THE AUSTRALIAN BASELINE SEA LEVEL MONITORING PROJECT

MONTHLY DATA REPORT

NOVEMBER 2009

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 November 2009 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

NOVEMBER 2009

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 NOVEMBER 2009

Sea level data return (Figures 1 and 17) in November 2009 was good for most stations. The Baseline array network modernisation project has almost been completed, with no new data loggers installed in November. Rosslyn Bay is the only remaining station awaiting upgrading to the new Telmet 320 logger and is due to be replaced in December. At Cape Ferguson the backup sea level sensor, which has been used following the failure of the primary sensor in September 2009, experienced problems that resulted in a 2 day gap in the sea level record. The Broome Port Authority policy of switching off the power when fuel ships are in dock resulted in the loss of 5 days of data at the Broome station.

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 November 2009 with the long-term values. Note that the long-term ranges are calculated using the previous sets of November data for each station ***excluding*** the current month of data.

A record maximum air temperature for November was set for Burnie (29.5°C) and a maximum water temperature was set at Thevenard (25.3°C) this month. The barometric pressures for November 2009 fell within the long-term minimums and maximums for all stations.

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.

The sea level anomalies (Figure 12) in November 2009 were positive for Cocos Islands, Thevenard and Cape Ferguson and negative at Groote Eylandt, Darwin and Broome. At other locations the anomalies are mostly negative and generally trending towards zero.

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 November 2009 were close to or trending towards zero at all sites, with the largest anomalies of 2 to 3 hPa observed at Burnie, Spring Bay and Port Kembla. 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. Warmer than normal air and water temperatures were generally observed south of the continent from Esperance to Port Kembla.

The number of hits to the Australian Baseline Sea Level Monitoring project web pages from January 2006 to October 2009 are given in Figure A. The November 2009 statistics are unavailable at present.

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 November 2009.

Recent short-term sea level trends in the project area based upon SEAFRAME data through November, 2009				
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	+8.6	+0.1
Groote Eylandt	13°51'36.2"S / 136°24'56.1"E	Sep 1993	+7.3	-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	+8.5	-0.1
Hillarys	31°49'32.0"S / 115°44'18.9"E	Nov 1991	+8.5	0.0
Esperance	33°52'15.2"S / 121°53'43.3"E	Mar 1992	+5.9	0.0
Thevenard	32°08'56.2"S / 133°38'28.8"E	Mar 1992	+5.0	+0.2
Port Stanvac	35°06'31.0"S / 138°28'1.3"E	Jun 1992	+5.7	0.0
Portland	38°20'36.4"S / 141°36'47.4"E	Jul 1991	+3.3	0.0
Lorne	38°32'49.4"S / 143°59'19.8"E	Jan 1993	+1.8	-0.1
Stony Point	38°22'19.7"S / 145°13'28.9"E	Jan 1993	+1.8	-0.1
Burnie	41°03'0.3"S / 145°54'54.0"E	Sep 1992	+3.0	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	+3.1	0.0
Rosslyn Bay	23°09'39.7"S / 150°47'24.6"E	Jun 1992	+1.8	-0.1
Cape Ferguson	19°16'38.4"S / 147°03'30.4"E	Sep 1991	+3.2	+0.1

Figure A: Number of hits on the Australian Baseline Sea Level Monitoring Project web pages from 2006 to October 2009. (November 2009 statistics not available.)

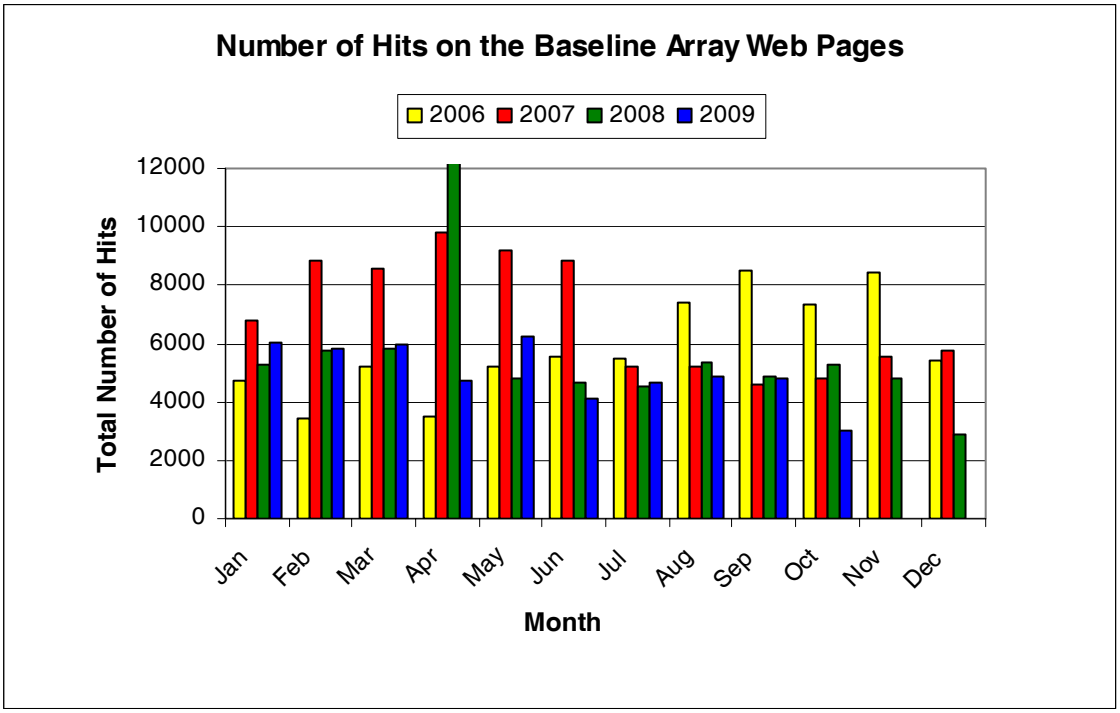
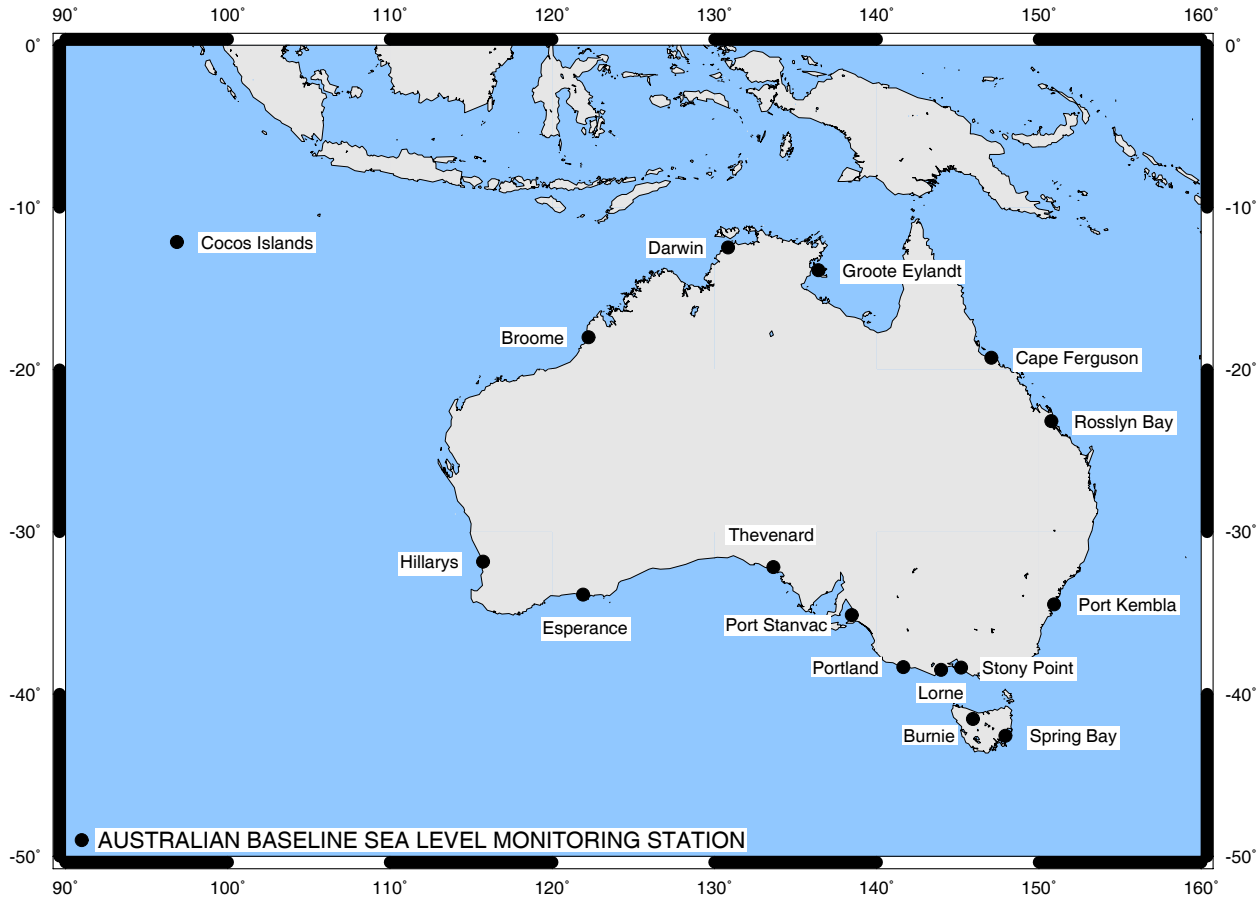


Figure B: Australian Baseline Sea Level Monitoring Project sites.



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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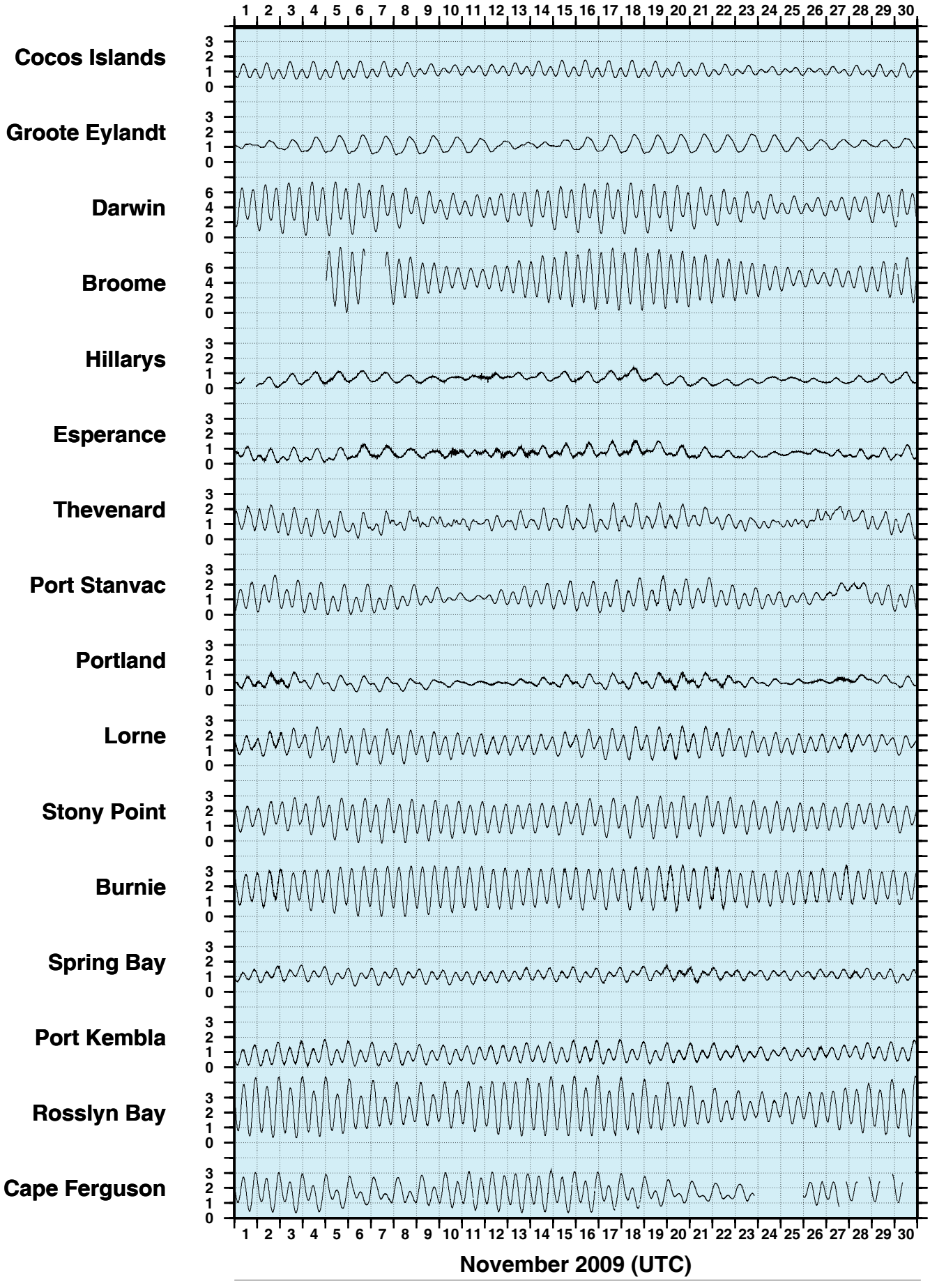
Please note the following:

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

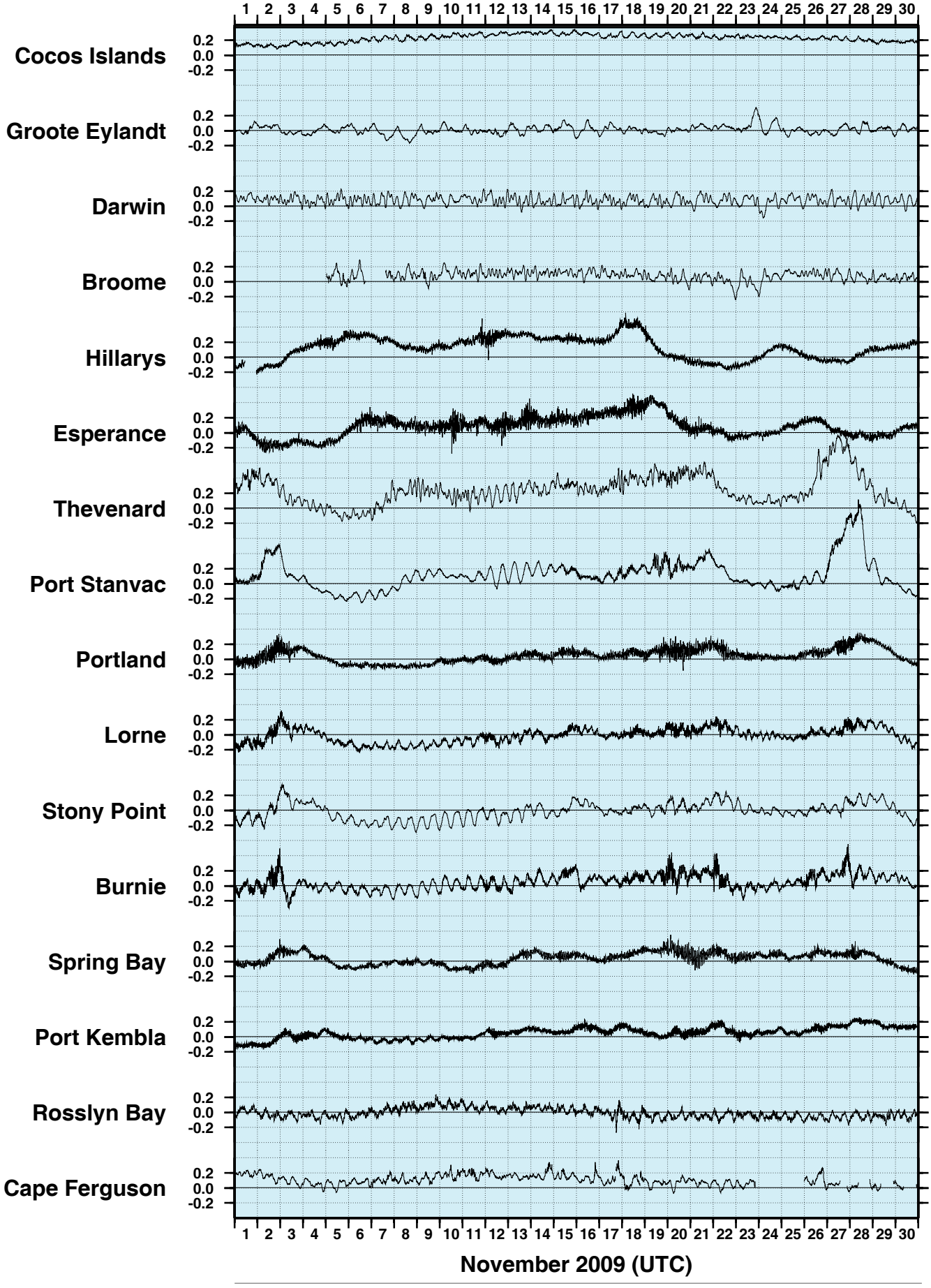
NOVEMBER 2009
SIX MINUTE SEA LEVEL OBSERVATIONS (m)



National Tidal Centre, Bureau of Meteorology

Figure 2

NOVEMBER 2009
SIX MINUTE RESIDUAL WATER LEVELS (m)



National Tidal Centre, Bureau of Meteorology

Figure 3

NOVEMBER 2009
SIX MINUTE RESIDUALS
ADJUSTED FOR ATMOSPHERIC PRESSURE (m)

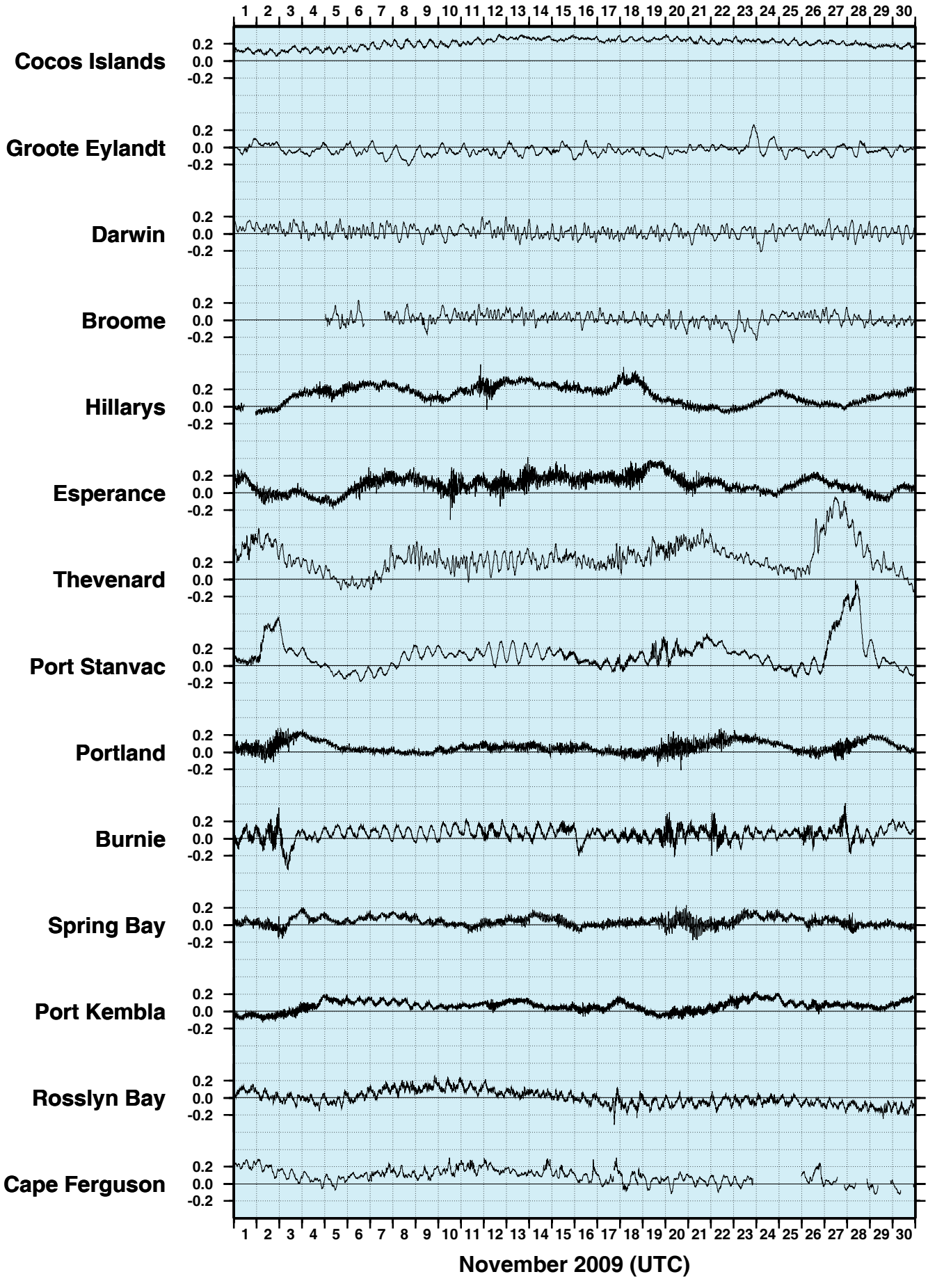


Figure 4

NOVEMBER 2009
HOURLY WIND SPEEDS (m/s)

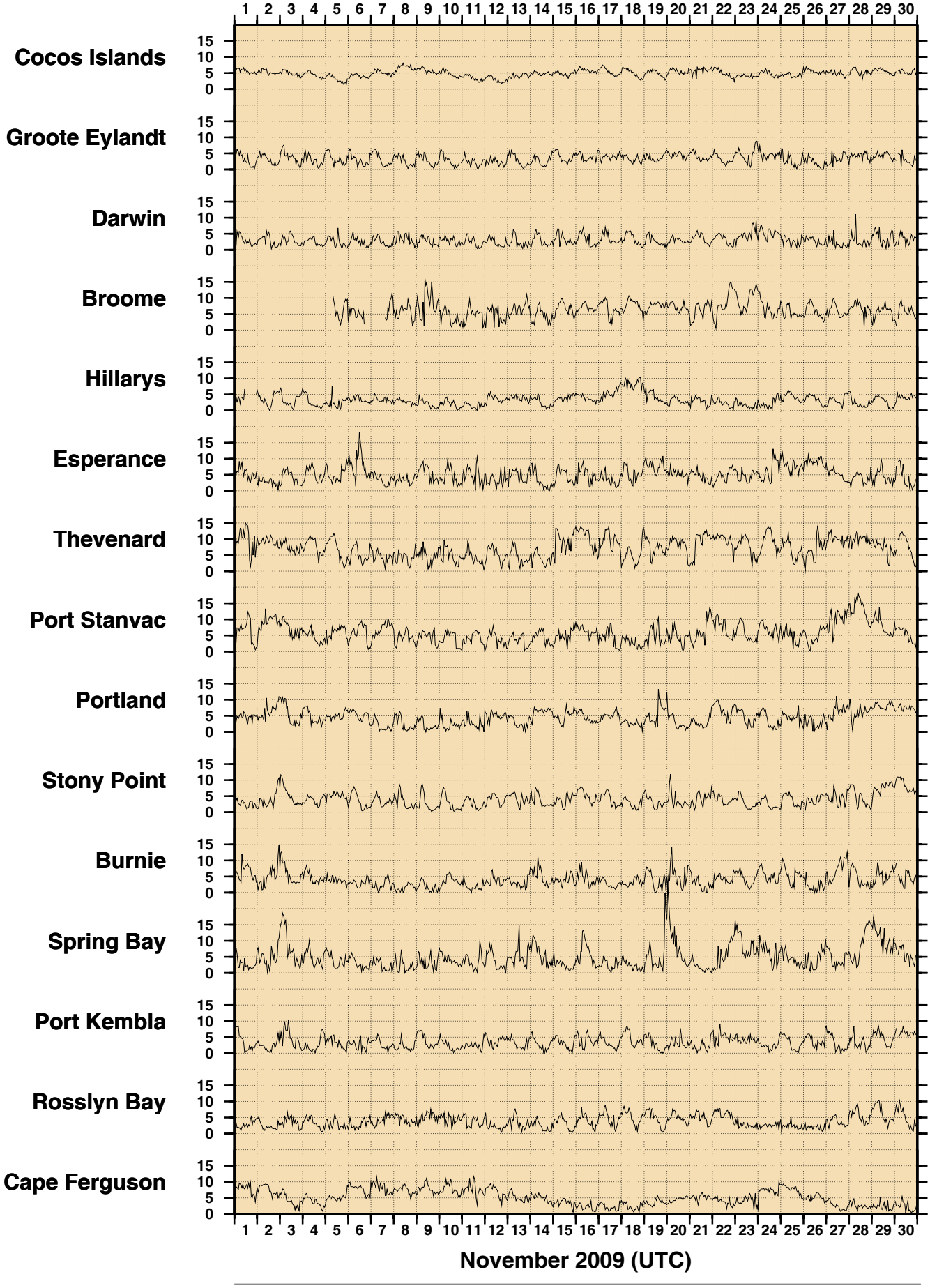


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Figure 5

NOVEMBER 2009
HOURLY INCIDENT WINDS (m/s, deg True)

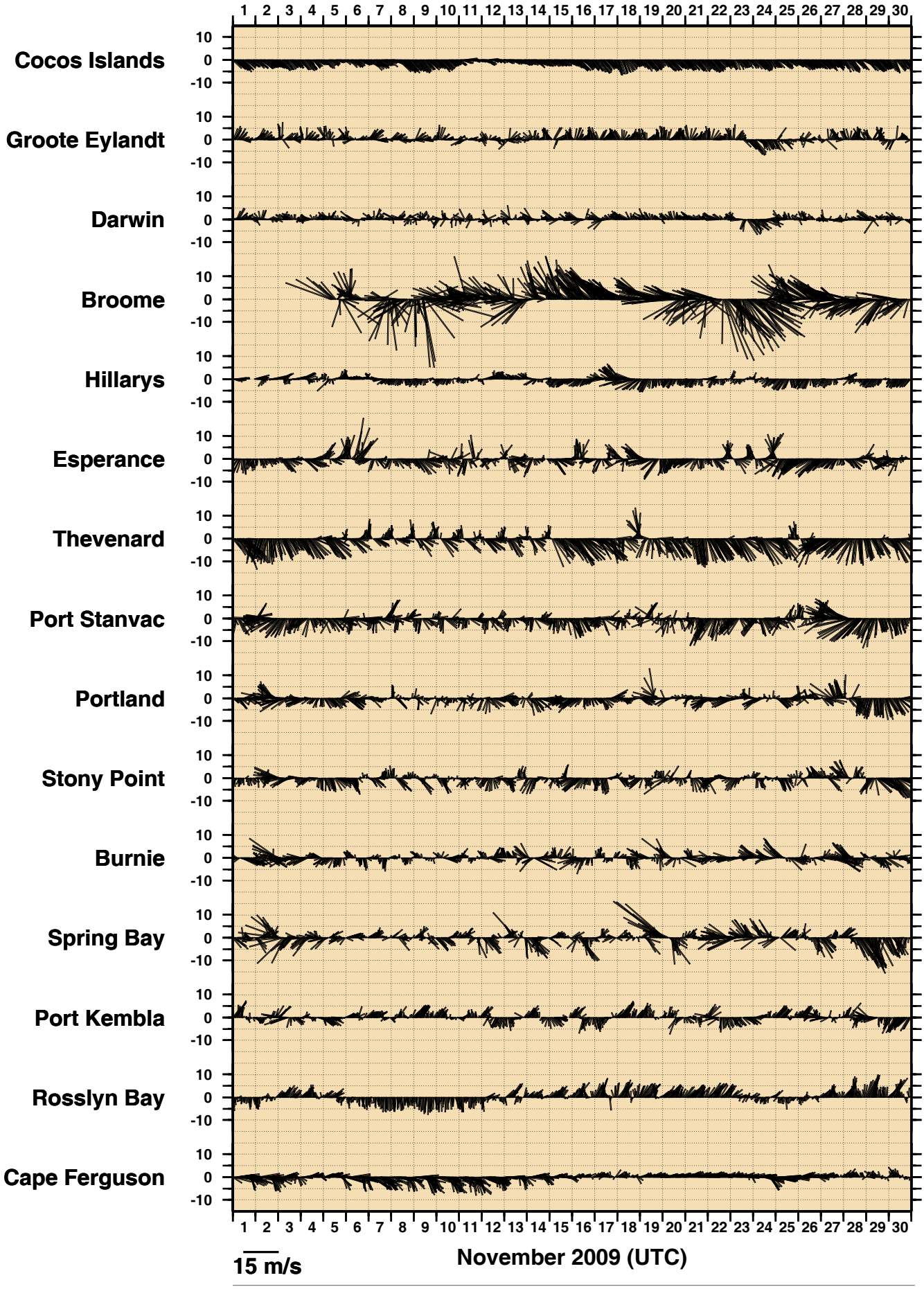
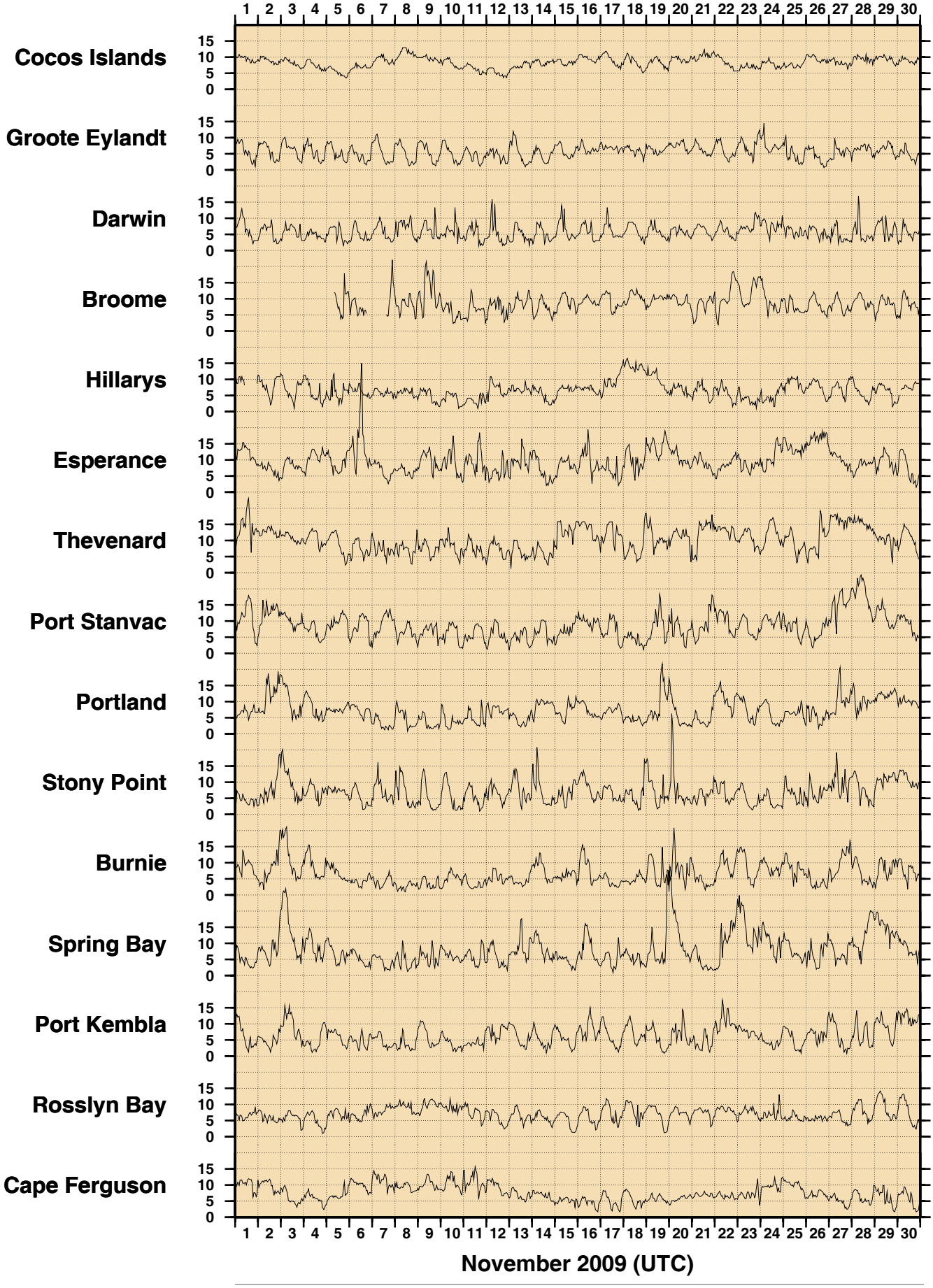


Figure 6

NOVEMBER 2009
HOURLY MAXIMUM WIND GUSTS (m/s)



National Tidal Centre, Bureau of Meteorology

Figure 7

NOVEMBER 2009
HOURLY AIR TEMPERATURES (˚C)

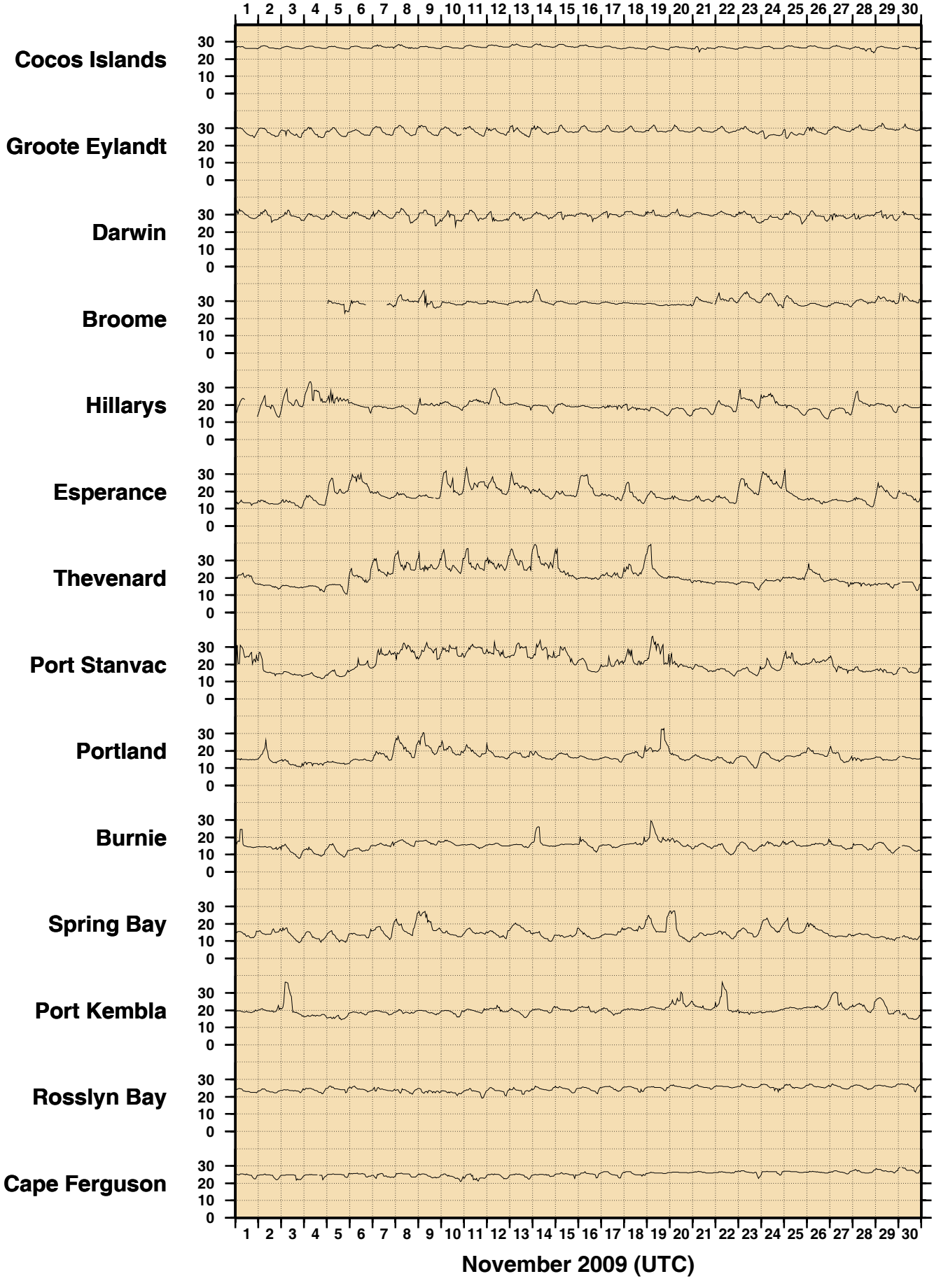


Figure 8

NOVEMBER 2009
HOURLY WATER TEMPERATURES (˚C)

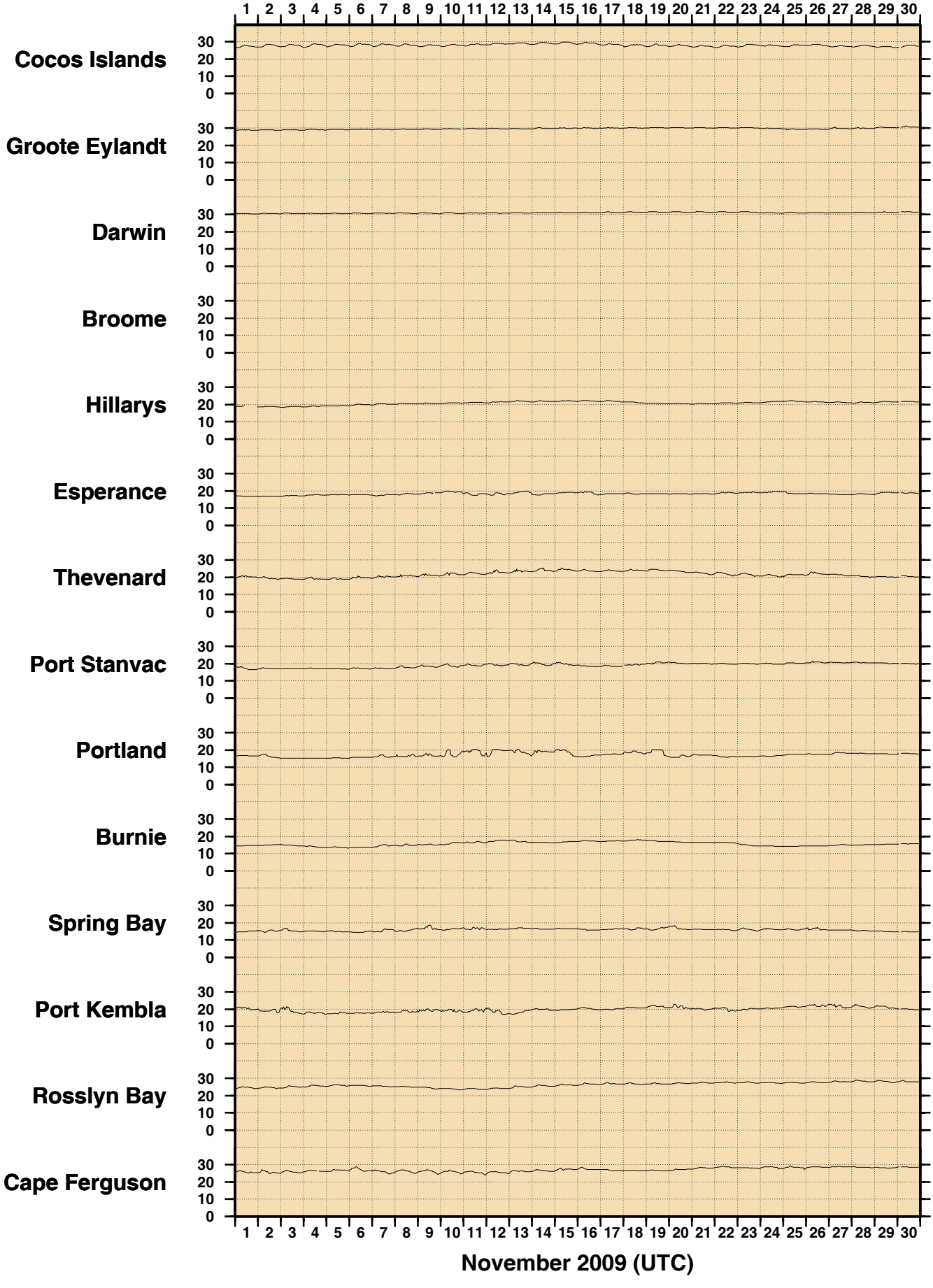


Figure 9

NOVEMBER 2009
HOURLY ATMOSPHERIC PRESSURE (hPa)

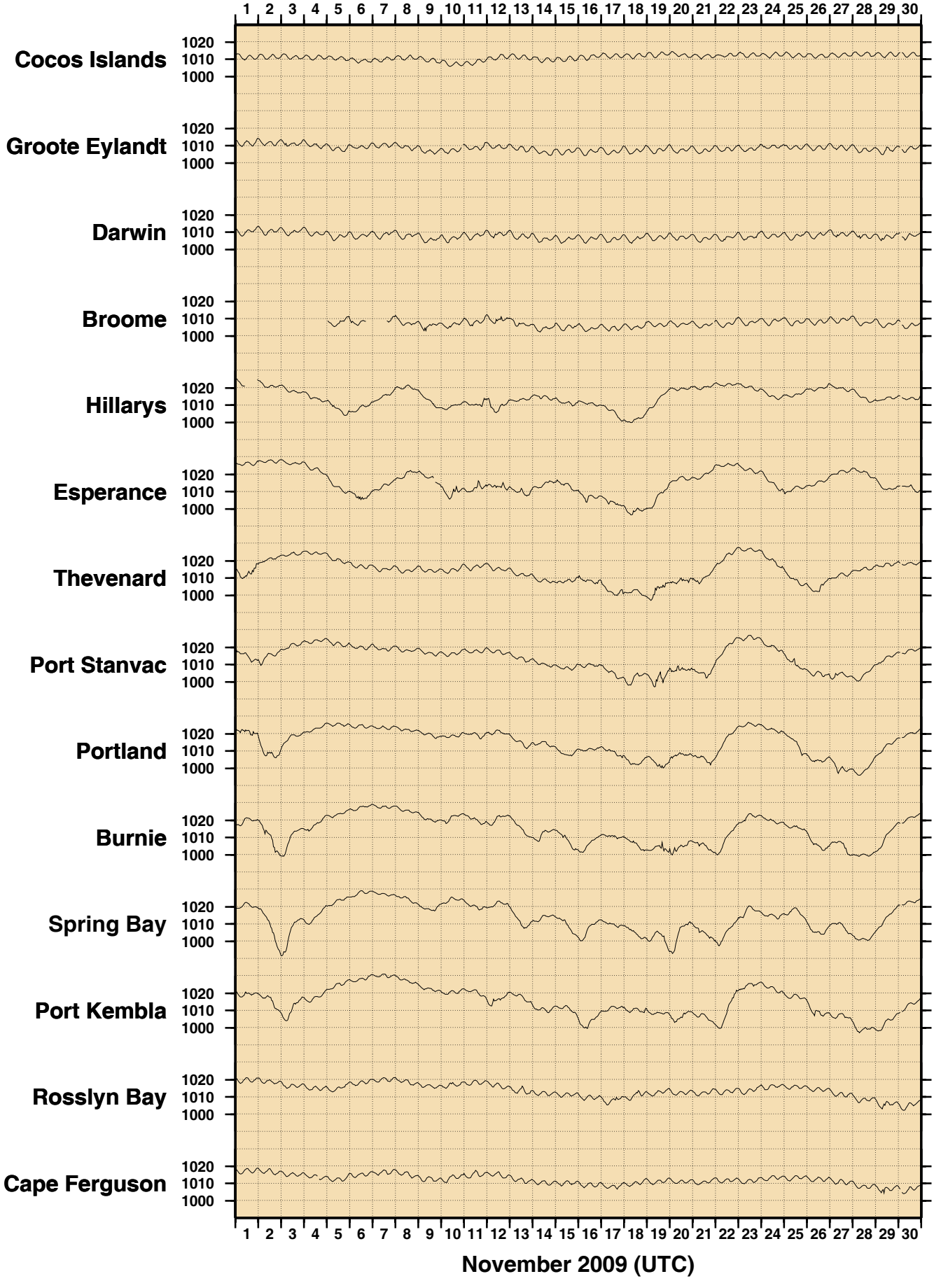
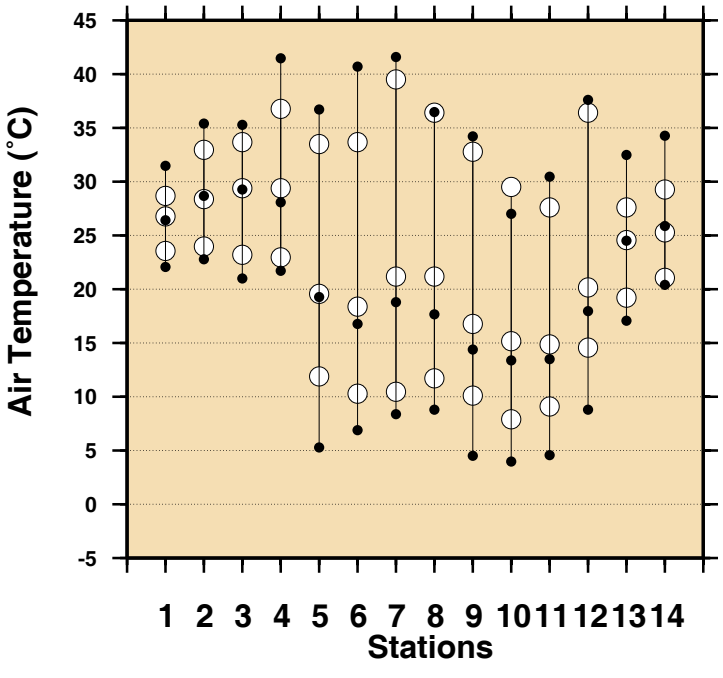
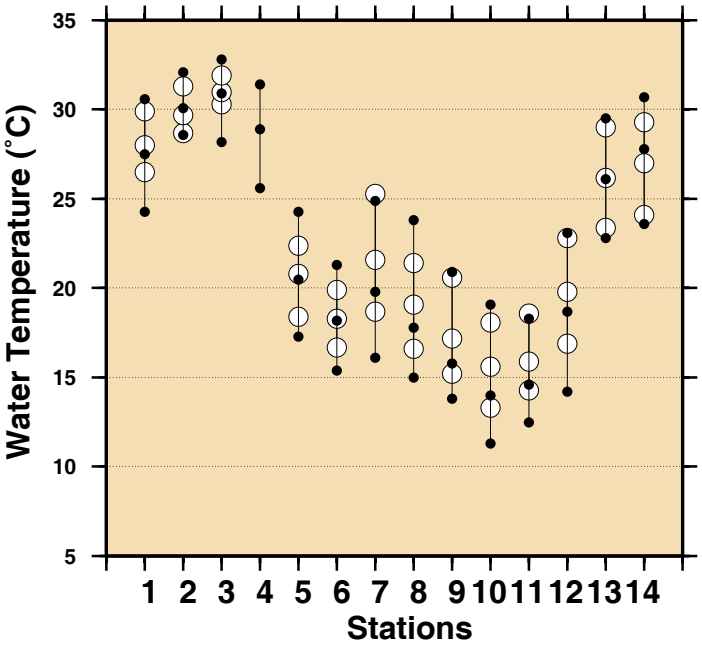
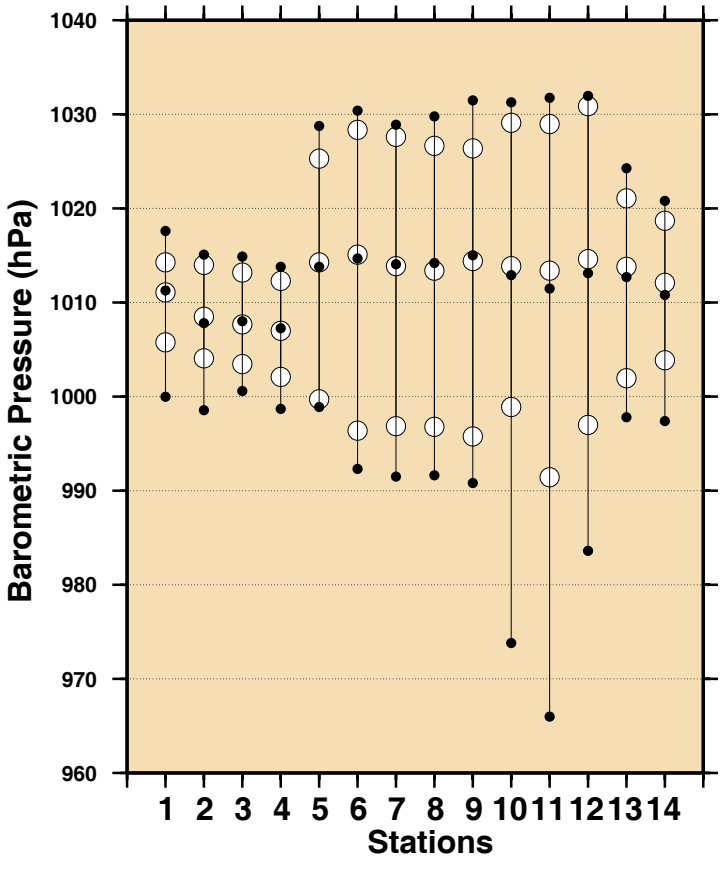


Figure 10

Comparison of November 2009 Max, Min & Mean with Long Term November 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

November 2009 Maximum
November 2009 Mean
November 2009 Minimum

Long Term November Maximum
Long Term November Mean
Long Term November Minimum

Figure 11
MONTHLY MEAN SEA LEVELS TO NOVEMBER 2009 (m)

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

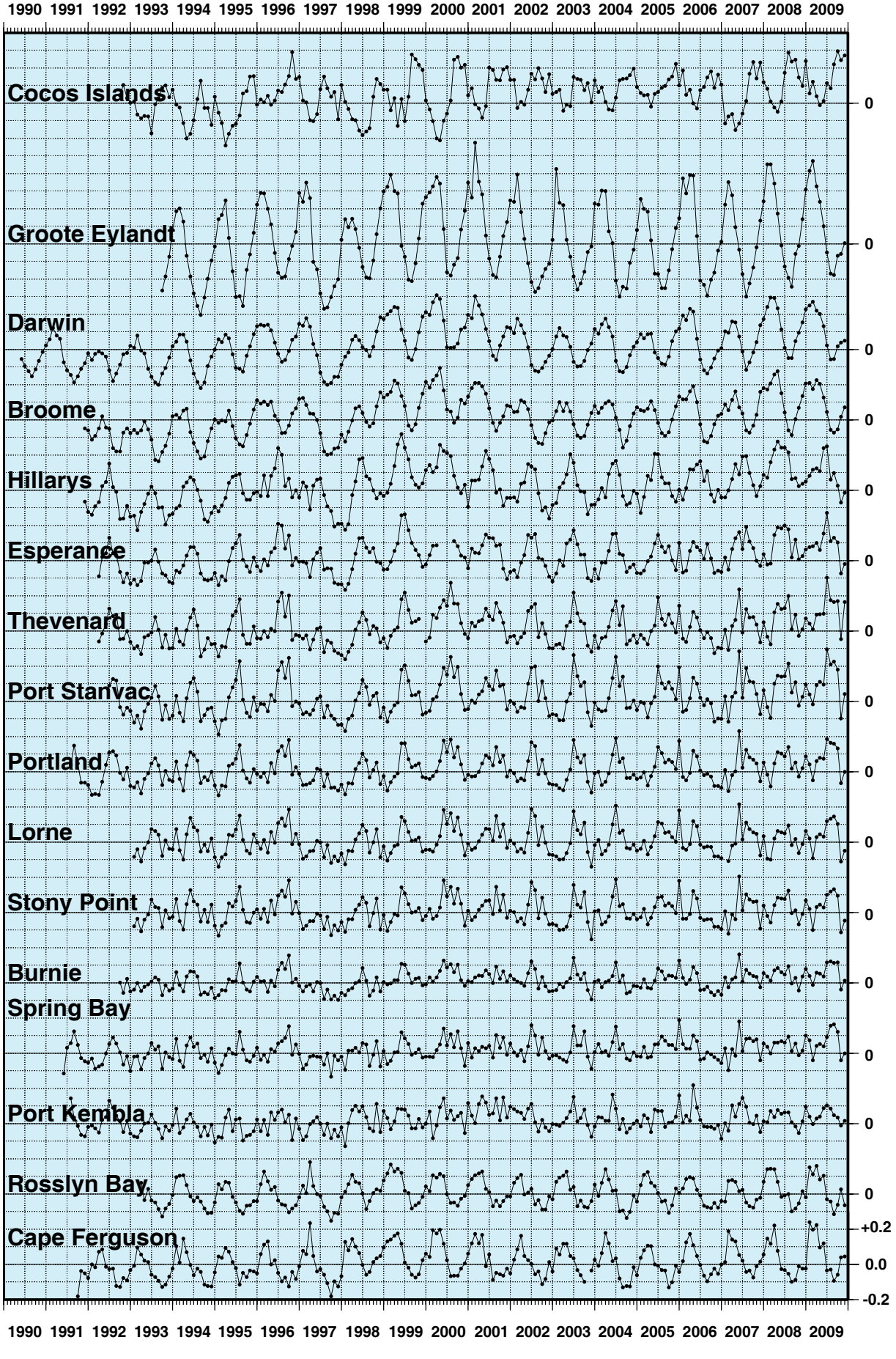


Figure 12

SEA LEVEL ANOMALIES THROUGH NOVEMBER 2009 (m)

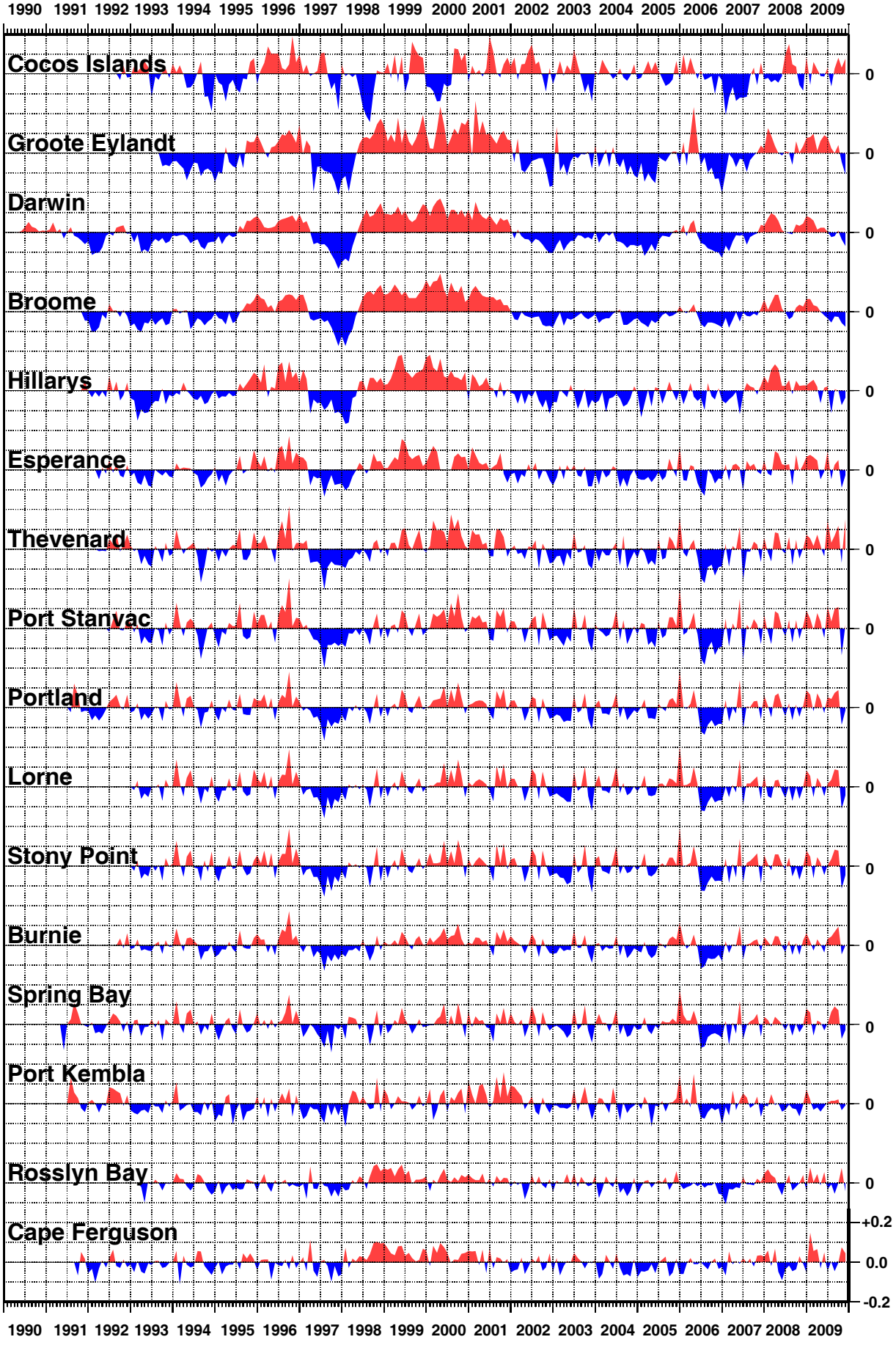


Figure 13

SEA LEVEL TRENDS THROUGH NOVEMBER 2009 (mm/year)

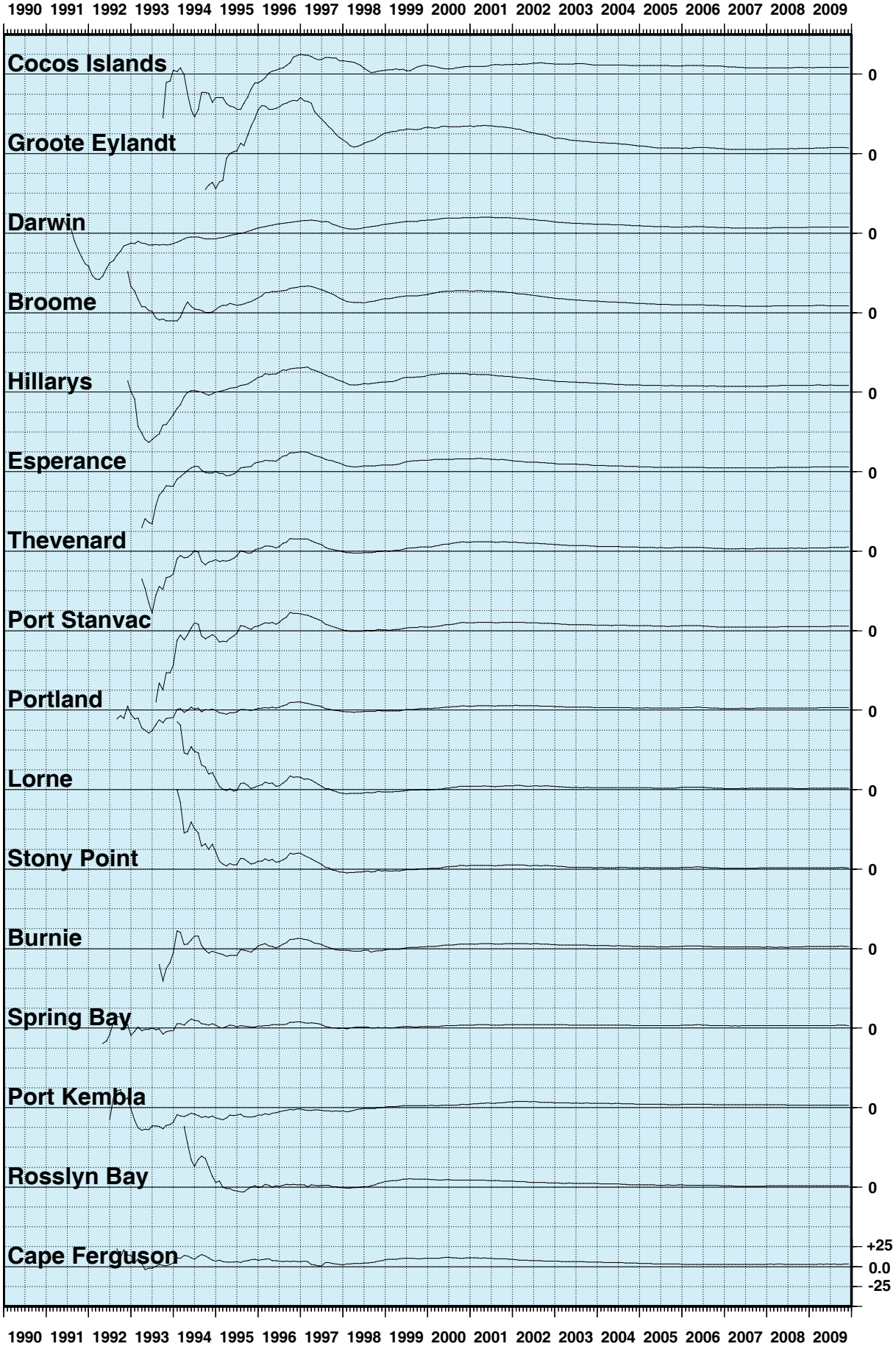


Figure 14

BAROMETRIC PRESSURE ANOMALIES THROUGH NOVEMBER 2009 (hPa)

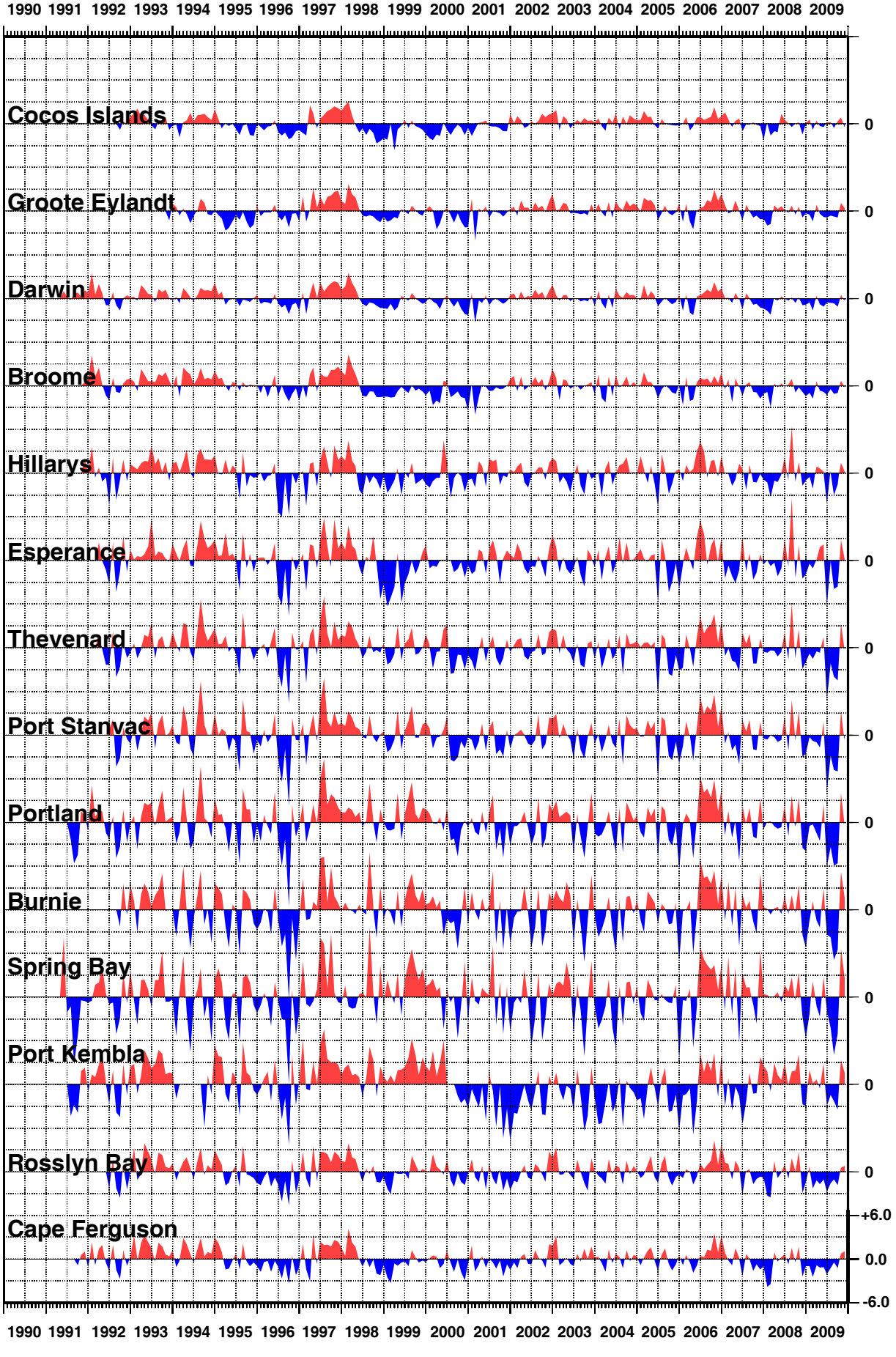


Figure 15

WATER TEMPERATURE ANOMALIES THROUGH NOVEMBER 2009 (˚C)

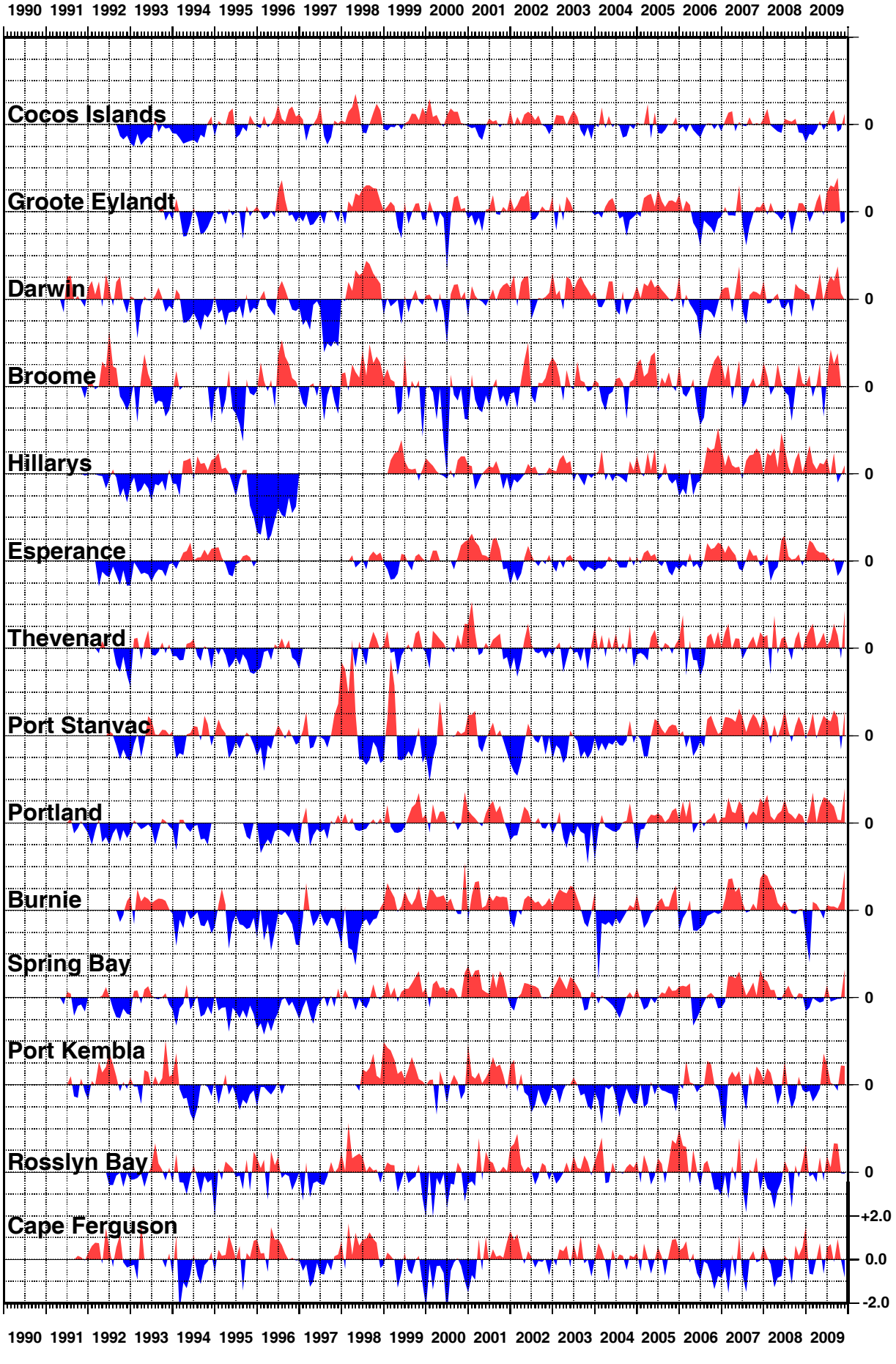


Figure 16

AIR TEMPERATURE ANOMALIES THROUGH NOVEMBER 2009 (˚C)

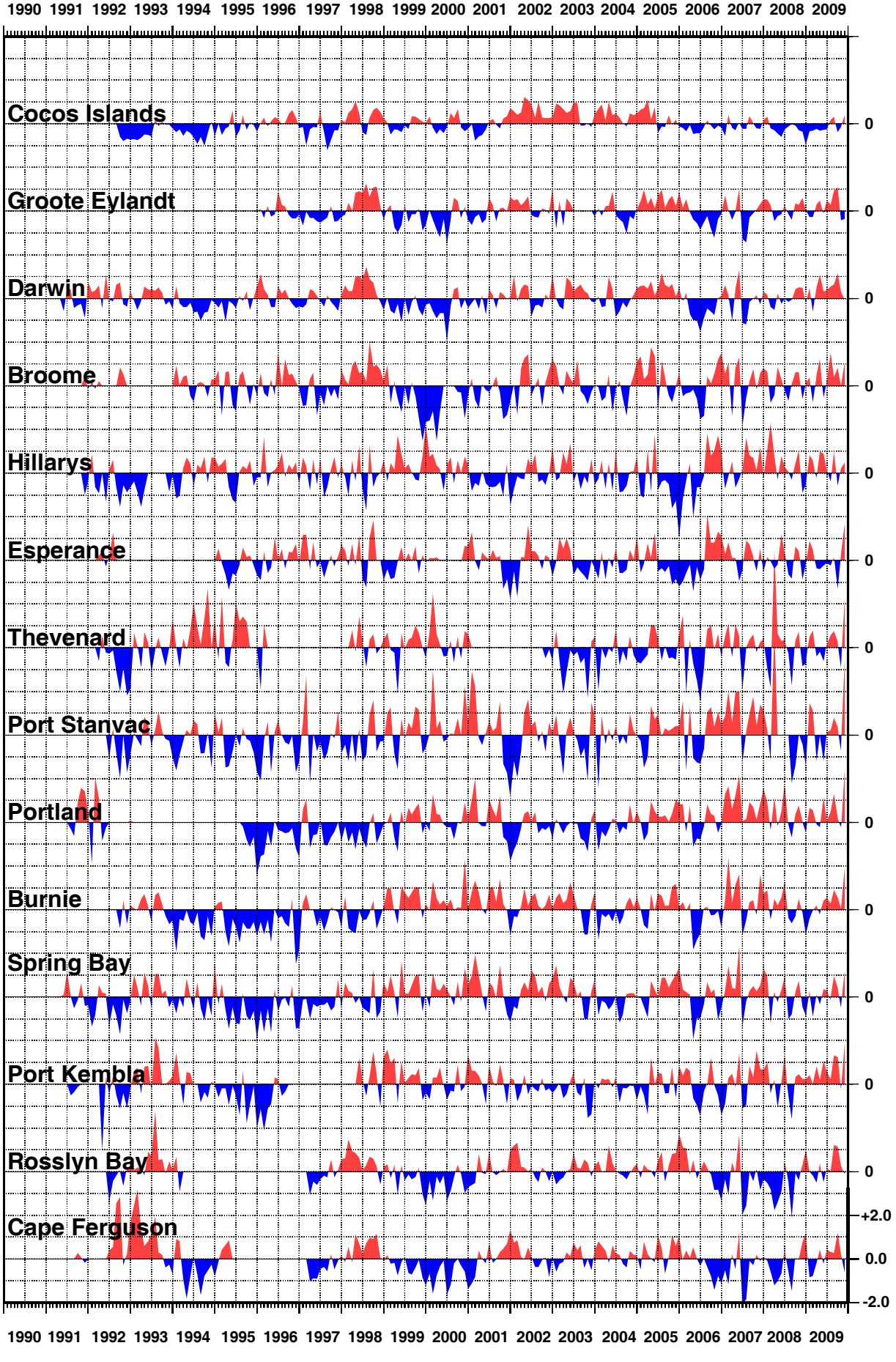
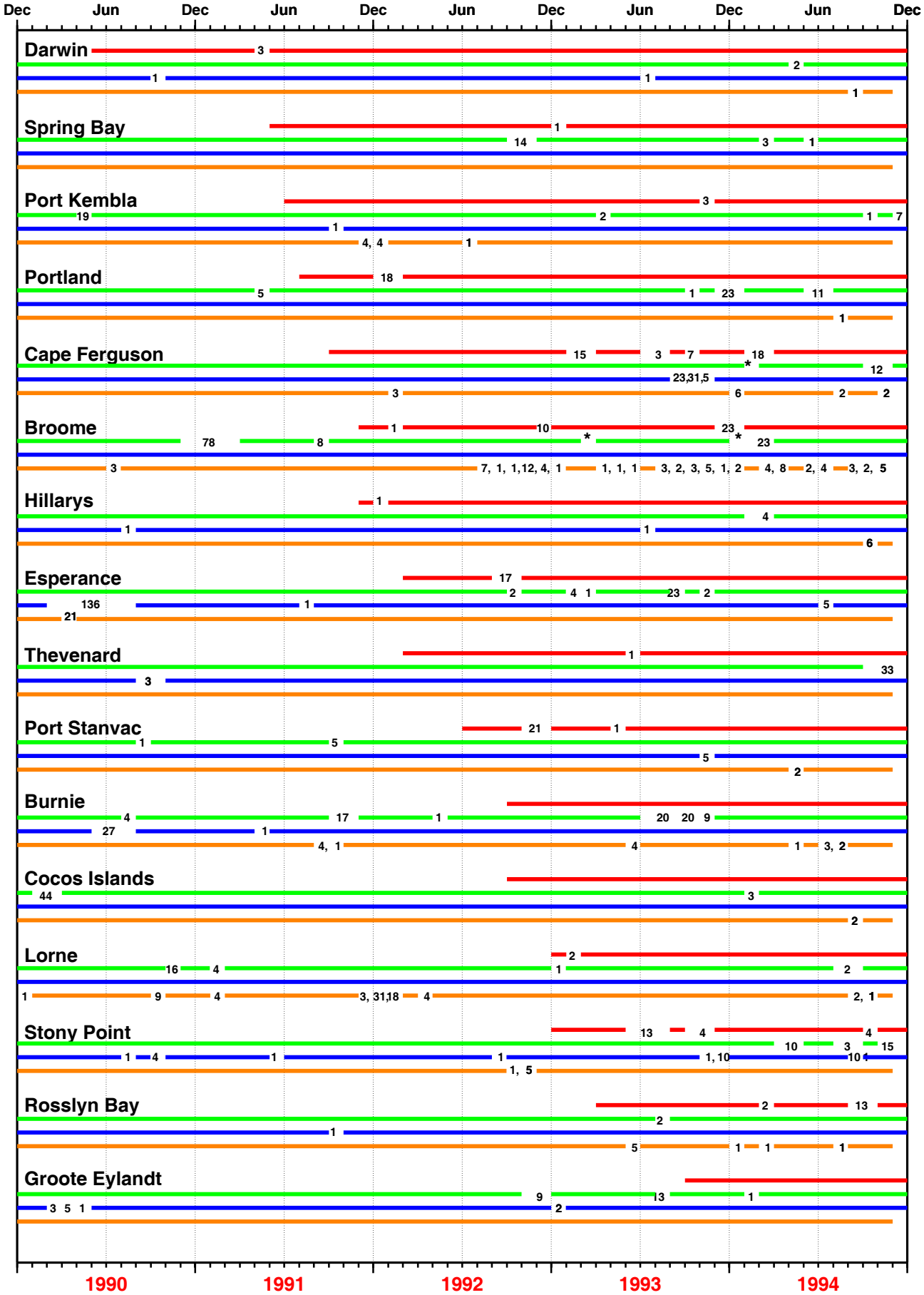


Figure 17

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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