

**THE AUSTRALIAN BASELINE SEA LEVEL  
MONITORING PROJECT**

**MONTHLY DATA REPORT**

**DECEMBER 2008**



**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 December 2008 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**

**DECEMBER 2008**

### **INTRODUCTION**

The mission of the Australian Baseline Sea Level Monitoring Project (ABSLMP) is to monitor changes in sea level around Australia. It involves the operation and maintenance of an array of high-resolution sea level gauges and associated meteorological instruments (see Figure B) and management of a quality controlled national database of observations that is made available to 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.

This report is one of a series of monthly data reports that provide tables and figures summarising the data collected to date. The accompanying text relates primarily to the quality of the data rather than its interpretation. Periodic scientific evaluation of the data in the context of climate variability and climate change is provided in an annual data report.

The trends are derived from the sea level record. However, 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. It is important to note that as the sea level record becomes longer, the short-term trend estimate becomes more stable and reliable. 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.

### **NOTES ON THE DATA FOR DECEMBER 2008**

Sea level data return (Figures 1 and 17) in December 2008 was good for most stations. Due to occupational health and safety reasons the station at Broome is being switched off when ships are being loaded. This has resulted in a loss of 21 hours of un-recoverable data.

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) and can also indicate the passage of a tsunami. The meteorological convention is followed in Figure 5 where the vector indicates the direction from which the wind is blowing.

Figure 10 compares the mean, maximum and minimum values for air temperature, water temperature and barometric pressure for December 2008 with the long-term values. Note

that the long-term ranges are calculated using the previous sets of December data for each station **excluding** the current month of data.

The maximum and minimum air and water temperatures all fell within the long-term limits for all locations during December. A record December low barometric pressure was recorded at Esperance (995.0 hPa) on the 20<sup>th</sup> of December.

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

The sea level anomalies (Figure 12) in December 2008 were positive for all sites except Rosslyn Bay and Cape Ferguson which were slightly negative.

Figure 13 shows the history 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. It is important to stress that as the sea level record becomes longer, the short-term trend estimate becomes more stable and reliable. Observed trends in sea level include natural variability, for example, events such as El Niño and effects due to many other atmospheric, oceanographic and geological processes. Longer-term data sets for all stations are required in order to separate the effects of the different signals. ***Please exercise caution in interpreting the short-term trends in the table below*** – they will almost certainly change over the coming years as the data set increases in length.

The barometric pressure anomalies (Figure 14) reflect the slight negativity of the December 2008 mean pressures with respect to the long-term means presented in Figure 10. 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.

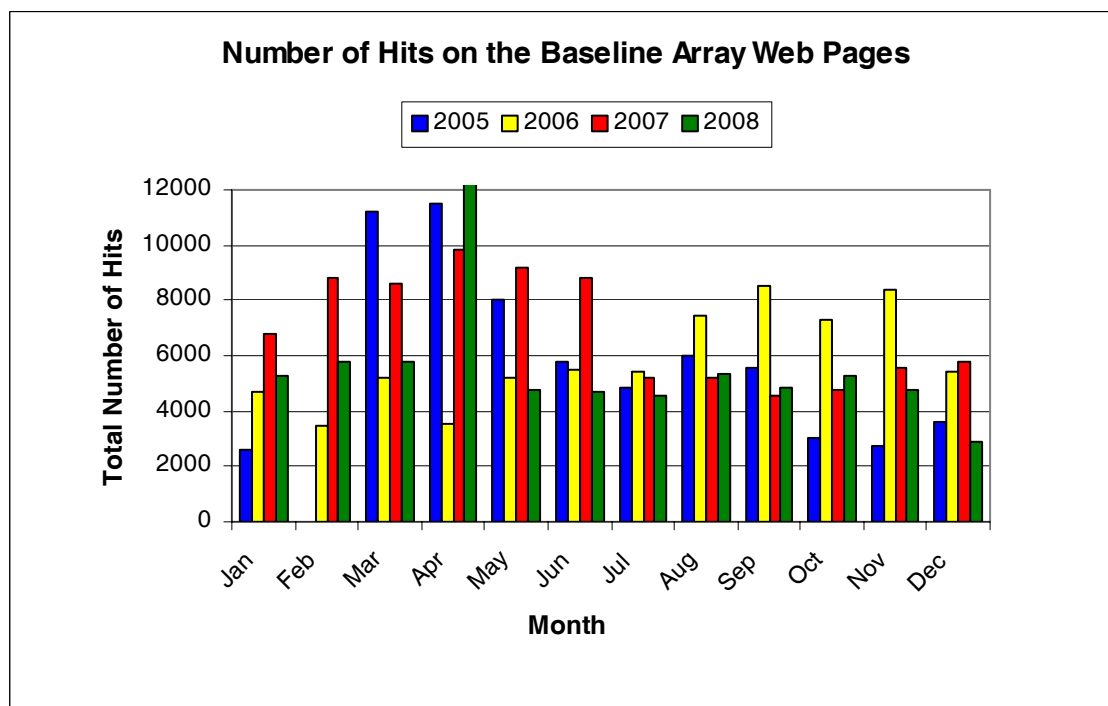
The number of hits to the Australian Baseline Sea Level Monitoring project web pages from 2005 to December 2008 are given in Figure A.

*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.*

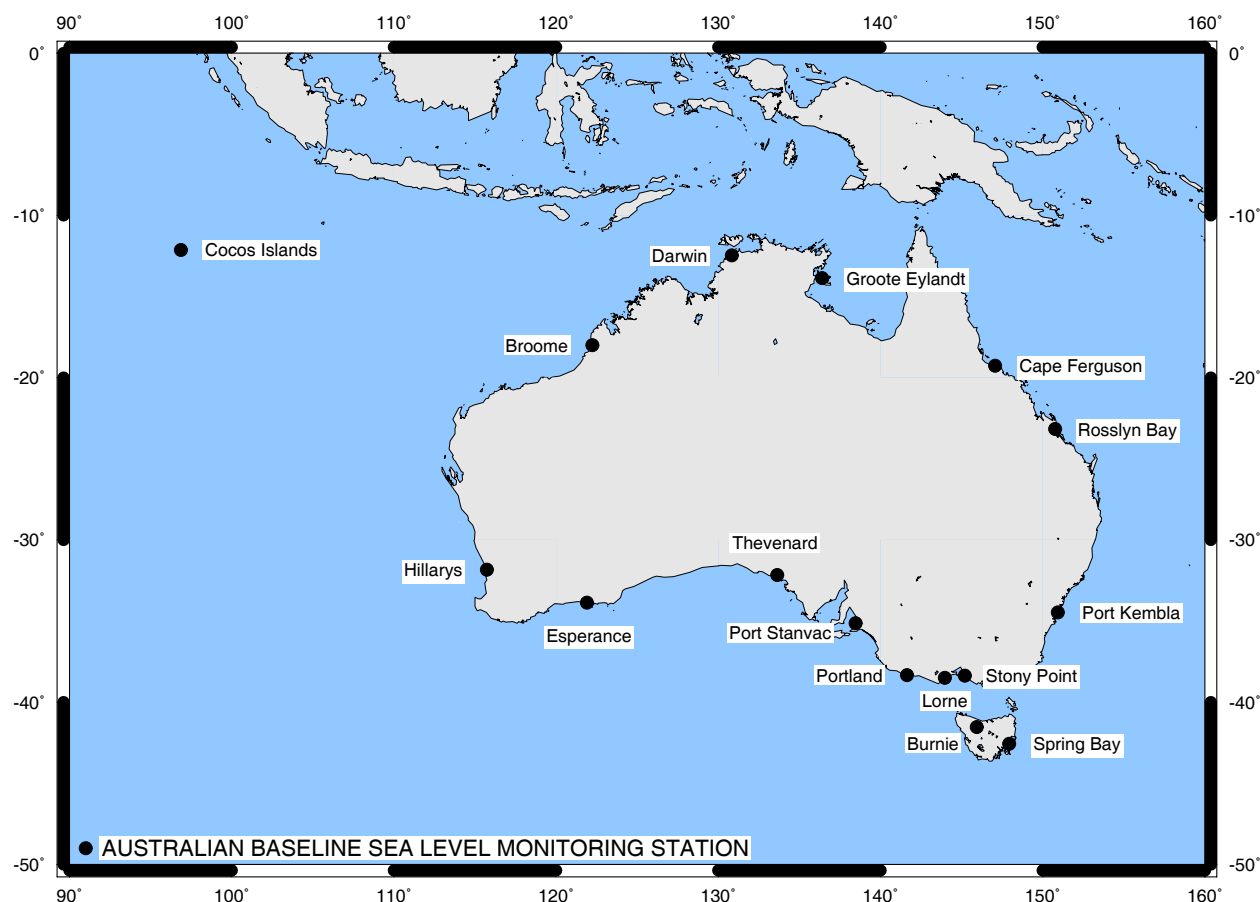
**Table 1: Tide gauge position, data start date, short-term sea level trends and change in trend from the previous month for the Australian Baseline array through December 2008.**

Recent short-term sea level trends in the project area based upon SEAFRAME data through December, 2008				
Location	Lat / Long	Installation Date	Trend (mm/yr)	Change from previous month
Cocos Islands	12°07'07.1"S / 96°53'30.9"W	Sep1992	+8.3	+0.2
Groote Eylandt	13°51'36.2"S / 136°24'56.1"E	Sep 1993	+6.6	+0.2
Darwin	12°28'18.4"S / 130°50'45.1"E	May 1990	+7.5	+0.1
Broome	18°00'03.0"S / 122°13'07.1"E	Nov 1991	+8.8	+0.1
Hillarys	31°49'32.0"S / 115°44'18.9"E	Nov 1991	+8.7	0.0
Esperance	33°52'15.2"S / 121°53'43.3"E	Mar 1992	+5.7	+0.1
Thevenard	32°08'56.2"S / 133°38'28.8"E	Mar 1992	+3.9	+0.2
Port Stanvac	35°06'31.0"S / 138°28'1.3"E	Jun 1992	+5.1	+0.2
Portland	38°20'36.4"S / 141°36'47.4"E	Jul 1991	+2.7	+0.2
Lorne	38°32'49.4"S / 143°59'19.8"E	Jan 1993	+1.6	+0.2
Stony Point	38°22'19.7"S / 145°13'28.9"E	Jan 1993	+1.7	+0.2
Burnie	41°03'0.3"S / 145°54'54.0"E	Sep 1992	+2.6	+0.1
Spring Bay	42°32'45.1"S / 147°55'57.8"E	May 1991	+3.2	+0.1
Port Kembla	34°28'25.5"S / 150°54'42.7"E	Jul 1991	+3.2	+0.1
Rosslyn Bay	23°09'39.7"S / 150°47'24.6"E	Jun 1992	+1.6	-0.1
Cape Ferguson	19°16'38.4"S / 147°03'30.4"E	Sep 1991	+2.7	-0.1

**Figure A: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2004 to December 2008.**



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



The *Monthly Data Report* is prepared by the NTC, Bureau of Meteorology for the Australian Greenhouse Office. 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**

**DECEMBER 2008  
SIX MINUTE SEA LEVEL OBSERVATIONS (m)**

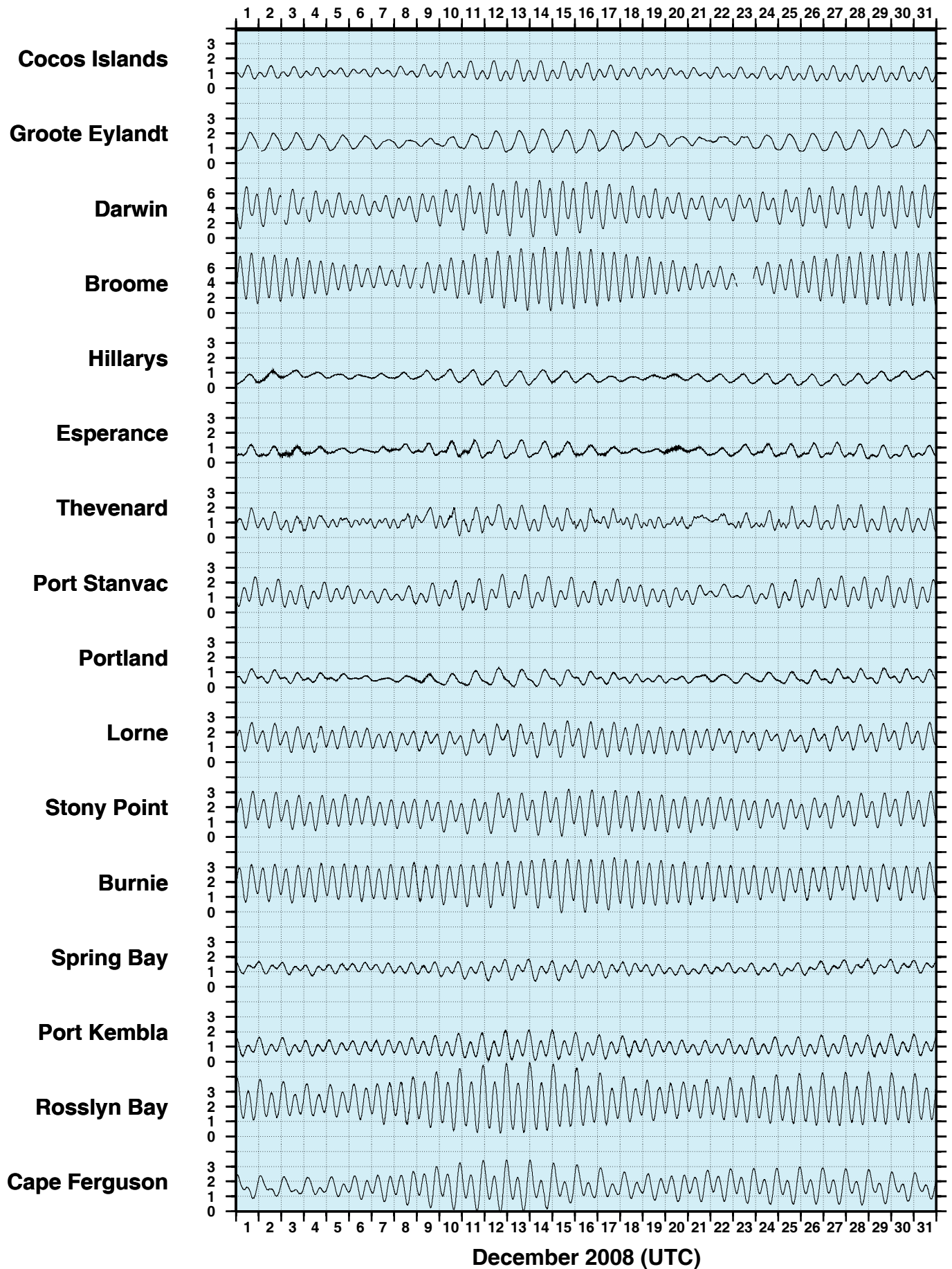
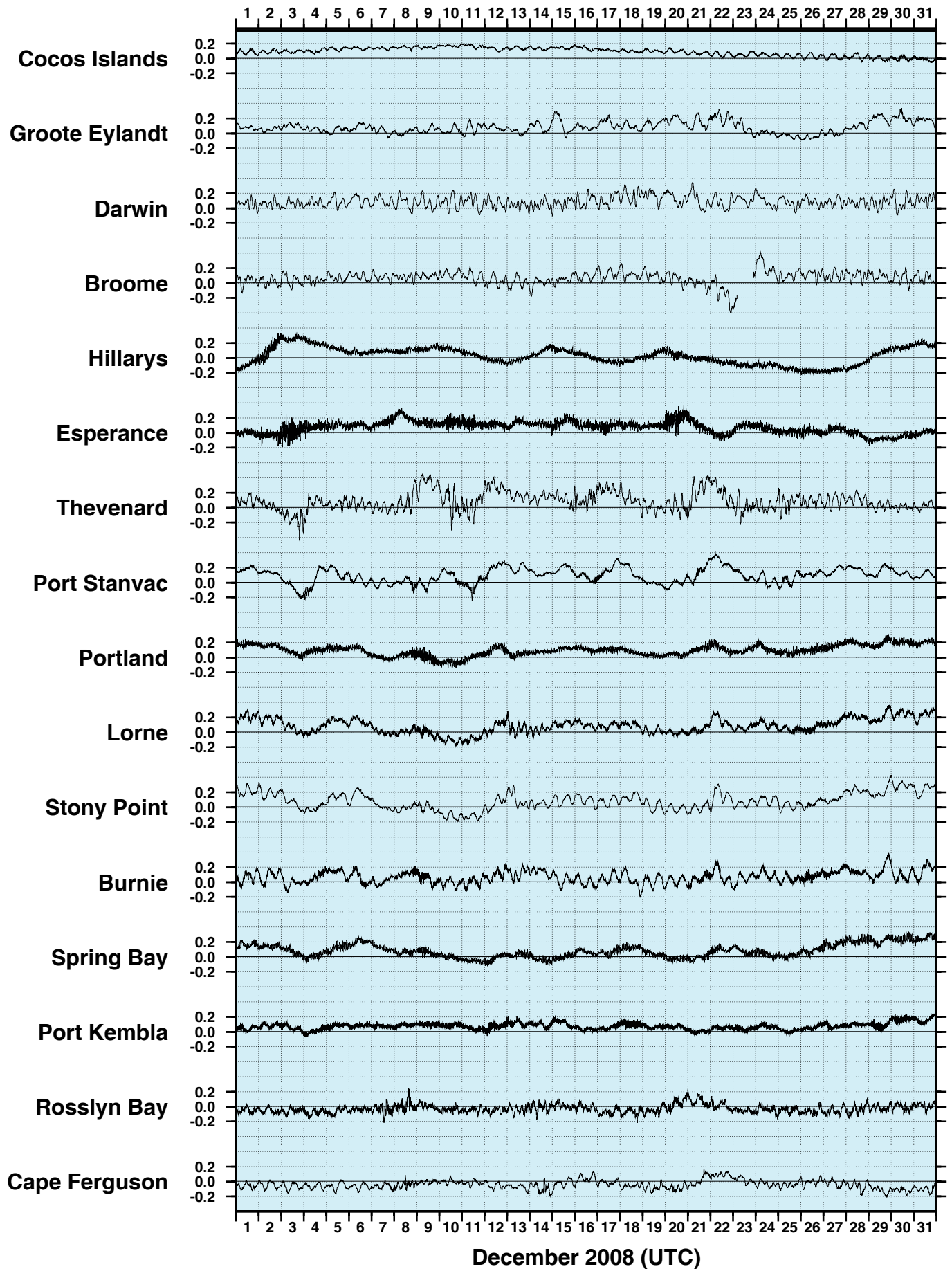




Figure 2

DECEMBER 2008  
SIX MINUTE RESIDUAL WATER LEVELS (m)



**Figure 3**  
**DECEMBER 2008**  
**SIX MINUTE RESIDUALS**  
**ADJUSTED FOR ATMOSPHERIC PRESSURE (m)**

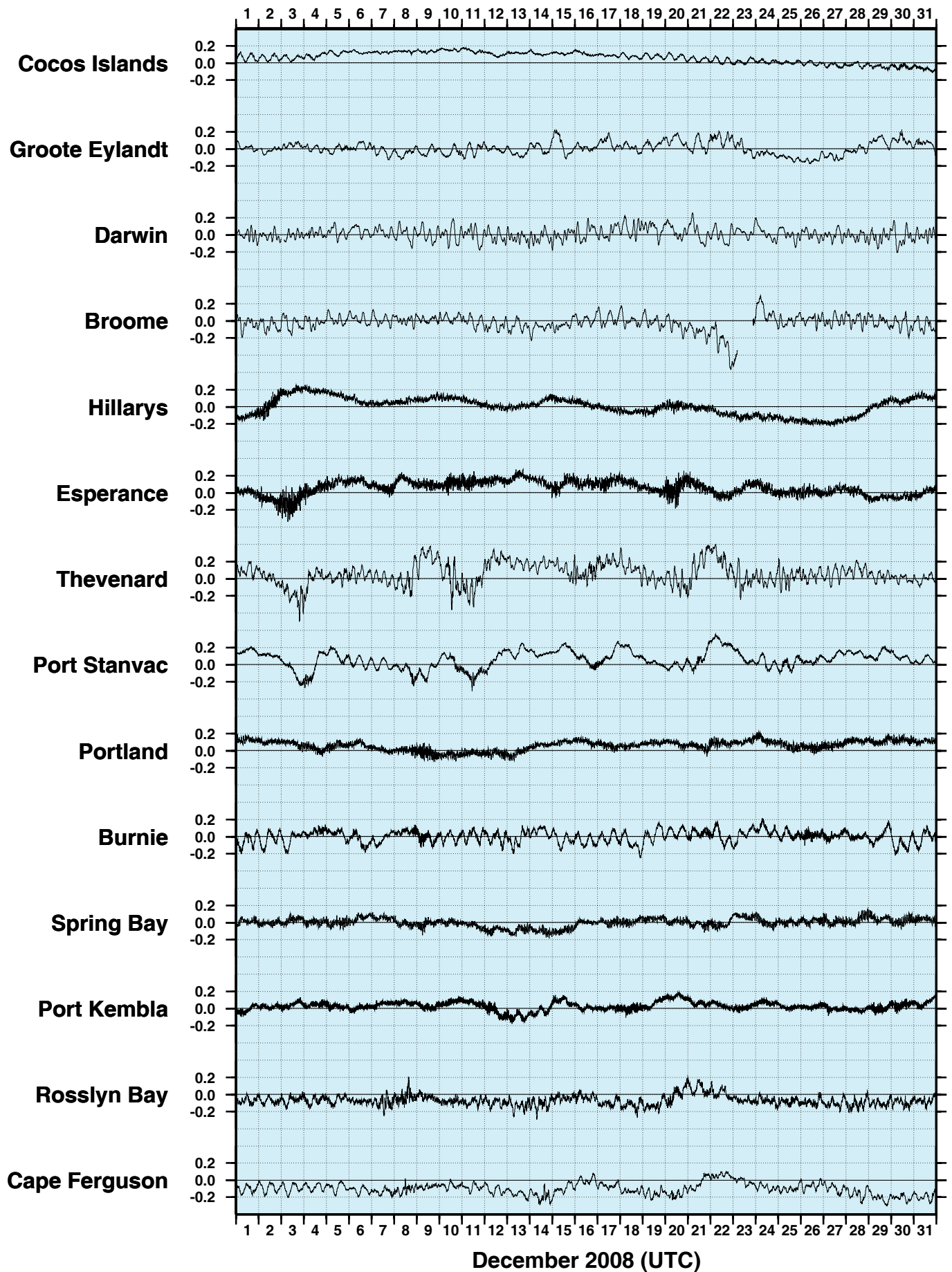


Figure 4

DECEMBER 2008  
HOURLY WIND SPEEDS (m/s)

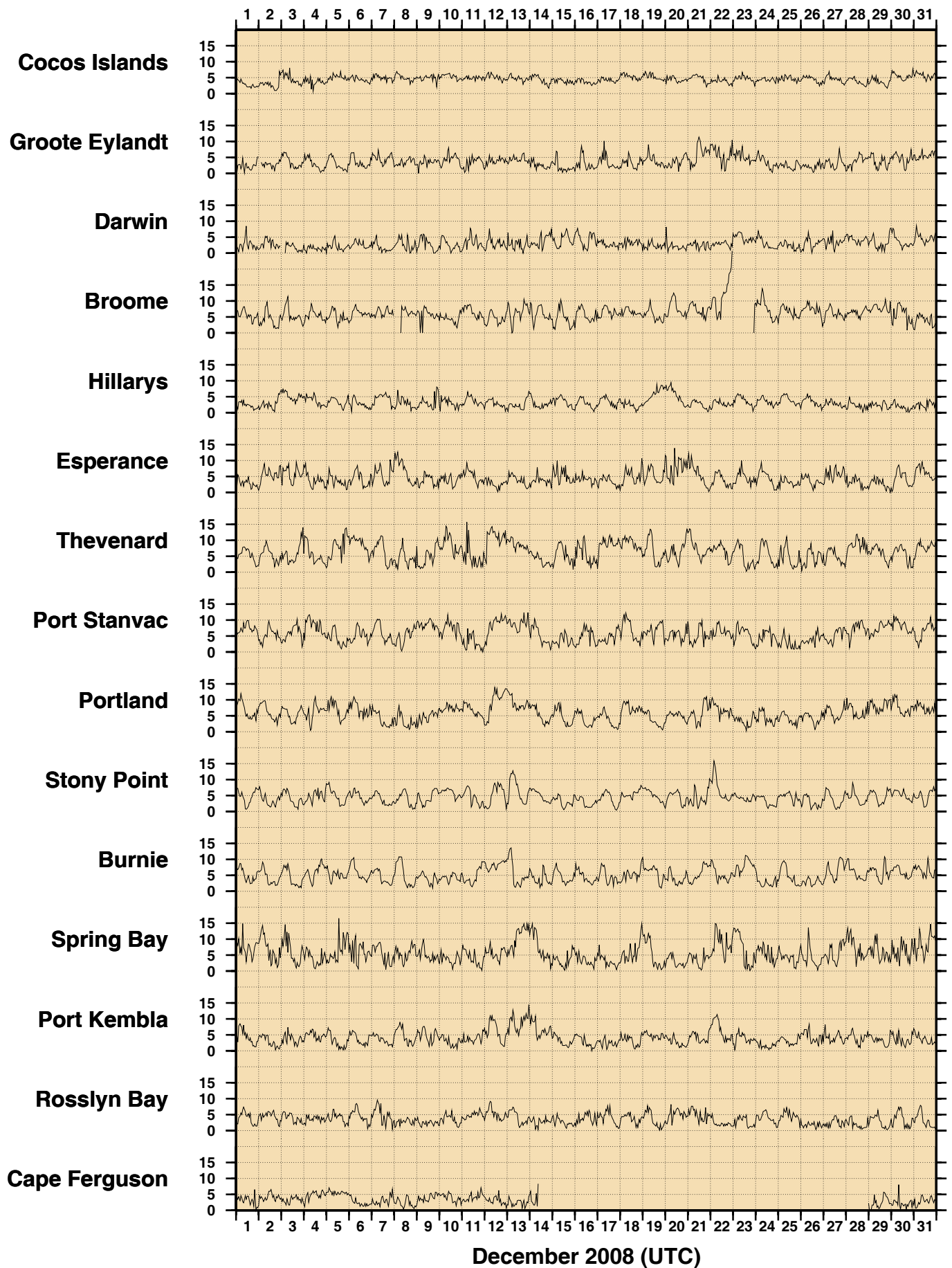


Figure 5

DECEMBER 2008  
HOURLY INCIDENT WINDS (m/s, deg True)

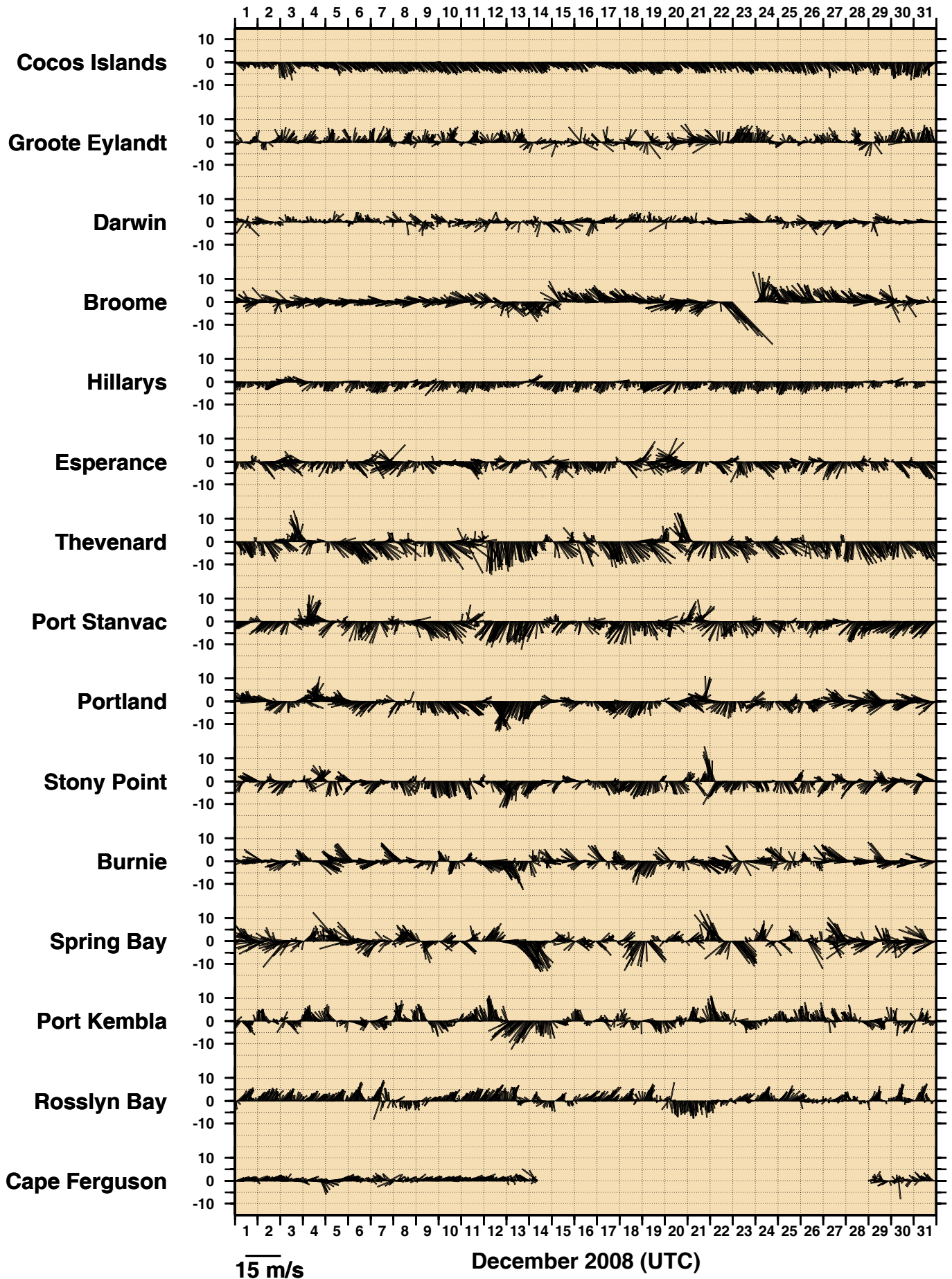




Figure 6

**DECEMBER 2008**  
**HOURLY MAXIMUM WIND GUSTS (m/s)**

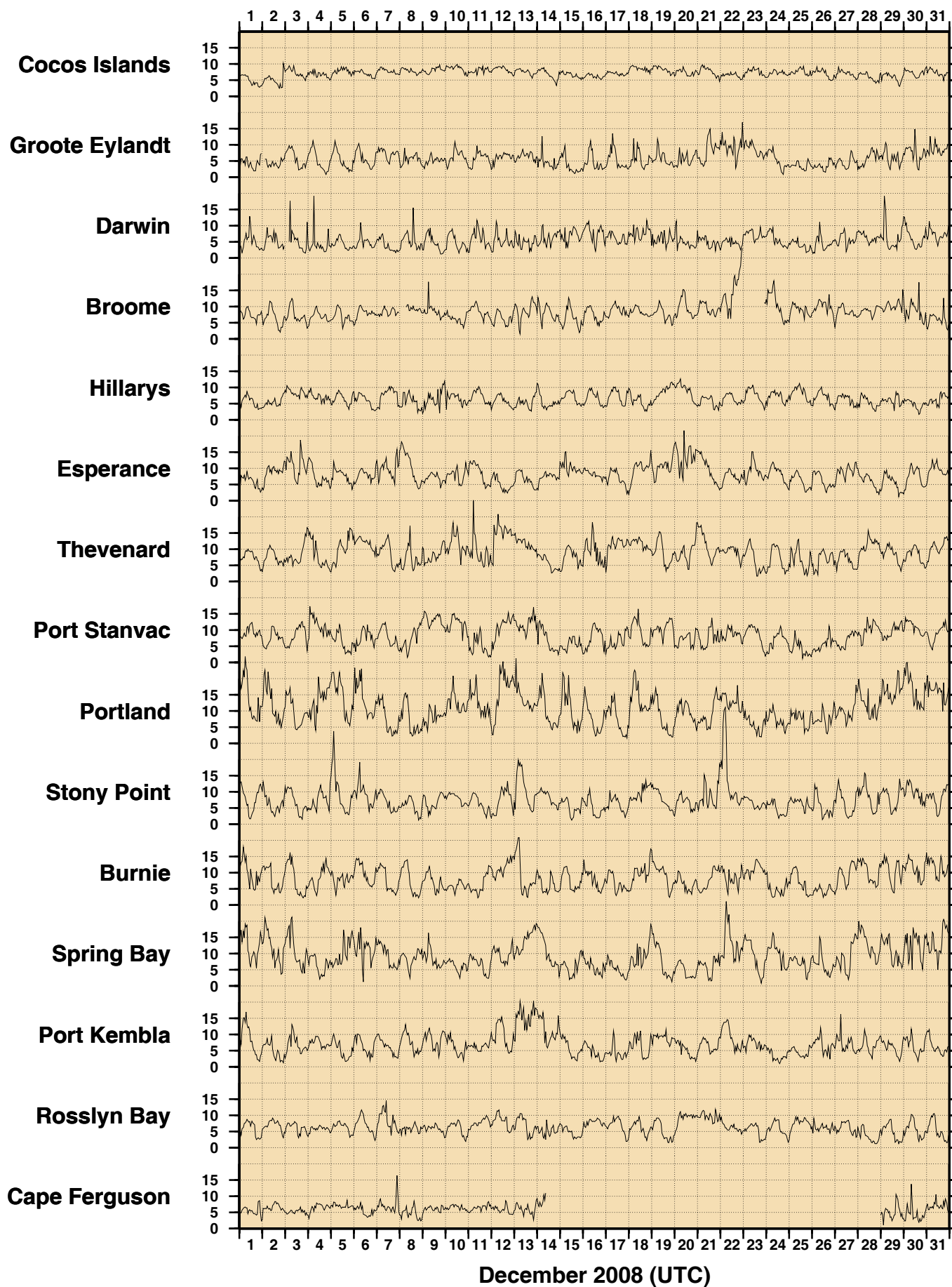


Figure 7

DECEMBER 2008  
HOURLY AIR TEMPERATURES (°C)

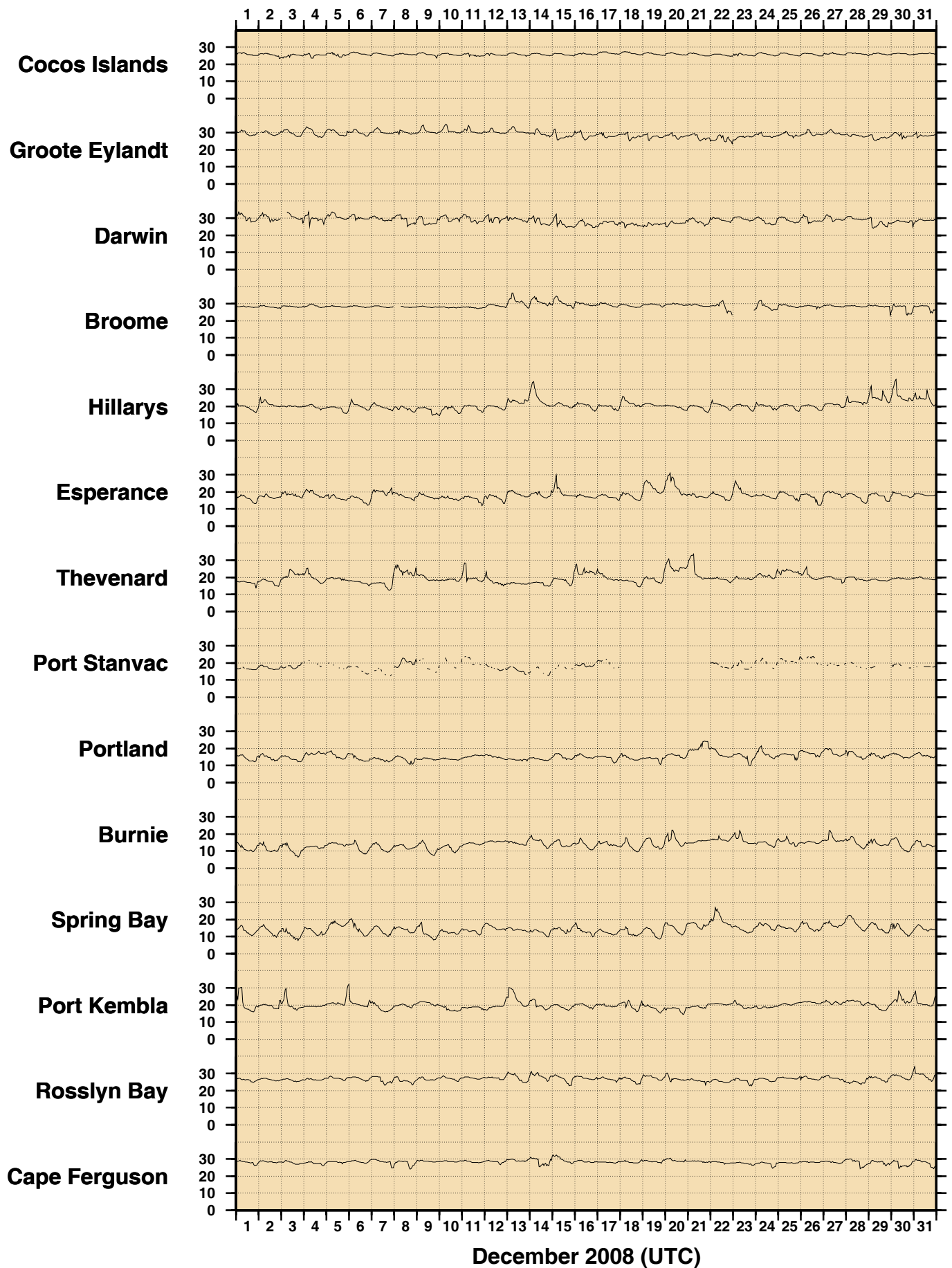


Figure 8

DECEMBER 2008  
HOURLY WATER TEMPERATURES (°C)

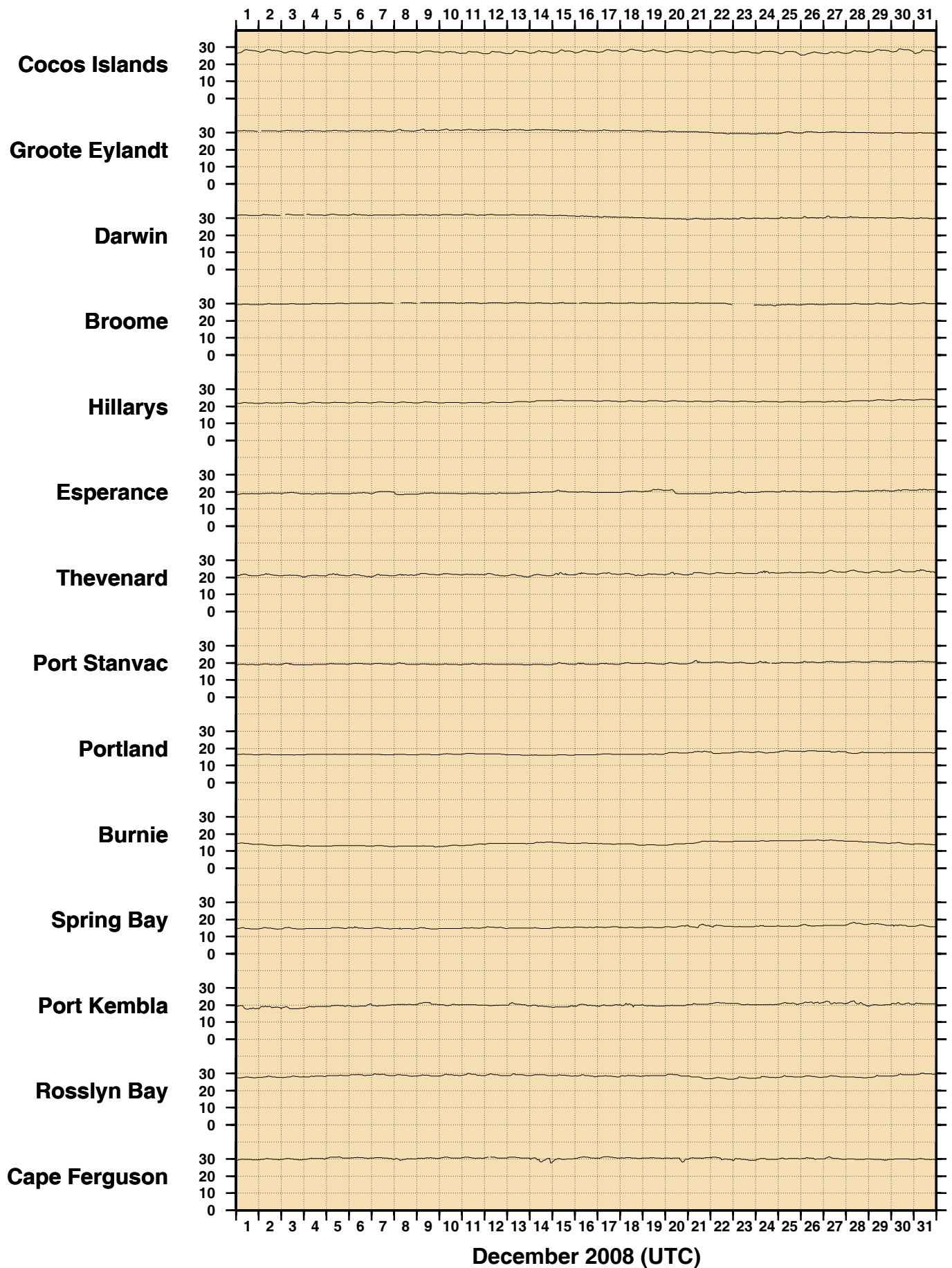
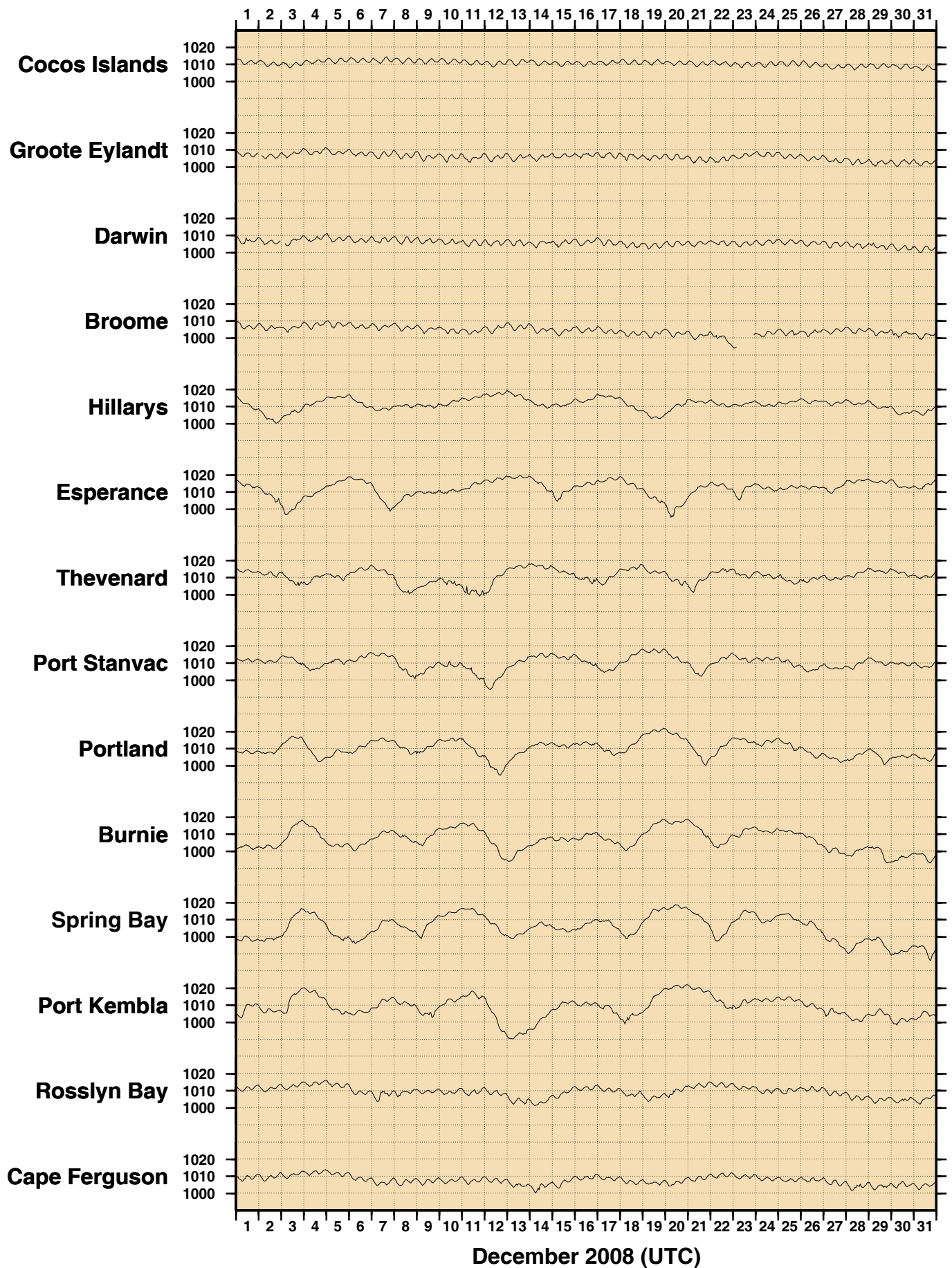


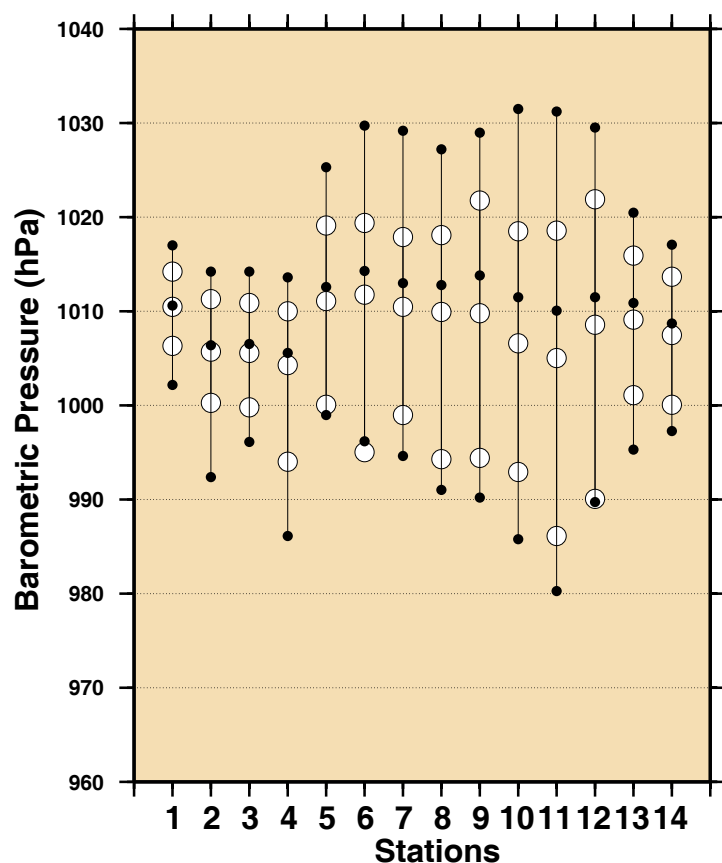
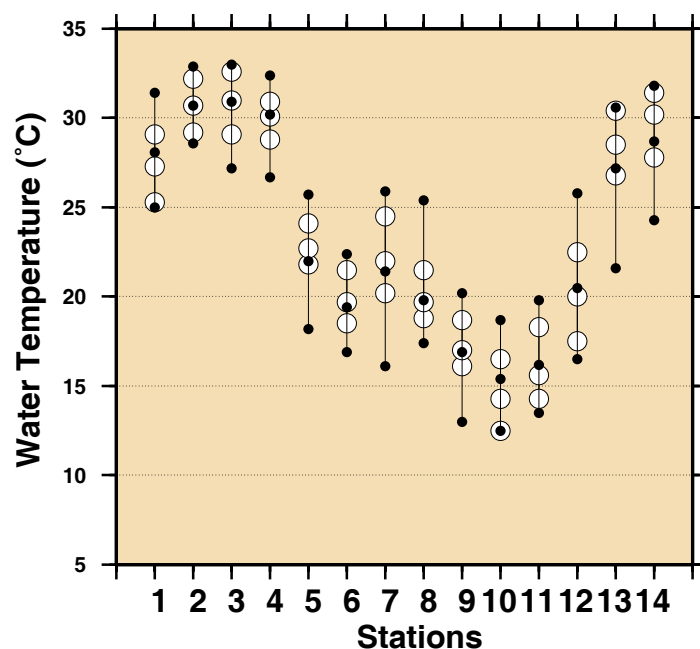
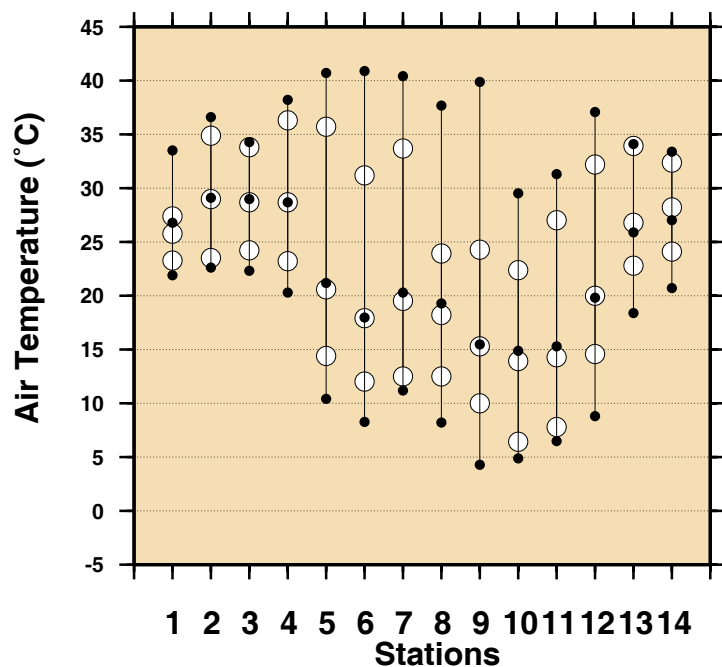
Figure 9

**DECEMBER 2008**  
**HOURLY ATMOSPHERIC PRESSURE (hPa)**





**Figure 10**  
**Comparison of December 2008 Max, Min & Mean with**  
**Long Term December Values.**



### Stations

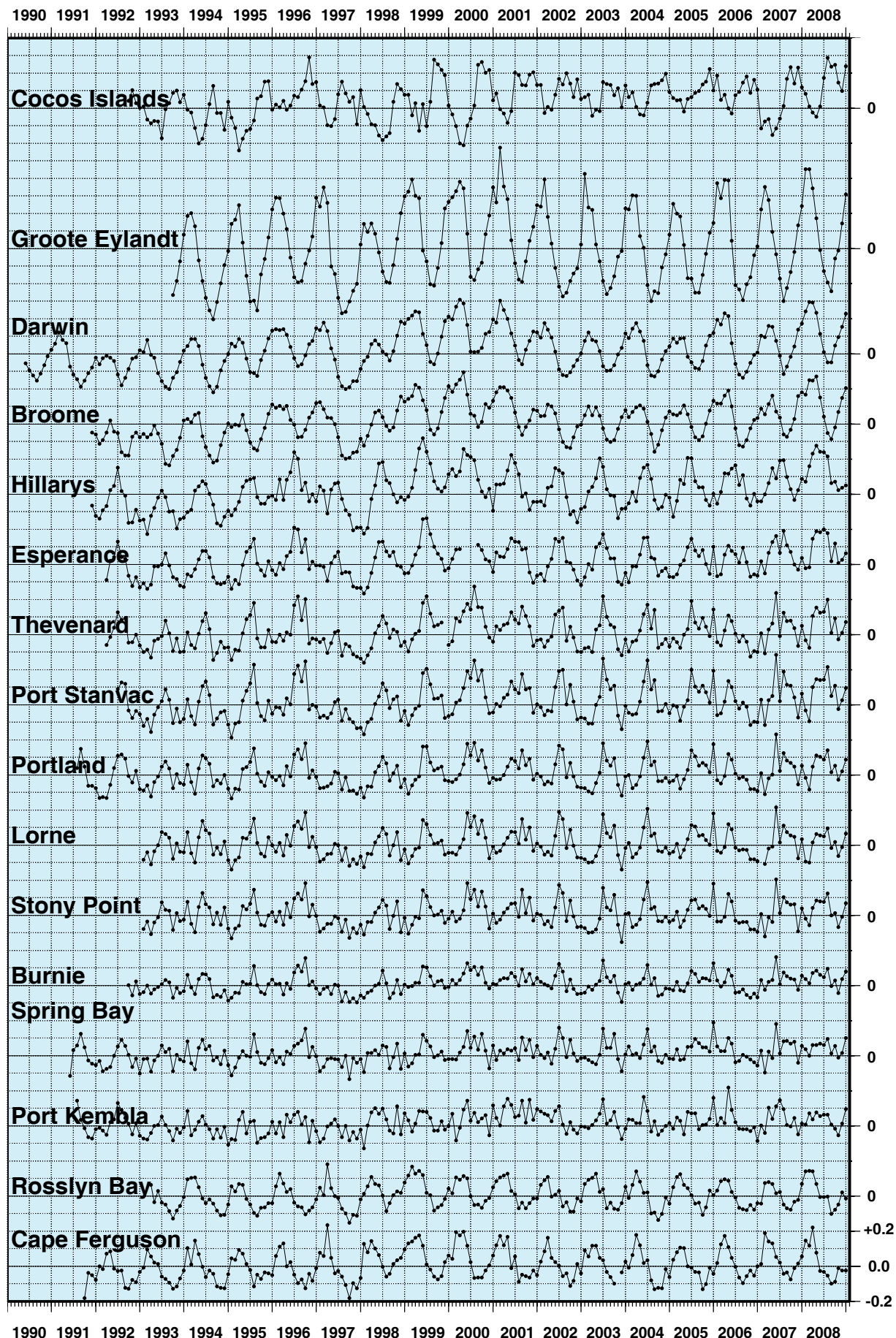
- 1 - Cocos Islands
- 2 - Groote Eylandt
- 3 - Darwin
- 4 - Broome
- 5 - Hillarys
- 6 - Esperance
- 7 - Thevenard
- 8 - Port Stanvac
- 9 - Portland
- 10 - Burnie
- 11 - Spring Bay
- 12 - Port Kembla
- 13 - Rosslyn Bay
- 14 - Cape Ferguson

- December 2008 Maximum
- December 2008 Mean
- December 2008 Minimum
- Long Term December Maximum
- Long Term December Mean
- Long Term December Minimum

# Figure 11

## MONTHLY MEAN SEA LEVELS TO DECEMBER 2008 (m)

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



**Figure 12**  
**SEA LEVEL ANOMALIES THROUGH DECEMBER 2008 (m)**

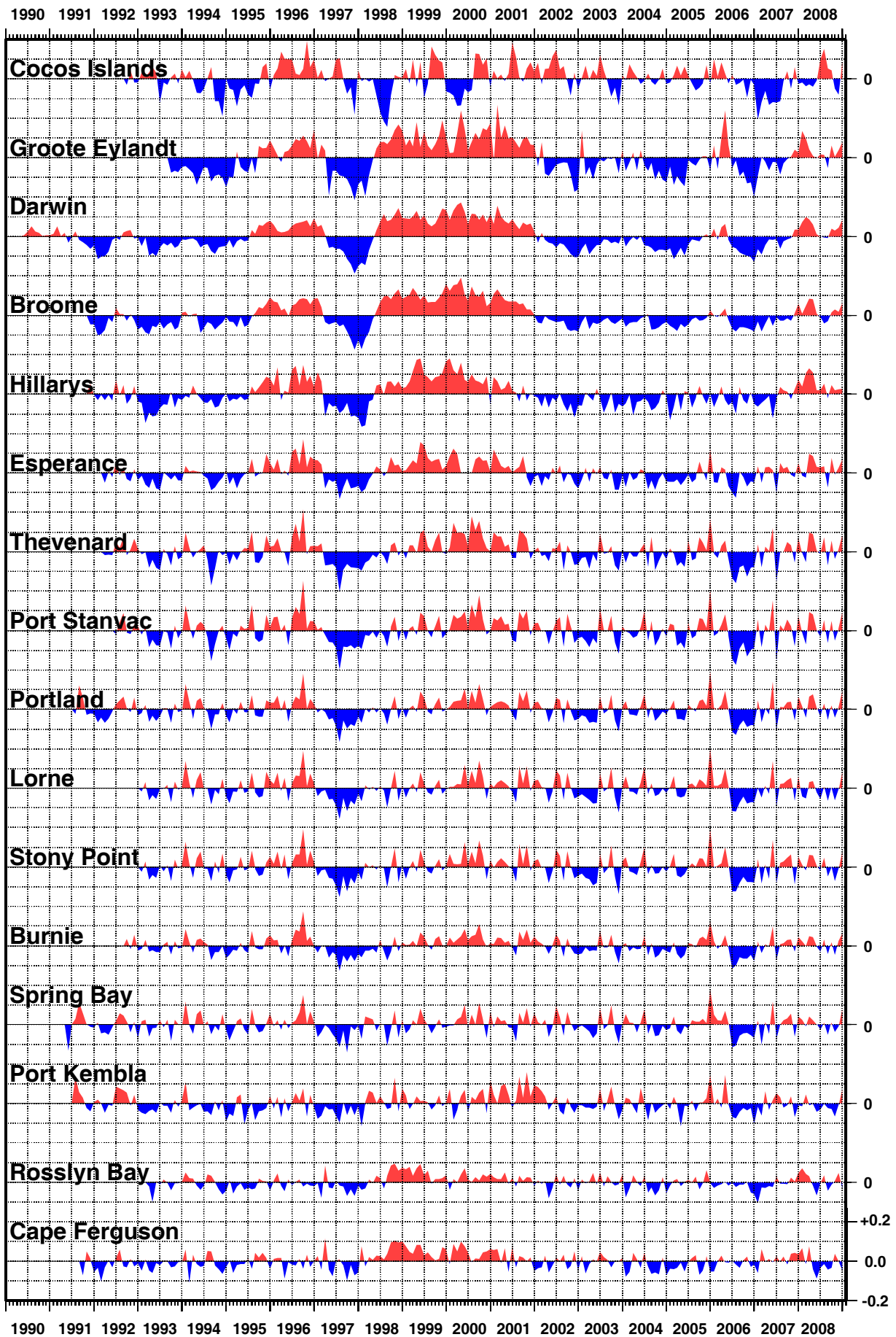


Figure 13

SEA LEVEL TRENDS THROUGH DECEMBER 2008 (mm/year)

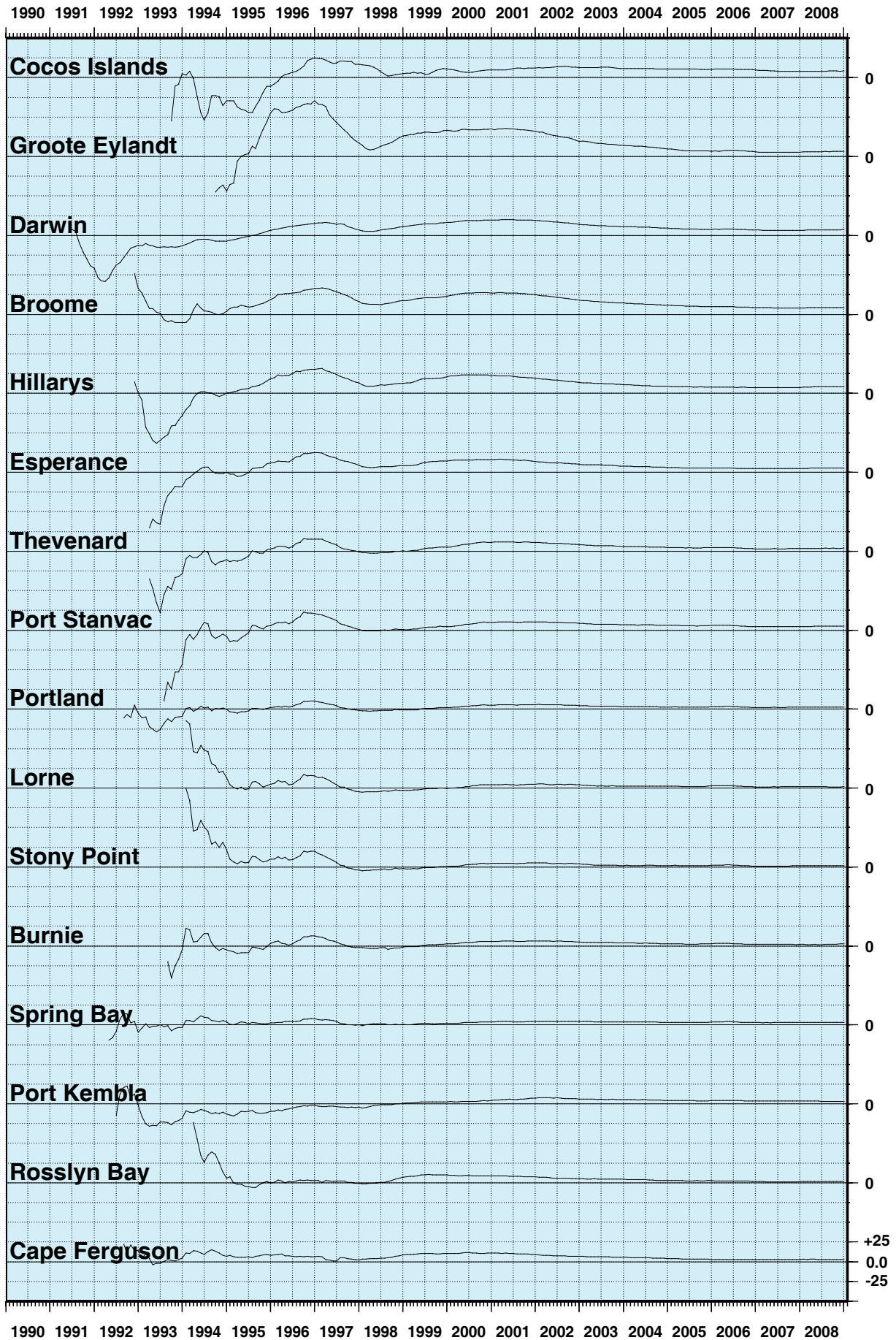


Figure 14

# BAROMETRIC PRESSURE ANOMALIES THROUGH DECEMBER 2008 (hPa)

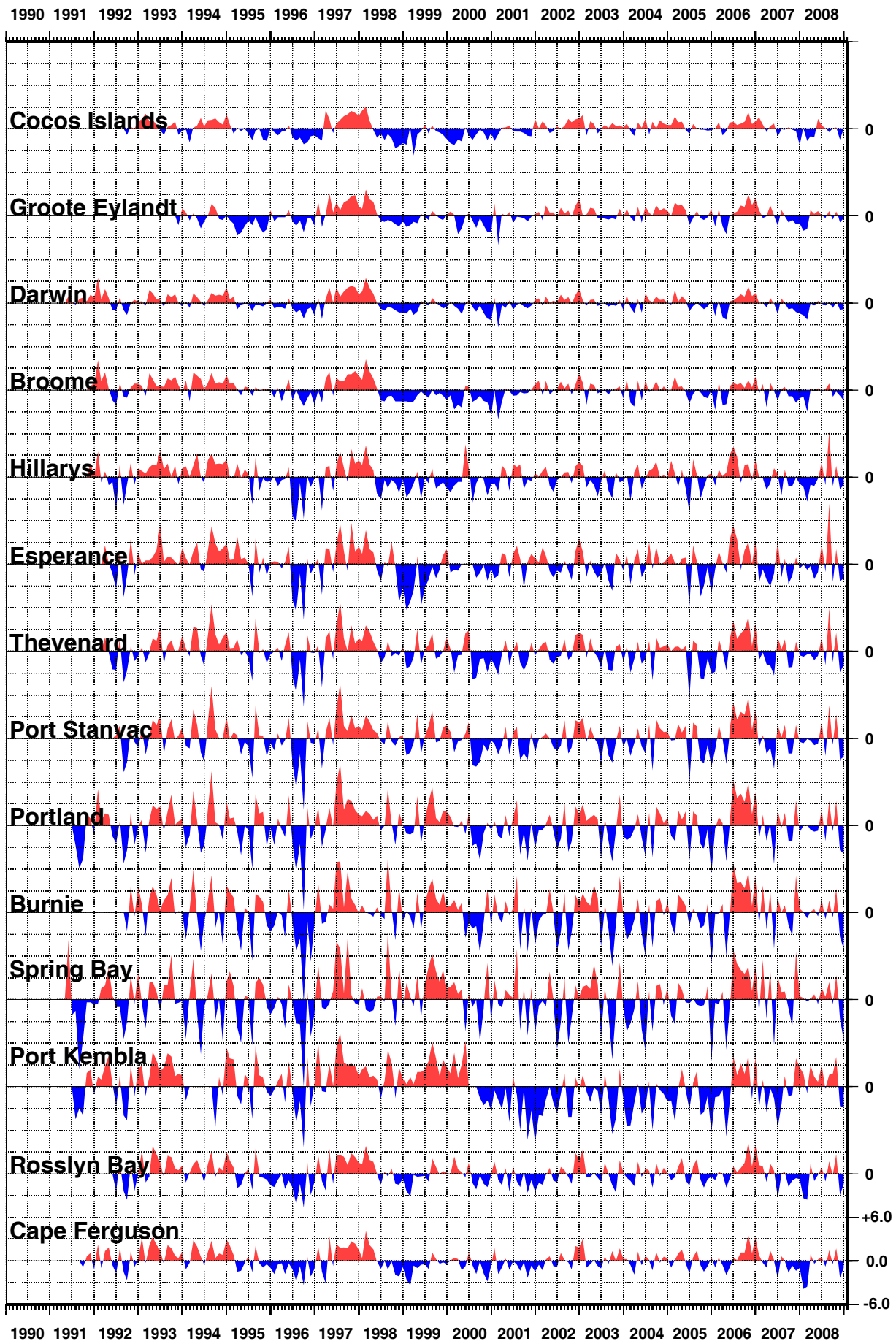
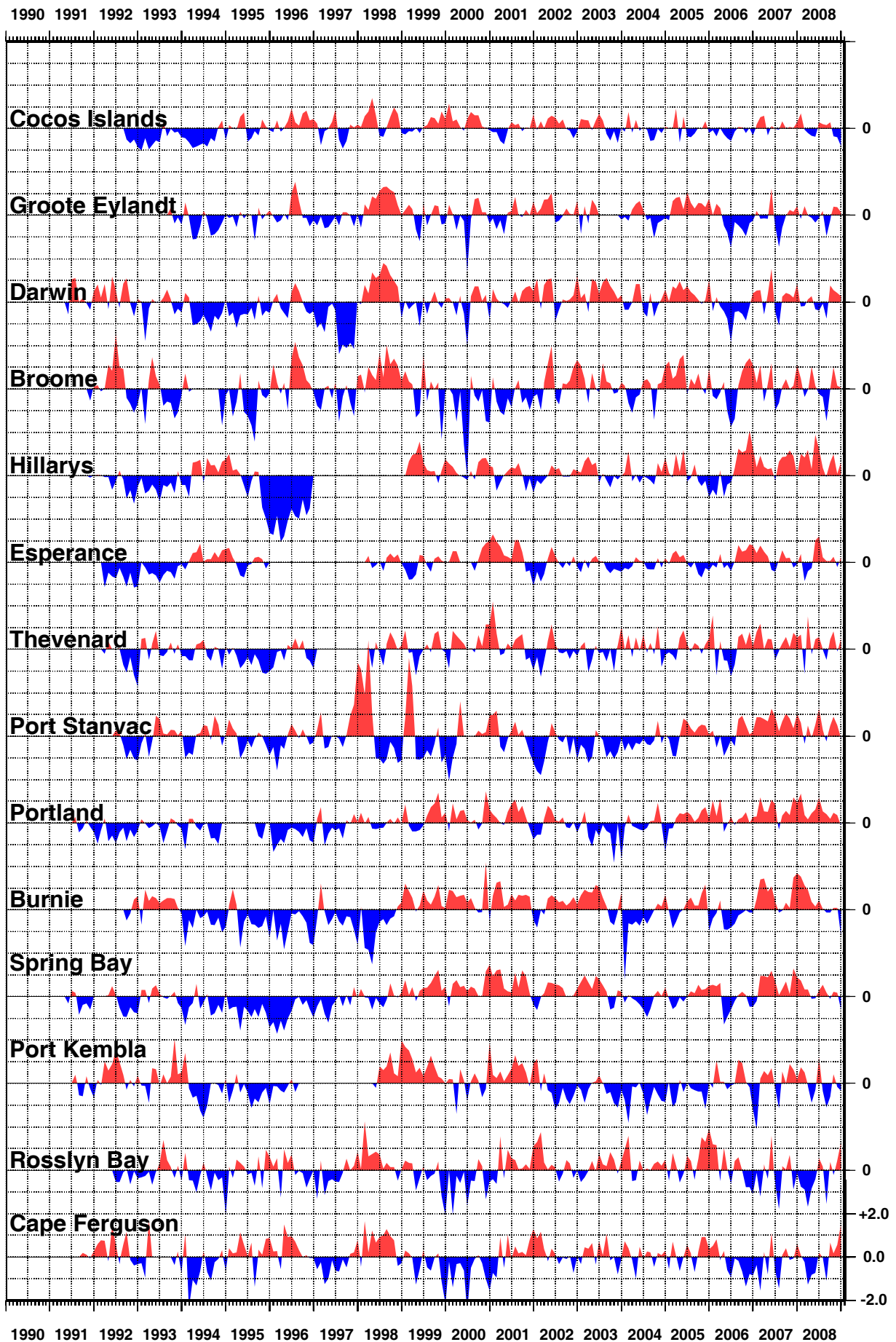


Figure 15

## WATER TEMPERATURE ANOMALIES THROUGH DECEMBER 2008 (°C)





**Figure 16**  
**AIR TEMPERATURE ANOMALIES**  
**THROUGH DECEMBER 2008 (°C)**

