

**THE AUSTRALIAN BASELINE SEA LEVEL
MONITORING PROJECT**

MONTHLY DATA REPORT

OCTOBER 2010



Australian Government

Bureau of Meteorology

This report was prepared under the Australian Climate Change Science Program for the Department of Climate Change and Energy Efficiency, 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 October 2010 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

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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.

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.

NOTES ON THE DATA FOR OCTOBER 2010

Sea level data return (Figures 1 and 17) was good for most stations for October 2010. The Broome Port Authority's policy of switching off the power when fuel ships are in dock resulted in the loss of 25 hours of Broome sea level and ancillary data during October. Communication issues with the gauge at Cocos Island meant some isolated sea level data could not be recovered. The Stony Point wind data has been removed while suspect high wind speeds and gusts are investigated further, whilst wind data received from Groote Eylandt continued to indicate instrument failure and have been removed from the record. A fault in the Port Kembla barometric pressure transducer resulted in the loss of barometric pressure data at the beginning of October. This data was replaced with quality-controlled barometric data from the adjacent Port Kembla Comparison Gauge. During October 2010 the Portland water temperature sensor recorded a constant value of 13.3° and has been removed from the record.

The residuals (Figures 2 and 3), being the difference between the observations and the tidal predictions, are the non-tidal components of the sea level. They are primarily the consequence of short-term meteorological effects (Figures 5 and 9) and can also indicate the passage of a tsunami. A small tsunami signal was recorded at Cocos Islands and Hillarys following the Mw 7.5 earthquake off Sumatra on October the 25th, 2010.

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 October 2010 with the long-term values. Note that the long-term ranges are calculated using the previous sets of October data for each station *excluding* the current month of data.

A new October minimum air temperature (14.3°) was established at Rosslyn Bay during October 2010. Maximum October barometric pressures were recorded at Burnie (1034.3 hPa), Spring Bay (1035.2 hPa) and Port Kembla (1033.9 hPa) whilst record minimum October barometric pressures were recorded at Cocos Islands (1000.1 hPa) and Port Kembla (984.2 hPa) during October 2010.

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 and trends removed from the data.

In October 2010 positive sea level anomalies (Figure 12) exceeding 10cm were observed across Northern Australia from Broome to Rosslyn Bay. Negative anomalies of around -10cm were observed at Cocos Islands.

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.

Positive barometric pressure anomalies (Figure 14) were observed around southern Australia from Hillarys to Port Kembla during October 2010. 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. Water temperature anomalies were close to normal for October 2010. Air temperature anomalies were negative at Thevenard and Port Stanvac for October 2010 and close to normal at all other locations.

The number of hits to the Australian Baseline Sea Level Monitoring Project (ABSLMP) web pages from January 2007 to October 2010 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 October 2010.

Recent short-term sea level trends in the project area based upon SEAFRAME data through October, 2010				
Location	Lat / Long	Installation Date	Trend (mm/yr)	Change from previous month
Cocos Islands	12°07'07.1"S / 96°53'30.9"E	Sep1992	+8.0	-0.2
Groote Eylandt	13°51'36.2"S / 136°24'56.1"E	Sep 1993	+8.0	+0.3
Darwin	12°28'18.4"S / 130°50'45.1"E	May 1990	+7.7	+0.2
Broome	18°00'03.0"S / 122°13'07.1"E	Nov 1991	+8.3	+0.2
Hillarys	31°49'32.0"S / 115°44'18.9"E	Nov 1991	+7.6	+0.1
Esperance	33°52'15.2"S / 121°53'43.3"E	Mar 1992	+5.2	0.0
Thevenard	32°08'56.2"S / 133°38'28.8"E	Mar 1992	+4.1	0.0
Port Stanvac	35°06'31.0"S / 138°28'1.3"E	Jun 1992	+4.7	-0.1
Portland	38°20'36.4"S / 141°36'47.4"E	Jul 1991	+2.9	0.0
Lorne	38°32'49.4"S / 143°59'19.8"E	Jan 1993	+1.2	0.0
Stony Point	38°22'19.7"S / 145°13'28.9"E	Jan 1993	+1.2	0.0
Burnie	41°03'0.3"S / 145°54'54.0"E	Sep 1992	+2.8	0.0
Spring Bay	42°32'45.1"S / 147°55'57.8"E	May 1991	+3.4	0.0
Port Kembla	34°28'25.5"S / 150°54'42.7"E	Jul 1991	+3.0	-0.1
Rosslyn Bay	23°09'39.7"S / 150°47'24.6"E	Jun 1992	+2.8	+0.2
Cape Ferguson	19°16'38.4"S / 147°03'30.4"E	Sep 1991	+3.9	+0.2

Figure A: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2007 to October 2010.

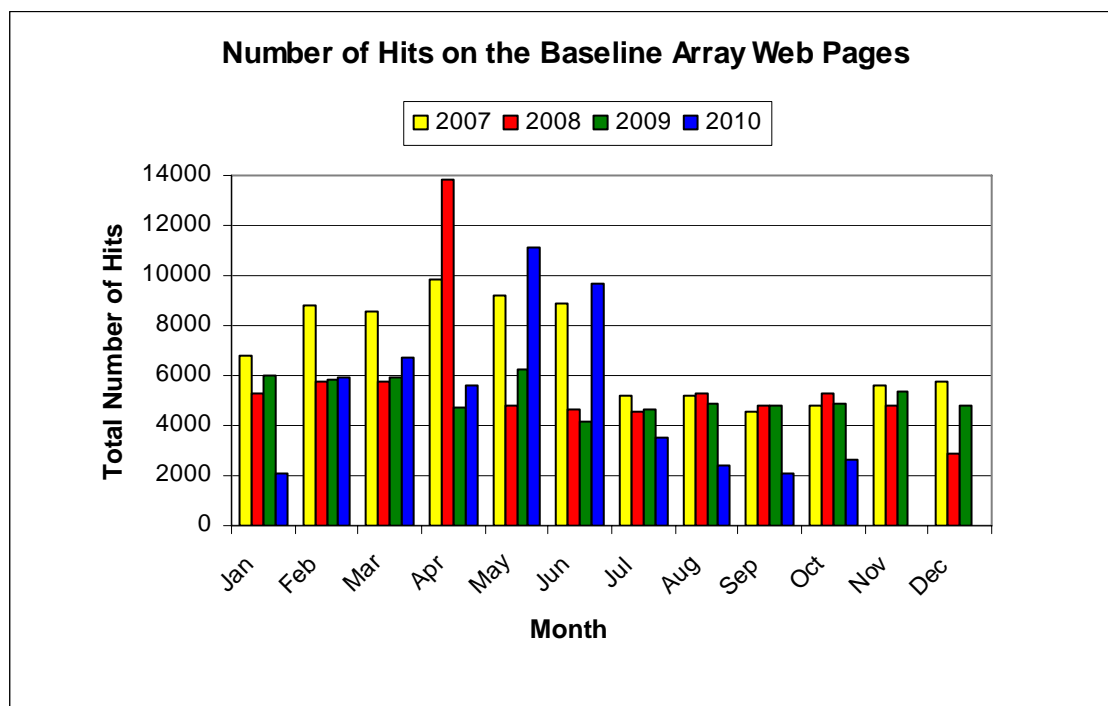
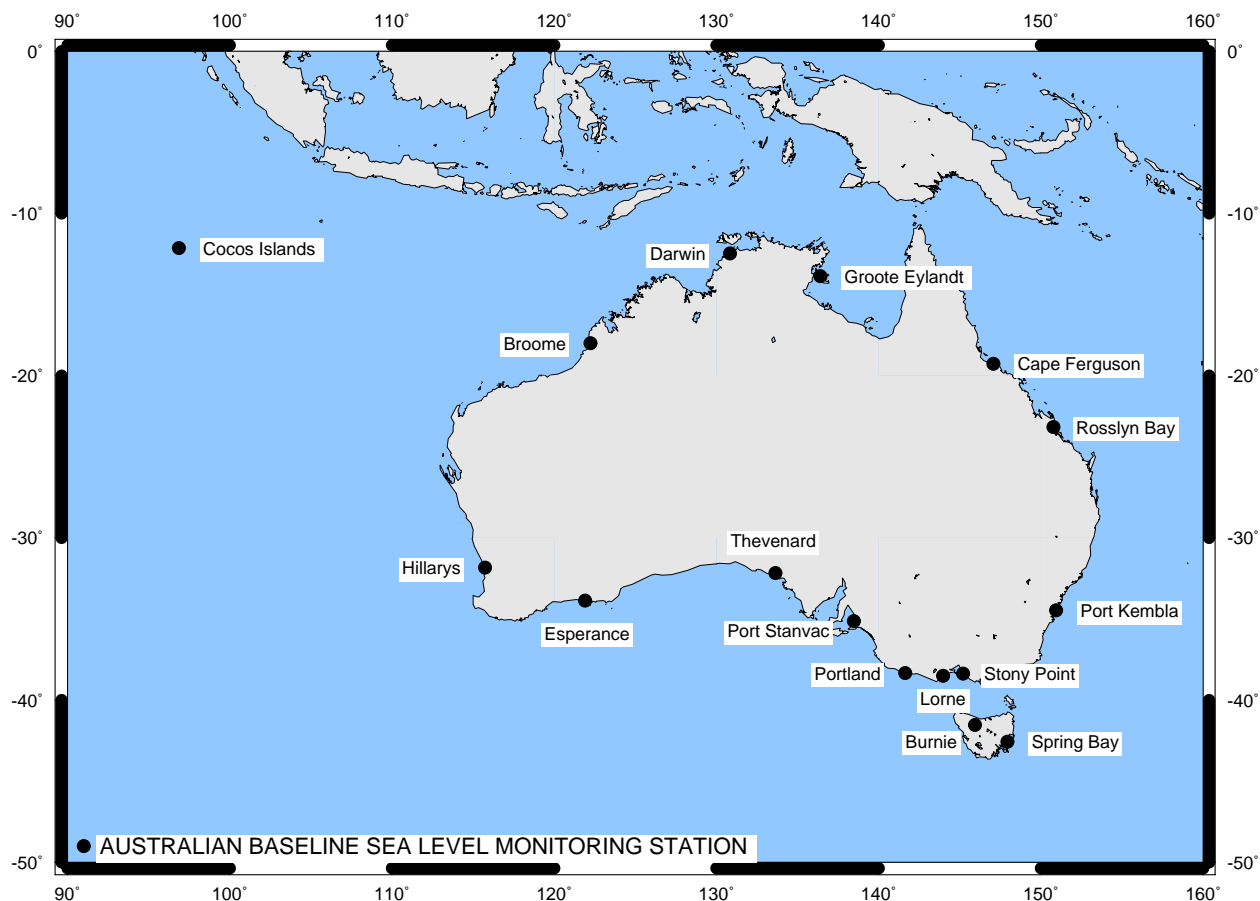


Figure B: Australian Baseline Sea Level Monitoring Project sites.



The *Monthly Data Report* is prepared by the NTC, Bureau of Meteorology for the Department of Climate Change and Energy Efficiency. 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.

Figure 1

**OCTOBER 2010
SIX MINUTE SEA LEVEL OBSERVATIONS (m)**

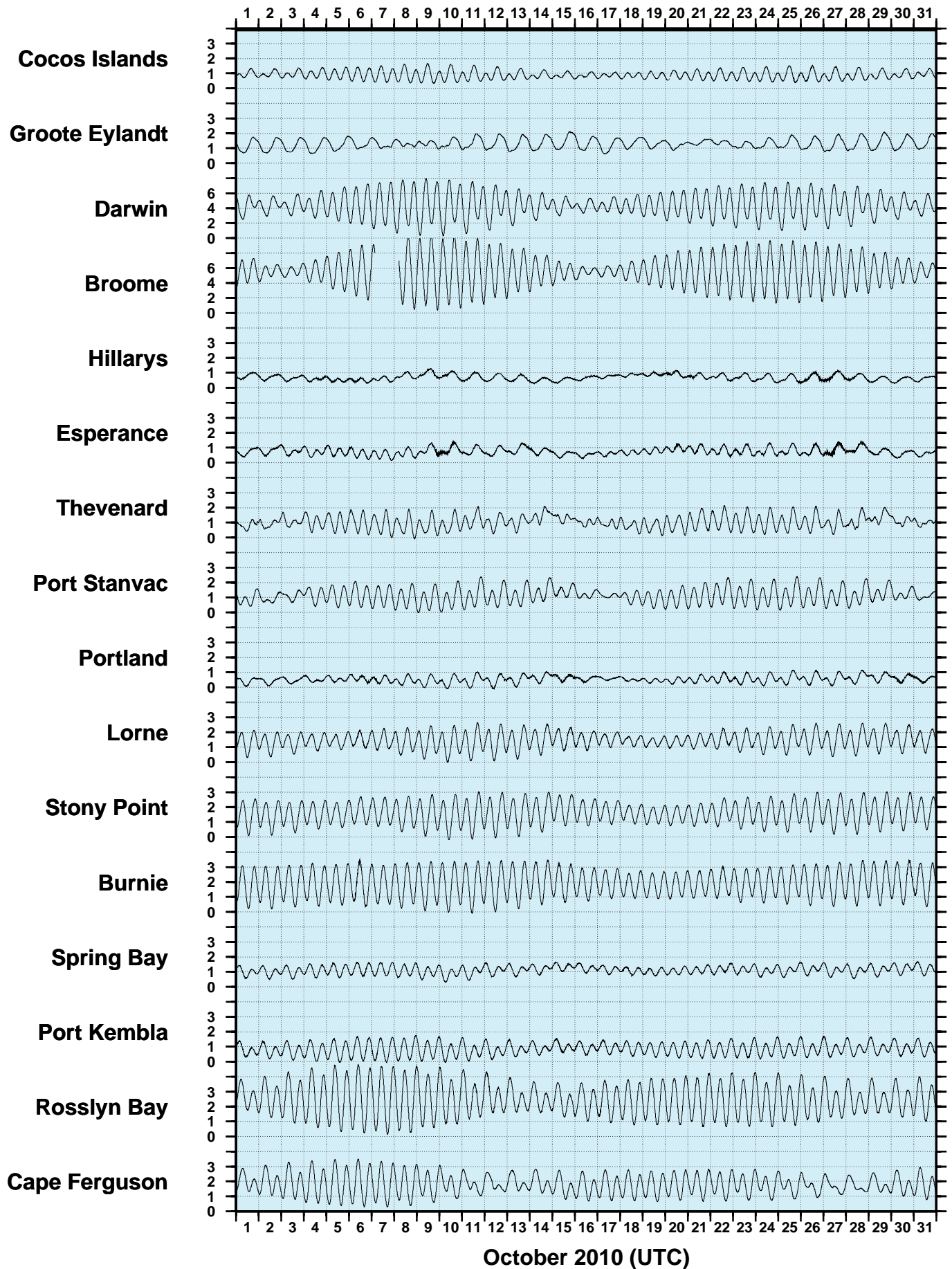


Figure 2

OCTOBER 2010
SIX MINUTE RESIDUAL WATER LEVELS (m)

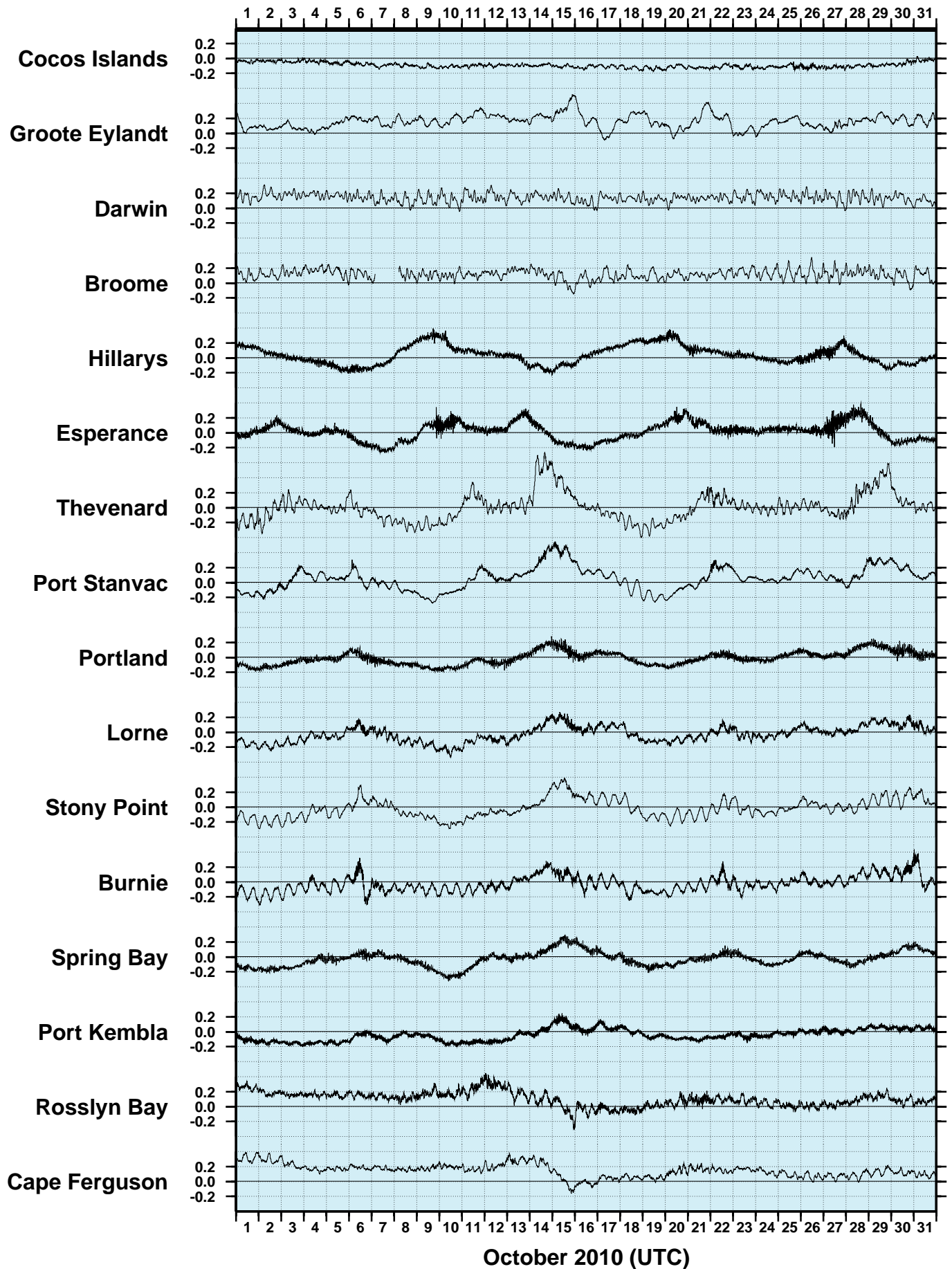


Figure 3
OCTOBER 2010
SIX MINUTE RESIDUALS
ADJUSTED FOR ATMOSPHERIC PRESSURE (m)

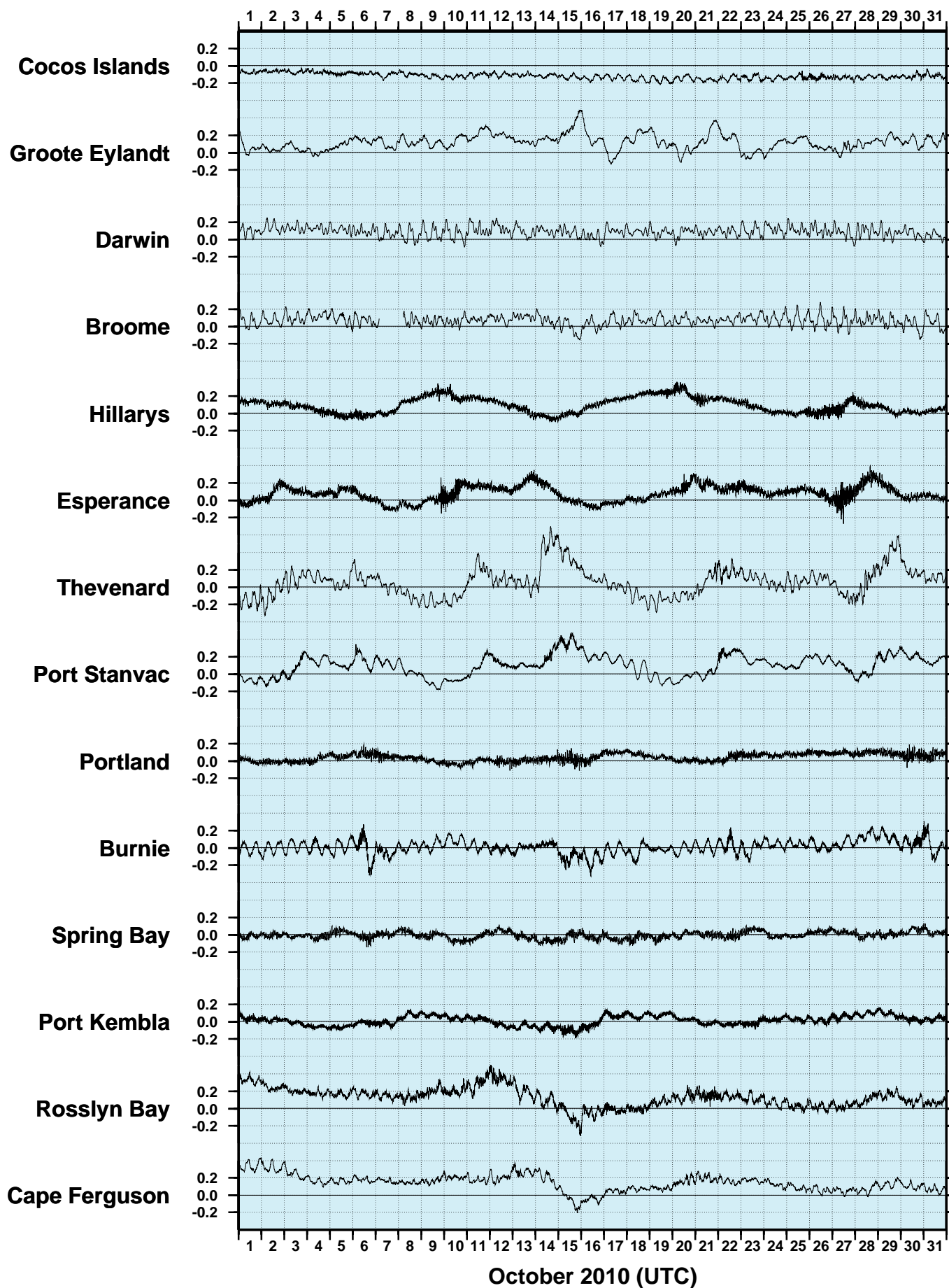


Figure 4

**OCTOBER 2010
HOURLY WIND SPEEDS (m/s)**

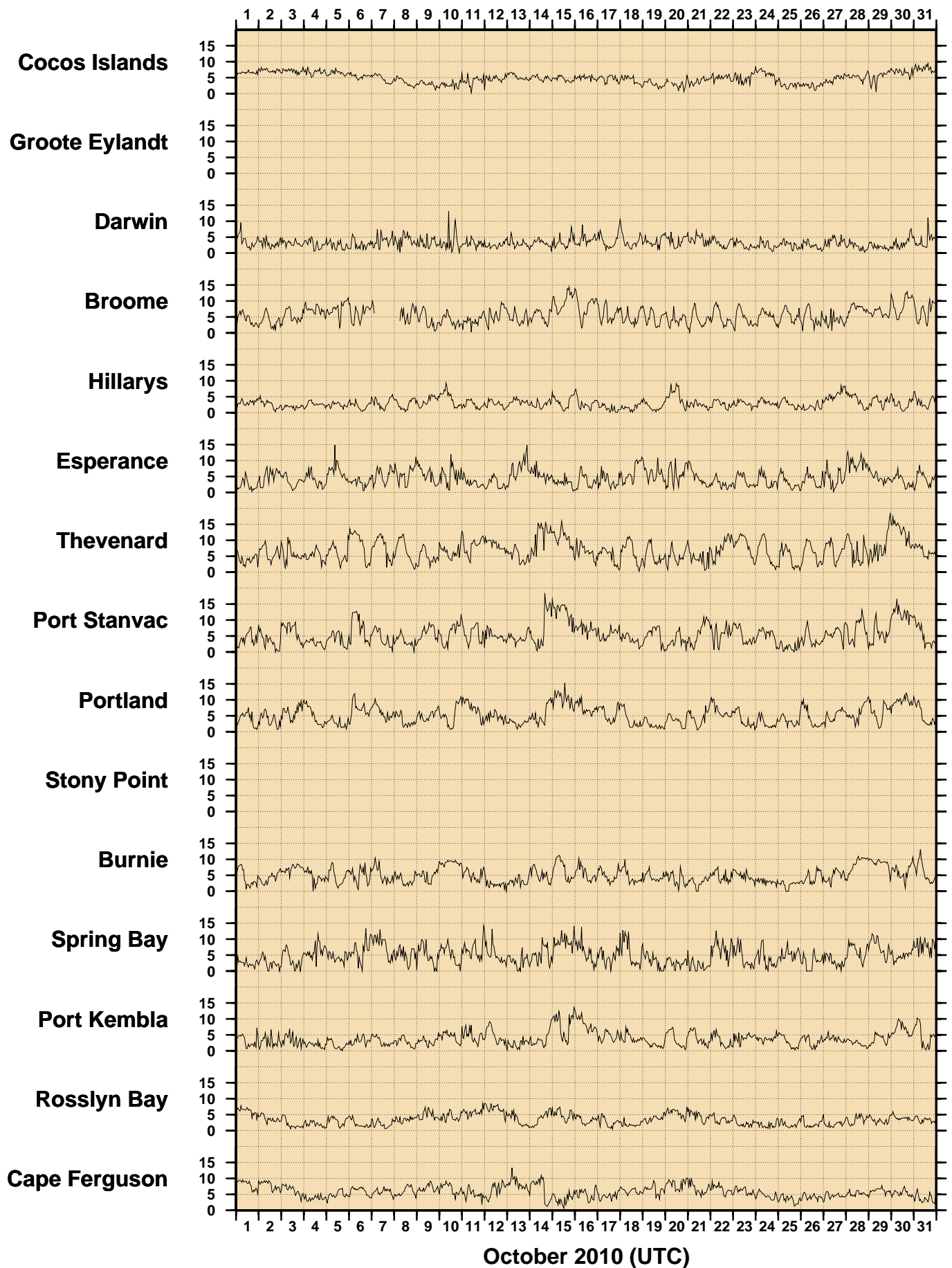


Figure 5

OCTOBER 2010
HOURLY INCIDENT WINDS (m/s, deg True)

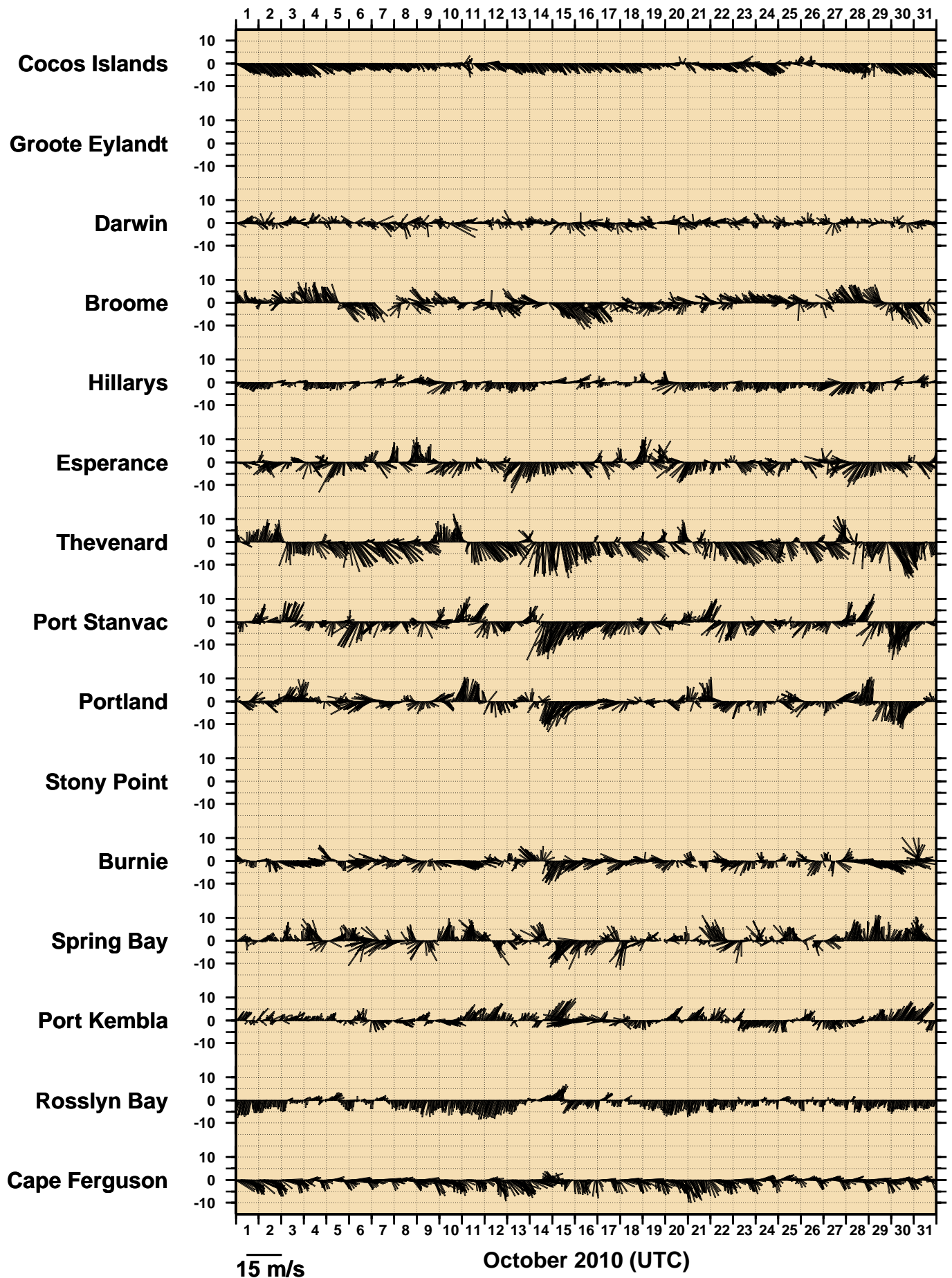


Figure 6

OCTOBER 2010
HOURLY MAXIMUM WIND GUSTS (m/s)

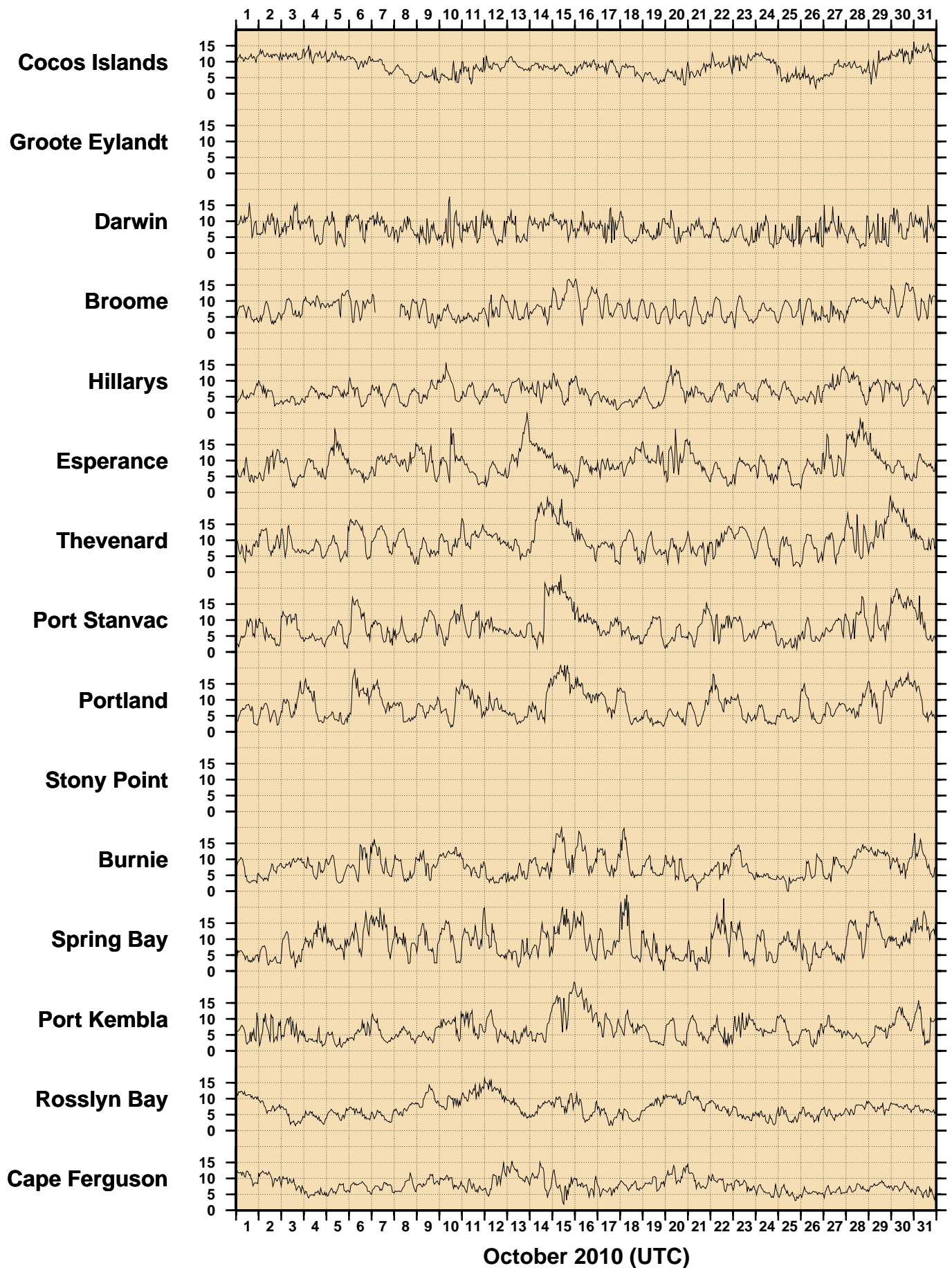


Figure 7

OCTOBER 2010
HOURLY AIR TEMPERATURES (°C)

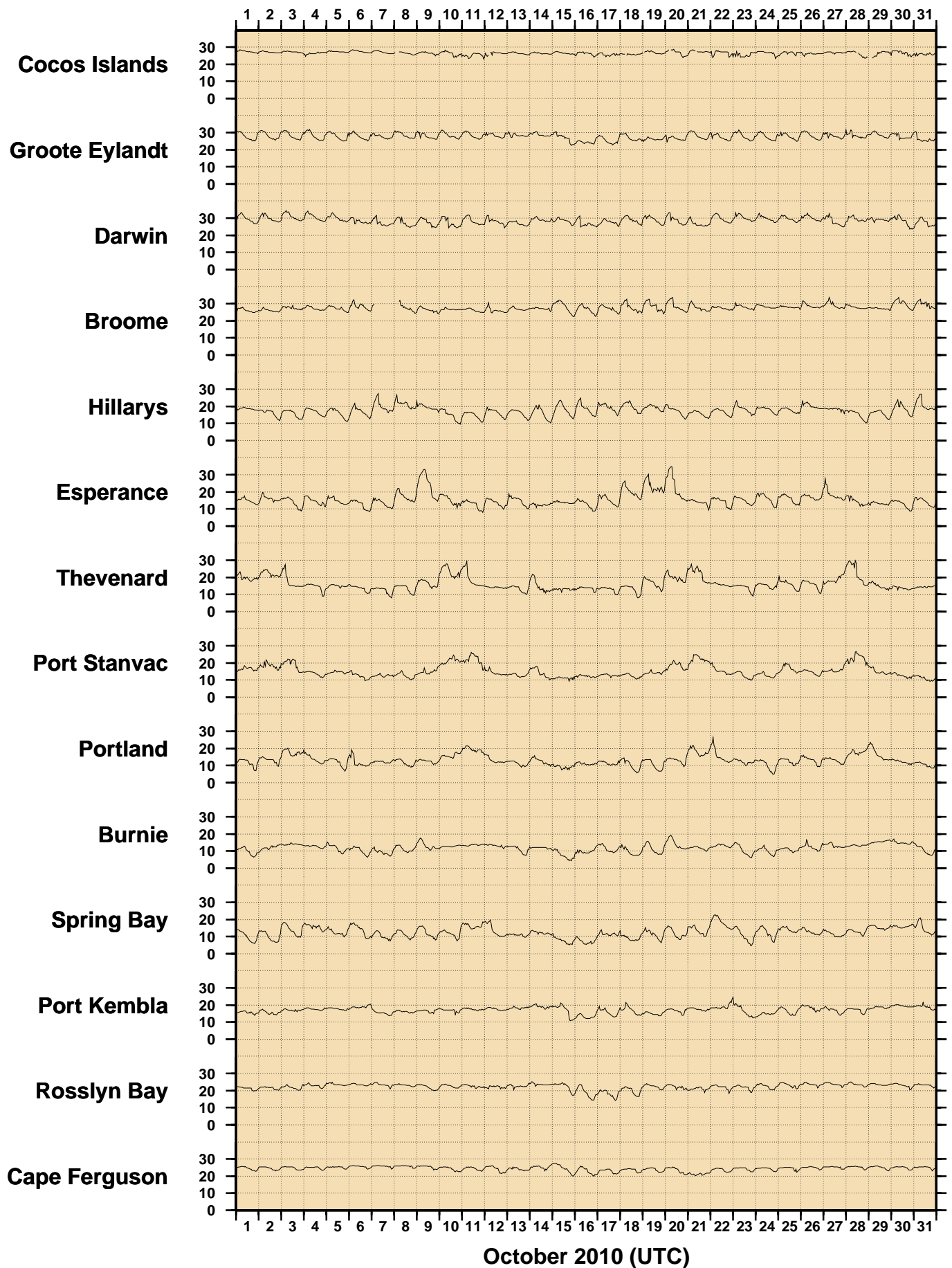


Figure 8

OCTOBER 2010
HOURLY WATER TEMPERATURES (°C)

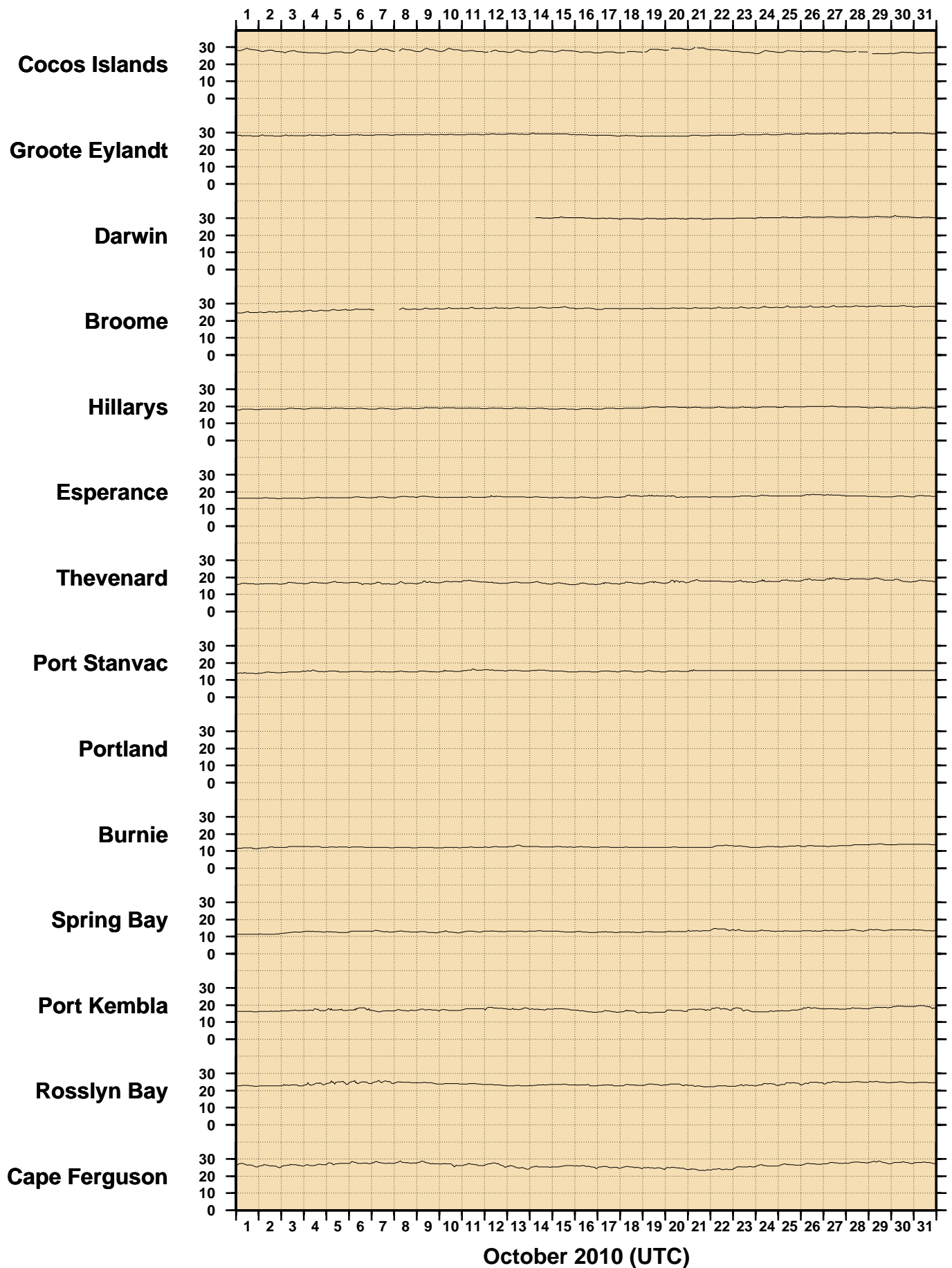


Figure 9

OCTOBER 2010
HOURLY ATMOSPHERIC PRESSURE (hPa)

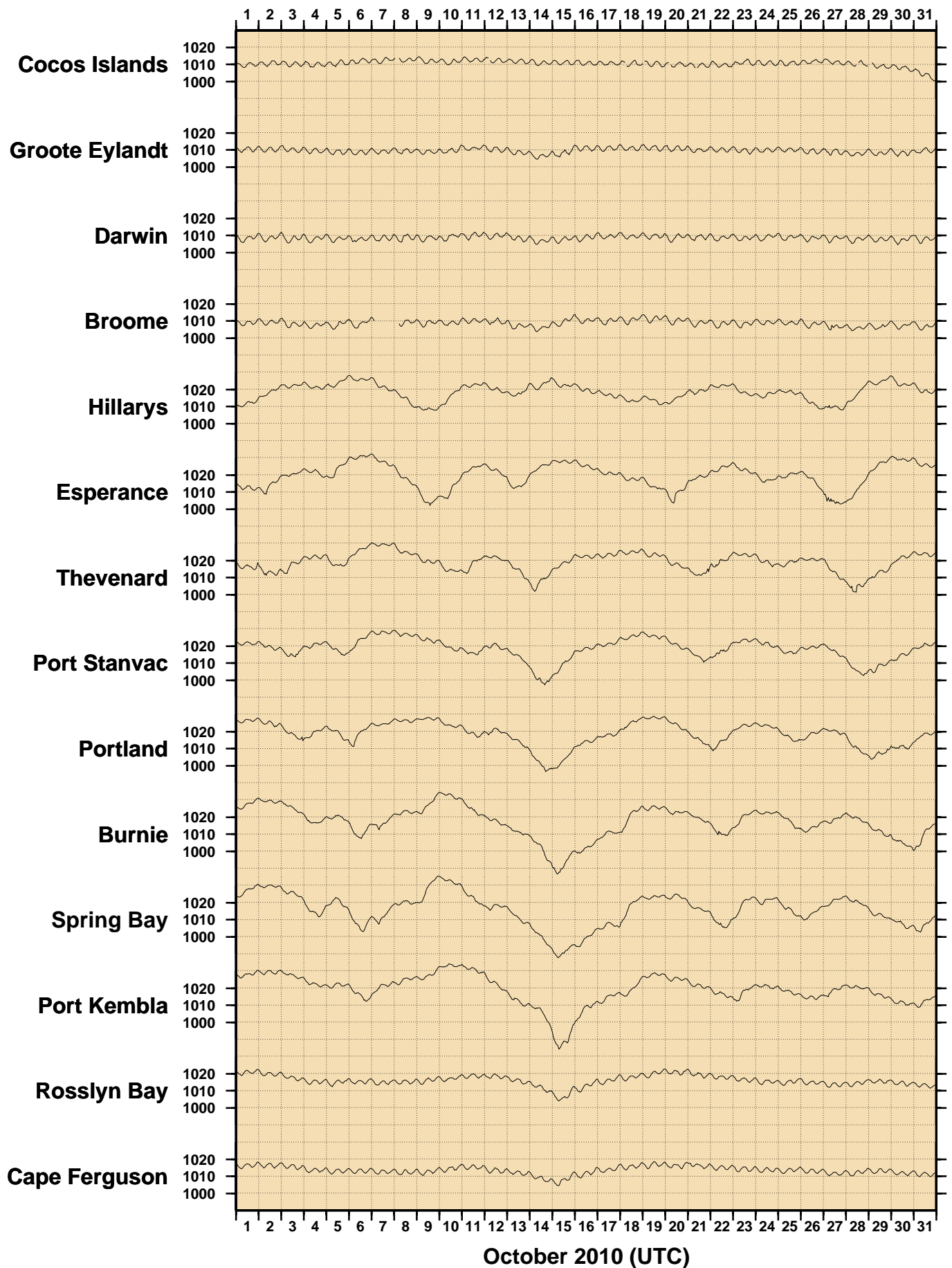
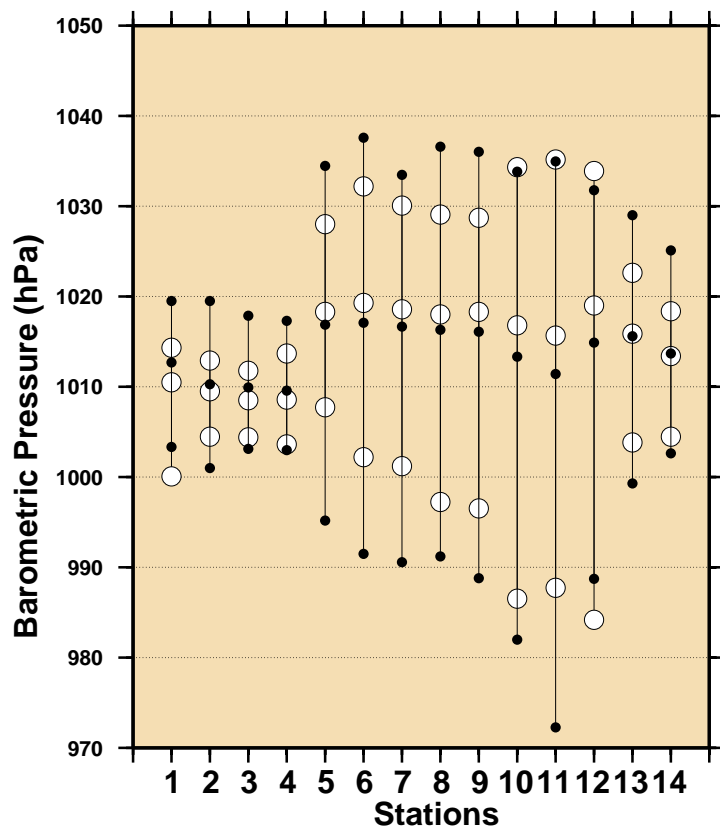
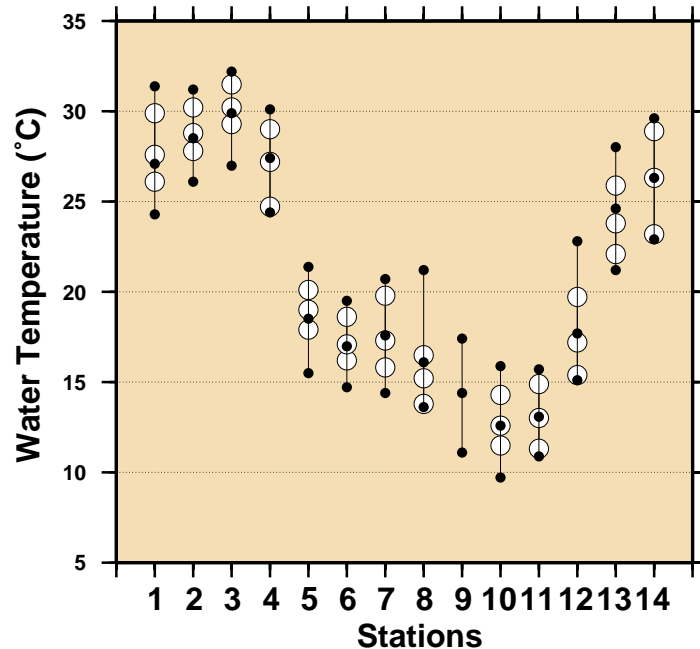
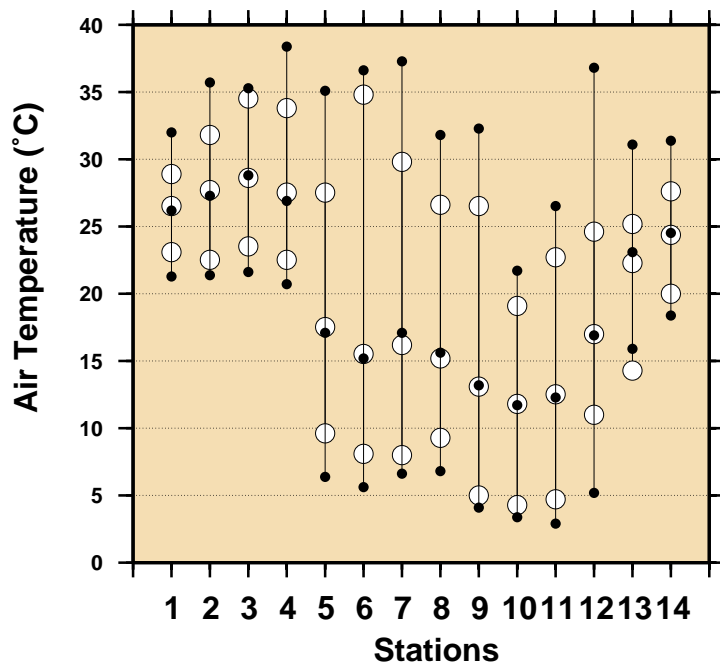


Figure 10
Comparison of October 2010 Max, Min & Mean with
Long Term October Values.



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

- October 2010 Maximum
- October 2010 Mean
- October 2010 Minimum
- Long Term October Maximum
- Long Term October Mean
- Long Term October Minimum

Figure 11

MONTHLY MEAN SEA LEVELS TO OCTOBER 2010 (m)

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

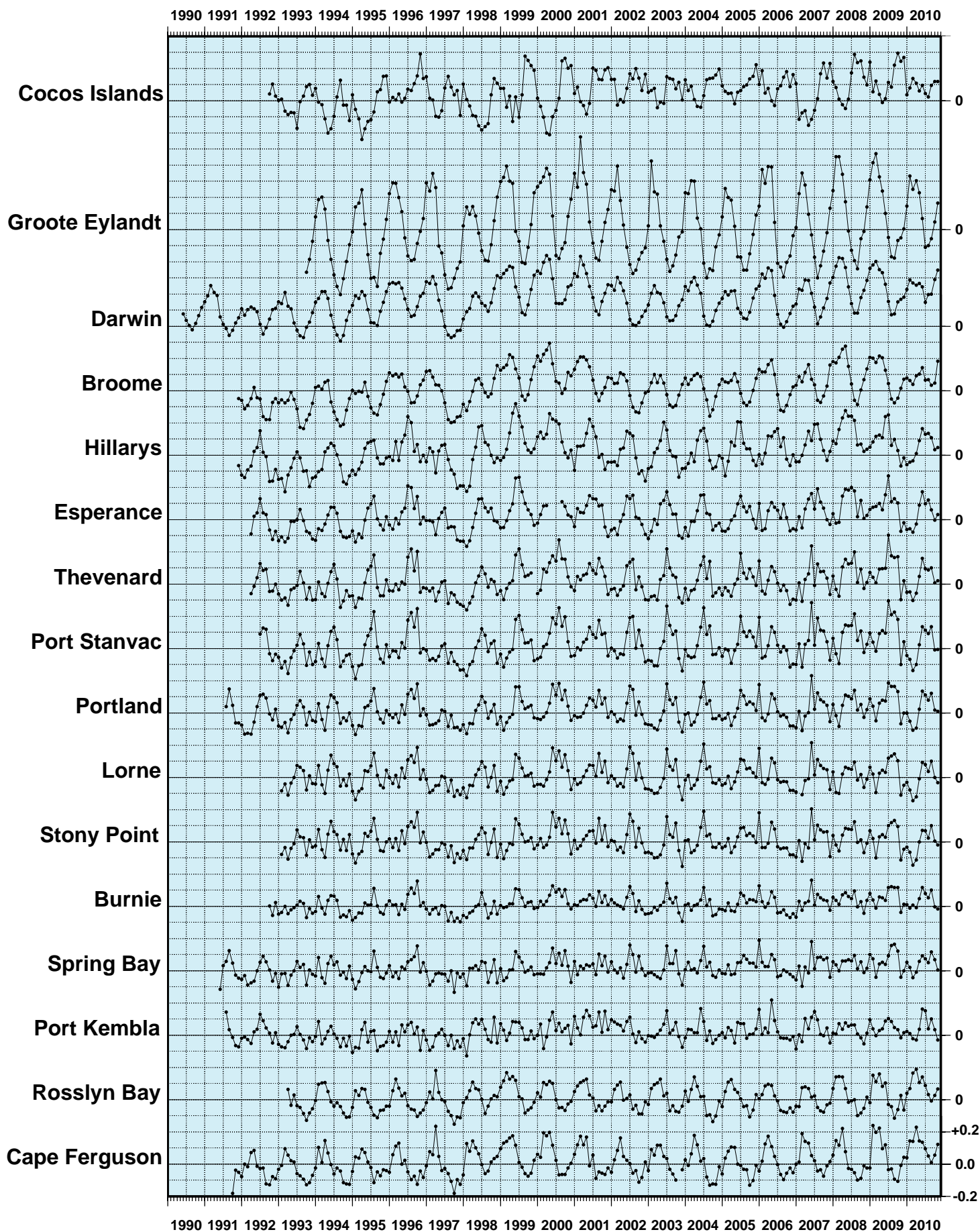


Figure 12
SEA LEVEL ANOMALIES THROUGH OCTOBER 2010 (m)

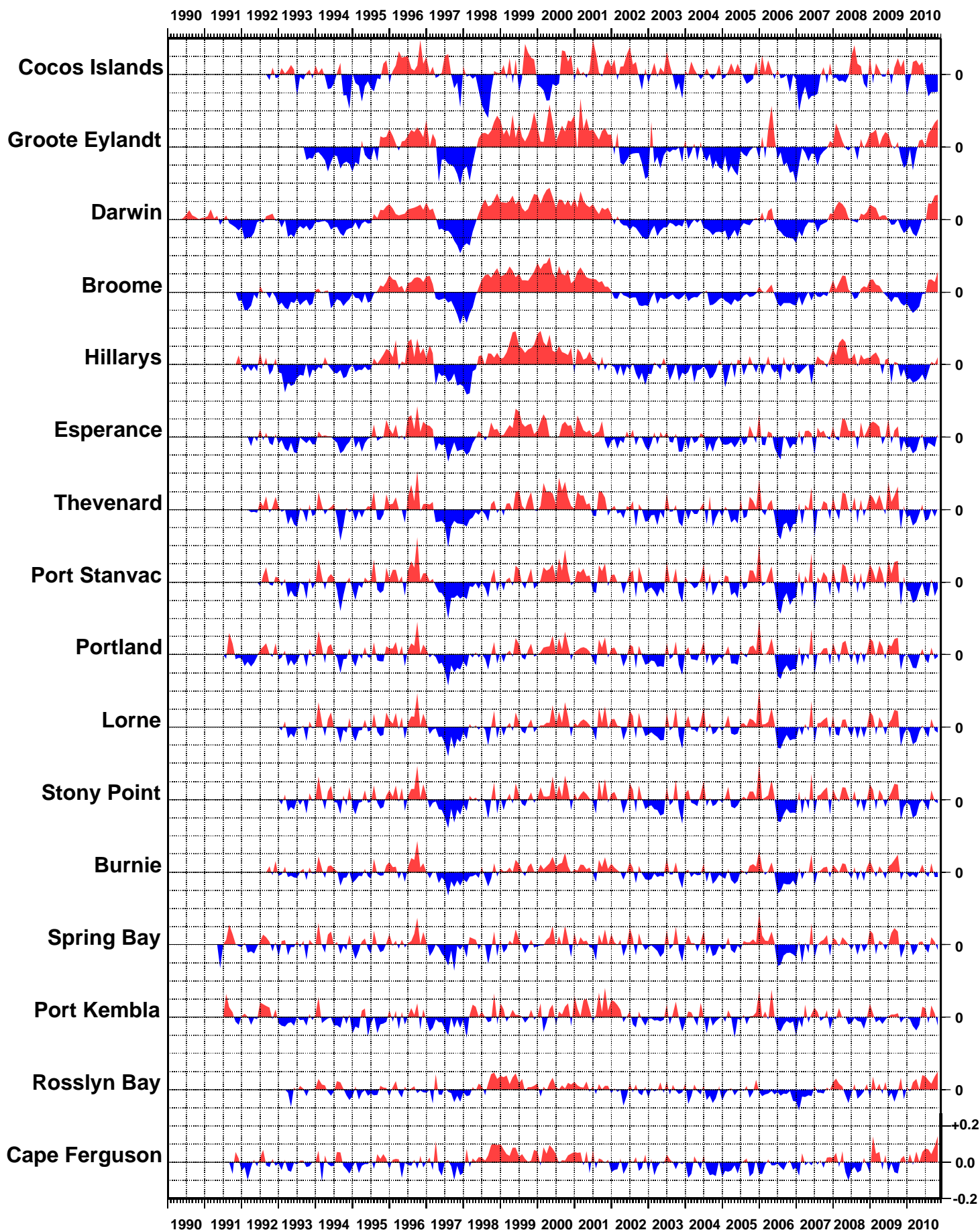


Figure 13

SEA LEVEL TRENDS THROUGH OCTOBER 2010 (mm/year)

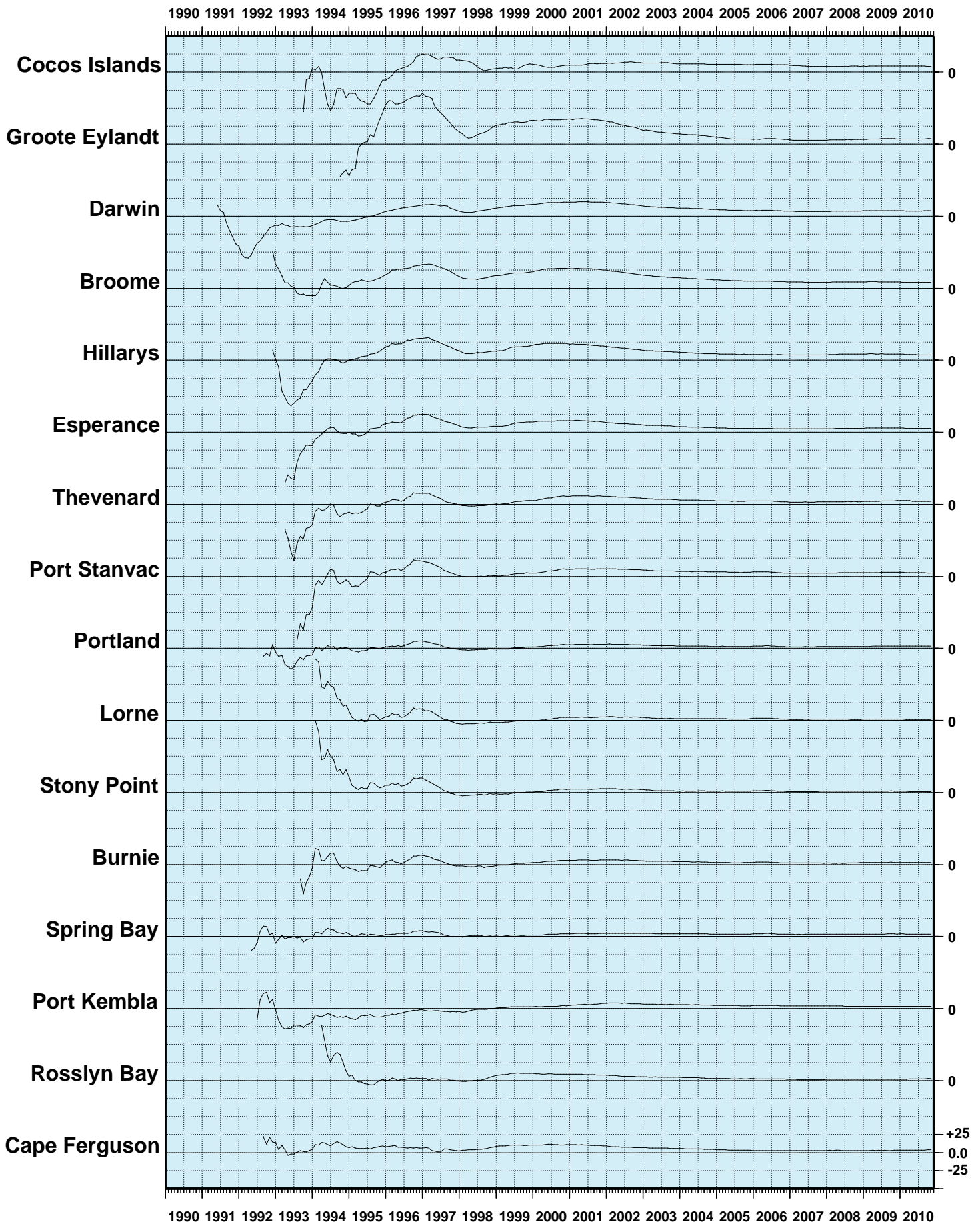


Figure 14

BAROMETRIC PRESSURE ANOMALIES THROUGH OCTOBER 2010 (hPa)

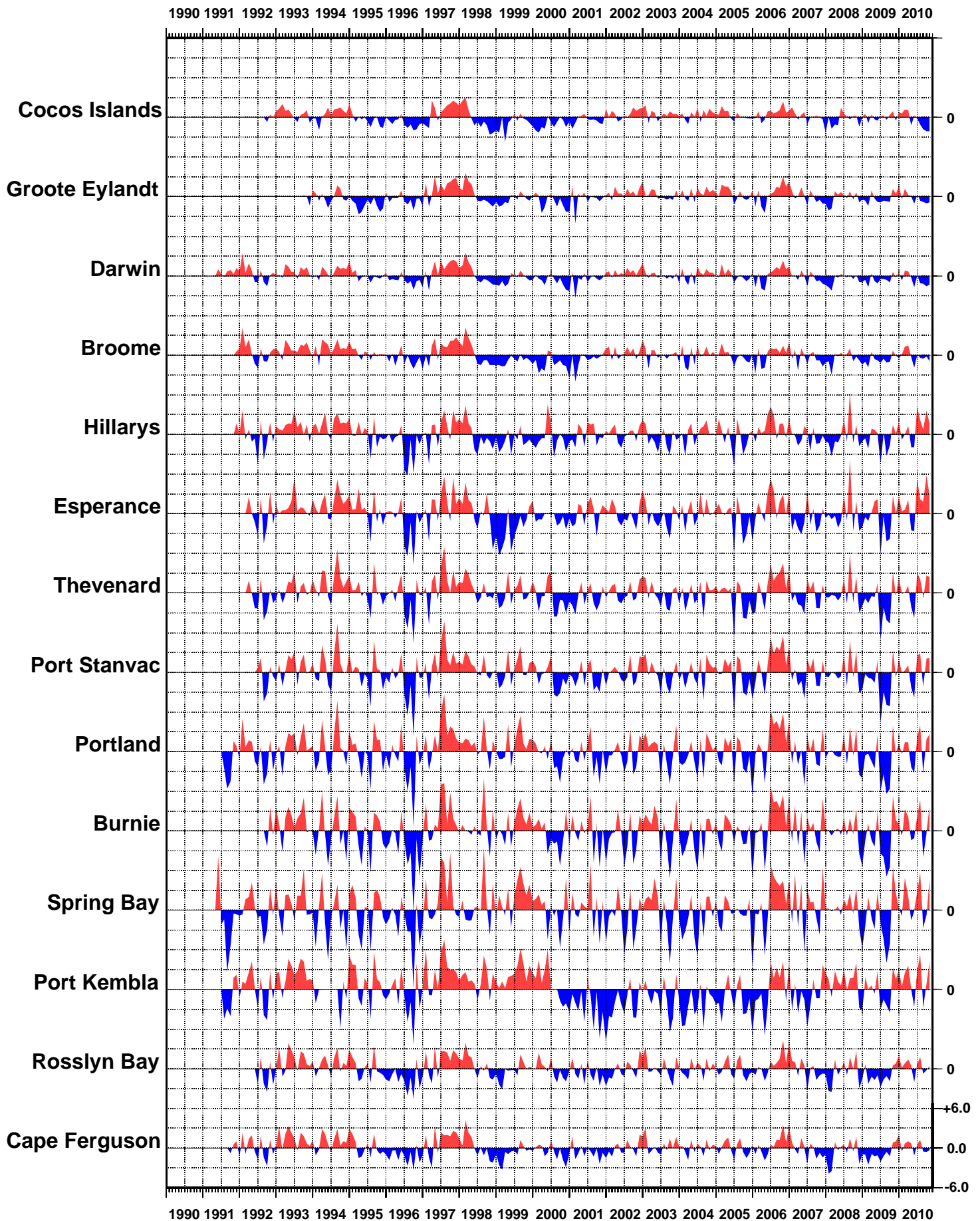


Figure 15

WATER TEMPERATURE ANOMALIES THROUGH OCTOBER 2010 (°C)

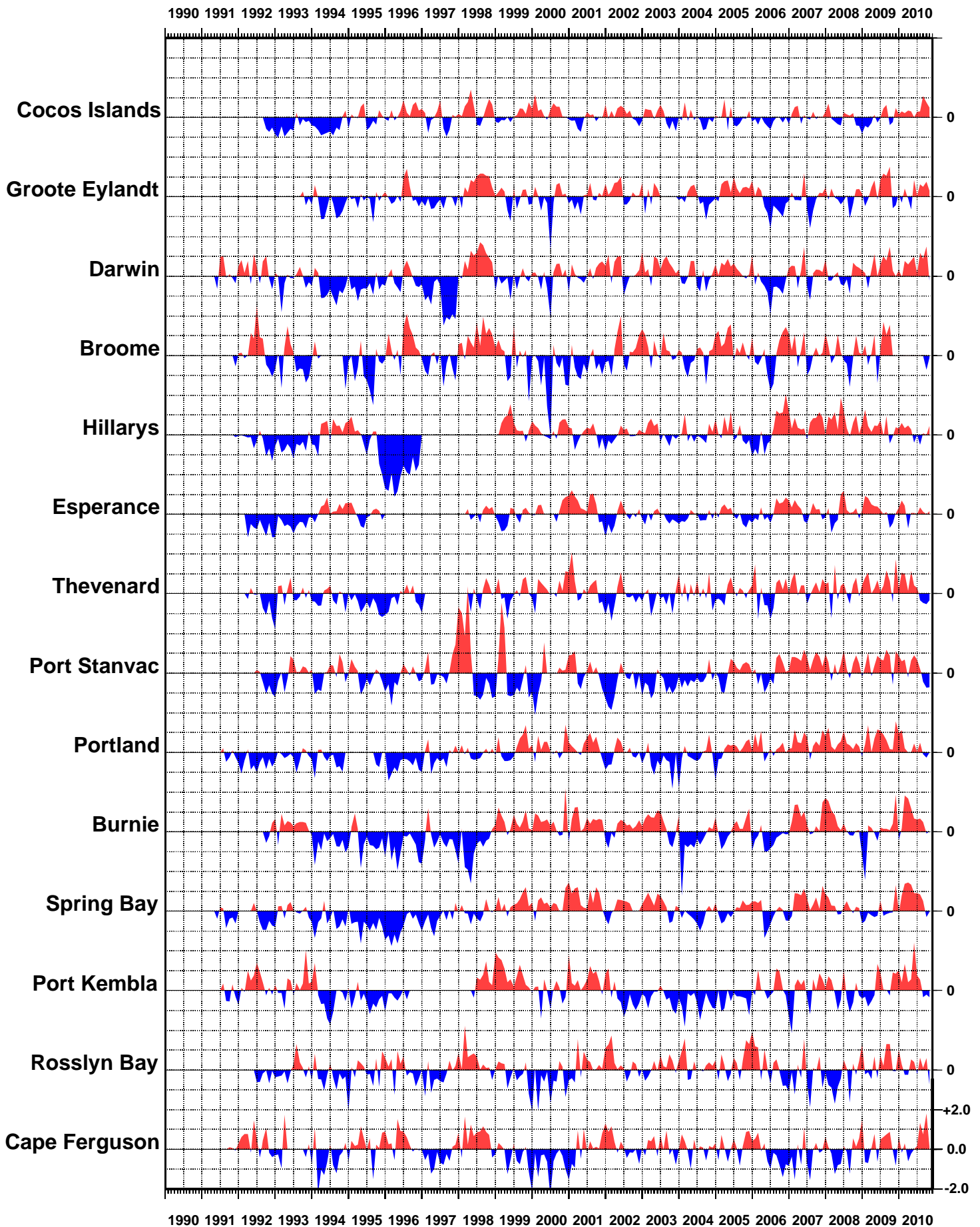


Figure 16

AIR TEMPERATURE ANOMALIES THROUGH OCTOBER 2010 (°C)

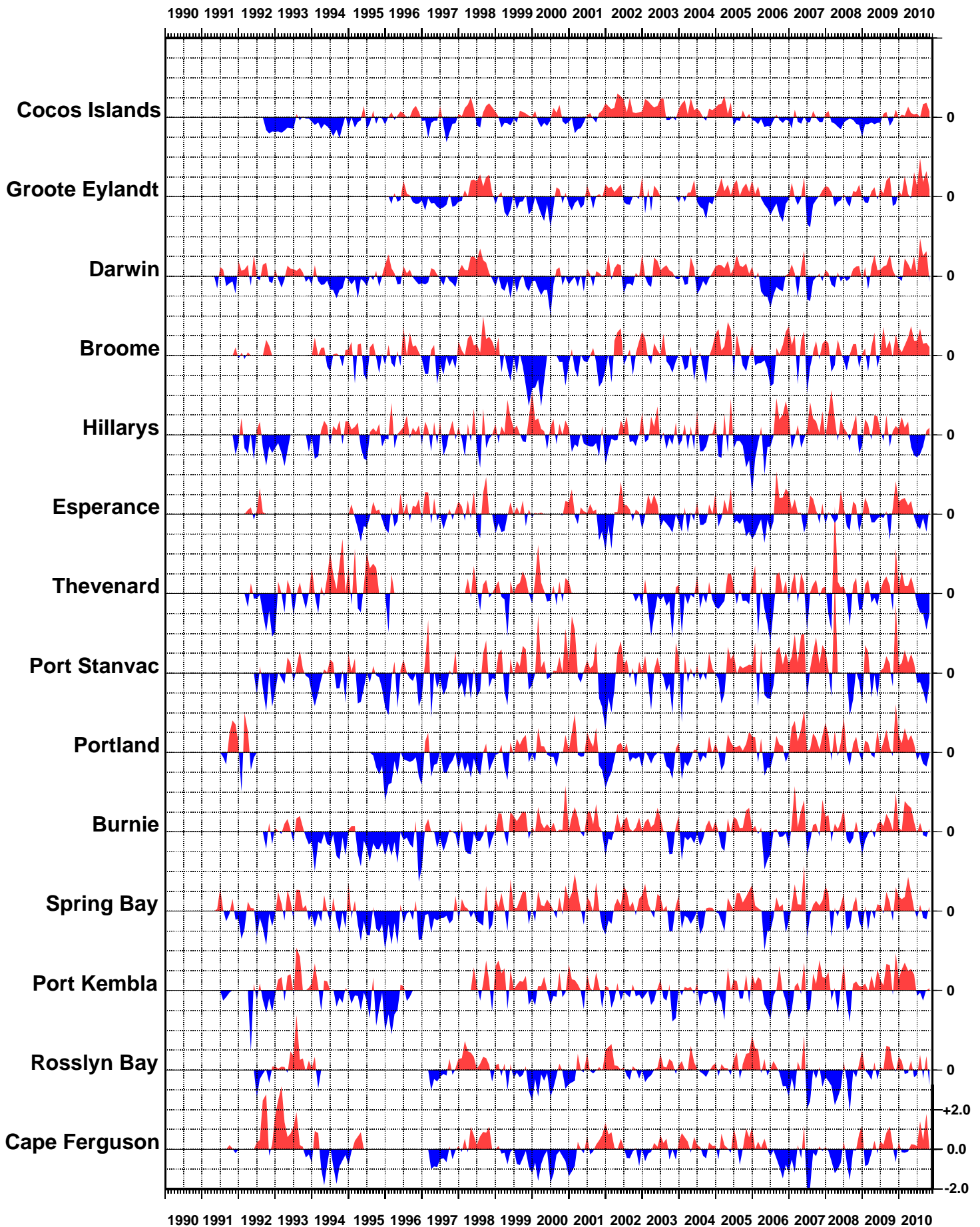


Figure 17 SEA LEVEL DATA RETURN

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

* Patchy record

