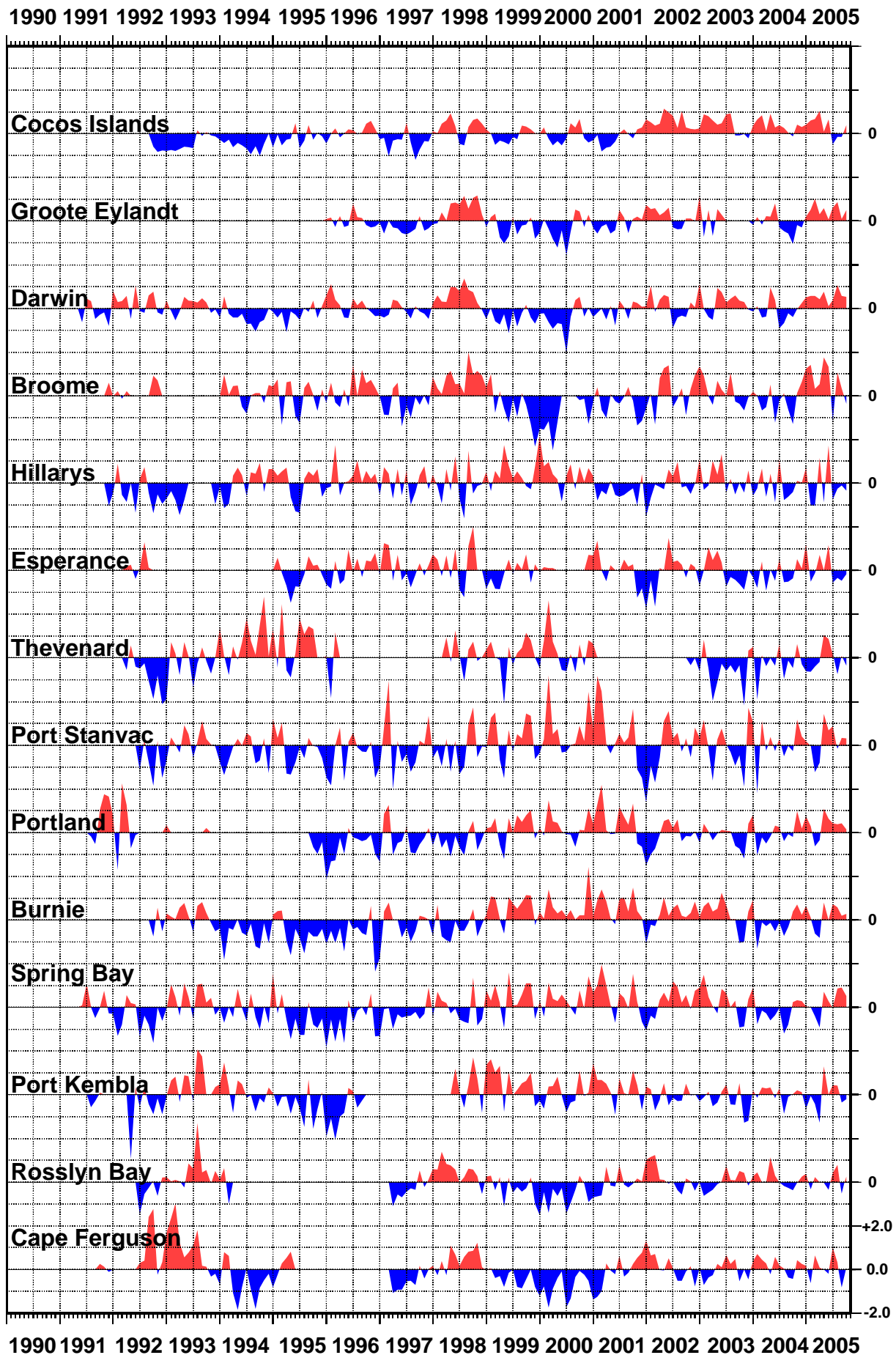


Figure 16

**AIR TEMPERATURE ANOMALIES  
THROUGH SEPTEMBER 2005 (°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

