THE AUSTRALIAN BASELINE SEA LEVEL MONITORING PROJECT

MONTHLY DATA REPORT

MARCH 2011

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.

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Quality Certification:

I authorise the issue of this Australian Baseline Sea Level Monitoring Project Monthly Data Report for March 2011 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

MARCH 2011

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 MARCH 2011

Sea level data return (Figures 1 and 17) was good for most operative stations during March 2011. Please note that no data exists for Port Stanvac since November 2010 as the station was removed to allow the former owners of the site (Mobil Refining Australia) to rehabilitate and vacate the Port Stanvac oil refinery precinct. Re-establishment of the gauge depends on the long-term future of the wharf. The Broome Port Authority's policy of switching off the power when fuel ships are in dock resulted in the loss of 34 hours of Broome sea level and ancillary data during March. Broome wind monitoring was re-established following replacement of the Young anemometer on the 24th of March. The Stony Point wind data have been removed while suspect high wind speeds and gusts are investigated further. Wind data received from the Groote Eylandt and Spring Bay stations indicate instrument failure and the entire month's wind data for both locations have been removed from the records. No Darwin water temperatures have been recorded for March following failure of the water temperature sensor in January.

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. Tsunami signals following the magnitude Mw 9.1 earthquake off

Japan on the 11th of March were recorded at Portland, Lorne, Burnie, Spring Bay, Port Kembla, Rosslyn Bay and Cape Ferguson. 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 March 2011 with the long-term values. Note that the long-term ranges are calculated using the previous sets of March data for each station ***excluding*** the current month of data.

A new maximum March water temperature was recorded at Hillarys (26.6°), whilst the March 2011 air temperatures and barometric pressures for all stations fell within the long-term March minimums and maximums.

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 March 2011 positive sea level anomalies (Figure 12) were observed at Groote Eylandt, Darwin, Broome, Hillarys and Esperance. A slightly negative sea level anomaly was observed at Cocos Islands and near zero anomalies observed at all other locations.

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.

Negative barometric pressure anomalies (Figure 14) were observed at Cocos Islands, Darwin, Broome and Hillarys and near zero for all other locations during March 2011. 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. During March 2011 positive water temperature anomalies near or greater than 1°C were observed at Hillarys and Esperance whilst negative anomalies below -0.5°C were observed at Groote Eylandt, Broome and Thevenard. A positive air temperature anomaly greater than 2°C was observed at Hillarys whilst negative anomalies near -1°C were observed at Darwin, Thevenard and Spring Bay.

The number of hits to the Australian Baseline Sea Level Monitoring Project (ABSLMP) web pages from January 2008 to March 2011 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 March 2011.

Recent short-term sea level trends in the project area based upon SEAFRAME data through March, 2011				
Location	**Lat / Long**	**Installation Date**	**Trend (mm/yr)**	**Change from previous month**
Cocos Islands	12°07'07.1"S / 96°53'30.9"E	Sep 1992	+8.2	0.0
Groote Eylandt	13°51'36.2"S / 136°24'56.1"E	Sep 1993	+8.7	+0.1
Darwin	12°28'18.4"S / 130°50'45.1"E	May 1990	+8.5	+0.1
Broome	18°00'03.0"S / 122°13'07.1"E	Nov 1991	+9.0	+0.1
Hillarys	31°49'32.0"S / 115°44'18.9"E	Nov 1991	+8.8	+0.1
Esperance	33°52'15.2"S / 121°53'43.3"E	Mar 1992	+5.7	0.0
Thevenard	32°08'56.2"S / 133°38'28.8"E	Mar 1992	+4.4	0.0
Port Stanvac	35°06'31.0"S / 138°28'1.3"E	Jun 1992	+4.7*	0.0
Portland	38°20'36.4"S / 141°36'47.4"E	Jul 1991	+3.2	0.0
Lorne	38°32'49.4"S / 143°59'19.8"E	Jan 1993	+1.4	0.0
Stony Point	38°22'19.7"S / 145°13'28.9"E	Jan 1993	+2.5	0.0
Burnie	41°03'0.3"S / 145°54'54.0"E	Sep 1992	+3.1	0.0
Spring Bay	42°32'45.1"S / 147°55'57.8"E	May 1991	+3.5	0.0
Port Kembla	34°28'25.5"S / 150°54'42.7"E	Jul 1991	+3.0	0.0
Rosslyn Bay	23°09'39.7"S / 150°47'24.6"E	Jun 1992	+3.5	0.0
Cape Ferguson	19°16'38.4"S / 147°03'30.4"E	Sep 1991	+4.6	0.0

***Port Stanvac decommissioned November 2010**

Figure A: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2008 to March 2011.

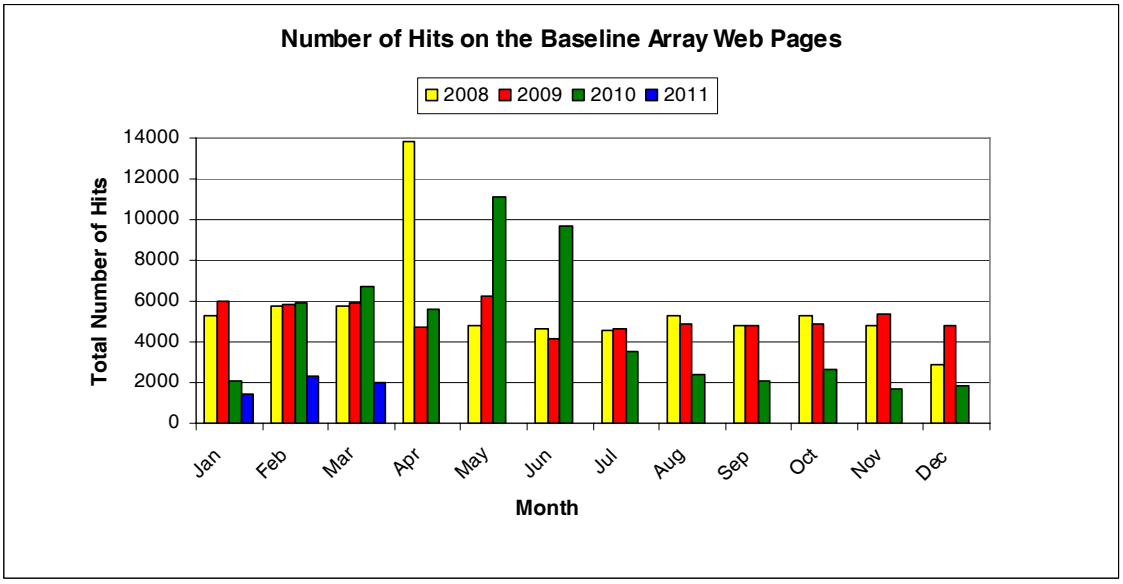
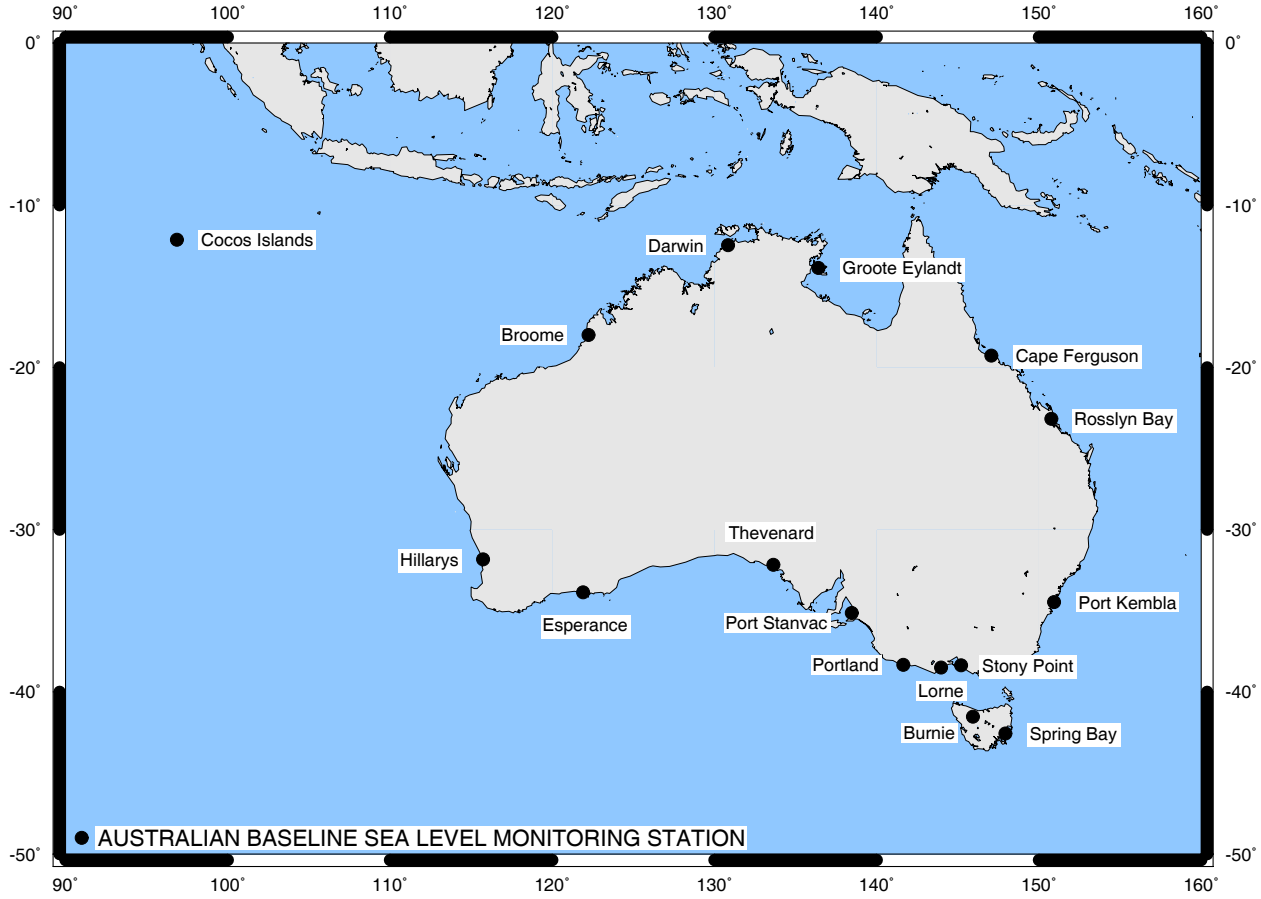


Figure B: Australian Baseline Sea Level Monitoring Project sites.



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:

Figure 1

MARCH 2011
SIX MINUTE SEA LEVEL OBSERVATIONS (m)

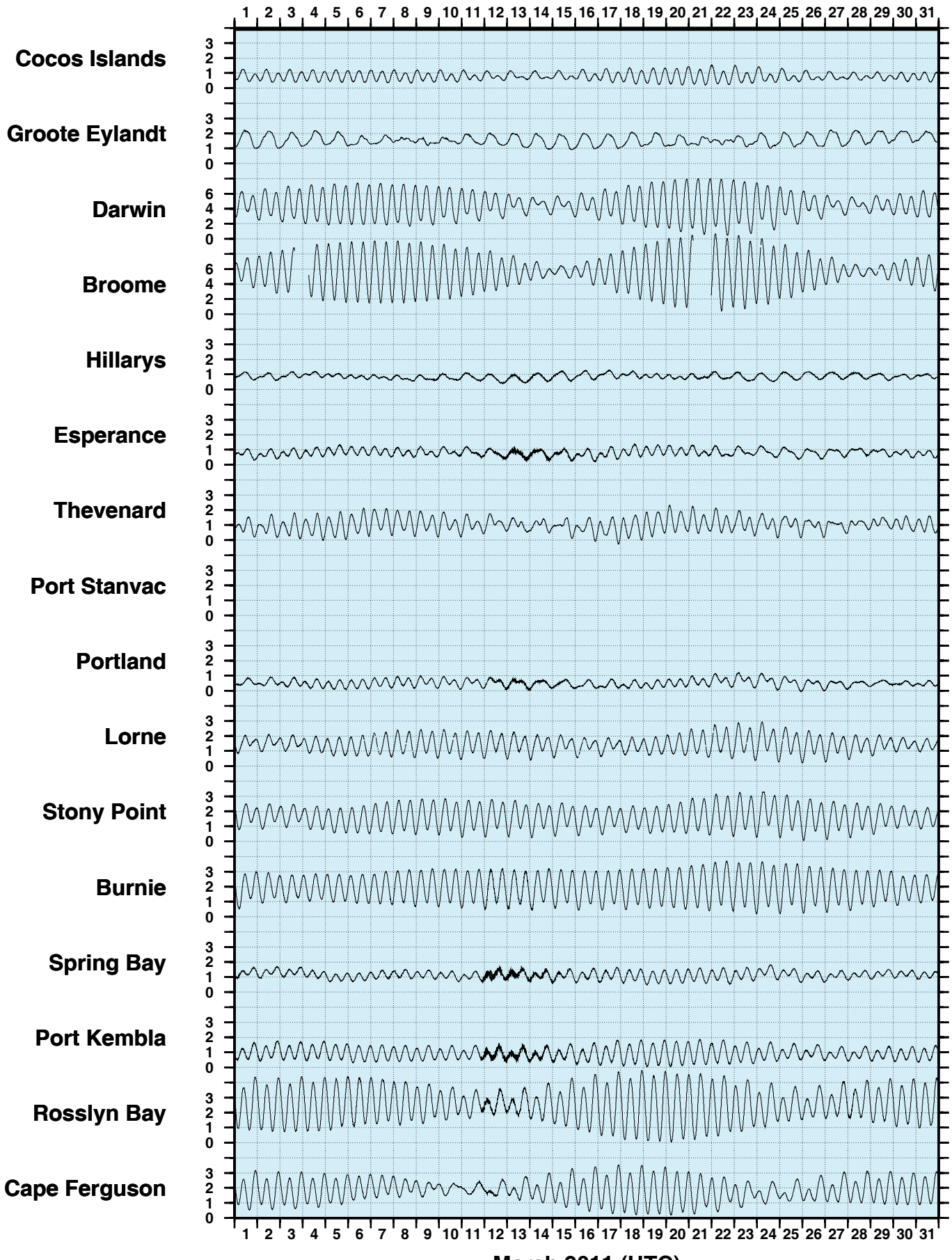

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Figure 2

MARCH 2011
SIX MINUTE RESIDUAL WATER LEVELS (m)

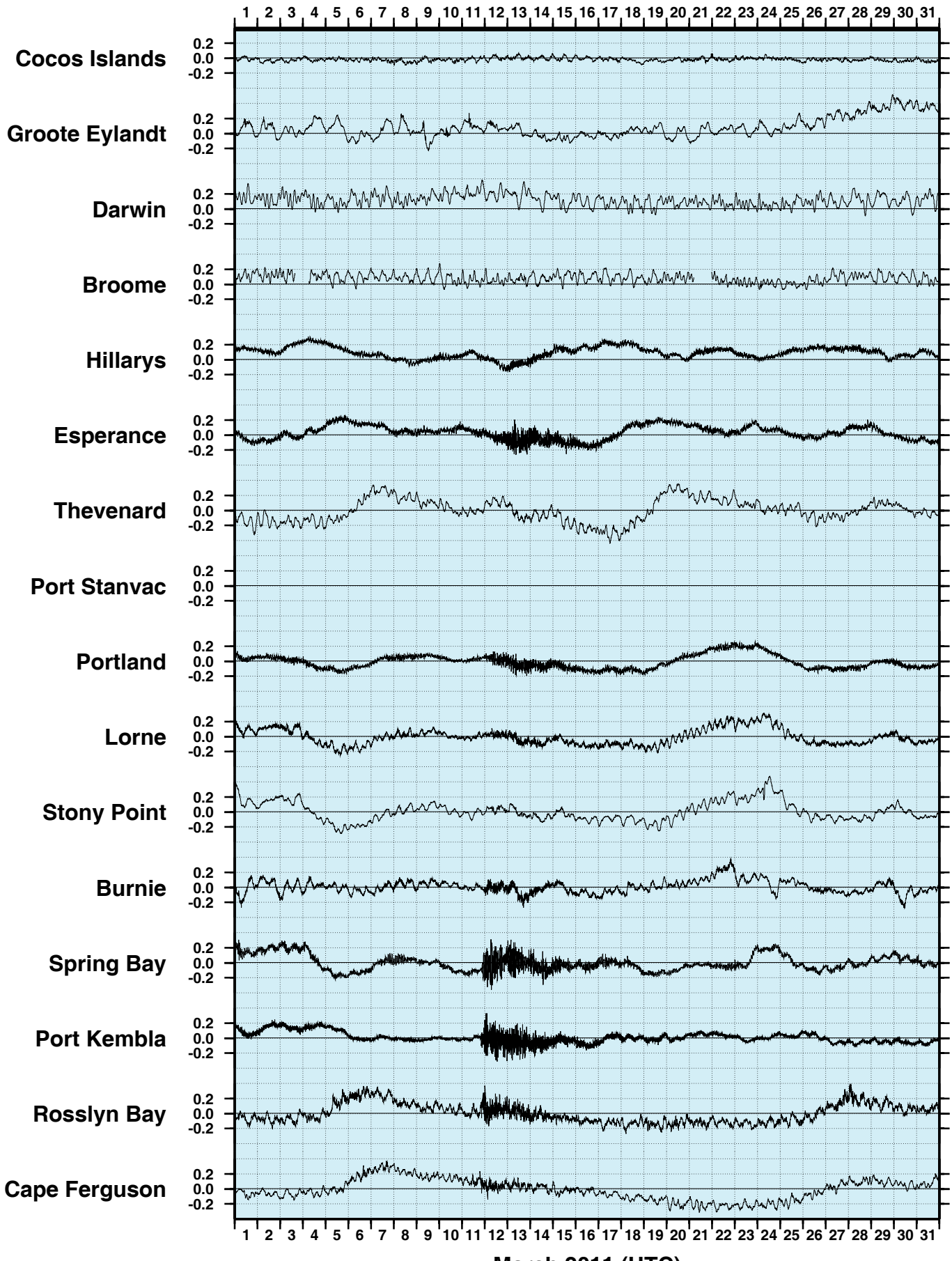

Figure 3

MARCH 2011
SIX MINUTE RESIDUALS
ADJUSTED FOR ATMOSPHERIC PRESSURE (m)

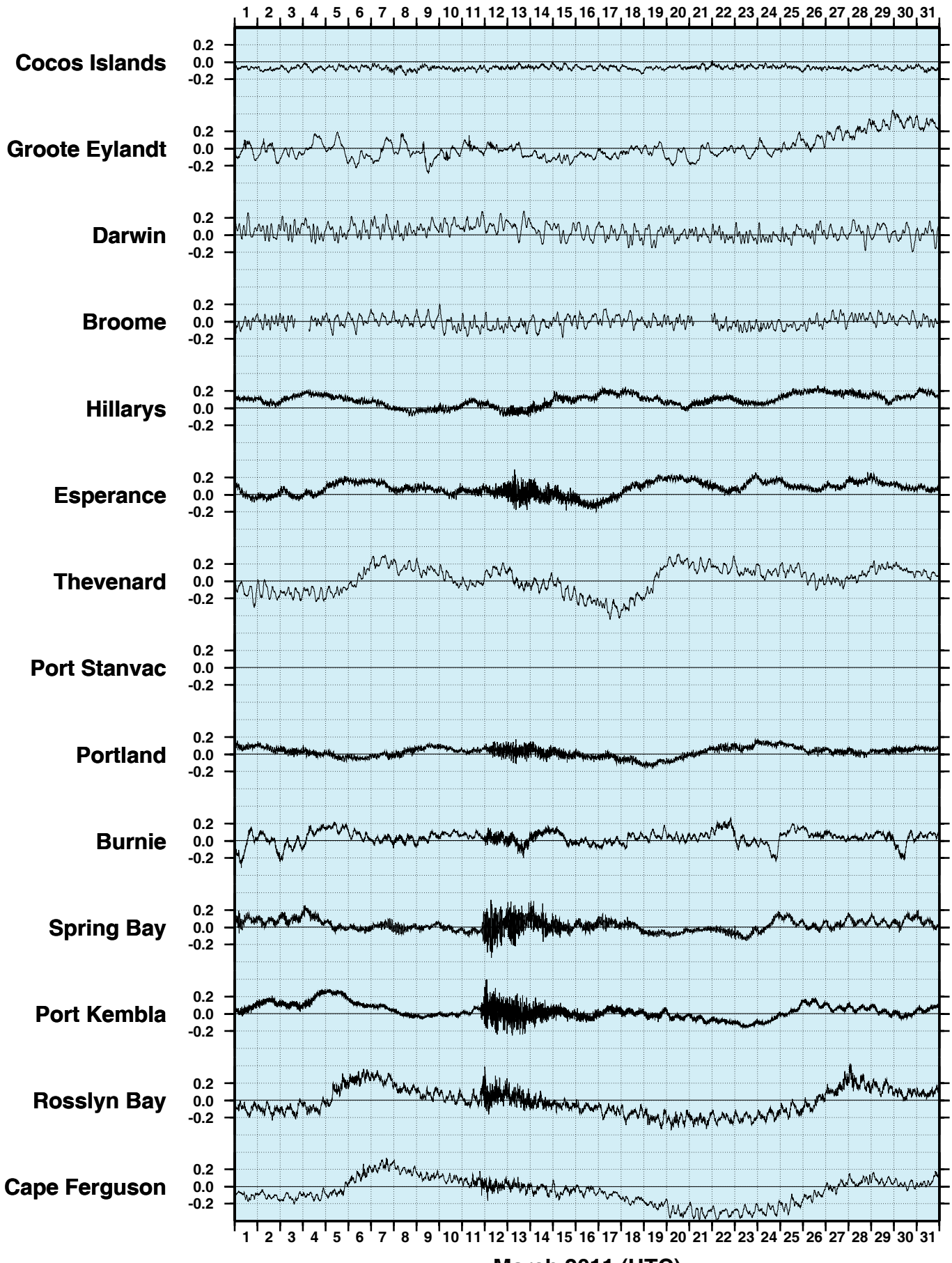

Figure 4

MARCH 2011
HOURLY WIND SPEEDS (m/s)

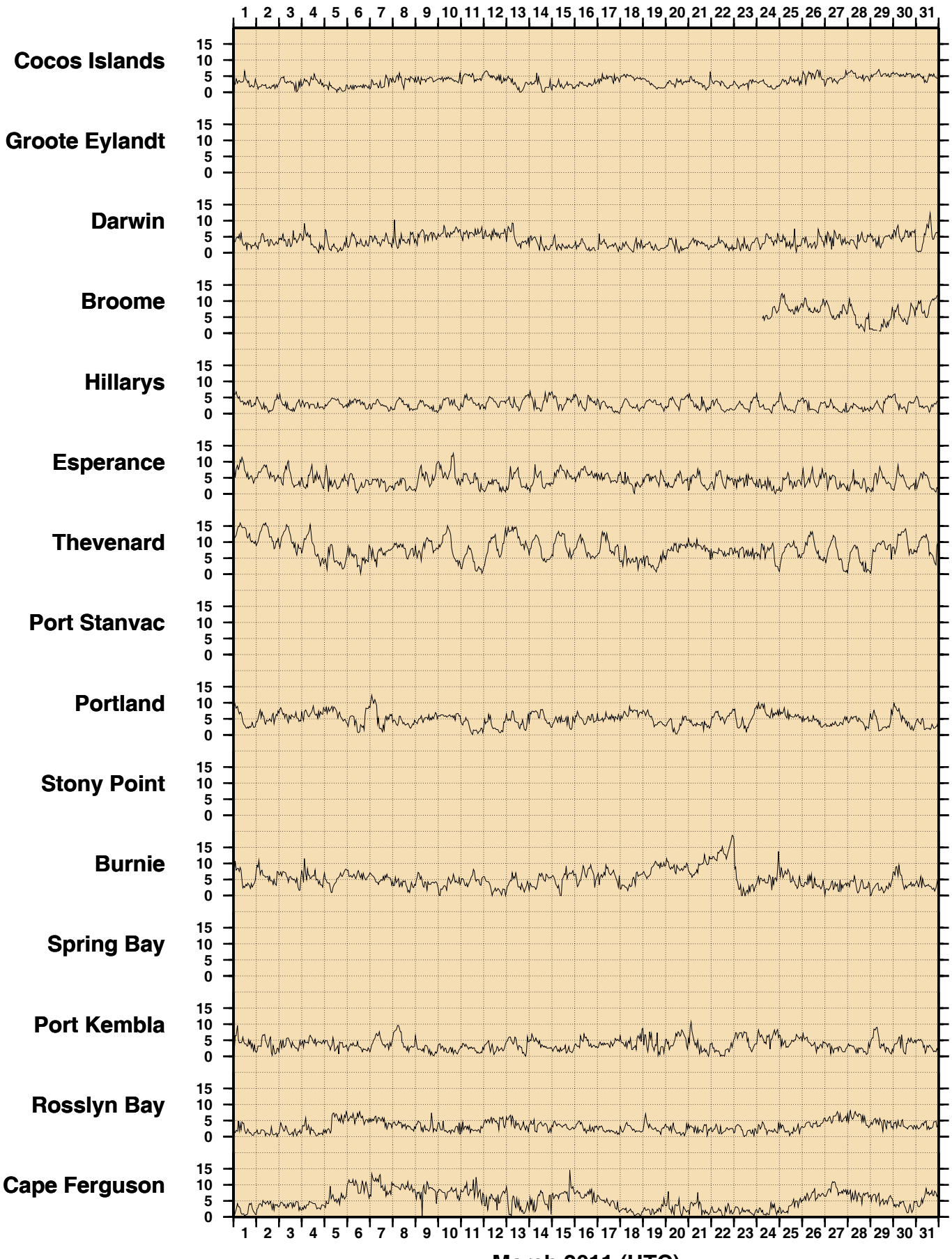

Figure 5

MARCH 2011
HOURLY INCIDENT WINDS (m/s, deg True)

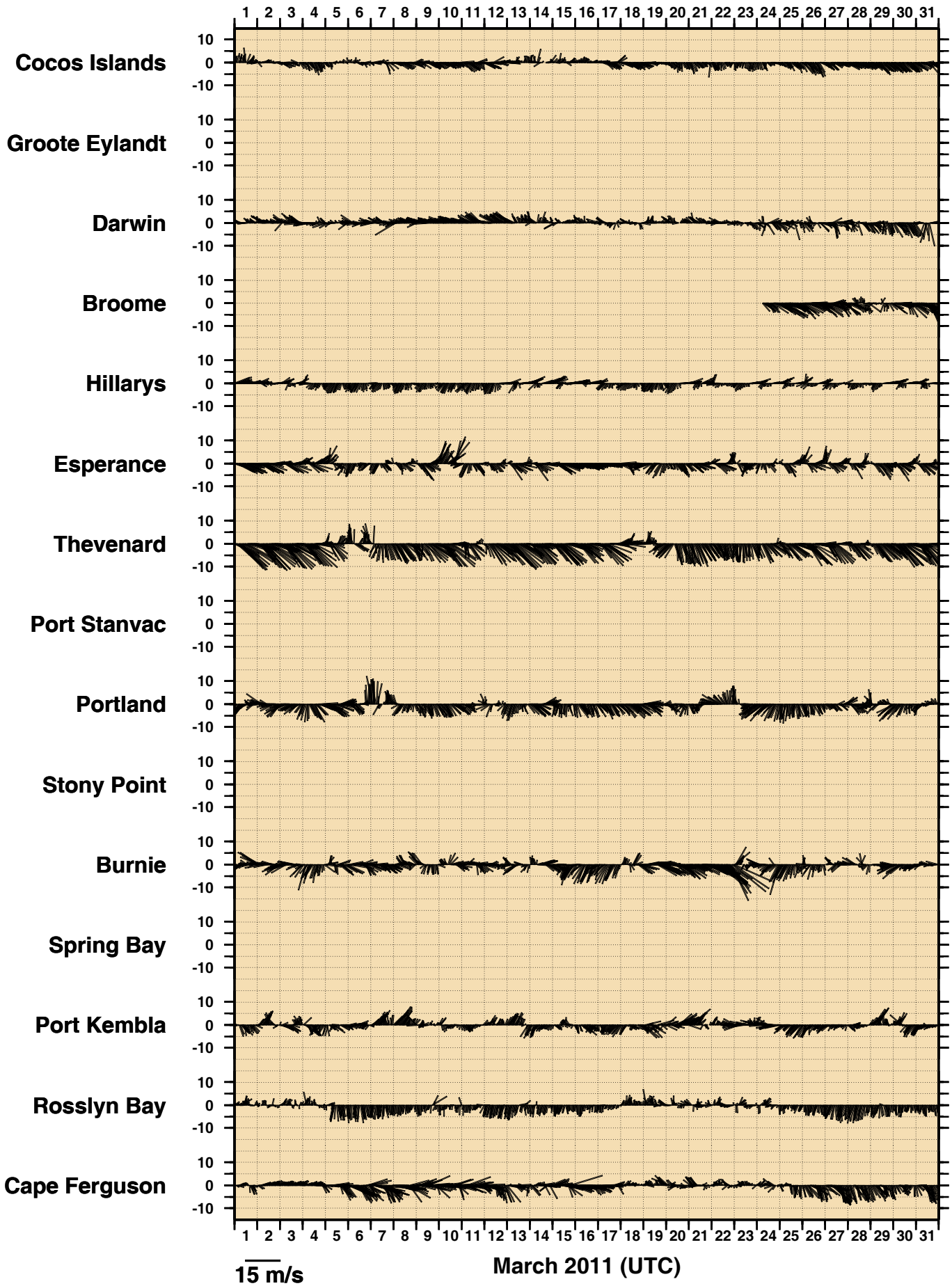

Figure 6

MARCH 2011
HOURLY MAXIMUM WIND GUSTS (m/s)

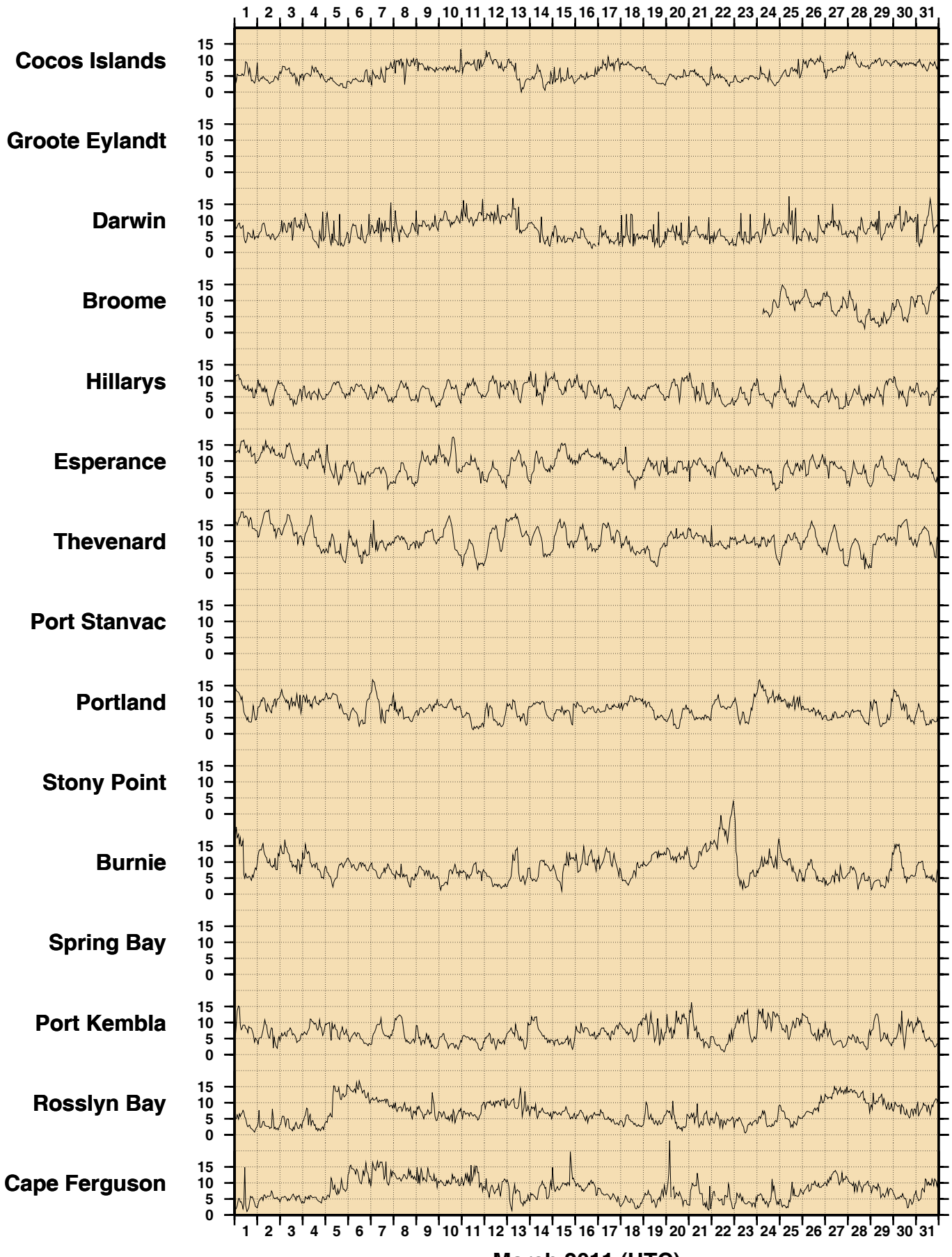

Figure 7

MARCH 2011
HOURLY AIR TEMPERATURES (˚C)

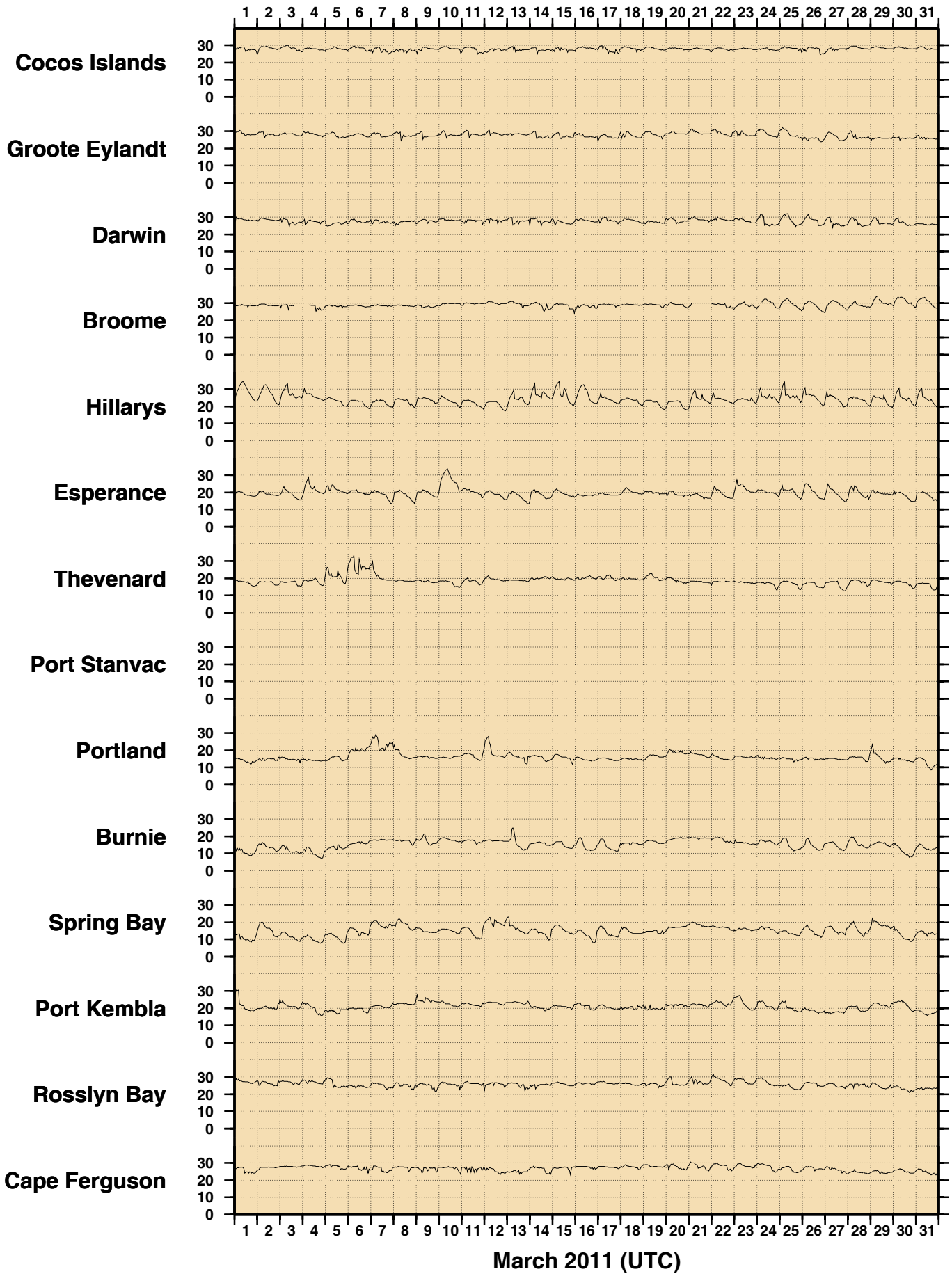

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Figure 8

MARCH 2011
HOURLY WATER TEMPERATURES (˚C)

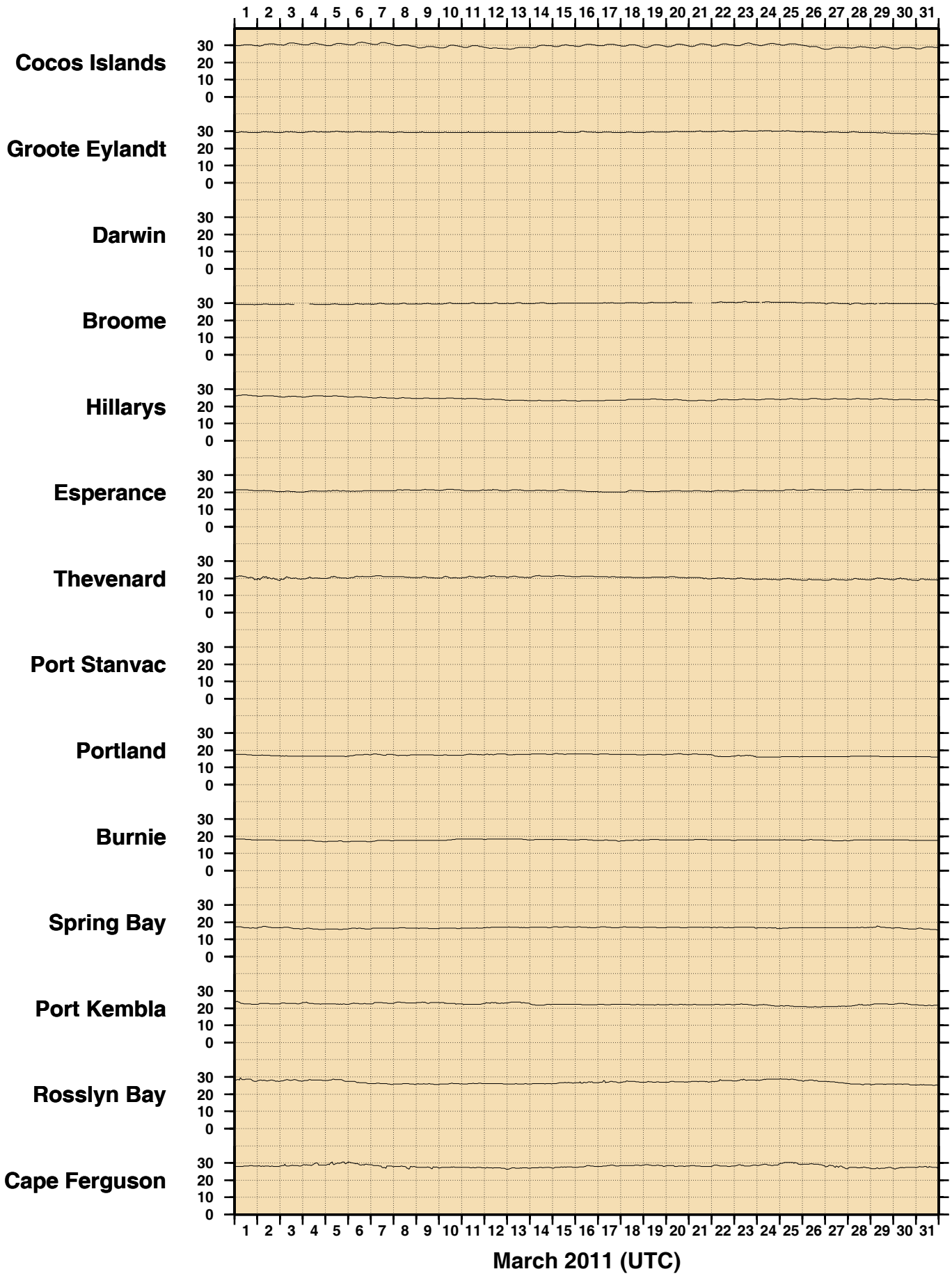

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Figure 9

MARCH 2011
HOURLY ATMOSPHERIC PRESSURE (hPa)

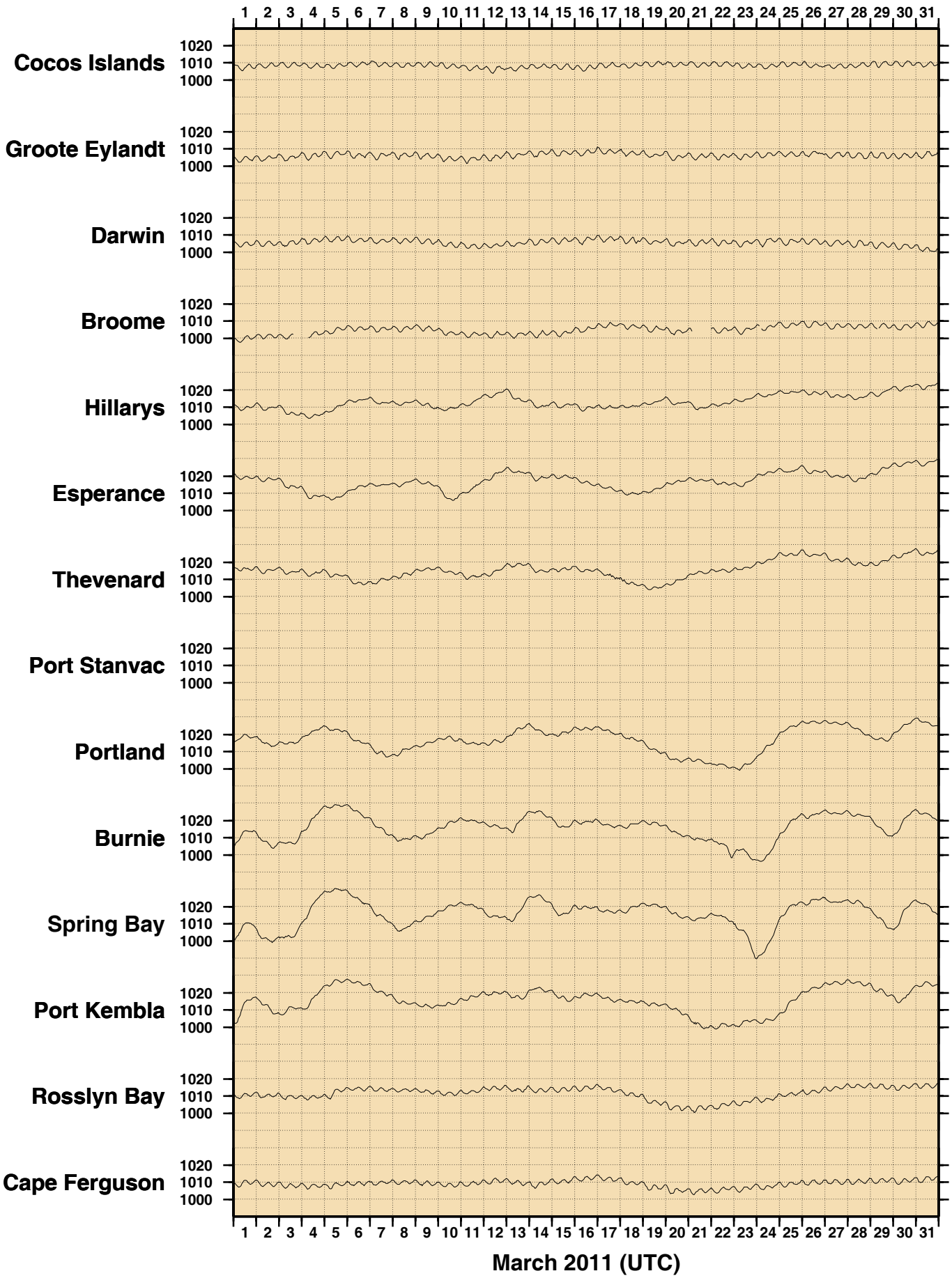
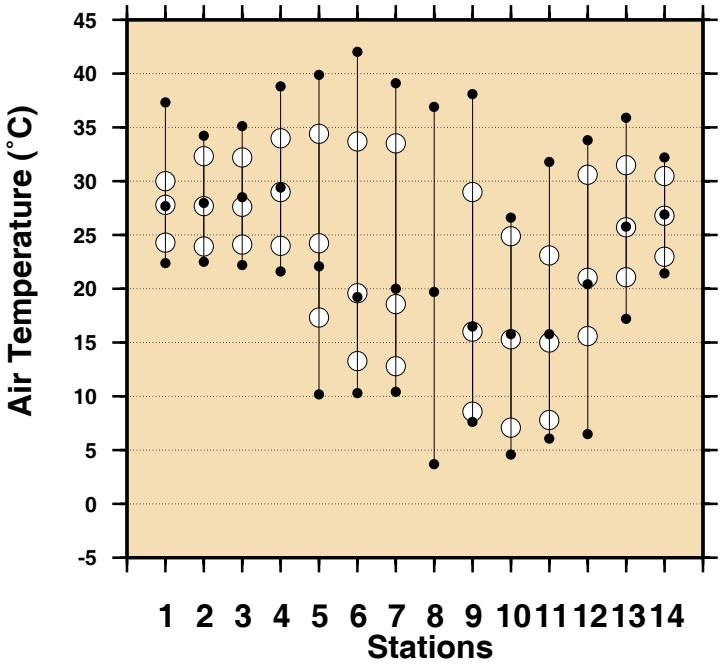
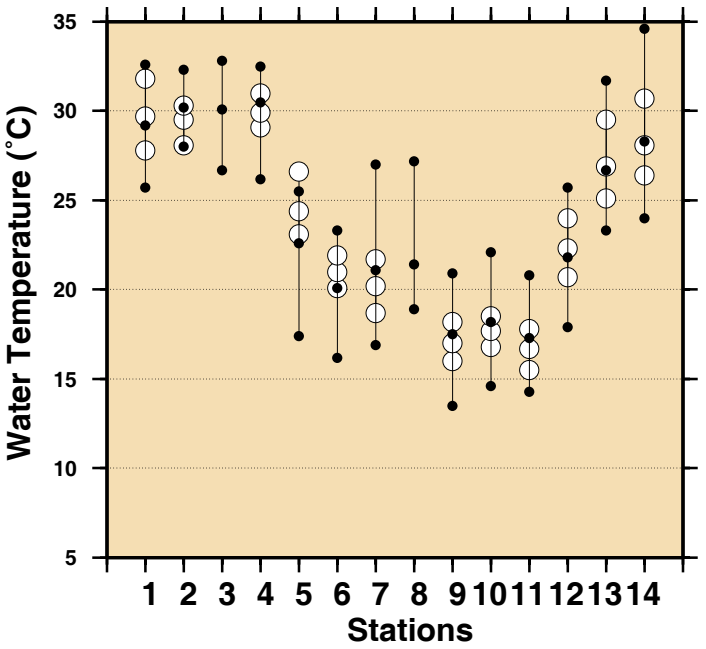
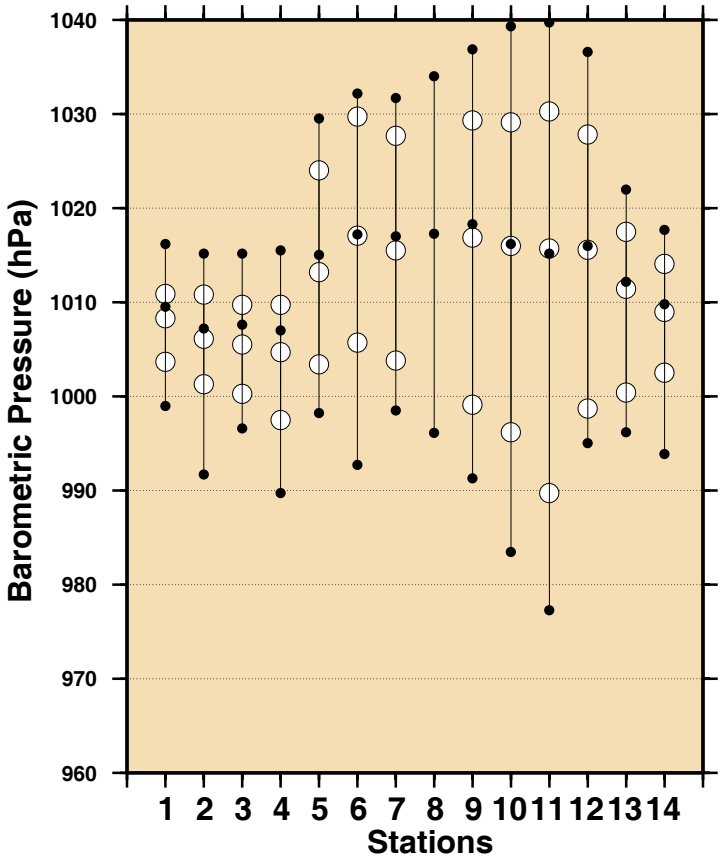


Figure 10

Comparison of March 2011 Max, Min & Mean with Long Term March 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

March 2011 Maximum
March 2011 Mean
March 2011 Minimum

Long Term March Maximum
Long Term March Mean
Long Term March Minimum

Figure 11
MONTHLY MEAN SEA LEVELS TO MARCH 2011 (m)

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

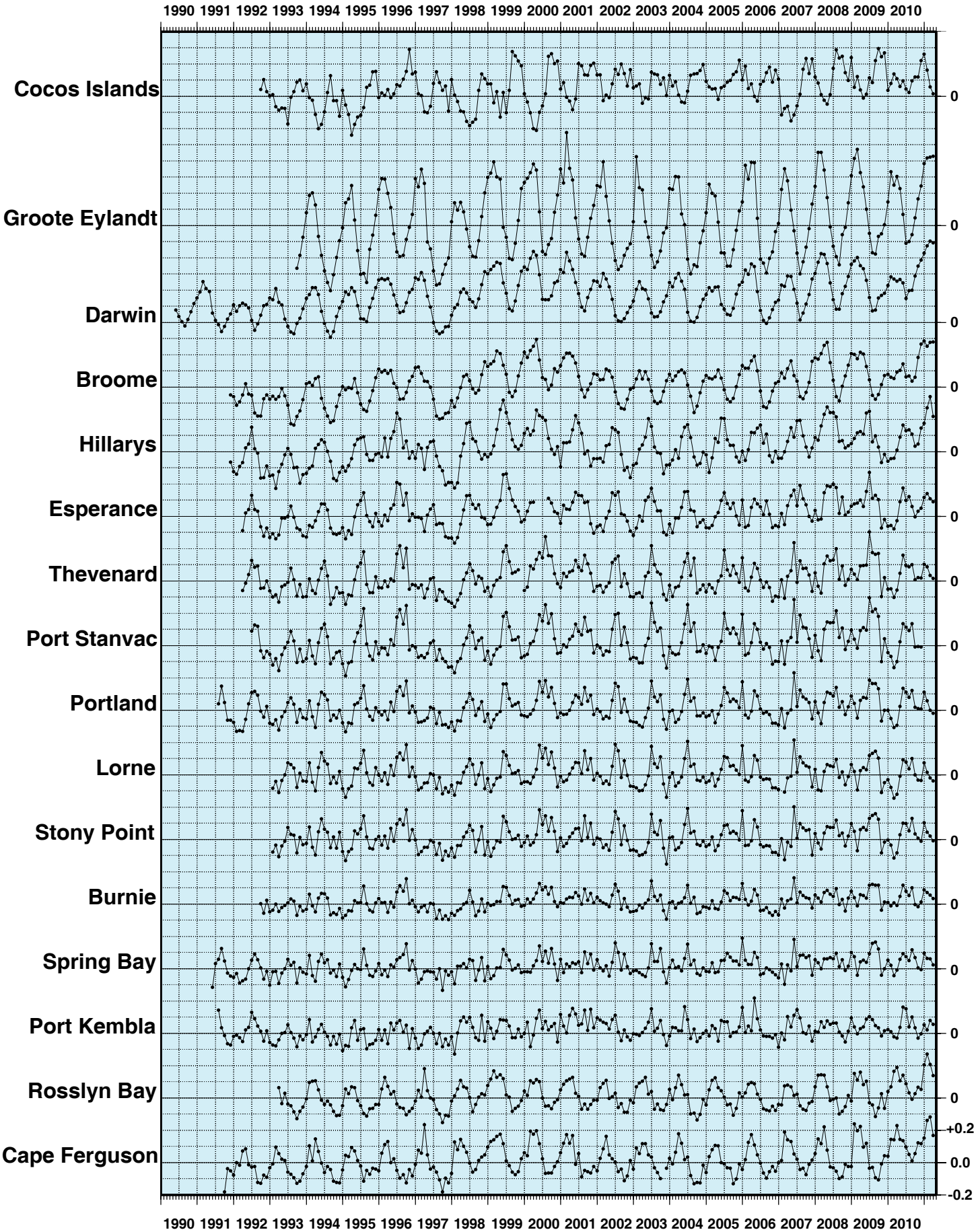


Figure 12

SEA LEVEL ANOMALIES THROUGH MARCH 2011 (m)

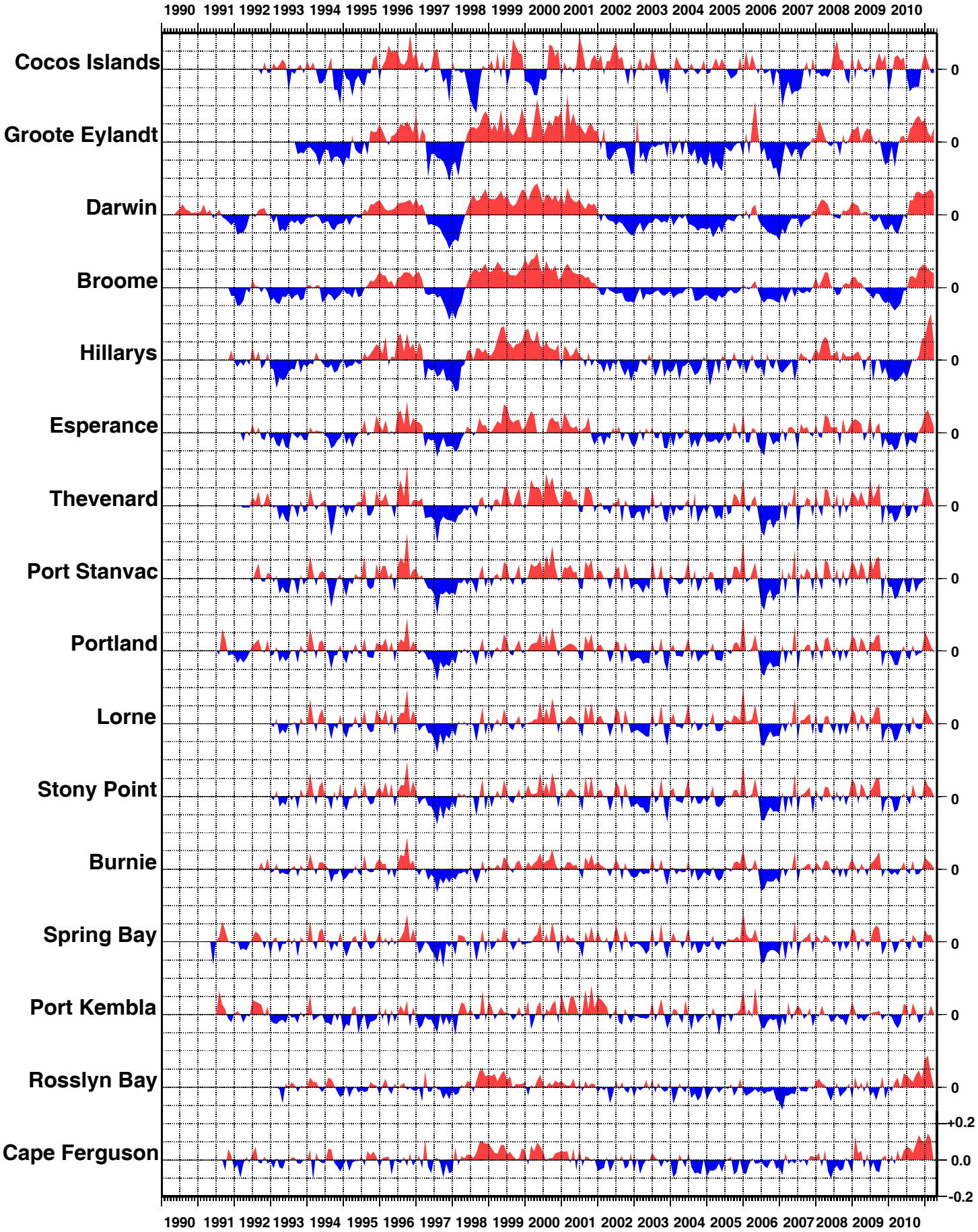


Figure 13

SEA LEVEL TRENDS THROUGH MARCH 2011 (mm/year)

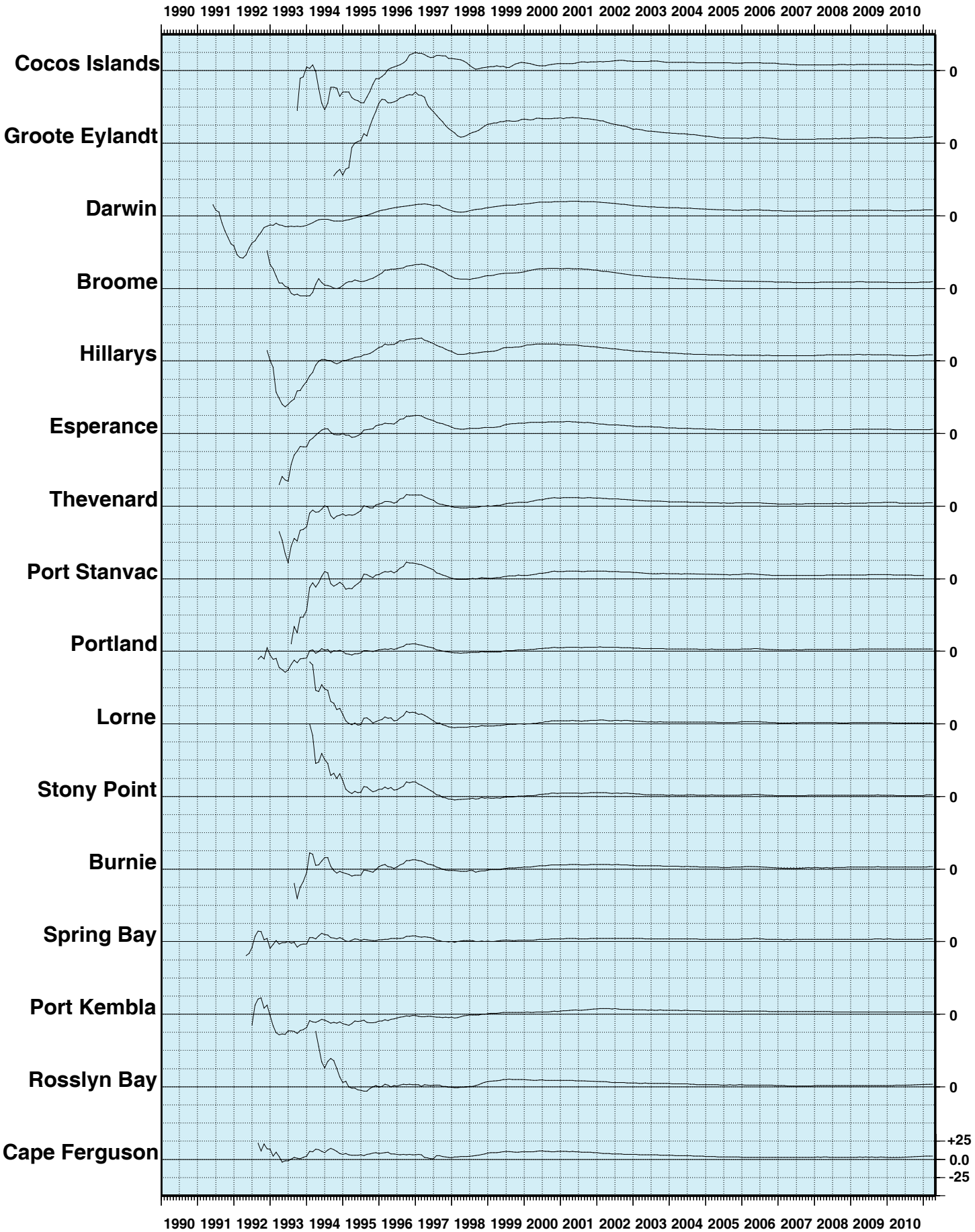


Figure 14

BAROMETRIC PRESSURE ANOMALIES THROUGH MARCH 2011 (hPa)

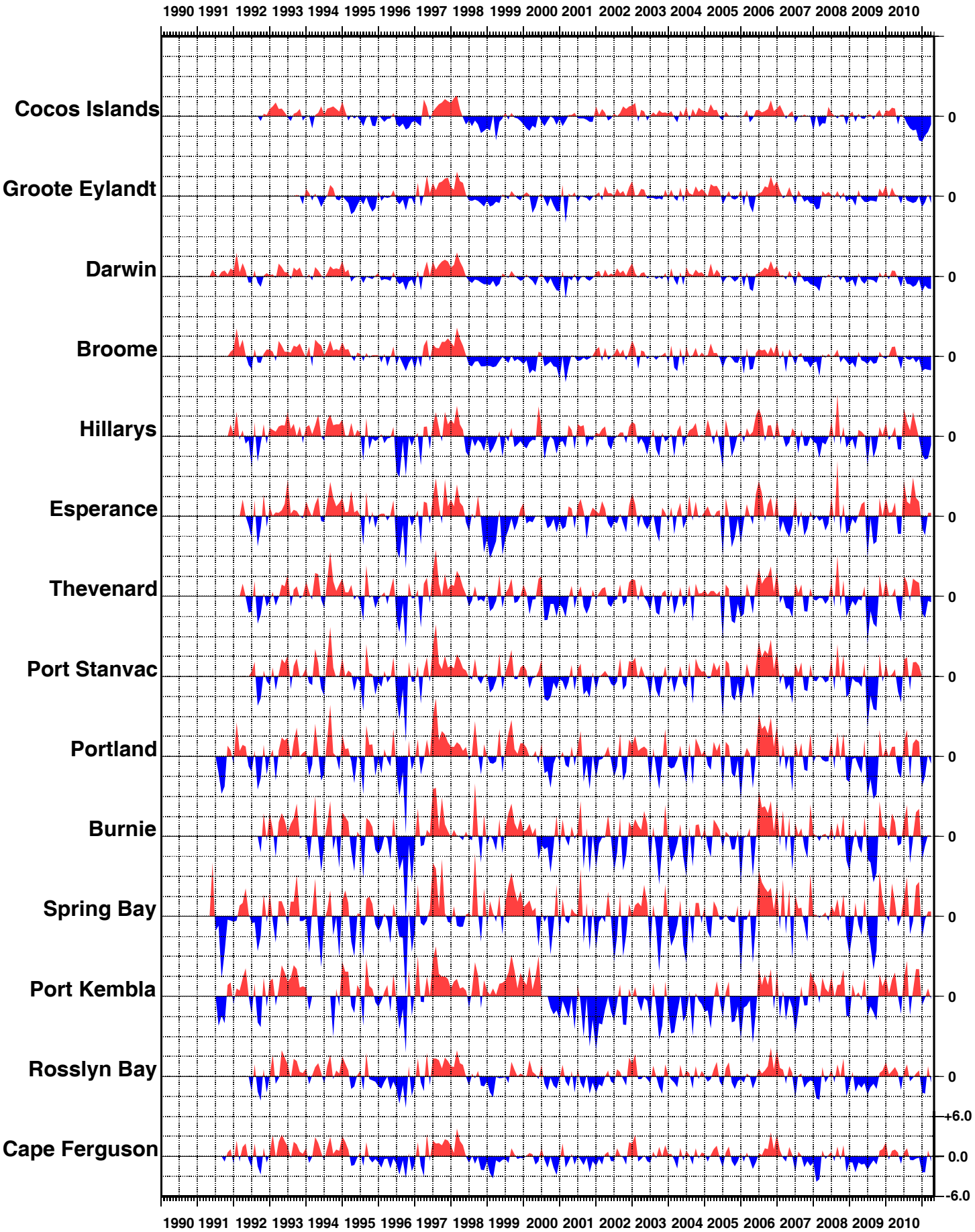


Figure 15

WATER TEMPERATURE ANOMALIES THROUGH MARCH 2011 (˚C)

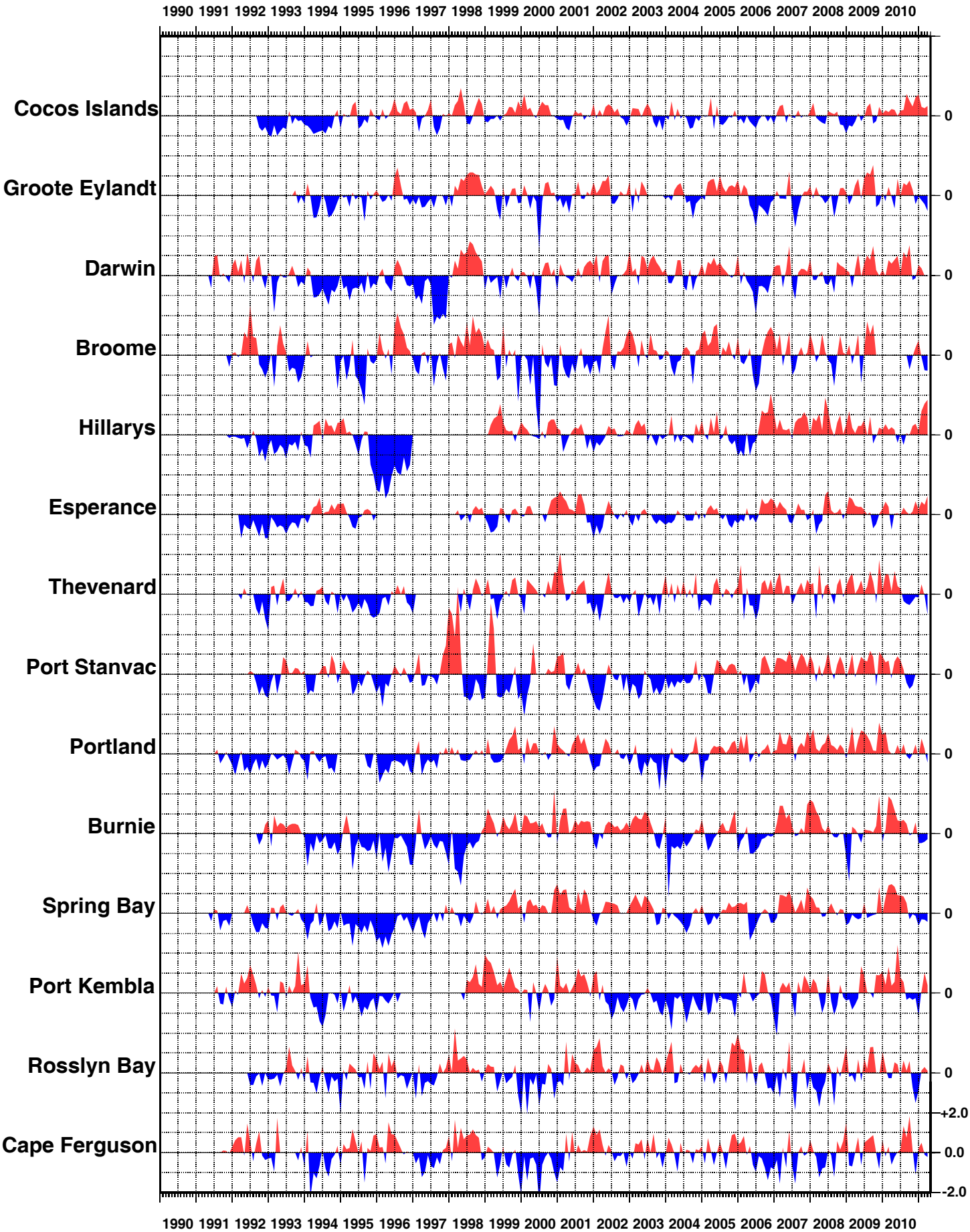


Figure 16

AIR TEMPERATURE ANOMALIES THROUGH MARCH 2011 (˚C)

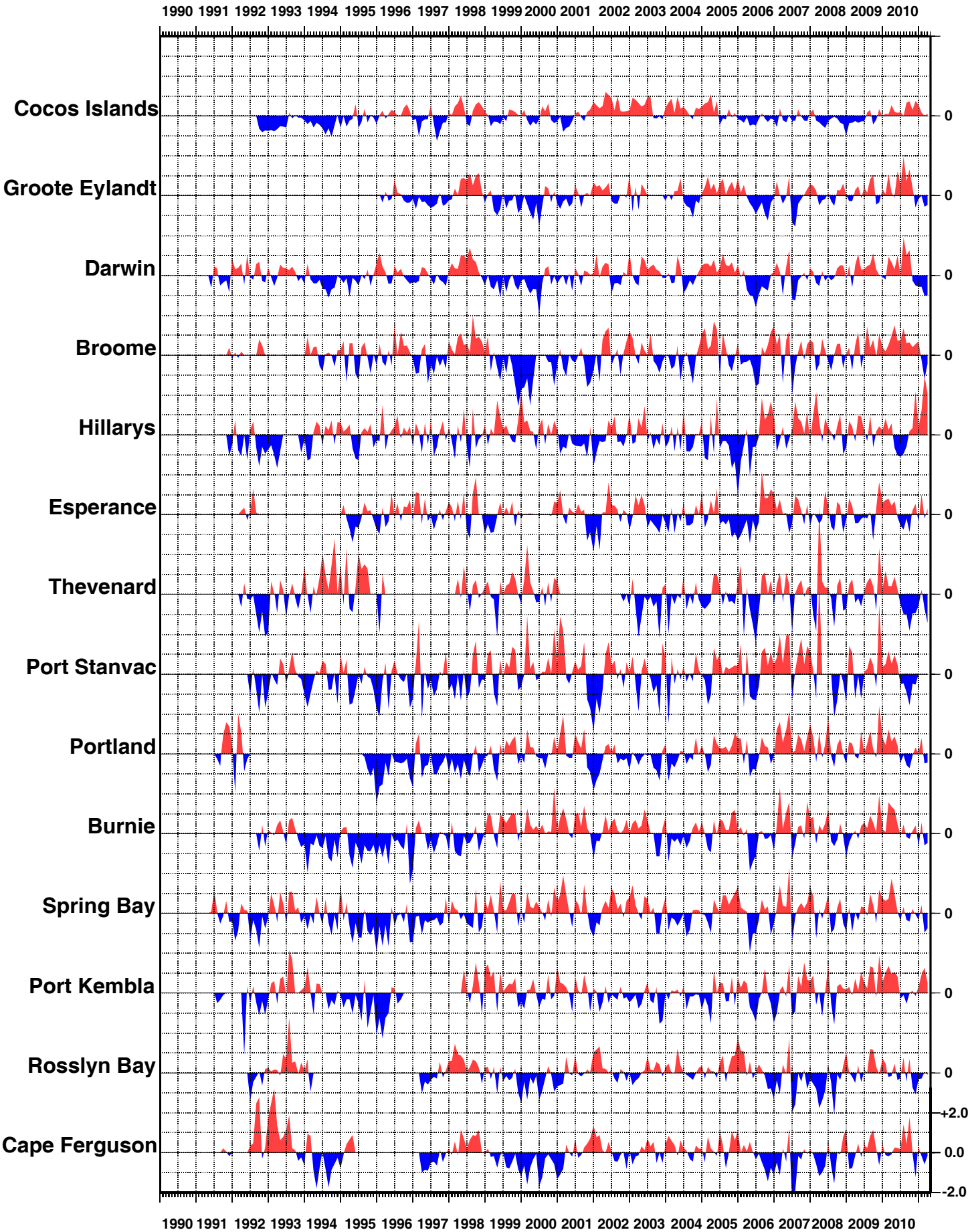


Figure 17

SEA LEVEL DATA RETURN

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

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