THE AUSTRALIAN BASELINE SEA LEVEL MONITORING PROJECT

MONTHLY DATA REPORT

JULY 2006

Australian Government

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.

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Quality Certification:

I authorise the issue of this Australian Baseline Sea Level Monitoring Project Monthly Data Report for July 2006 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 project 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.

Sea level trends are derived from the 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. 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 JULY 2006

Sea level data return (Figures 1 and 17) in July was good for most stations. Erroneous values in the data from Groote Eylandt have been removed.

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. A very small tsunami was evident in the residuals at Hillarys and Cocos Islands on the 17th of July. The tsunami was generated by a magnitude Mw7.7 earthquake off the Southern coast of Indonesia (Java) and caused extensive damage and loss of life along a section of the Java coast adjacent to the source. The wave height from one-minute data (not presented here) downloaded from the SEAFRAME gauge was 20 to 30 cm at Hillarys and 5 to 10 cm at Cocos Islands.

Wind speed and wind gust data from Stony Point was intermittently erroneous during July. These values and the corresponding incident wind directions have been removed (Figures 4, 5 and 6).

Figure 10 compares the mean, maximum and minimum values for air temperature, water temperature and barometric pressure for July 2006 with the long-term July values. Note that the long-term ranges are calculated using the historical sets of July data for each station ***excluding*** the current month of data.

The air temperatures in July 2006 were generally within the long-term July temperature ranges. The minimum air temperature at Port Stanvac (6.0°C) was below the previous record minima and the maximum temperature at Burnie (16.4°C) was above the previous record maxima. The water temperatures in July 2006 were generally within the long-term July water temperature ranges, with the exception of Burnie where a record minimum of 9.8°C was set. The barometric pressures in July 2006 were generally consistent with the long-term July pressure ranges, with the exceptions of Burnie (1037.1 hPa) and Spring Bay (1036.8 hPa) where record maximum pressures were set.

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 has the seasonal signal removed from the data.

The sea level anomalies (Figure 12) were negative at all sites in July. There was a gradient in the anomalies from slightly negative and near normal on the North East coast to strongly negative across the Southern seaboard in July. Sea levels were more than 10cm below normal across Southern Australia

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. The sea level trends decreased in July over the previous months trends and reflects the negative sea level anomalies.

The barometric pressure anomalies (Figure 14) were positive at all sites in July particularly around Southern Australia. The occurrence of lower than normal sea levels and higher than normal barometric pressures in this region is due to the inverse barometer effect.

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 2003 to July 2006 is 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 installation date, position, short-term sea level trends and change in trend from the previous month for the Australian Baseline array through June 2006.

Location	Lat / Long	Installation Date	Trend (mm/yr)	Change from previous month
Cocos Islands	12°07'00"S / 96°53'31"E	Sep 1992	+10.5	-0.1
Groote Eylandt	13°51'36"S / 136°24'57"E	Sep 1993	+7.8	-0.1
Darwin	12°28'19"S / 130°50'45"E	May 1990	+7.8	-0.1
Broome	18°00'03"S / 122°13'06"E	Nov 1991	+9.5	-0.2
Hillarys	31°49'32"S / 115°44'19"E	Nov 1991	+7.6	-0.2
Esperance	33°52'24"S / 121°53'42"E	Mar 1992	+4.8	-0.3
Thevenard	32°09'02"S / 133°38'25"E	Mar 1992	+4.0	-0.4
Port Stanvac	35°06'35"S / 138°27'55"E	Jun 1992	+5.4	-0.5
Portland	38°20'38"S / 141°36'49"E	Jul 1991	+2.9	-0.3
Lorne	38°30'00"S / 143°59'00"E	Jan 1993	+2.4	-0.4
Stony Point	38°22'00"S / 145°13'00"E	Jan 1993	+2.0	-0.4
Burnie	41°03'00"S / 145°54'53"E	Sep 1992	+2.6	-0.3
Spring Bay	42°32'47"S / 147°55'51"E	May 1991	+3.6	-0.3
Port Kembla	34°28'26"S / 150°54'43"E	Jul 1991	+4.1	-0.2
Rosslyn Bay	23°09'40"S / 150°47'24"E	Jun 1992	+2.2	-0.1
Cape Ferguson	19°16'39"S / 147°03'31"E	Sep 1991	+2.8	-0.1

Figure A: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2003 to July 2006. Note that the web hits for February 2005 are not available due to technical difficulties.

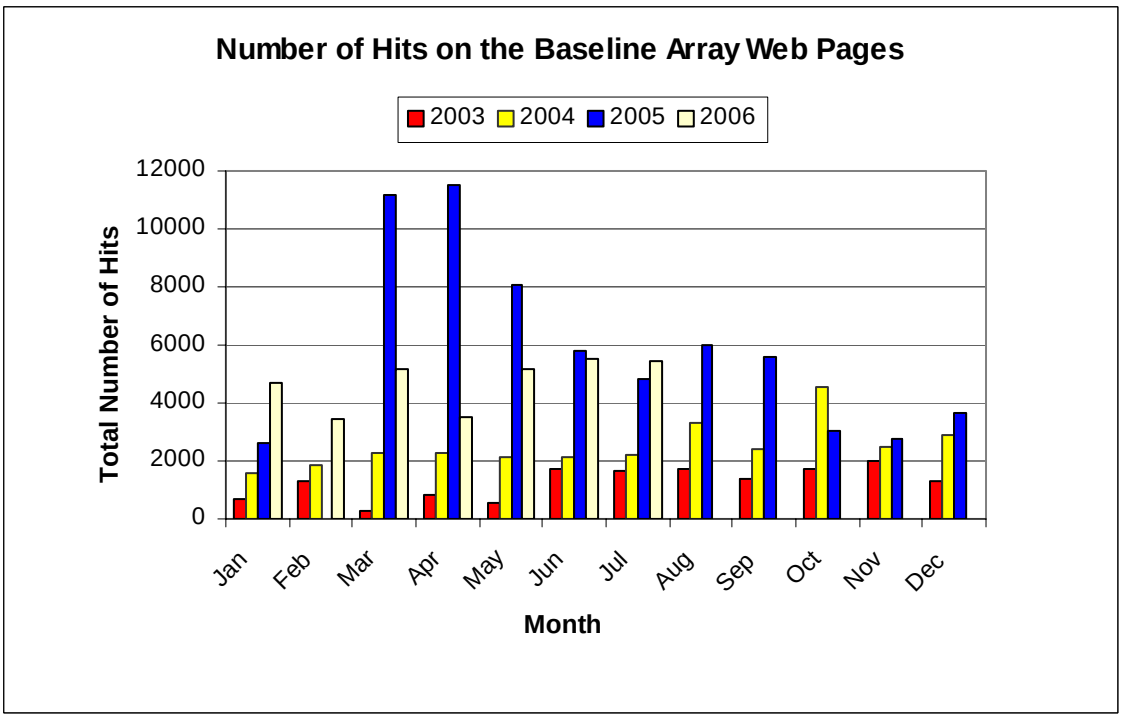
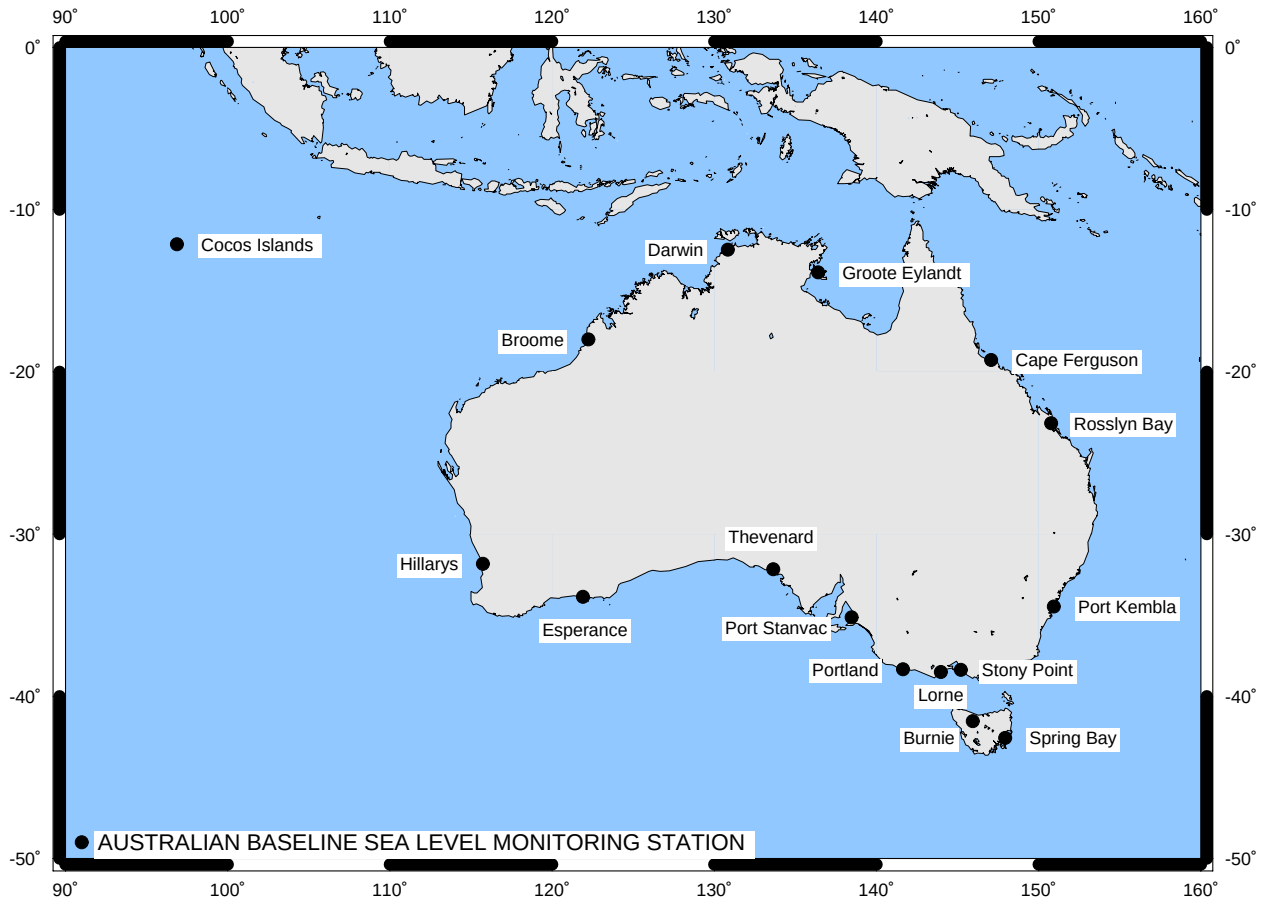


Figure B: Australian Baseline Sea Level Monitoring Project sites.



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.

National Tidal Centre
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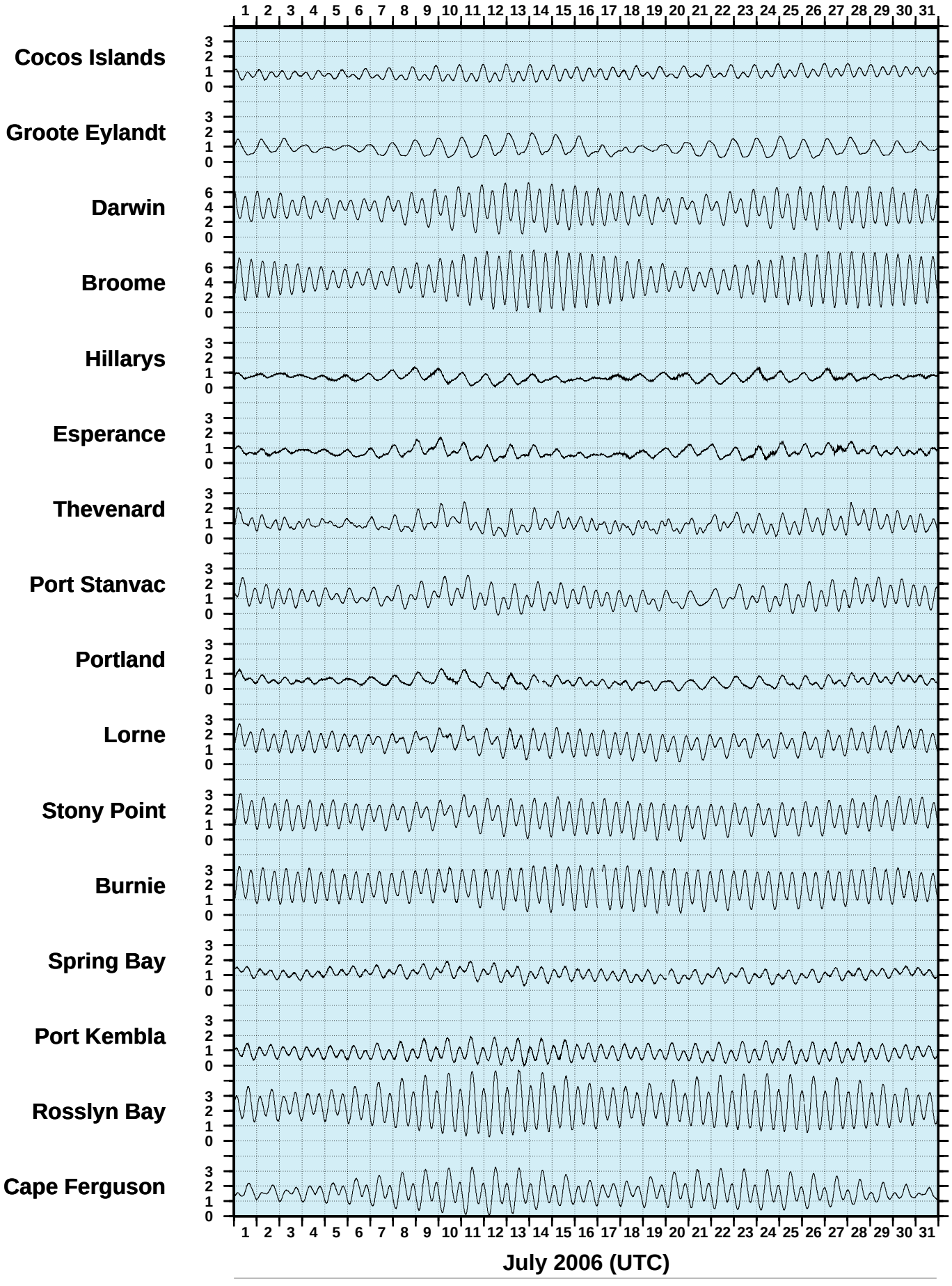
Please note the following:

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

JULY 2006
SIX MINUTE SEA LEVEL OBSERVATIONS (m)



National Tidal Centre, Bureau of Meteorology

Figure 2

JULY 2006
SIX MINUTE RESIDUAL WATER LEVELS (m)

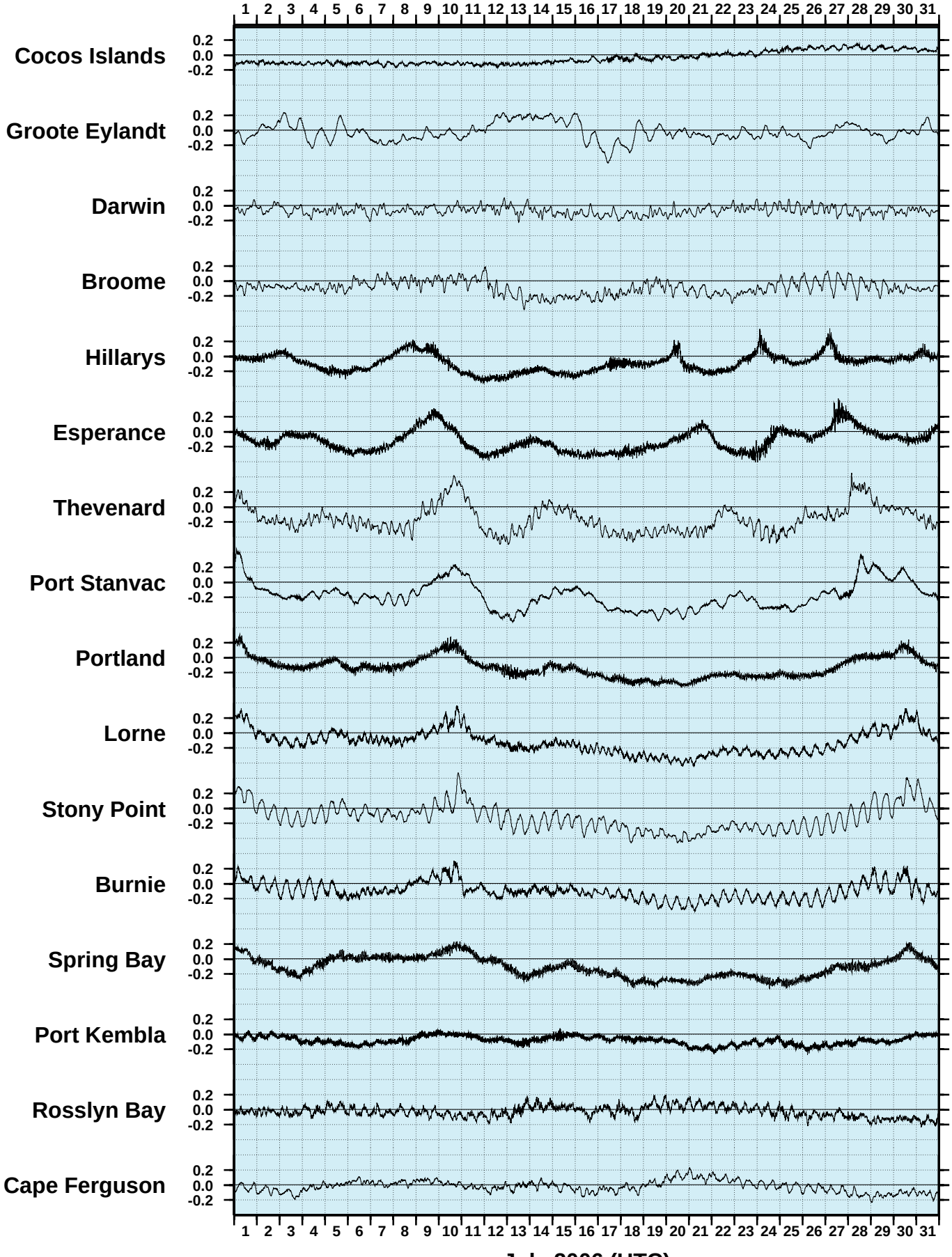


Figure 3

JULY 2006
SIX MINUTE RESIDUALS
ADJUSTED FOR ATMOSPHERIC PRESSURE (m)

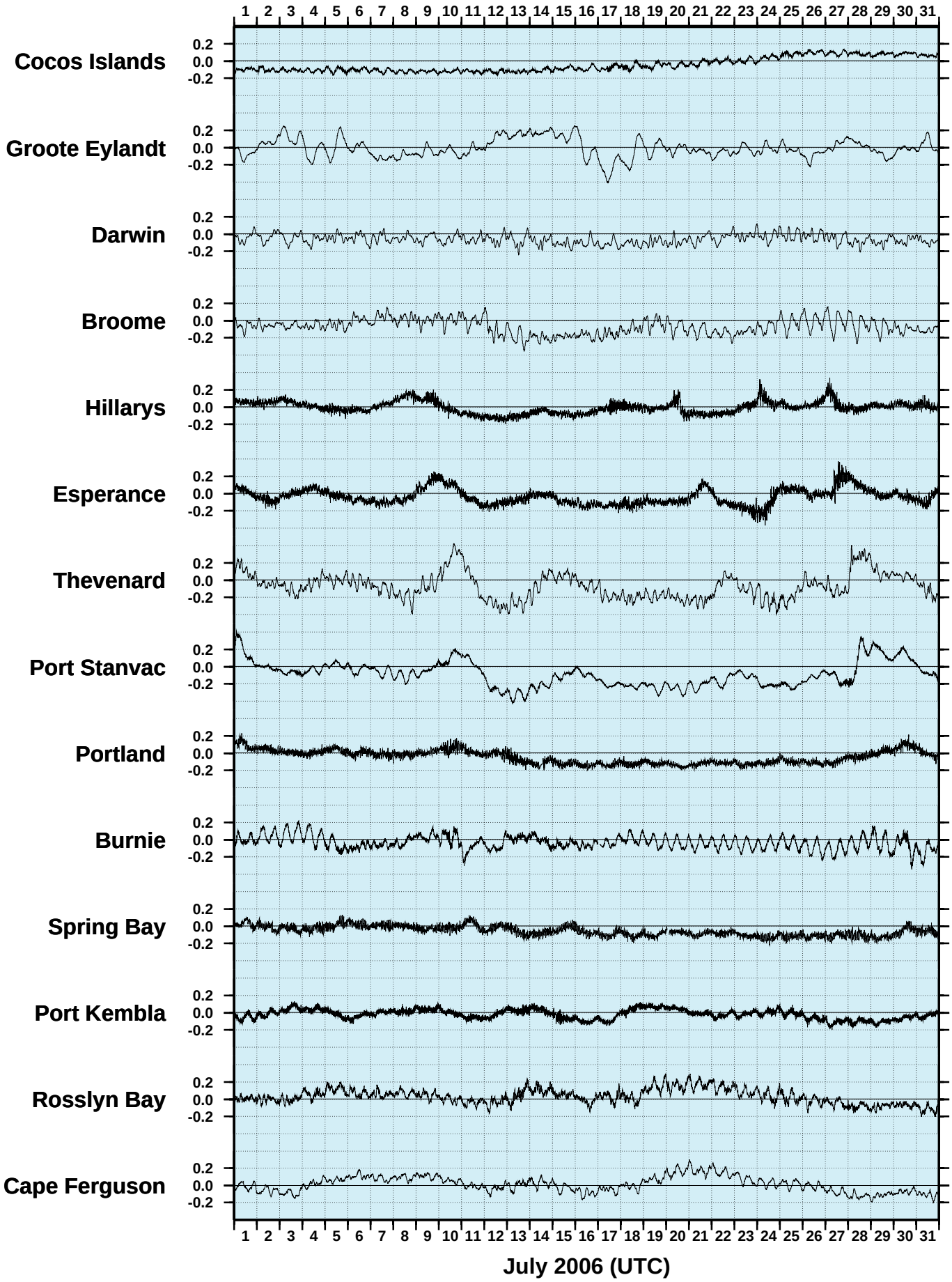


Figure 4

JULY 2006
HOURLY WIND SPEEDS (m/s)

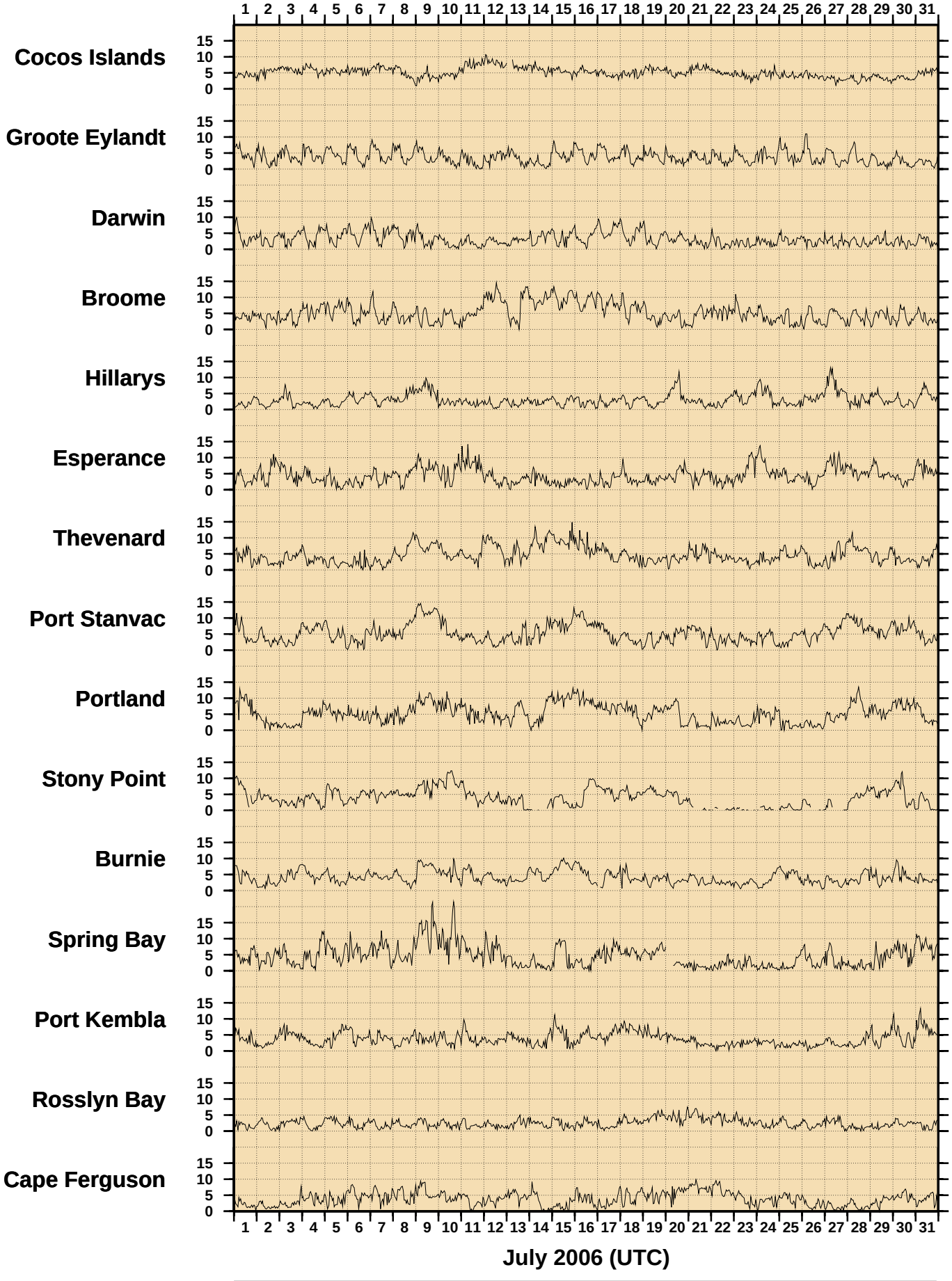


Figure 5

JULY 2006
HOURLY INCIDENT WINDS (m/s, deg True)

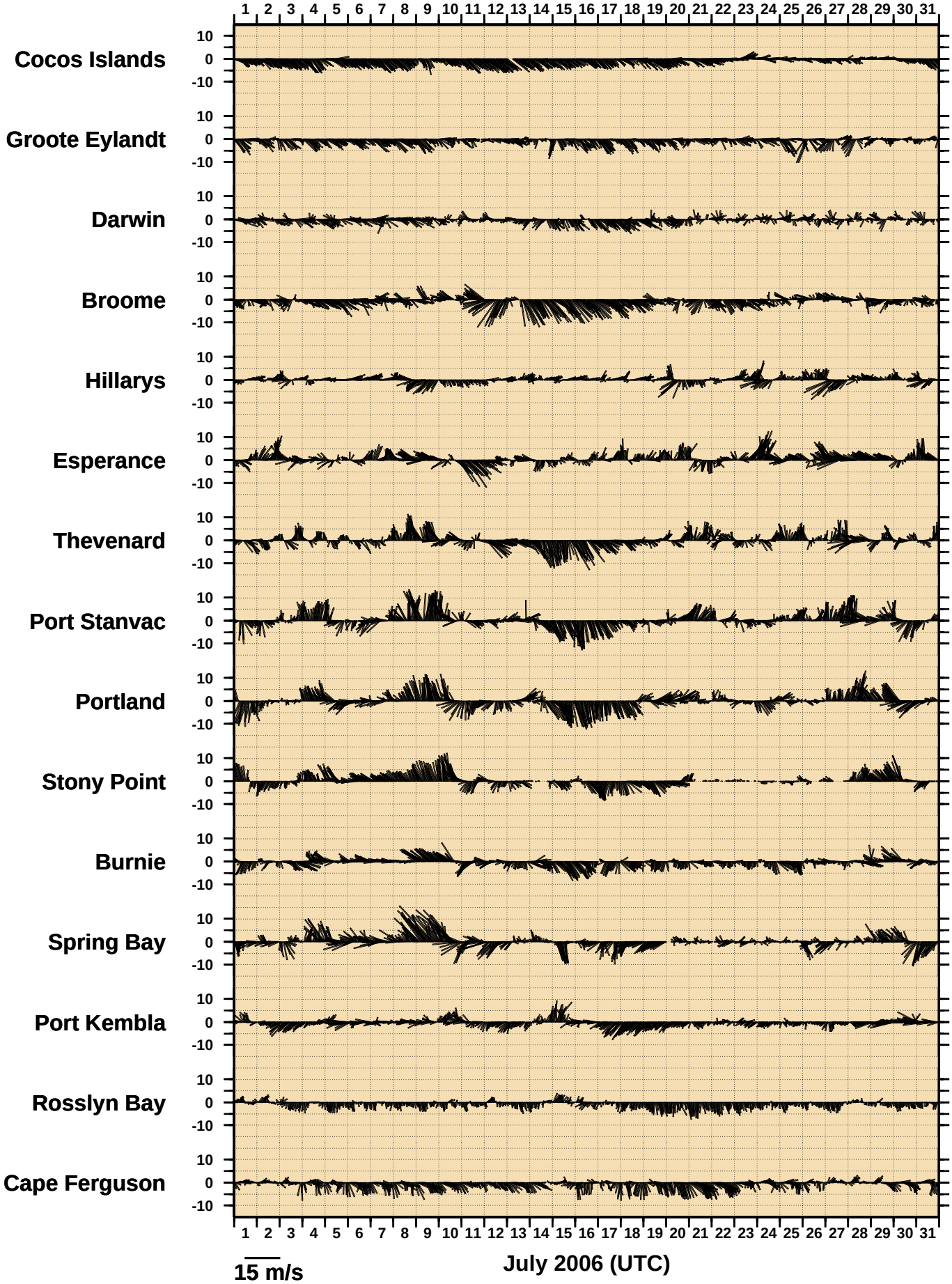


Figure 6

JULY 2006
HOURLY MAXIMUM WIND GUSTS (m/s)

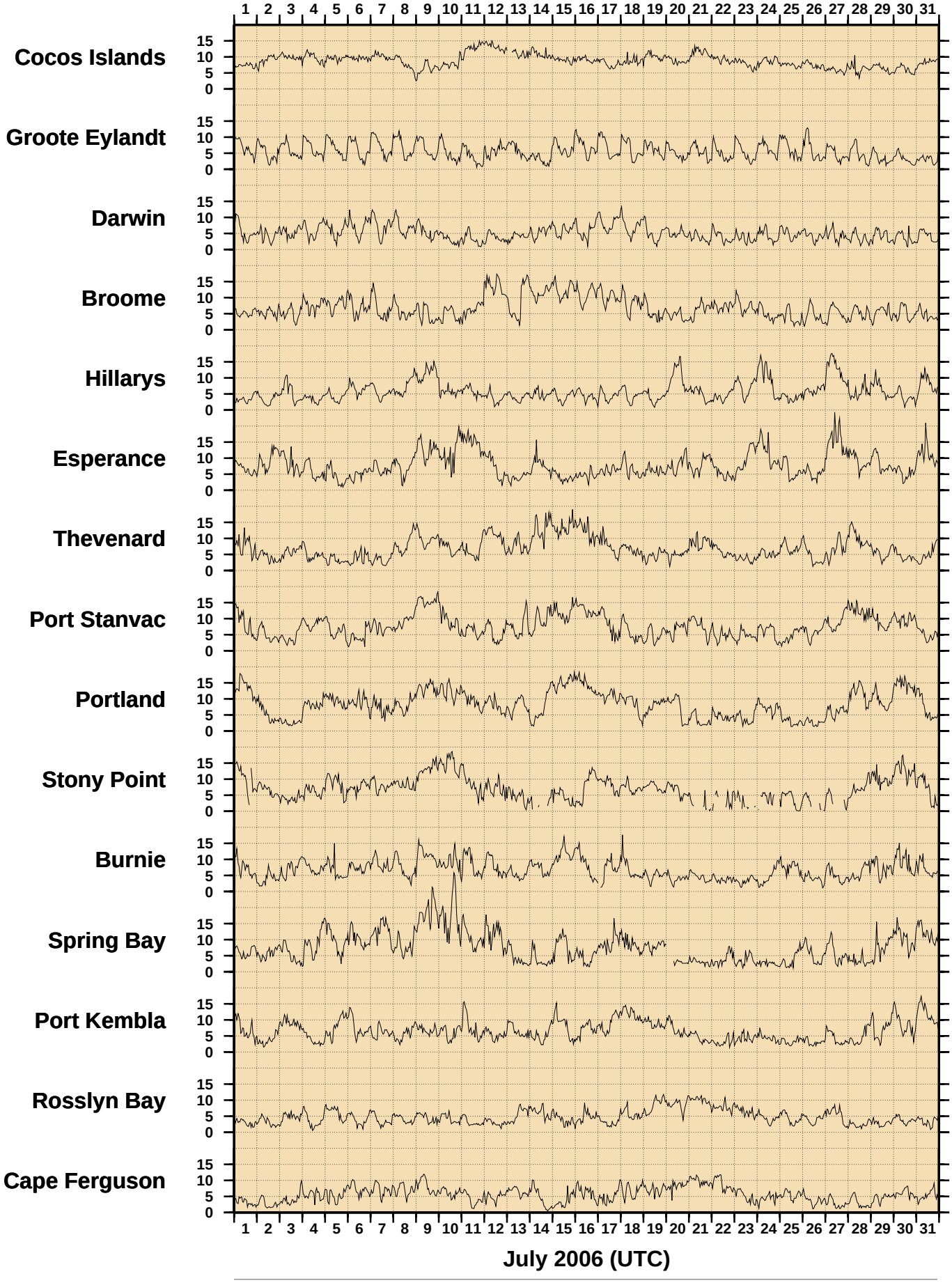


Figure 7

JULY 2006
HOURLY AIR TEMPERATURES (˚C)

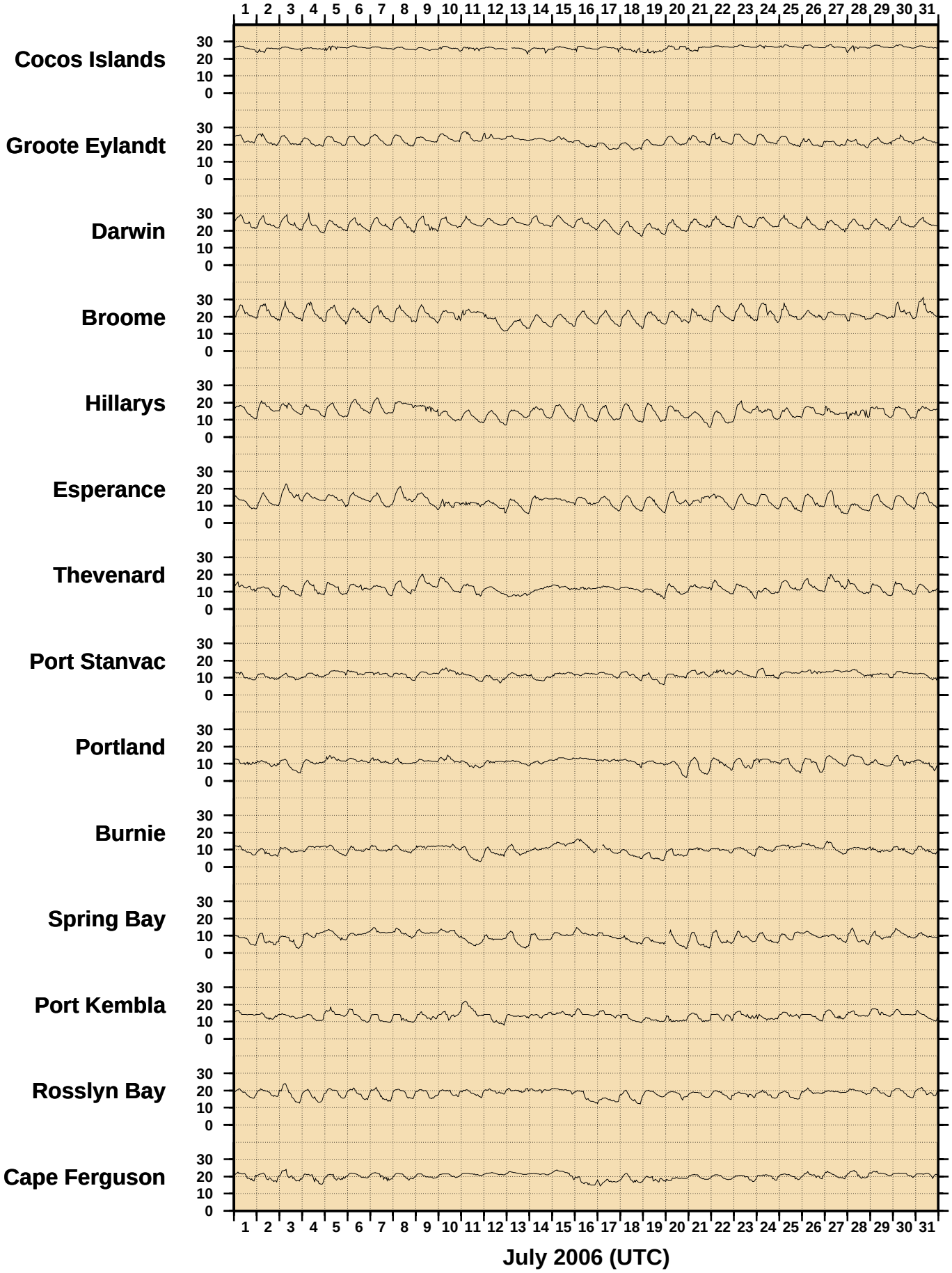


Figure 8

JULY 2006
HOURLY WATER TEMPERATURES (°C)

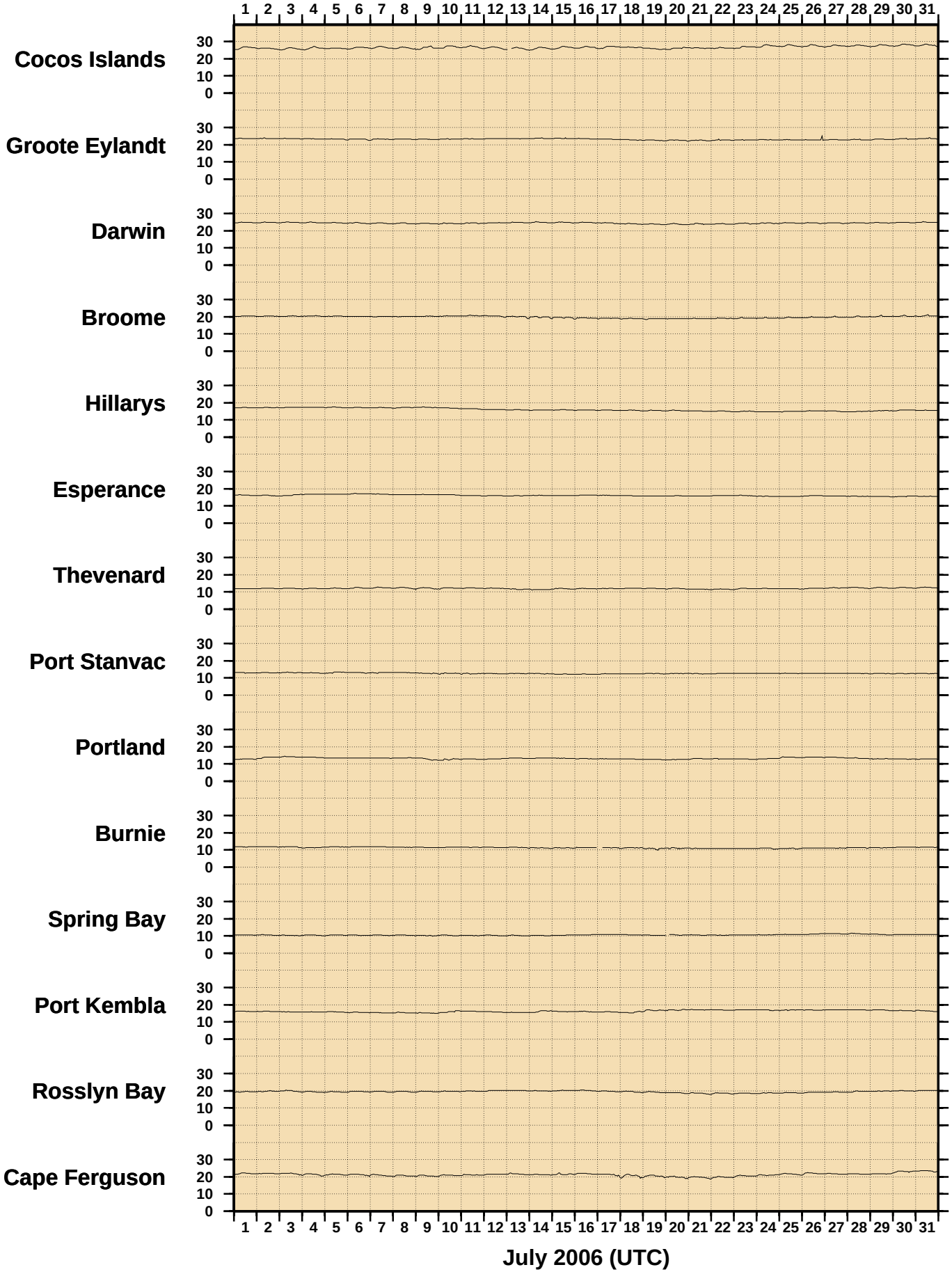


Figure 9

JULY 2006
HOURLY ATMOSPHERIC PRESSURE (hPa)

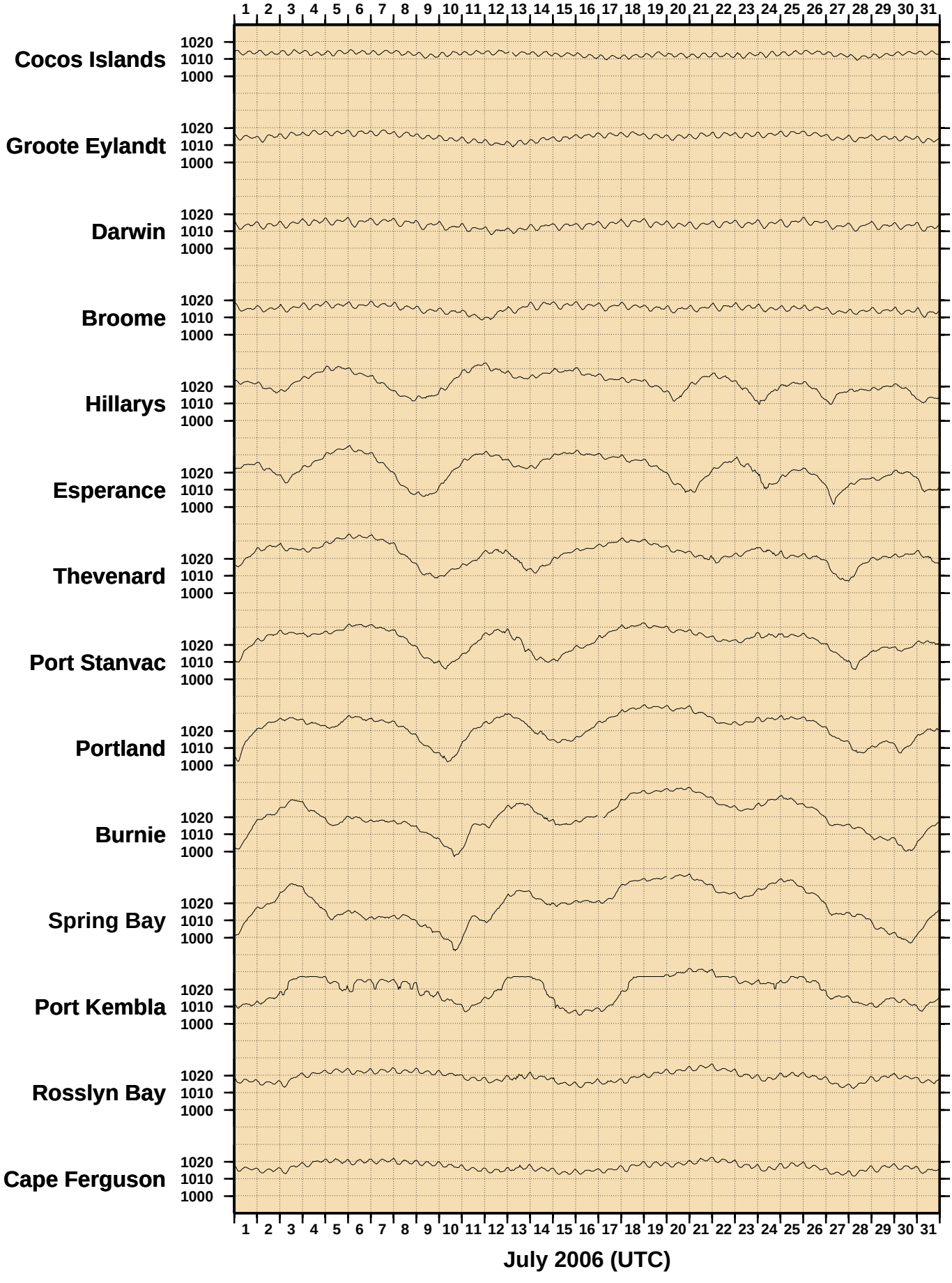
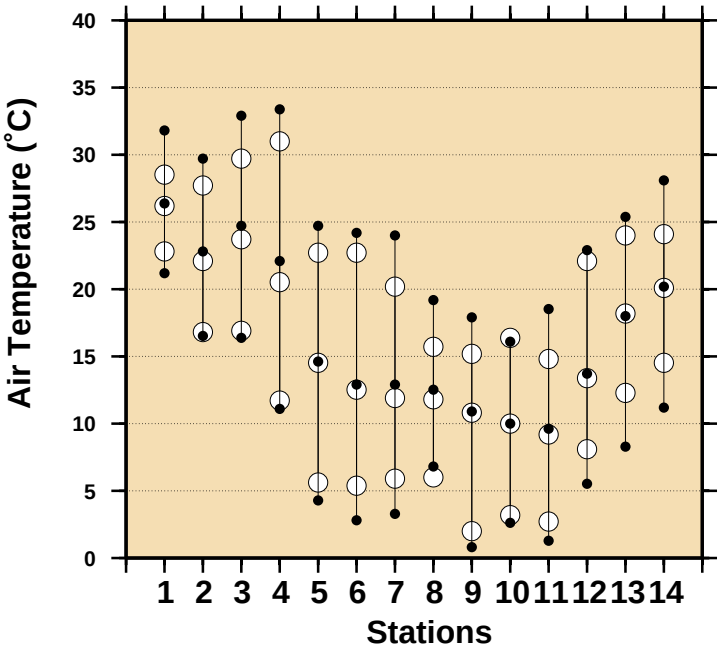
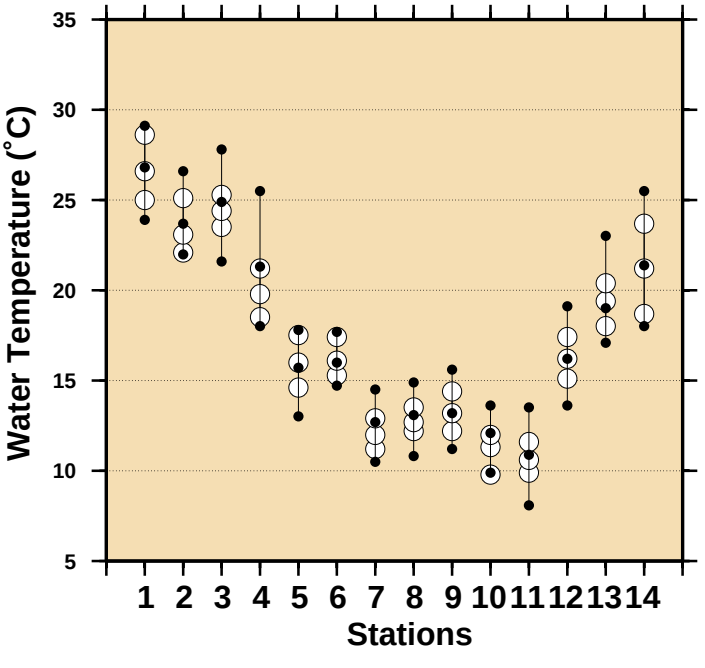
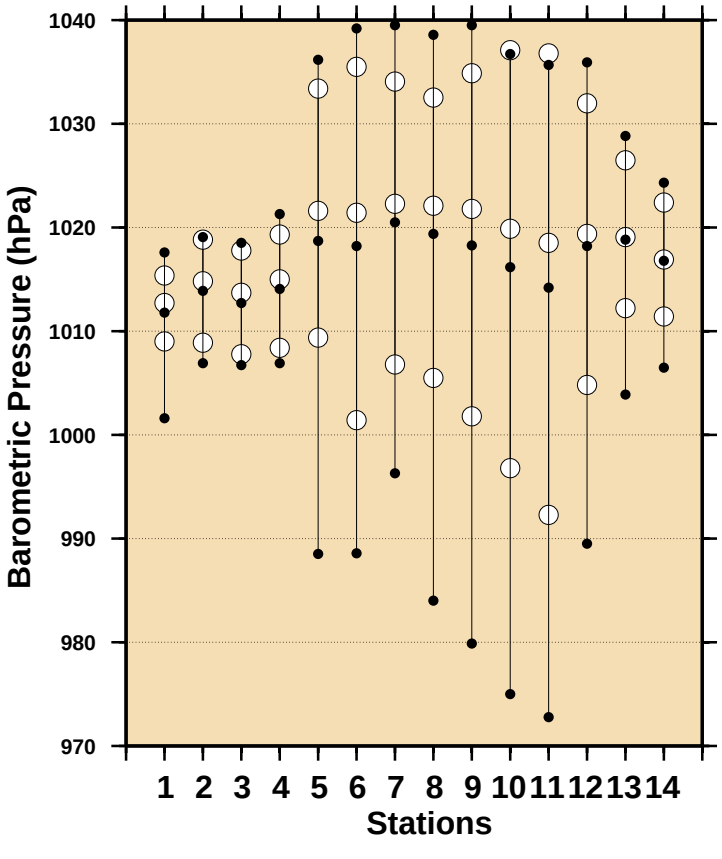


Figure 10

Comparison of July 2006 Max, Min & Mean with Long Term July 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

July 2006 Maximum
July 2006 Mean
July 2006 Minimum

Long Term July Maximum
Long Term July Mean
Long Term July Minimum

Figure 11
MONTHLY MEAN SEA LEVELS TO JULY 2006 (m)

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

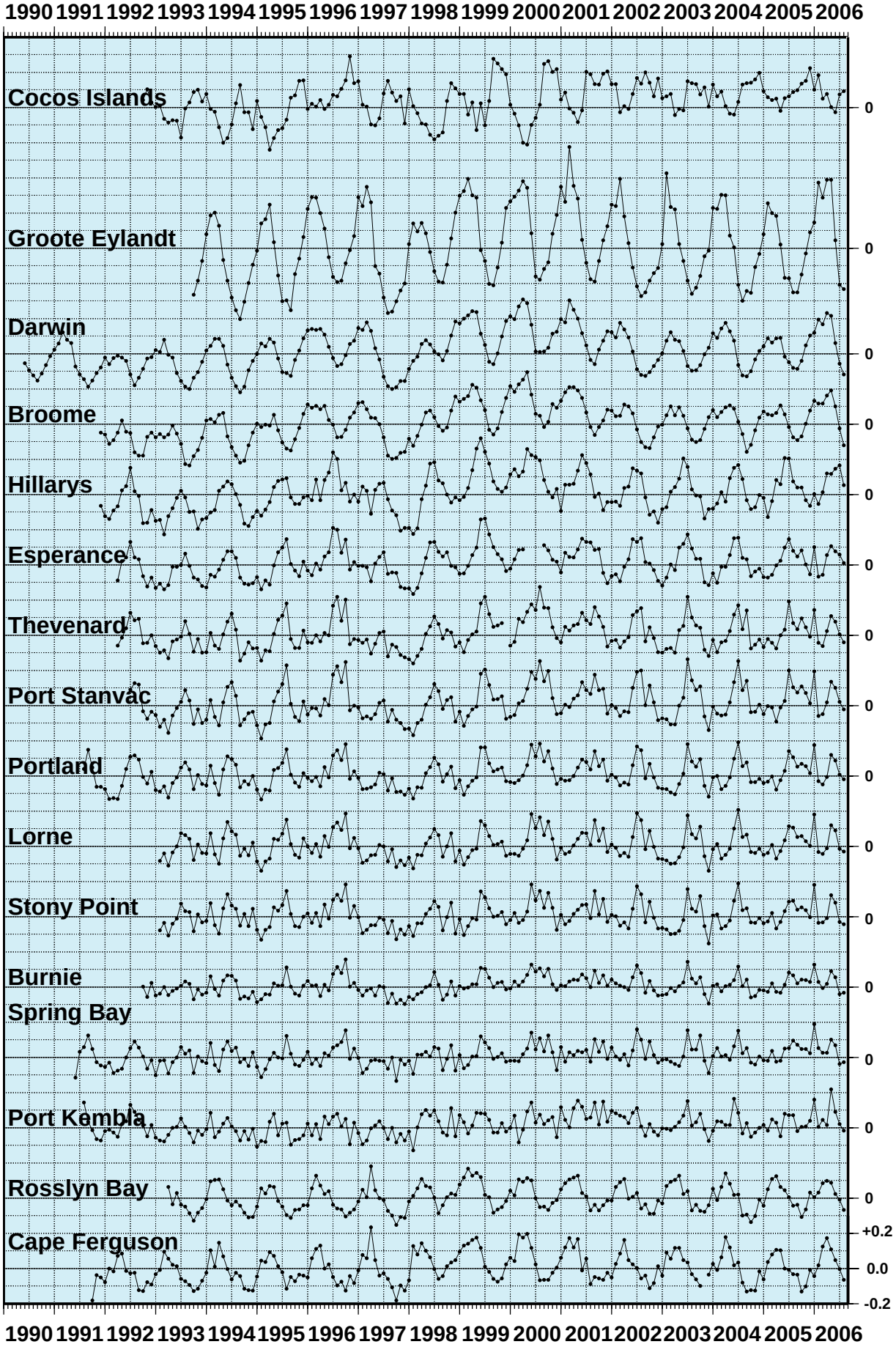


Figure 12

SEA LEVEL ANOMALIES THROUGH JULY 2006 (m)

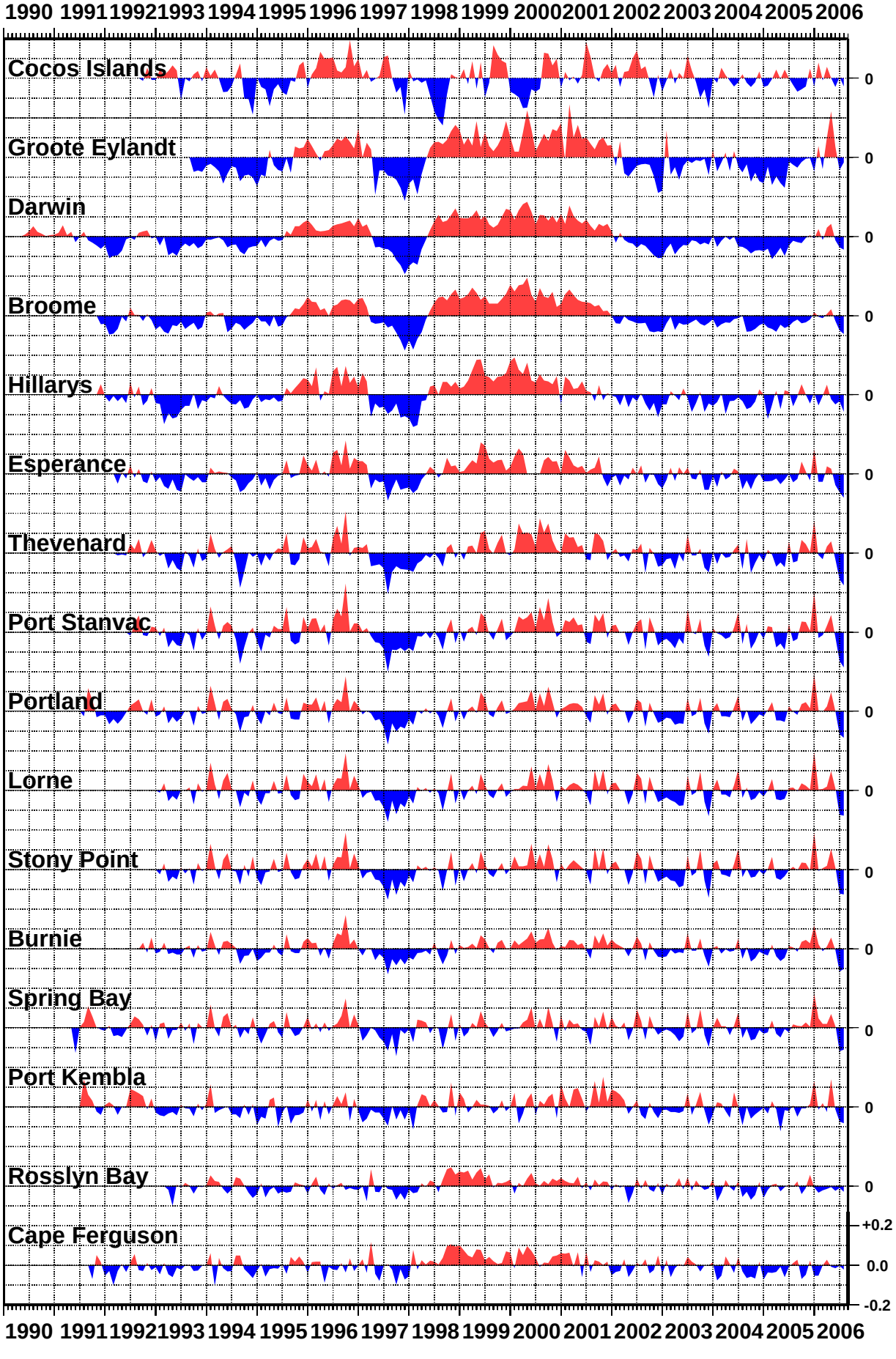


Figure 13

SEA LEVEL TRENDS THROUGH JULY 2006 (mm/year)

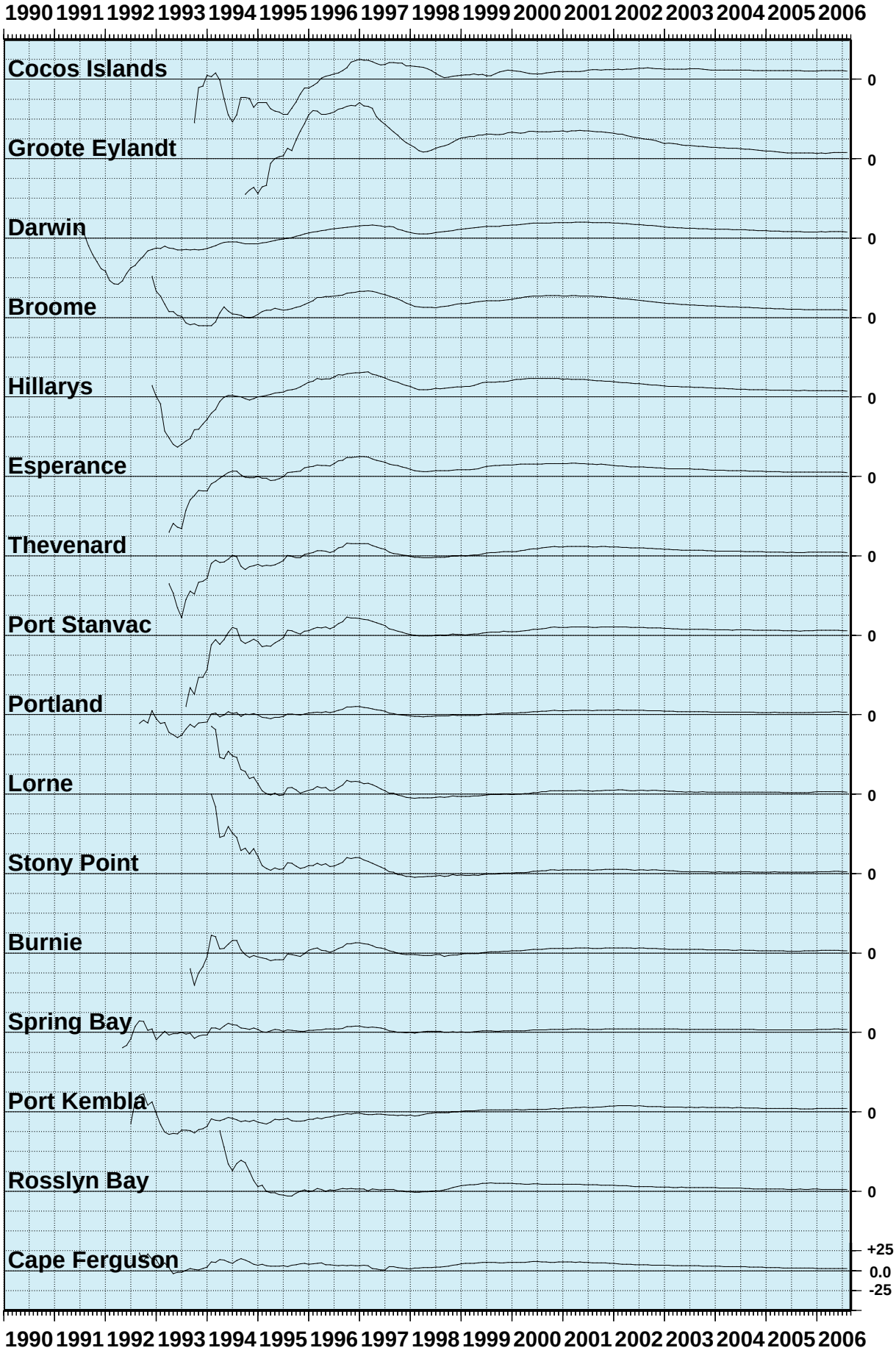


Figure 14

BAROMETRIC PRESSURE ANOMALIES THROUGH JULY 2006 (hPa)

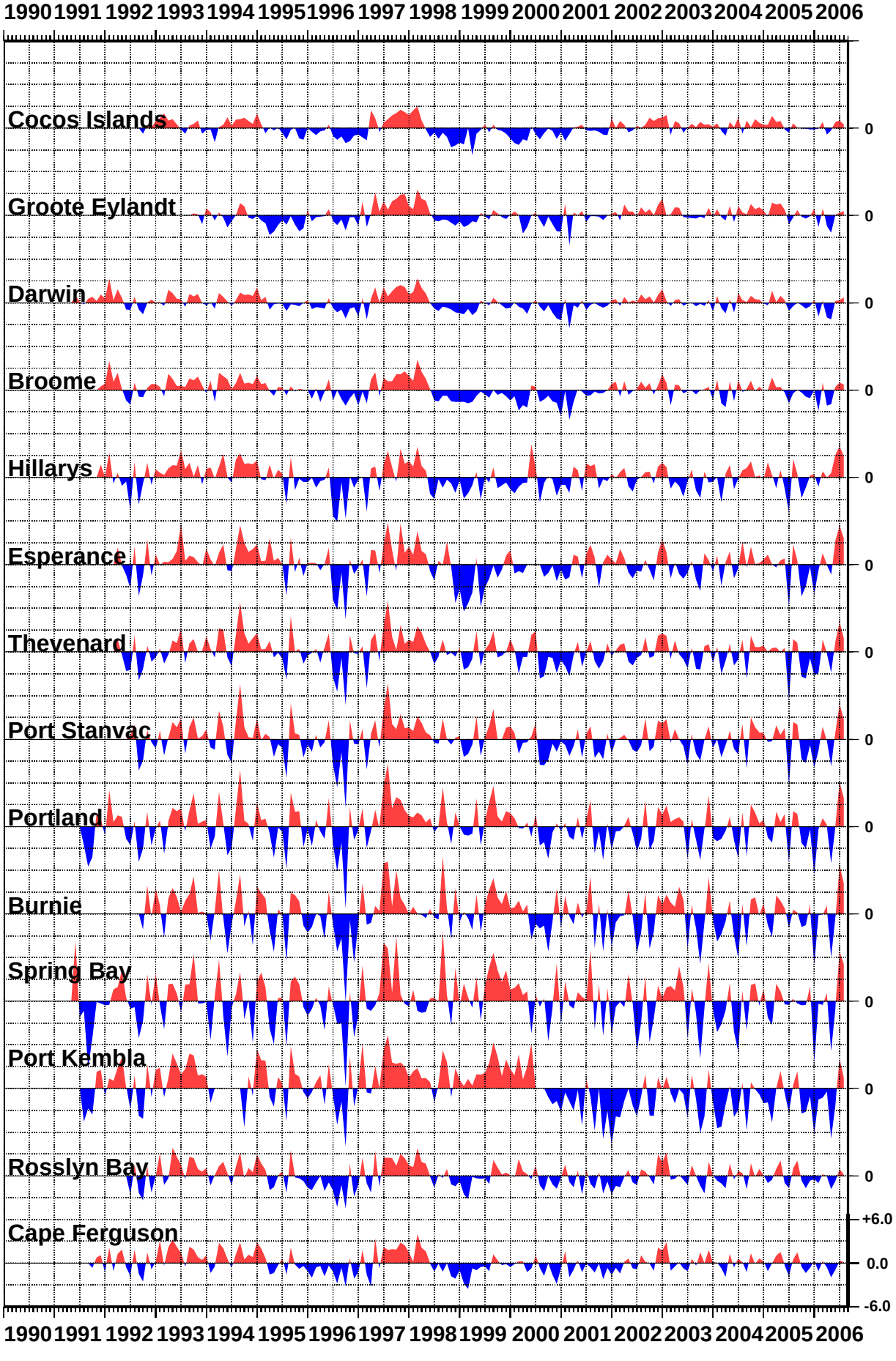


Figure 15

WATER TEMPERATURE ANOMALIES THROUGH JULY 2006 (˚C)

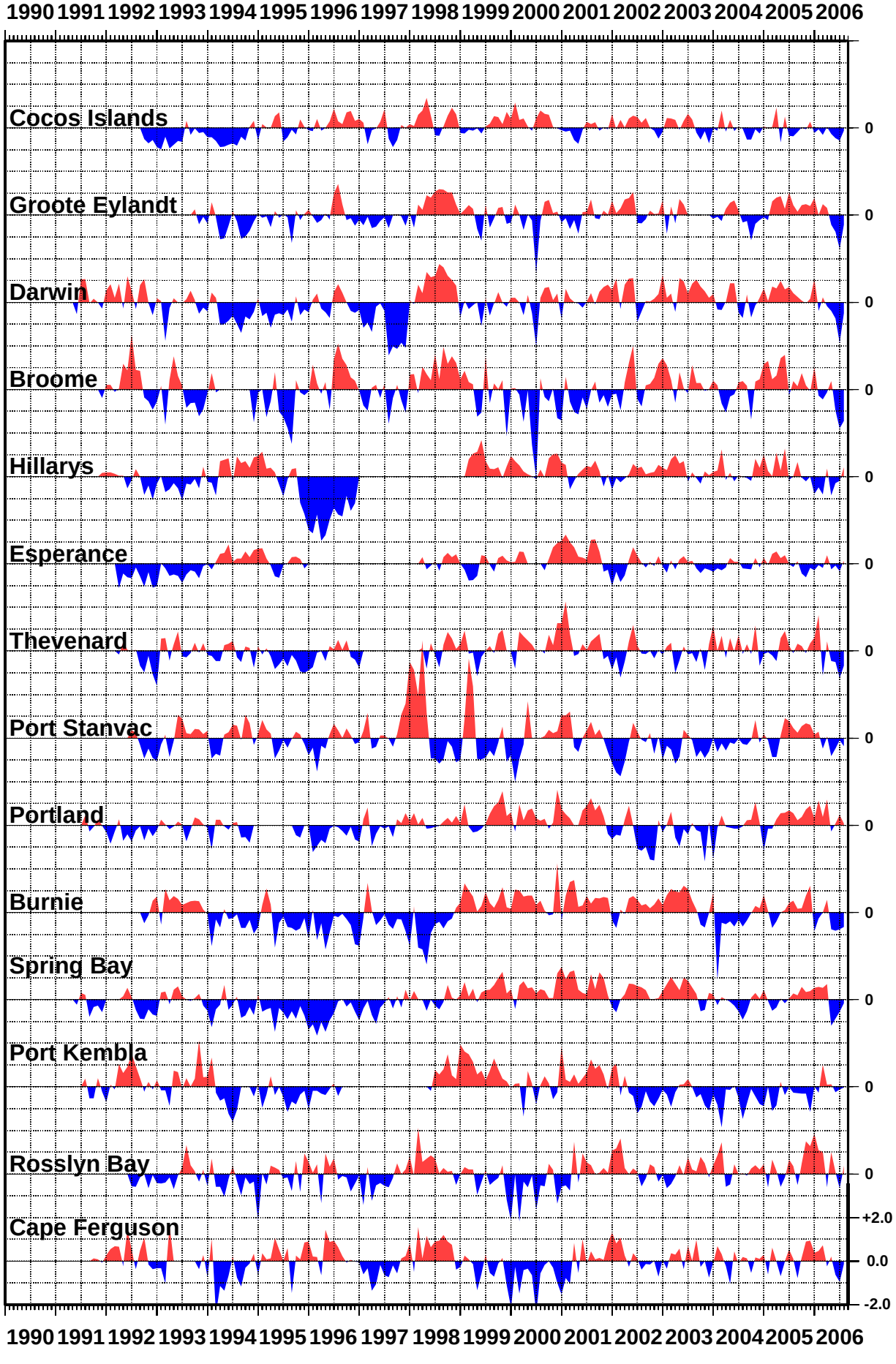


Figure 16

AIR TEMPERATURE ANOMALIES THROUGH JULY 2006 (˚C)

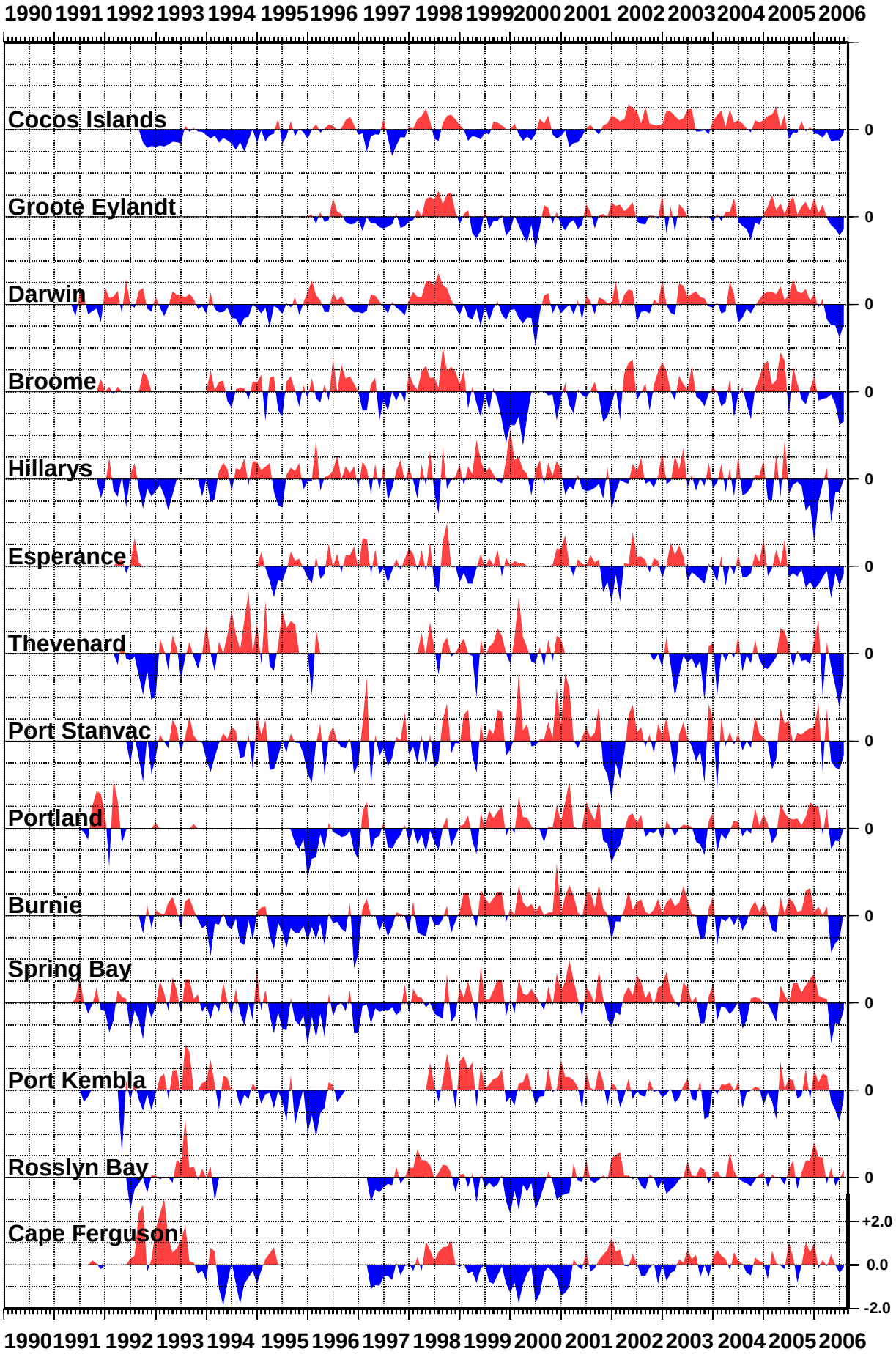
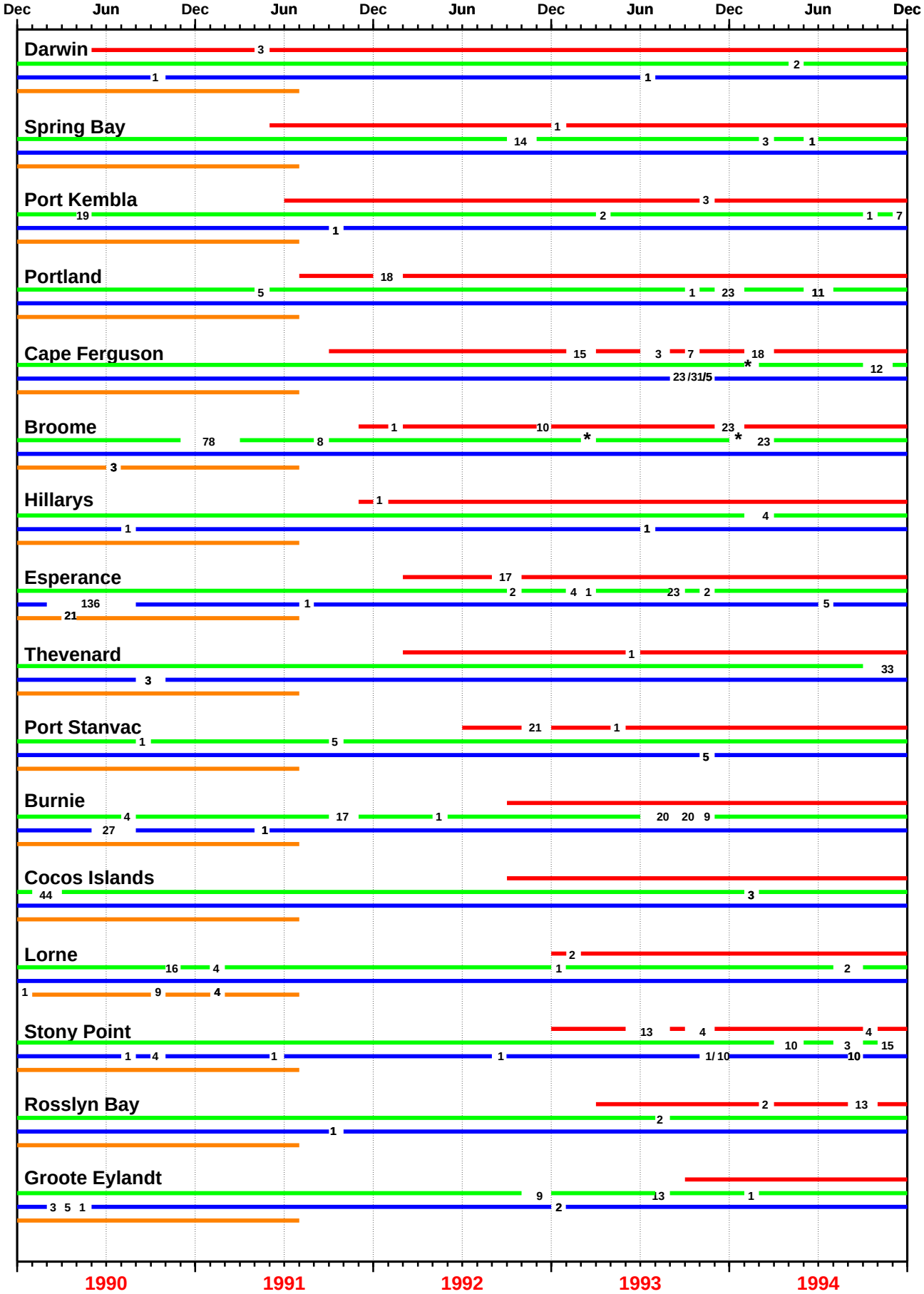


Figure 17

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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