THE AUSTRALIAN BASELINE SEA LEVEL MONITORING PROJECT

MONTHLY DATA REPORT

APRIL 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.

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Quality Certification:

I authorise the issue of this Australian Baseline Sea Level Monitoring Project Monthly Data Report for April 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. Movement of each station relative to the International Terrestrial Reference Frame is not monitored.

NOTES ON THE DATA FOR APRIL 2010

Sea level data return (Figures 1 and 17) in April 2010 was excellent for all stations. The Baseline array network modernisation project has been completed with Telmet 320 loggers in operation at all locations except the privately owned Lorne and Stony Point stations. No data was lost at Broome as a result of the Broome Port Authority's policy of switching off the power when fuel ships are in dock. Problems with the recording of wind data at Broome since December have continued into April. Inspection of the wind monitor revealed evidence of water incursion into the terminal block, corrosion and broken wiring. The Stony Point wind data has been removed while suspect high wind speeds and gusts are investigated further. An internal communications failure resulted in the non-recording of the Cocos Island barometric pressures after the 13th of April. Water temperature sensor failure at Broome and module failure at Portland meant no water temperatures were recorded during April for either of these sites.

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.

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

A record minimum barometric pressure was recorded at Groote Eylandt (1000.4 hPa) in April 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 April 2010 negative sea level anomalies (Figure 12) were observed at most locations anti-clockwise from Darwin to Stony Point, and Port Kembla. Positive anomalies were observed at Cocos Islands and Groote Eylandt, whilst near normal anomalies were recorded at Burnie, Spring Bay, Rosslyn Bay and Cape Ferguson. Investigation of the positive anomaly recorded at Thevenard revealed an incorrect datum had been introduced following the Telmet 320 logger change over in October 2009. All Thevenard sea level data since this date have been corrected. Whilst the sea level anomalies have been recalculated the March sea level trends to the end of March were not recalculated and this is reflected in the apparent fall in the Thevenard trend for April.

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) for April 2010 were close to normal at most sites, with slightly negative anomalies at Hillarys, Esperance, Thevenard, Port Stanvac, Portland, Burnie and Spring Bay. 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 greater than 1.0°C at Thevenard, Burnie and Spring Bay and slightly negative at Groote Eylandt and Cape Ferguson. Air temperature anomalies, which generally follow the water temperature anomalies, show close to normal temperatures were observed at Cocos Islands, Hillarys, Groote Eylandt, Rosslyn Bay and Cape Ferguson. Warmer than normal temperatures were observed at all other locations.

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

Recent short-term sea level trends in the project area based upon SEAFRAME data through April, 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	+8.7	+0.1
Groote Eylandt	13°51'36.2"S / 136°24'56.1"E	Sep 1993	+7.0	+0.1
Darwin	12°28'18.4"S / 130°50'45.1"E	May 1990	+7.1	-0.1
Broome	18°00'03.0"S / 122°13'07.1"E	Nov 1991	+7.8	-0.1
Hillarys	31°49'32.0"S / 115°44'18.9"E	Nov 1991	+7.8	-0.1
Esperance	33°52'15.2"S / 121°53'43.3"E	Mar 1992	+5.4	0.0
Thevenard	32°08'56.2"S / 133°38'28.8"E	Mar 1992	+4.3	-1.2
Port Stanvac	35°06'31.0"S / 138°28'1.3"E	Jun 1992	+5.1	-0.1
Portland	38°20'36.4"S / 141°36'47.4"E	Jul 1991	+3.0	0.0
Lorne	38°32'49.4"S / 143°59'19.8"E	Jan 1993	+1.3	0.0
Stony Point	38°22'19.7"S / 145°13'28.9"E	Jan 1993	+1.3	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	+2.8	-0.1
Rosslyn Bay	23°09'39.7"S / 150°47'24.6"E	Jun 1992	+2.1	0.0
Cape Ferguson	19°16'38.4"S / 147°03'30.4"E	Sep 1991	+3.2	0.0

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

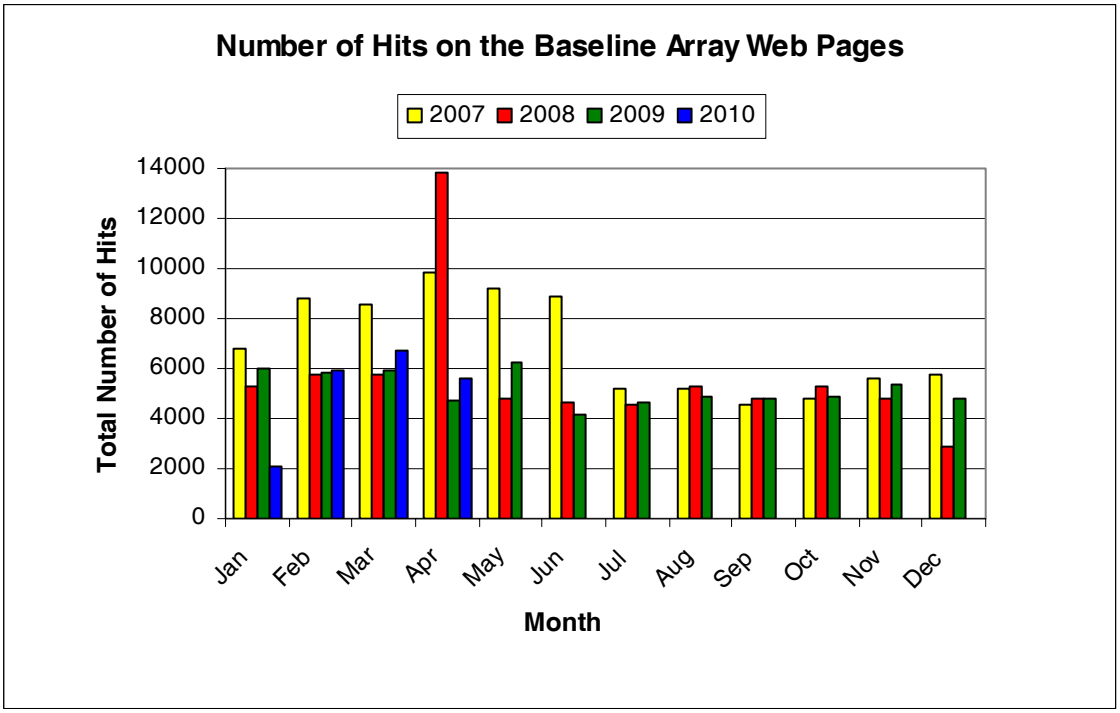
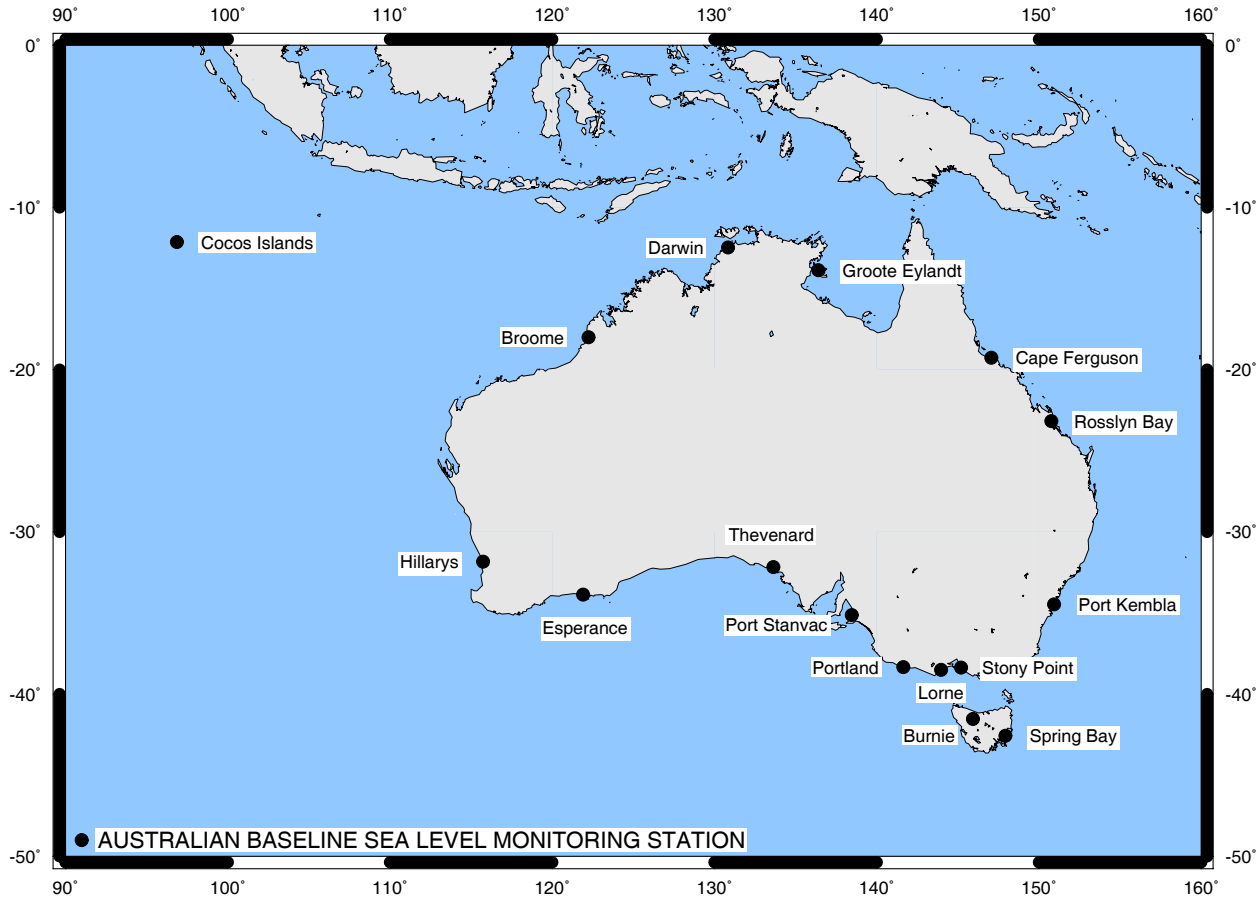


Figure B: Australian Baseline Sea Level Monitoring Project sites.



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.

National Tidal Centre
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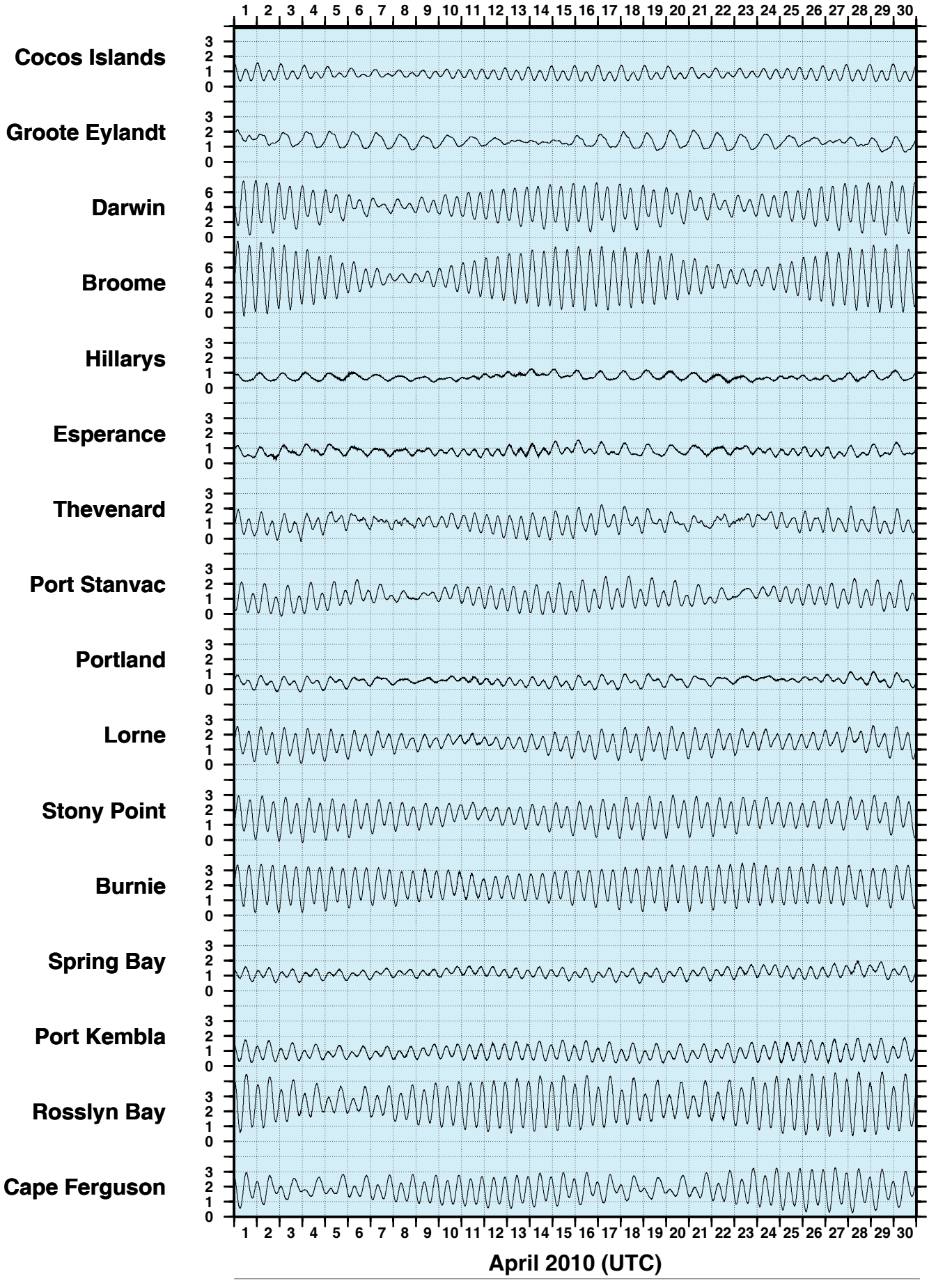
Please note the following:

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

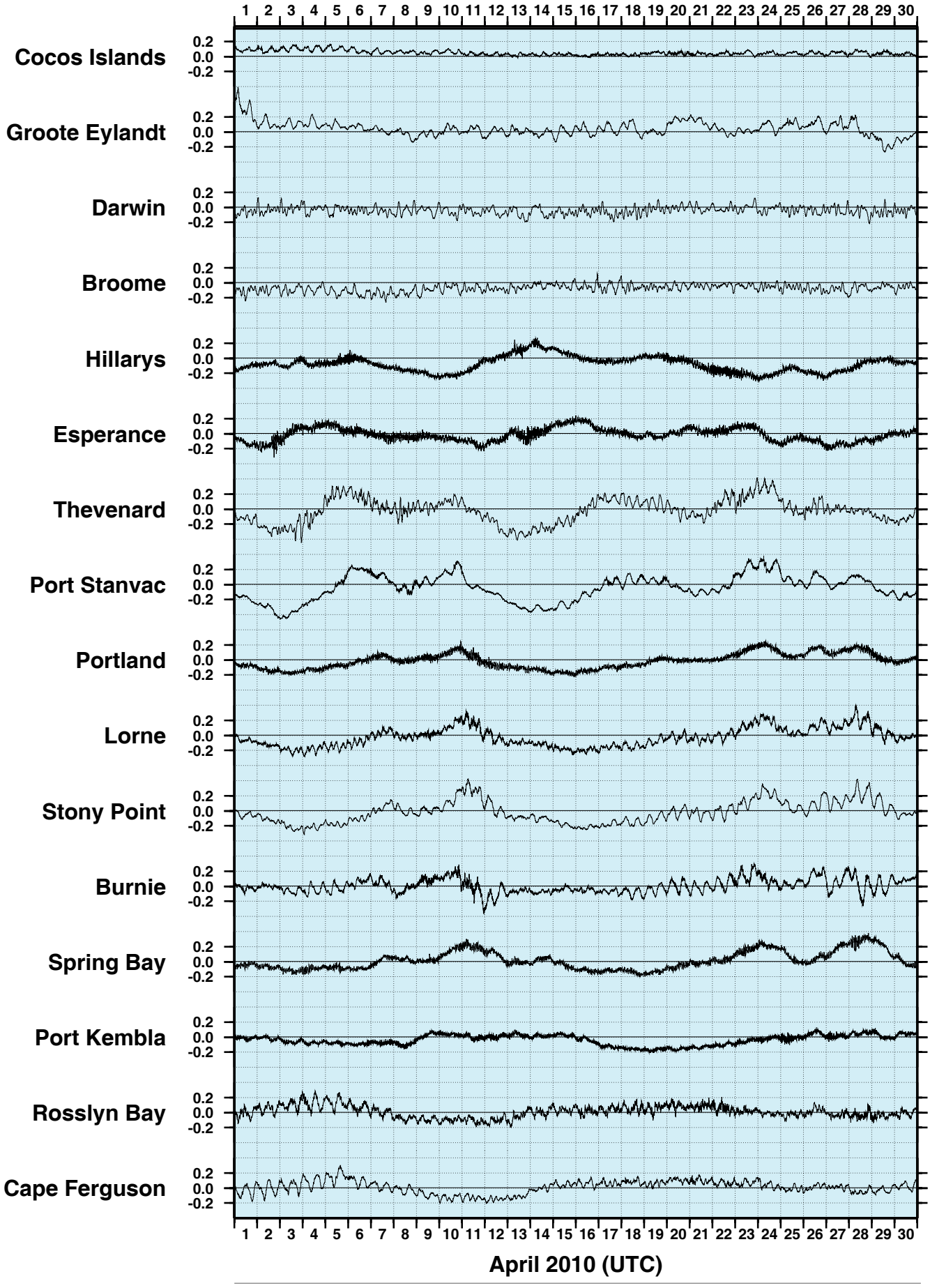
APRIL 2010
SIX MINUTE SEA LEVEL OBSERVATIONS (m)



National Tidal Centre, Bureau of Meteorology

Figure 2

APRIL 2010
SIX MINUTE RESIDUAL WATER LEVELS (m)



National Tidal Centre, Bureau of Meteorology

Figure 3

APRIL 2010
SIX MINUTE RESIDUALS
ADJUSTED FOR ATMOSPHERIC PRESSURE (m)

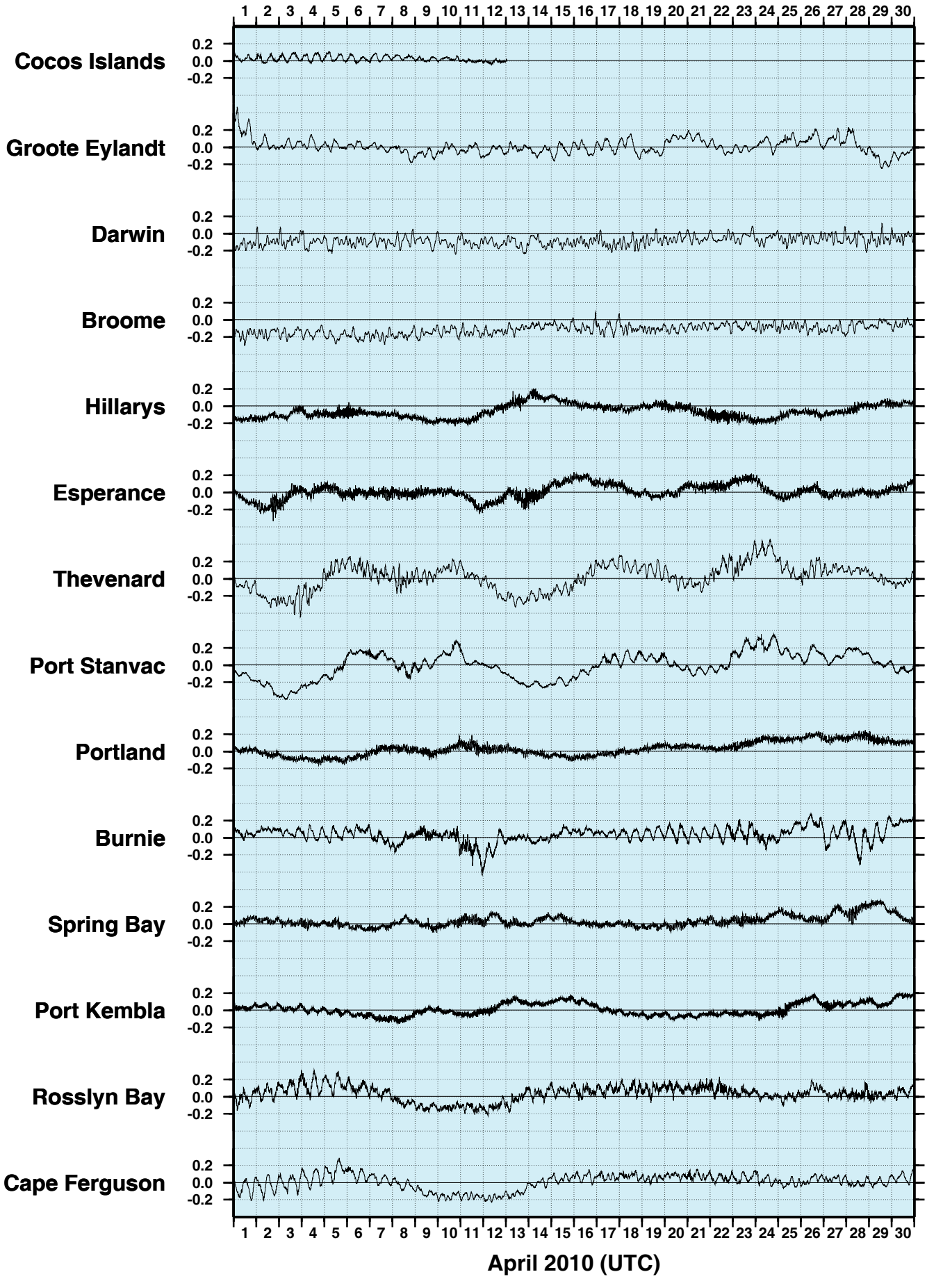


Figure 4

APRIL 2010
HOURLY WIND SPEEDS (m/s)

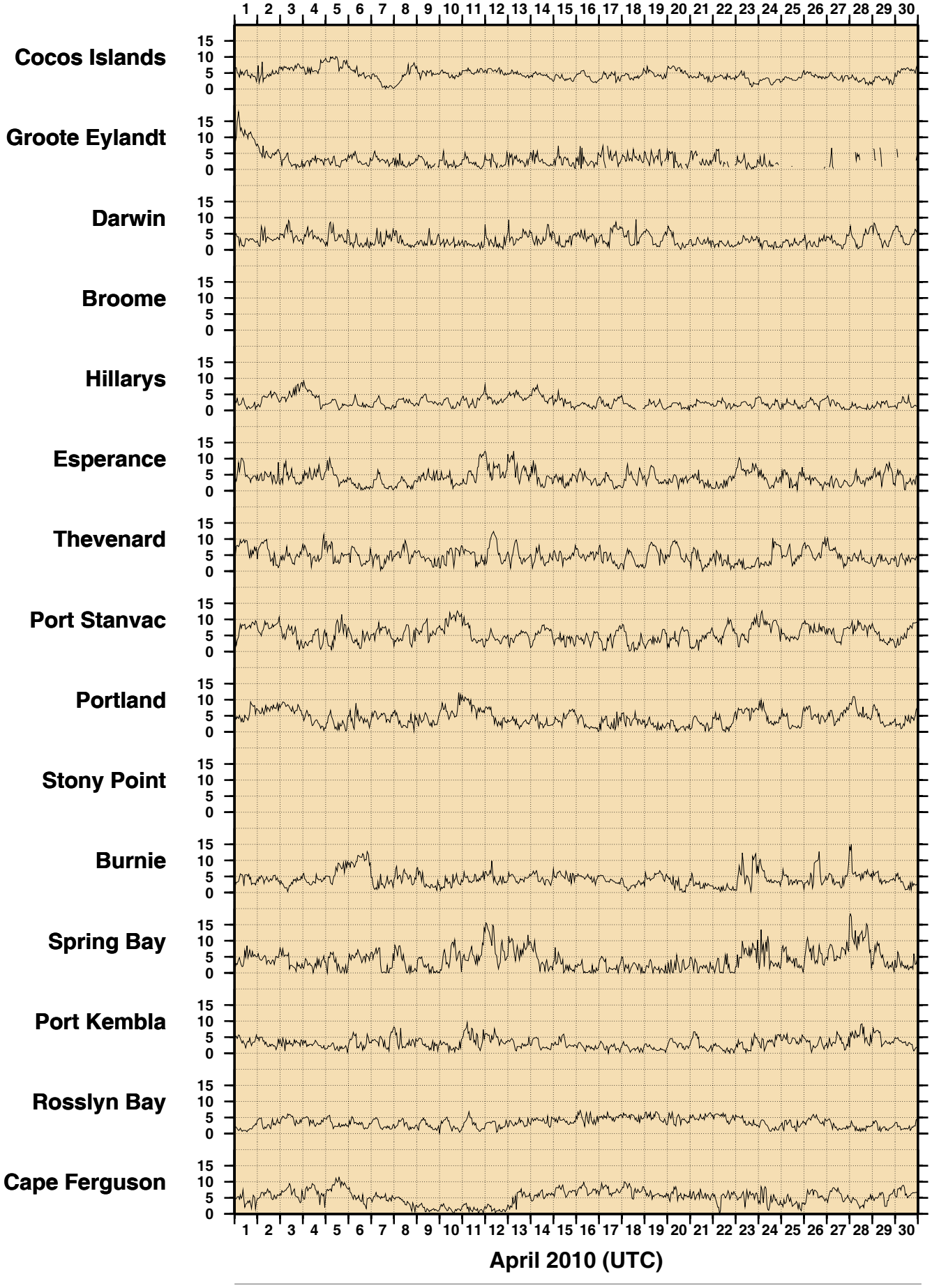


Figure 5

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

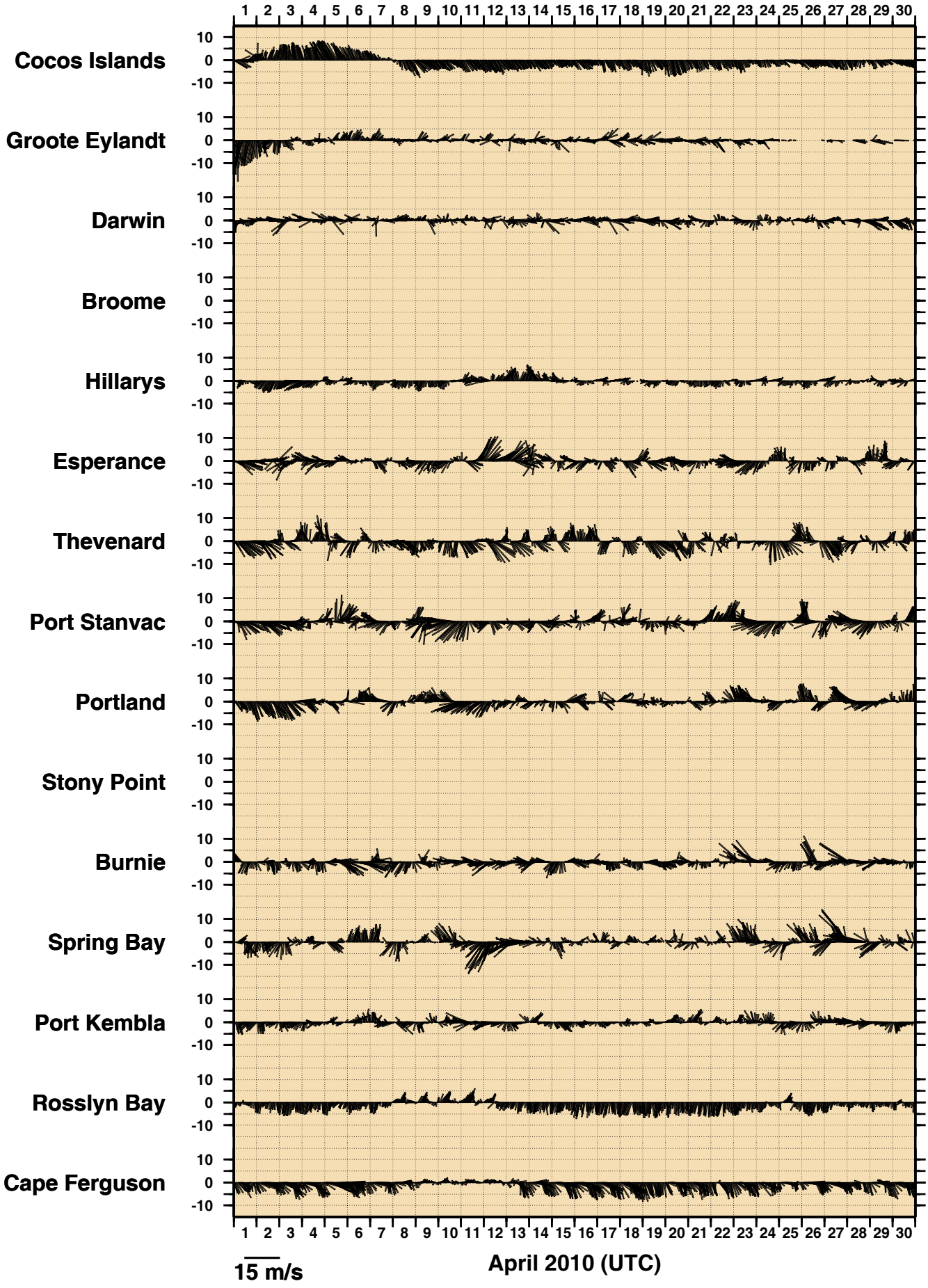


Figure 6

APRIL 2010
HOURLY MAXIMUM WIND GUSTS (m/s)

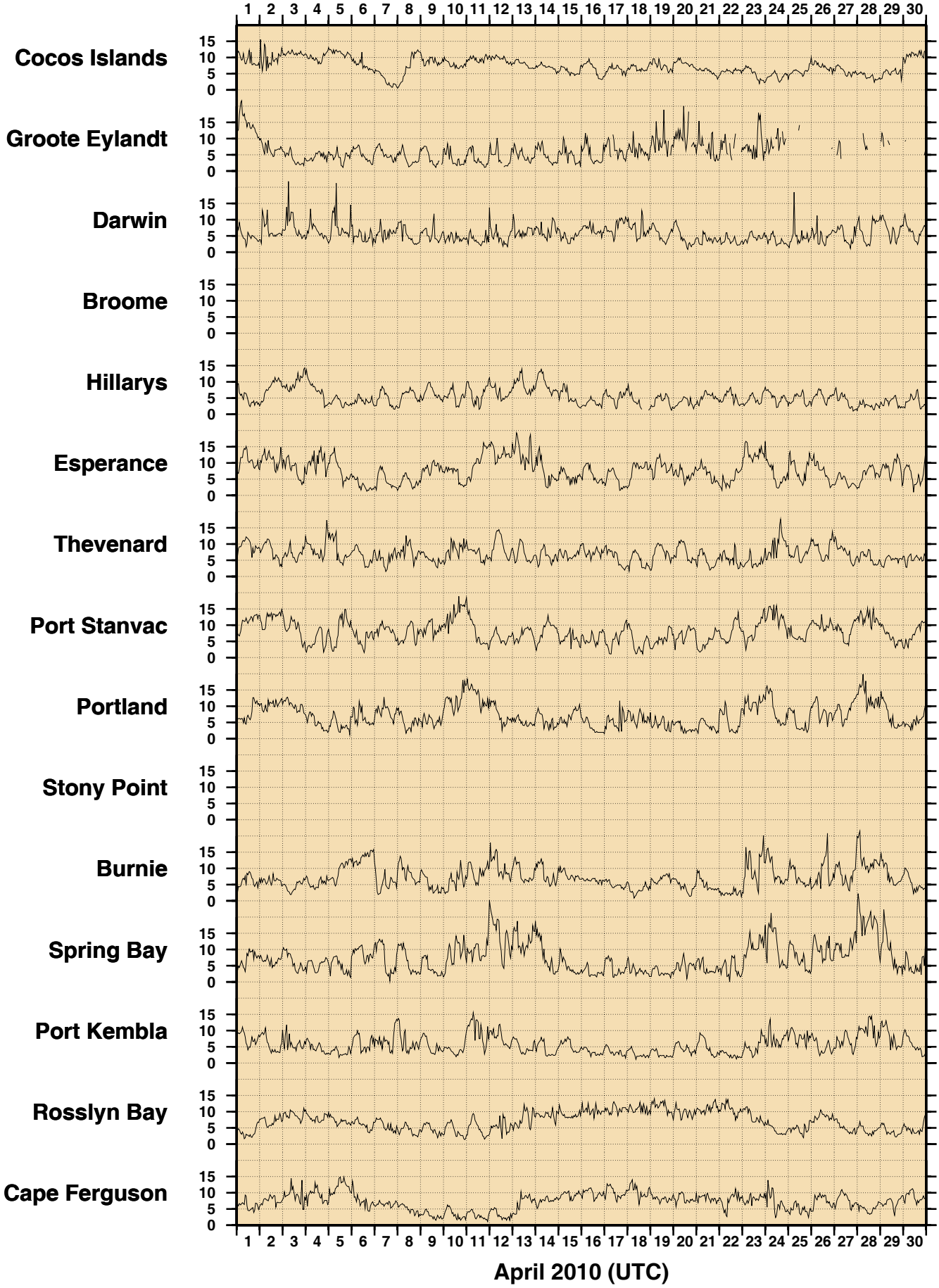


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Figure 7

APRIL 2010
HOURLY AIR TEMPERATURES (˚C)

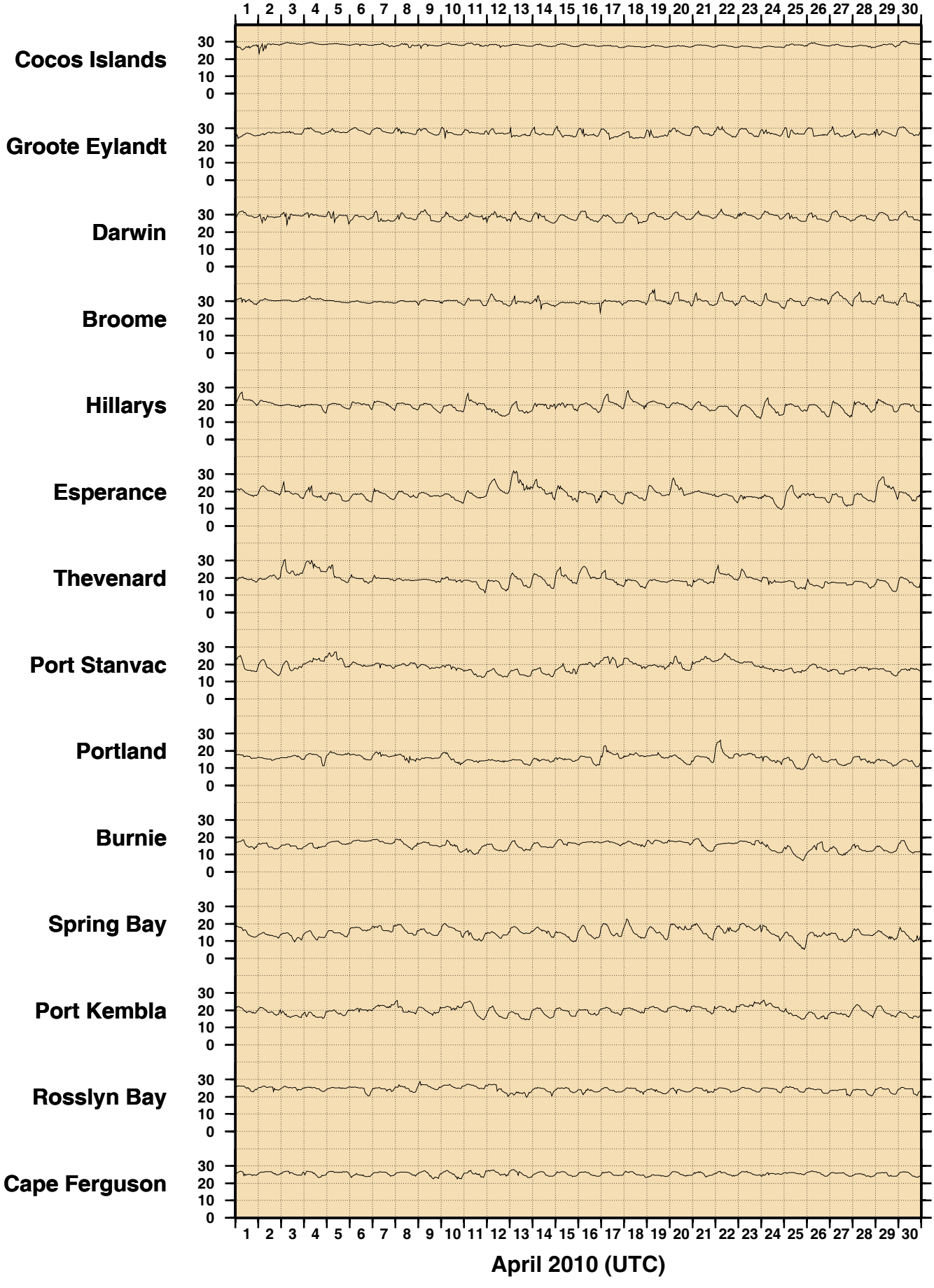


Figure 8

APRIL 2010
HOURLY WATER TEMPERATURES (˚C)

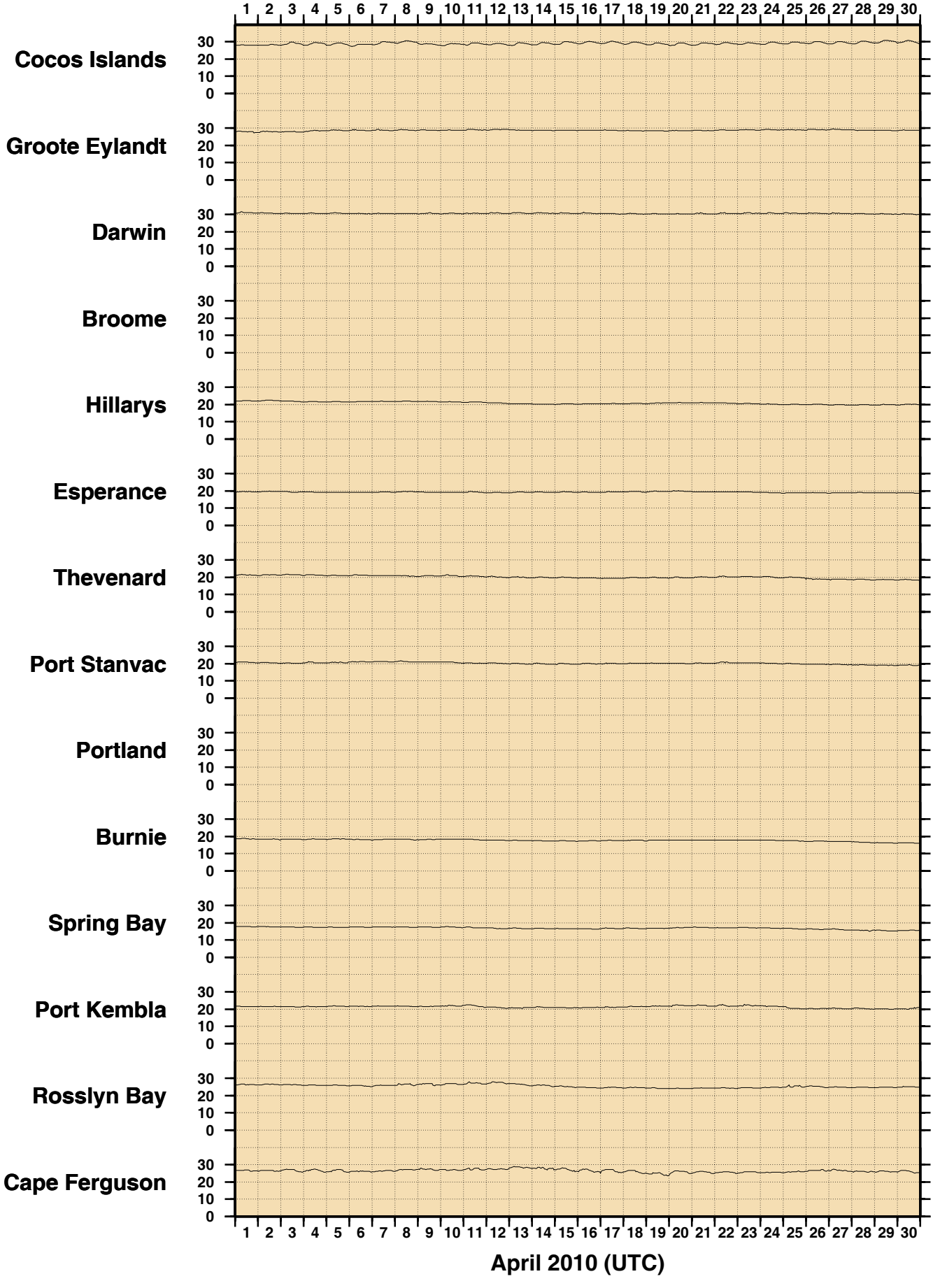


Figure 9

APRIL 2010
HOURLY ATMOSPHERIC PRESSURE (hPa)

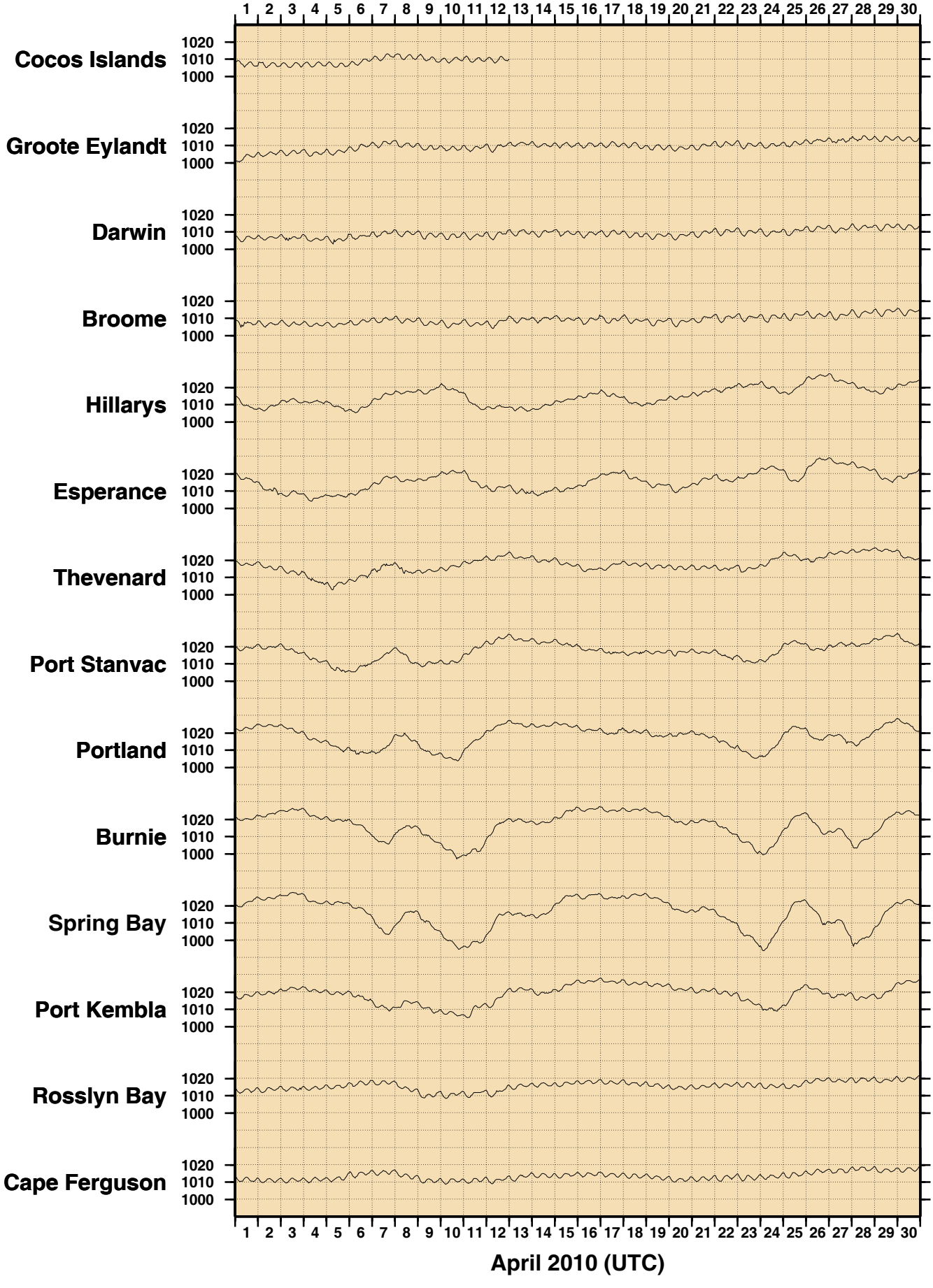
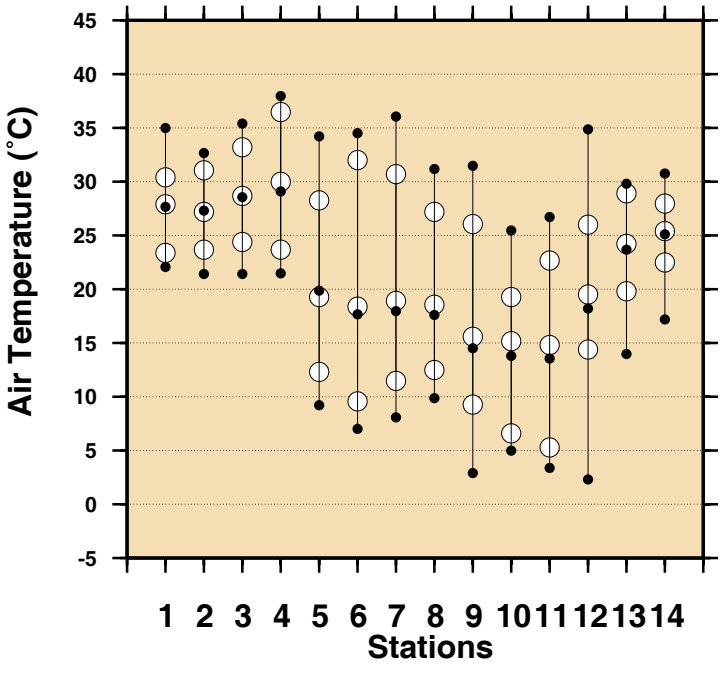
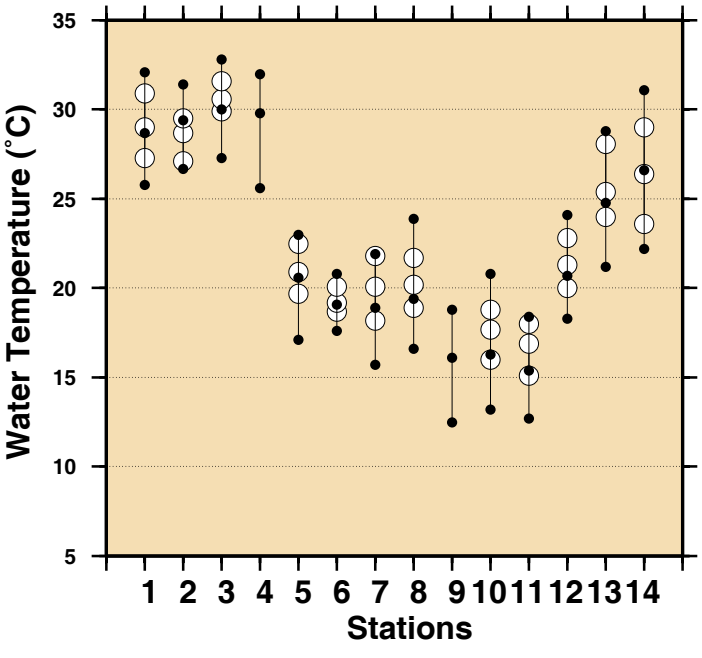
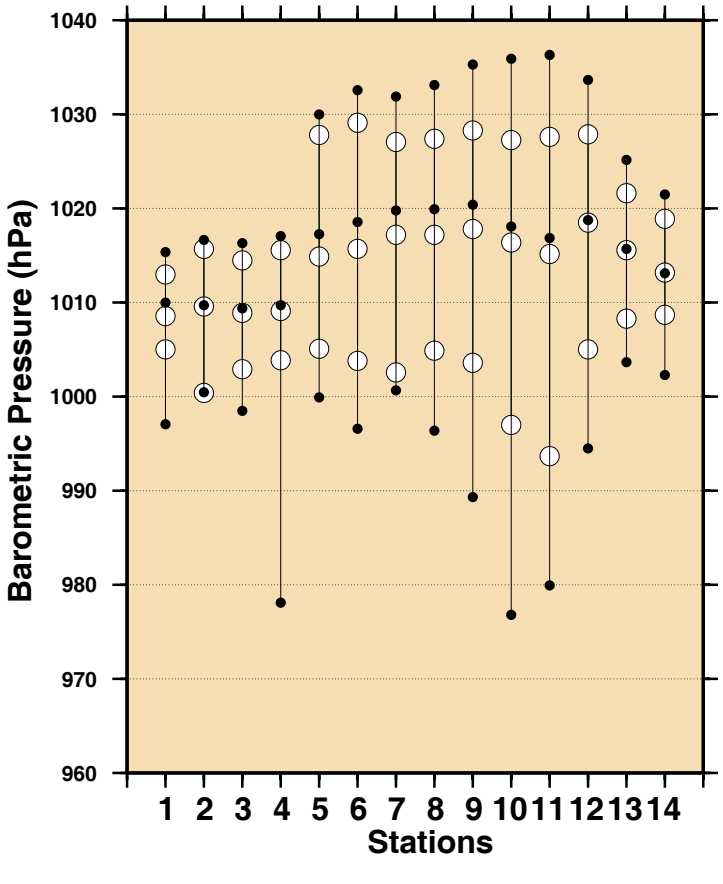


Figure 10

Comparison of April 2010 Max, Min & Mean with Long Term April 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

April 2010 Maximum
April 2010 Mean
April 2010 Minimum

Long Term April Maximum
Long Term April Mean
Long Term April Minimum

Figure 11
MONTHLY MEAN SEA LEVELS TO APRIL 2010 (m)

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

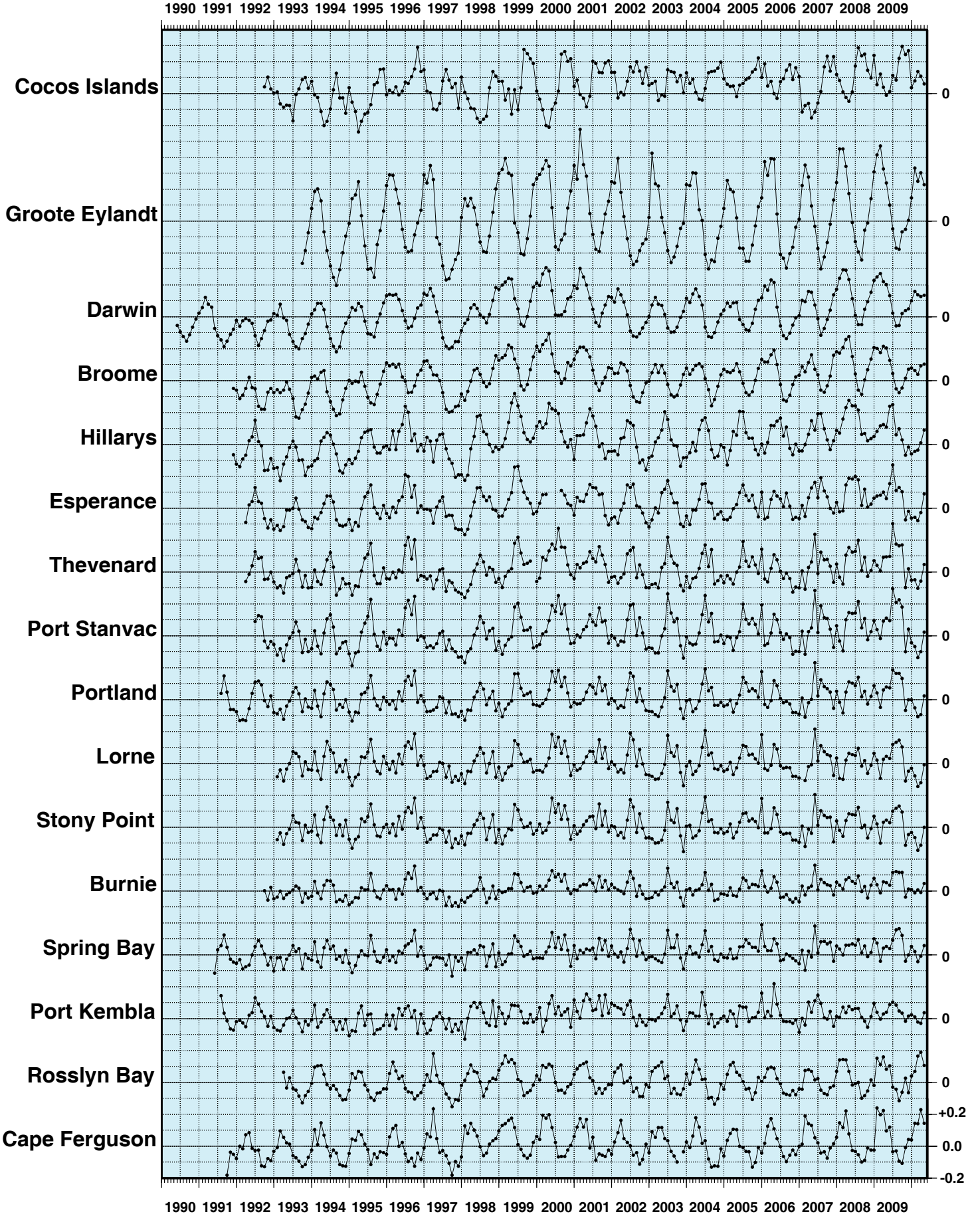


Figure 12

SEA LEVEL ANOMALIES THROUGH APRIL 2010 (m)

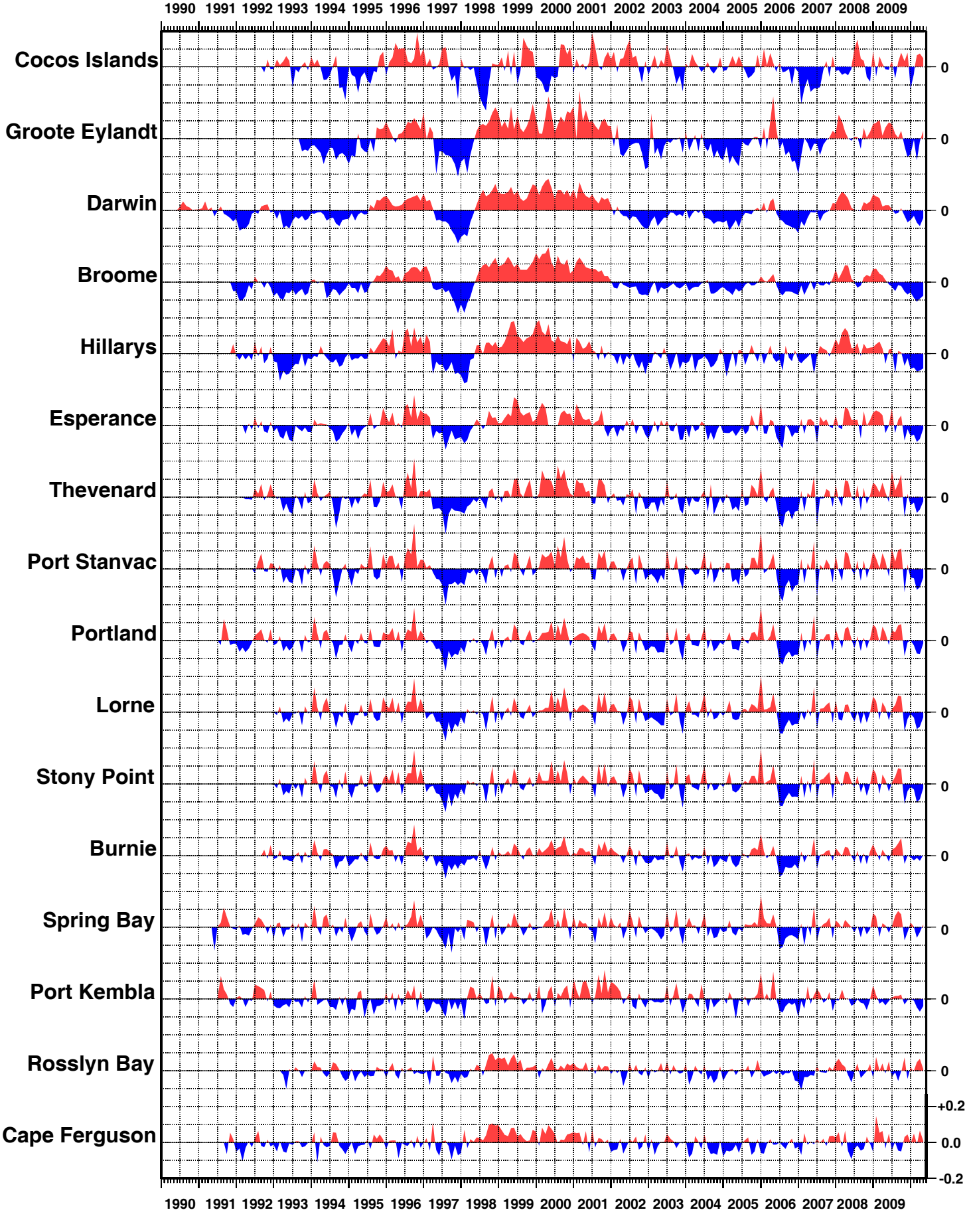


Figure 13

SEA LEVEL TRENDS THROUGH APRIL 2010 (mm/year)

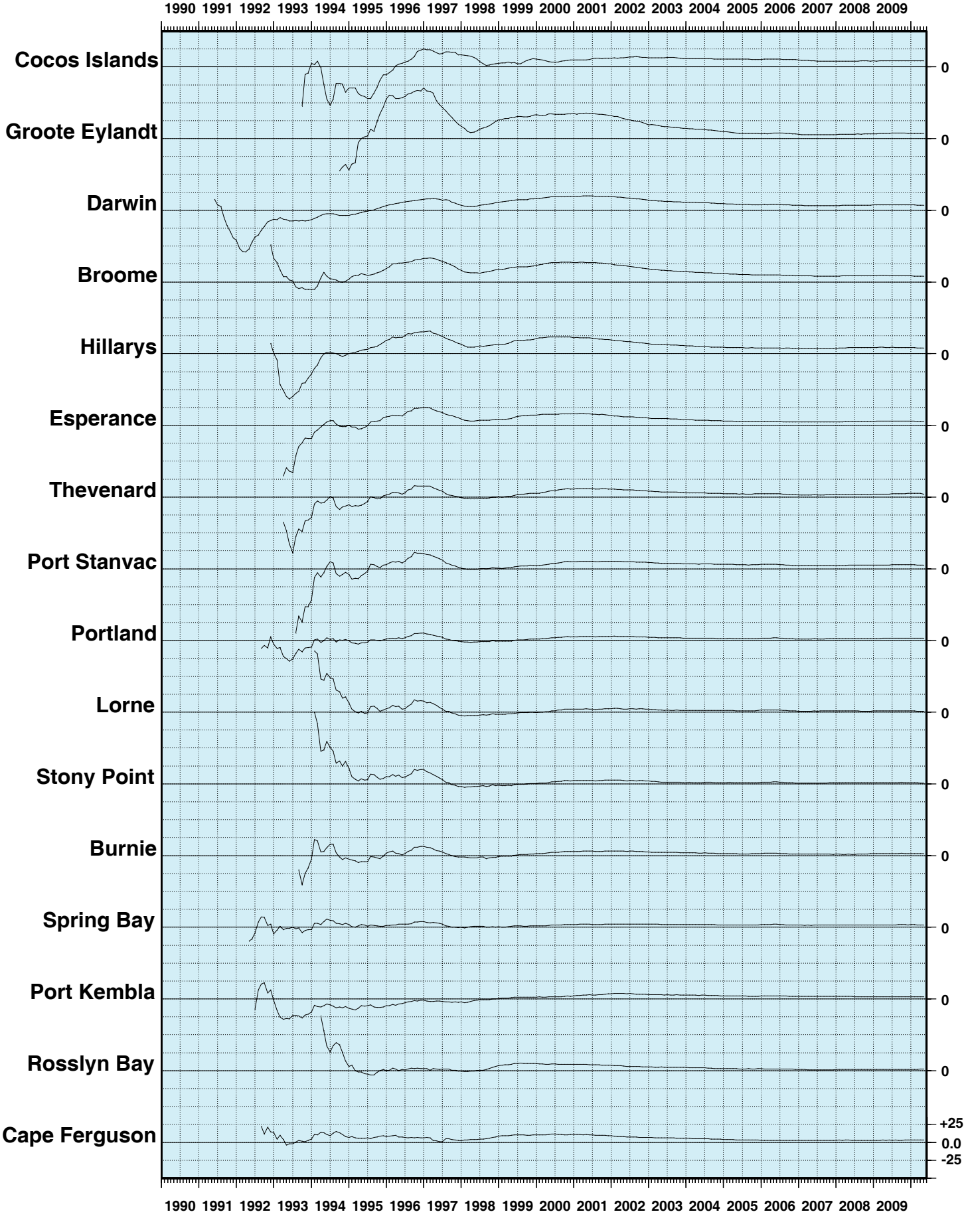


Figure 14

BAROMETRIC PRESSURE ANOMALIES THROUGH APRIL 2010 (hPa)

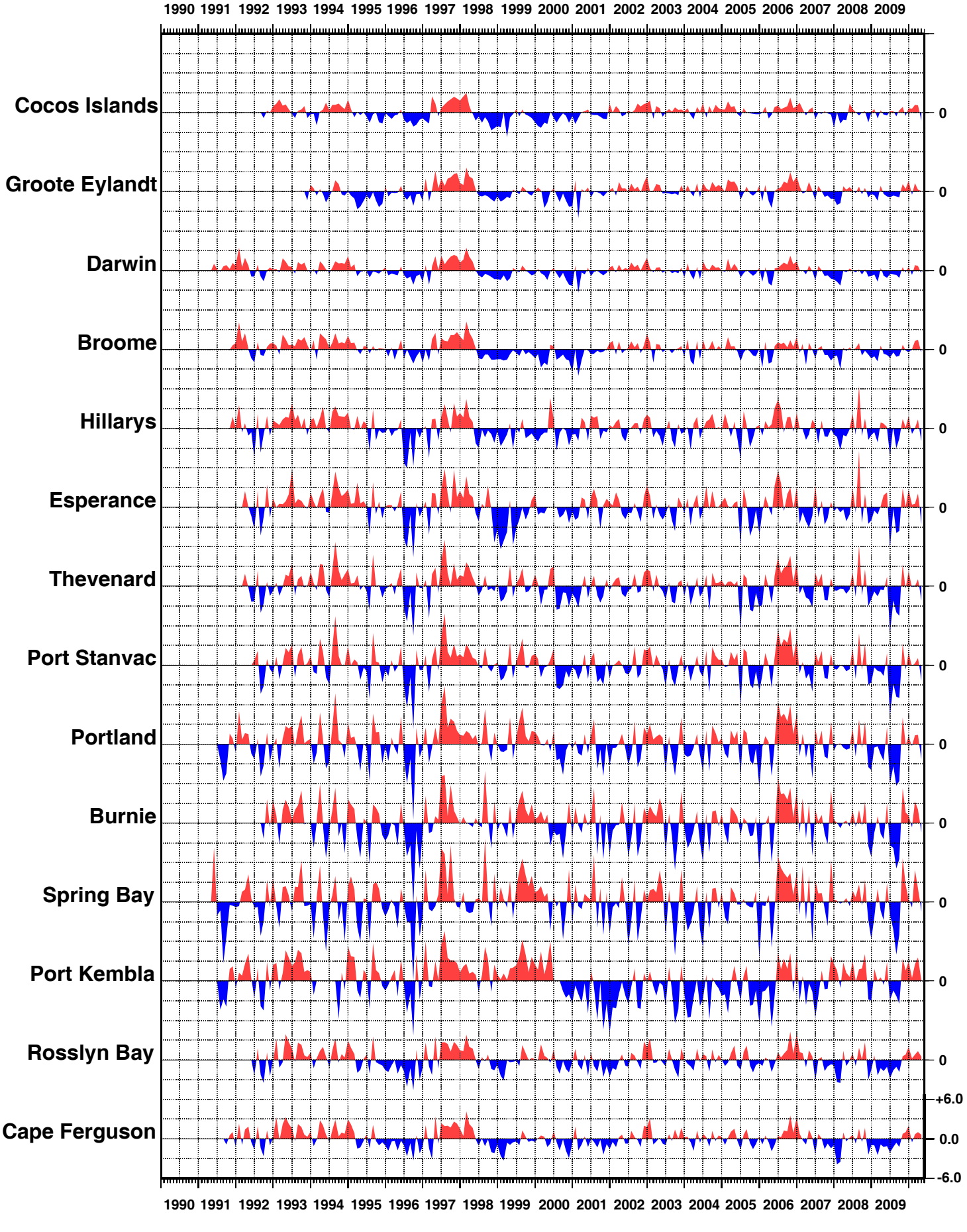


Figure 15

WATER TEMPERATURE ANOMALIES THROUGH APRIL 2010 (˚C)

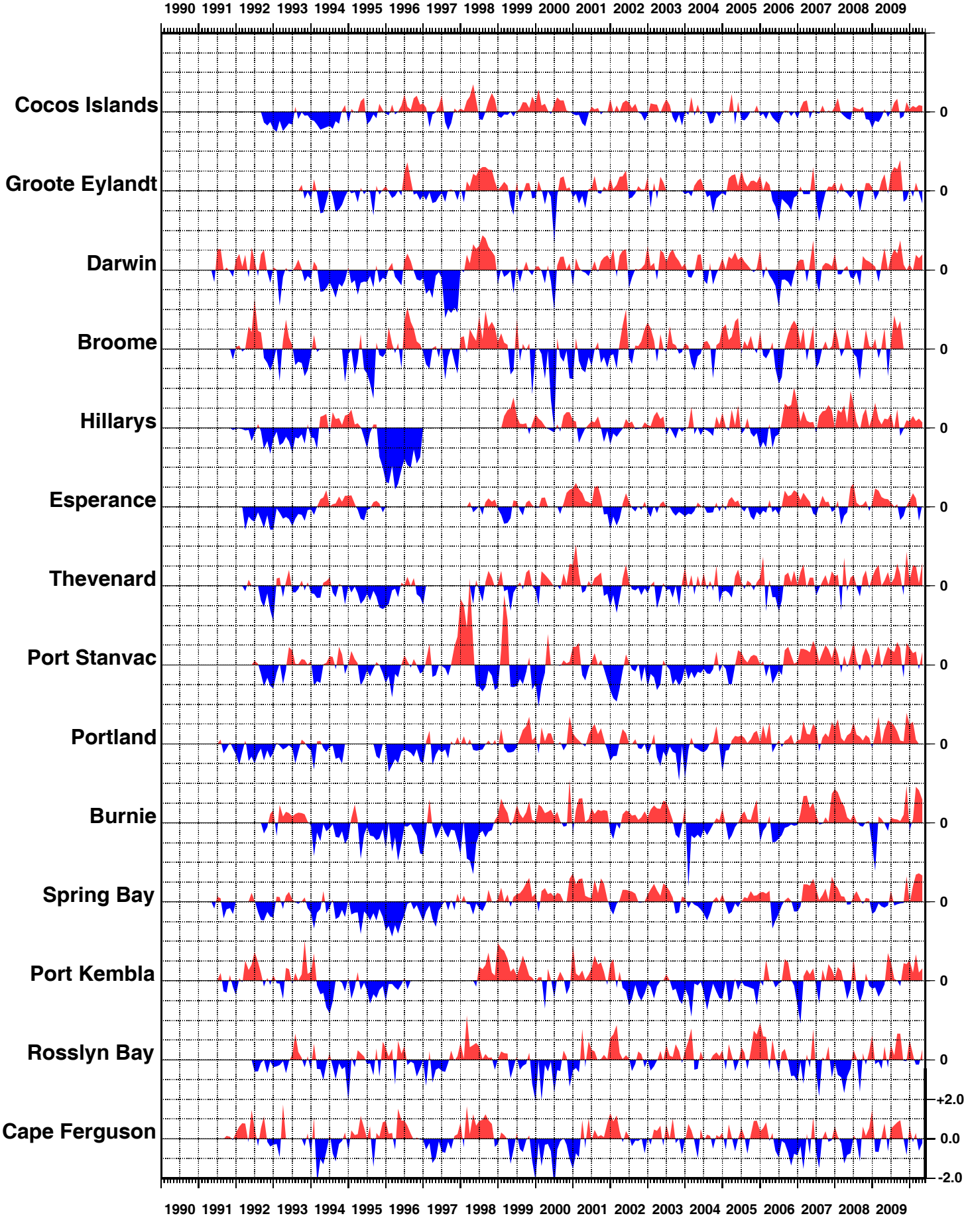


Figure 16

AIR TEMPERATURE ANOMALIES THROUGH APRIL 2010 (˚C)

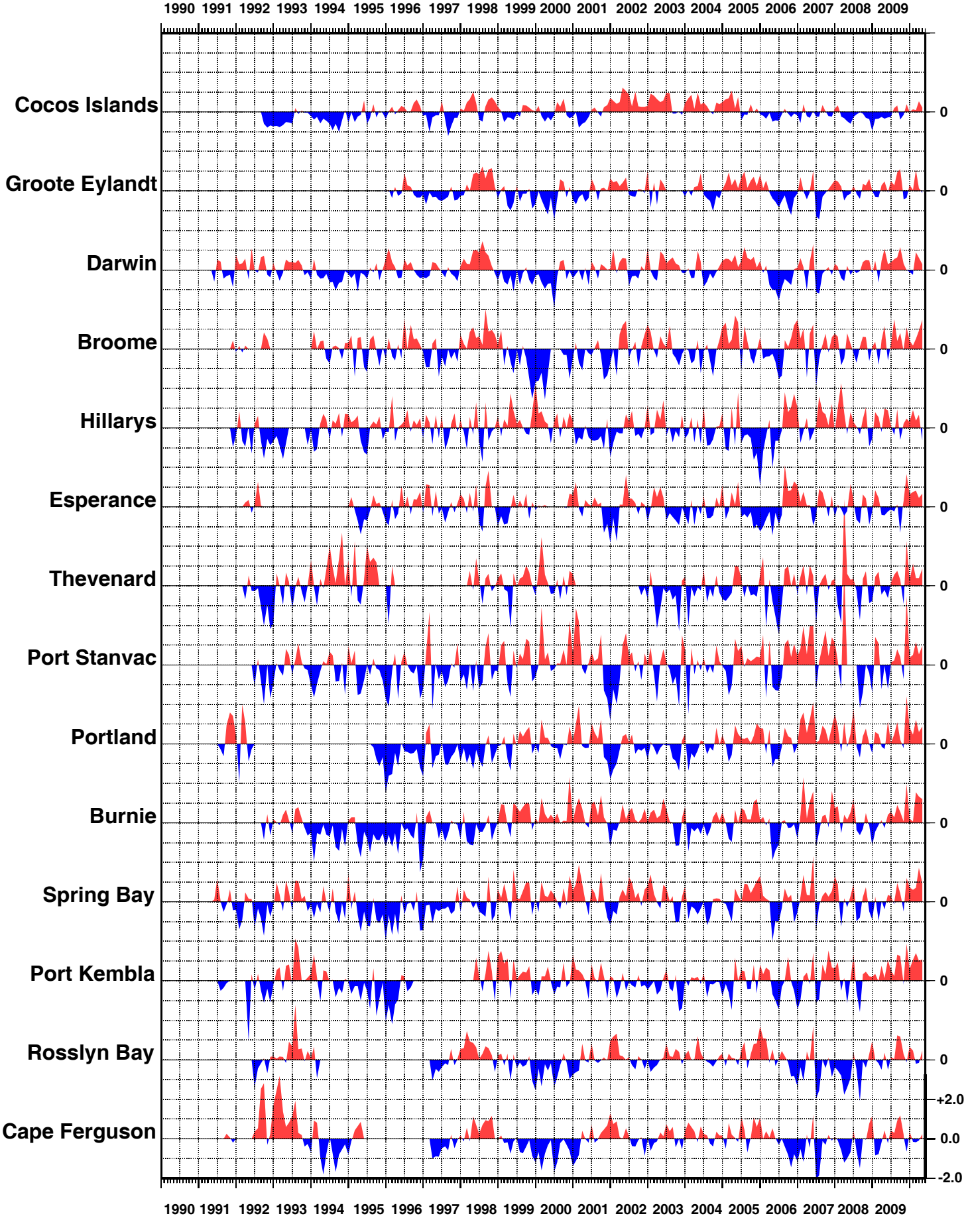
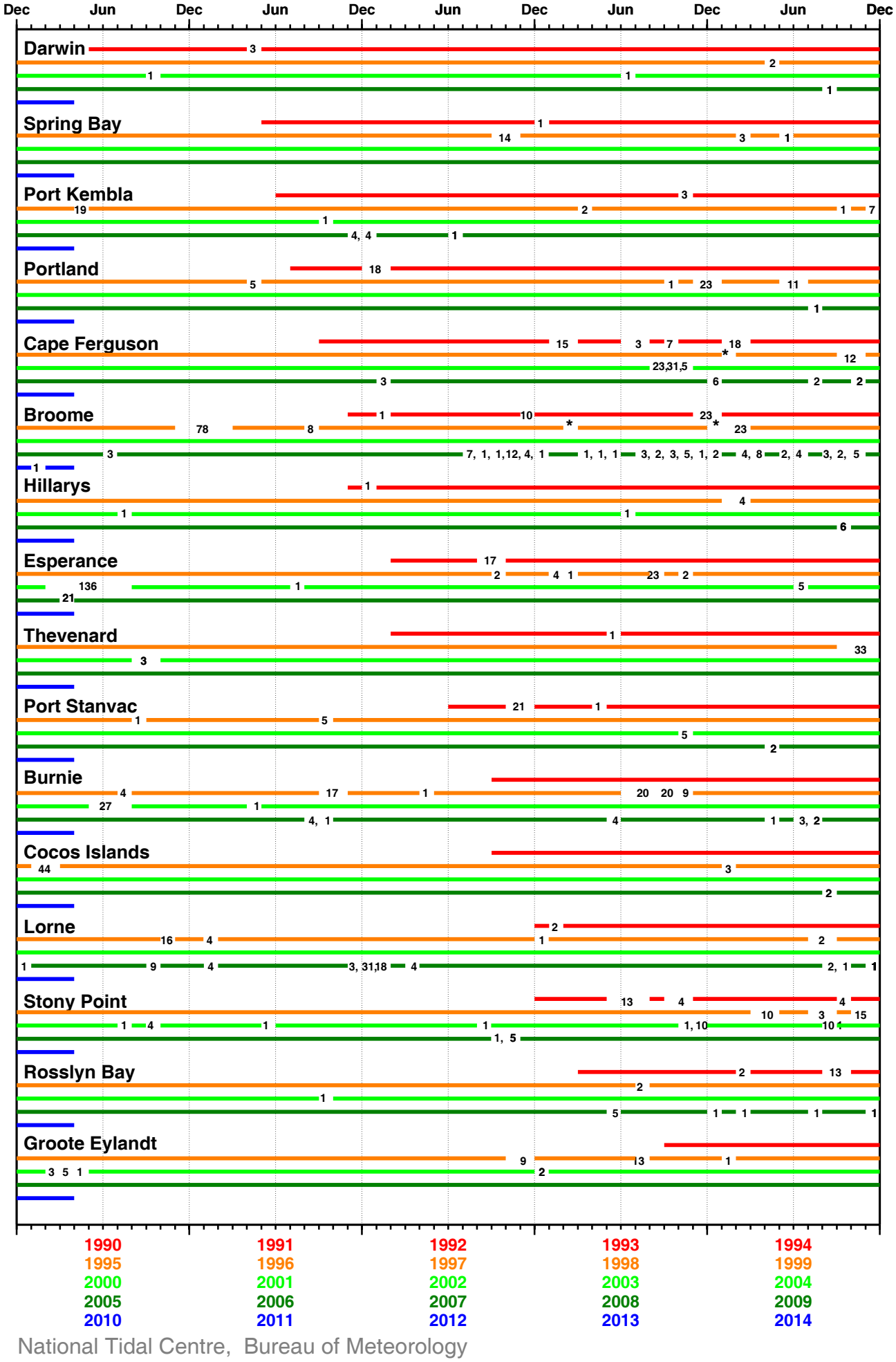


Figure 17

SEA LEVEL DATA RETURN

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



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