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NOAA Technical Memorandum ERL AOML-75

NEARSHORE CURRENT MEASUREMENTS FOR THE SEFLOE II PROJECT, 1991-1992

William L. McLeish
John R. Proni
Jack Stamates
Jules F. Craynock

Atlantic Oceanographic and Meteorological Laboratory
Miami, Florida
May 1993

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Environmental Research
Laboratories

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W. Paul Dammann
Jules F. Craynock

ABSTRACT. A compilation of current measurements in 25-m water depth off southeast Florida is presented.

1. INTRODUCTION

The 1989 Southeast Florida Outfall Experiment (SEFLOE) was performed to evaluate the dispersion and advection of wastewater from ocean outfalls along the southeast Florida coast. The results showed that more comprehensive current measurements were needed to interpret the wastewater dilution measurements, and SEFLOE II was scheduled to include the additional data collection. Continuous series of current measurements were obtained at four outfalls (Figure 1) both to support other measurements being collected during intensive survey periods and to compile long-term statistics of the different characters of ocean currents at the outfalls. Table 1 gives their locations. Current meters were installed at two depths on each mooring. The results are included in the SEFLOE report to the project sponsors (in preparation, 1993).

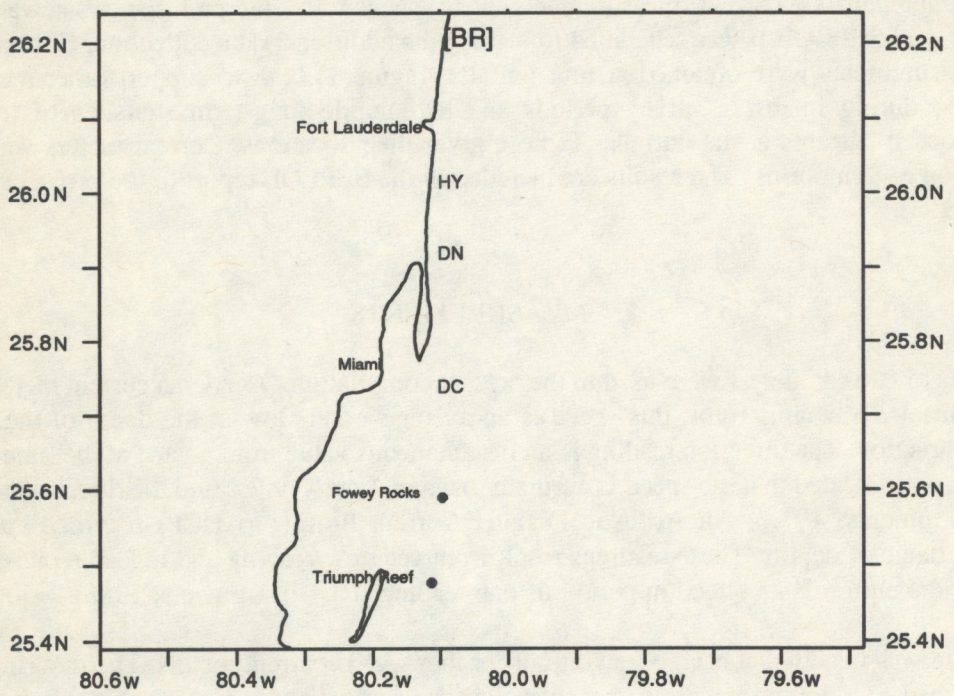
2. MEASUREMENTS

Two types of current meters were used in the present compilation. Aanderaa current meters (AAND) record speed from a Savonius rotor; this speed is an average water flow at the depth of the instrument regardless of direction. The direction reading is an instantaneous value from a vane at the time of reading. The manufacturer indicated that the speed is accurate to about 1 cm/s or 2% and the direction to 5 degrees (Aanderaa Instruments, 1979). An Acoustic Doppler Current Profiler (ADCP) recorded currents over nearly the full range of depths. These readings result from vector averaging and indeed represent the flow averaged over the entire data collection period of one reading (RDI Instruments, 1988).

A mooring was installed at each ocean outfall for the AAND current meters. The mooring consisted of a float attached to a bottom weight to hold it below the surface and two AAND meters suspended at different depths along the cable between them. The first current measurements in this series were provided by the University of Miami and are labeled "UM."

Table 1 shows the locations of the outfalls and the AAND current meter moorings. The moorings were not always successful: two failed on deployment and were replaced immediately; two broke loose later; and another was discovered adrift later in which the cable had been cut. One UM mooring was lost and not found after an extensive search.

Table 2 lists the current meter records available at this time. The data plots show the current measurements. The dates of the current measurements at top and bottom of an individual plot are parallel except that the top and bottom records at the Hollywood location differ by three days in the plots beginning January 16 and 19, February 1 and 4, and February 17 and 20, 1992.


[BR]
Fort Lauderdale
HY
DN
Miami
DC
Fowey Rocks
Triumph Reef
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26.0N
25.8N
25.6N
25.4N
80.6w
80.4w
80.2w
80.0w
79.8w
79.6w

Figure 1

Table 1. Locations of Current Meters.

	Latitude	Longitude	Depths			
			Float	Top	Bottom	Water
AOML Aanderaa:						
DC	25°44.208	80°05.240	9.8	13.4	16.8	23.8
DN	25°55.004	80°05.232	---	13.6	17.1	24.1
HY	26°00.775	80°05.145	---	13.2	16.5	24.4
BR:						
After November 25, 1991	26°15.330	80°03.820	---	13.2	16.0	22.6
After January 16, 1992	26°15.293	80°03.779	---	10.1	15.8	25.3
After August 19, 1992	26°14.760	80°03.770	10.1	14.0	18.9	29.0
UM Aanderaa:						
DN	25°54.873	80°05.436	5.0	6.5	13.4	23.2
HY	26°00.390	80°05.490	5.0	6.5	10.7	22.2
BR	26°14.899	80°04.264	5.0	6.5	11.9	22.2
AOML ADCP at DC:						
Deployment 1: July 10, 1992	25°44.160	80°05.281	---	---	---	24.0
Deployment 2: August 13, 1992	25°44.169	80°05.230	---	---	---	18.3

Table 2. List of Current Measurements.

Type	Location	Start	End
UM AAND	DNT	08-22-91	12-09-91
UM AAND	DNB	08-22-91	10-04-91
UM AAND	HYT	08-22-91	12-10-91
UM AAND	HYB	08-22-91	12-10-91
UM AAND	BRT	08-22-91	12-09-91
UM AAND	BRB	08-22-91	12-09-91
AOML AAND	DCT	11-26-91	12-07-91
AOML AAND	DCT	04-10-92	05-04-92
AOML AAND	DCT	09-10-92	12-21-92
AOML AAND	DCB	11-26-91	03-07-92
AOML AAND	DCB	04-10-92	06-11-92
AOML AAND	DCB	06-11-92	09-10-92
AOML AAND	DCB	09-10-92	12-21-92
AOML AAND	DNT	11-25-91	03-06-92
AOML AAND	DNT	05-15-92	07-30-92
AOML AAND	DNB	11-25-91	03-06-92
AOML AAND	DNB	05-15-92	07-30-92
AOML AAND	DNB	07-30-92	09-25-92
AOML AAND	HYT	11-25-91	03-06-92
AOML AAND	HYT	05-26-92	07-15-92
AOML AAND	HYB	11-25-91	01-07-92
AOML AAND	HYB	01-07-92	04-17-92
AOML AAND	HYB	05-26-92	07-15-92
AOML AAND	HYB	07-15-92	08-16-92
AOML AAND	BRT	11-25-91	02-14-92
AOML AAND	BRT	07-02-92	07-11-92
AOML AAND	BRB	11-25-91	12-20-91
AOML AAND	BRB	01-16-92	04-27-92
AOML AAND	BRB	07-02-92	07-11-92
NOS ADCP	DC	07-10-92	08-12-92
NOS ADCP	DC	08-13-92	08-24-92

3. ERRORS

The AAND current meters experienced several types of errors while deployed in the water. The rotors often became fouled while in the water, primarily from biofouling and fishing lines. Over time, sessile animals in the ocean attached themselves to the rotor. At first this slowed the rotor and gave low speed readings. Later, the rotors were stopped entirely. The stoppage was not always permanent, sometimes the rotor was freed to rotate again for a few days before a second or later stopping. An example of the extent of the biofouling problem in this area was provided by the experience with the University of Miami current meters included in this compilation (Shay *et al.*, 1992). Five of the six instruments that were recovered were biofouled, so that the rotors were blocked from freely rotating and measuring current speed. Even when not stopped, the rotors in these measurements apparently often became slowed by the biofouling. The effect of biofouling on speed readings may not be obvious unless the rotors are completely stopped. Indicated speeds of 1.5 cm/s represent a stopped rotor because of an offset speed calibration parameter. Plots of speed readings from an entire deployment of an AAND may show an overall decrease best attributed to biofouling (Shay *et al.*, 1992). In fact, any of these speed data after the instrument has been in the water for some time (such as a few weeks) might be degraded by biofouling effects.

A direct observation of the slowing of an Aanderaa rotor is shown in Figure 2. Daily average speeds from the AAND at DC-Bottom and the corresponding ADCP readings were compared during a 42-day period during the summer, the season of greatest biofouling. The AAND instrument had been in the water for 30 days, yet the first comparisons on the plots showed good agreement. During the plot period, however, the AAND speed decreased until the smoothed ratio was about 3/4. The rotor continued to turn until its recovery on day 254, although the data indicated that the rotor was nearly stalled at that time. Indeed, the rotor was heavily biofouled when it was returned. The irregular curve in Figure 2 shows that the decrease was not smooth but contained major rises and falls. Clearly, no correction of the AAND readings for fouling based only on the time in the water is possible.

In addition, the AAND systems were subject to errors from currents and ocean wave orbital motions. Normally encountered currents tilted the mooring, but these did not lead to AAND errors, largely because the instrument mount was on a swivel allowing 20 degrees of tilt and partly because small tilts of the instrument had little effect on the reading. Measurements reported in Serkin (1972) are in accord with a tilt response dependency of the AAND according to cosine**3 of the tilt angle; for 10 degrees of instrument tilt, the response is calculated to be 0.96, only a slight decrease.

The effect of orbital motions of waves that are average for this area in giving a tilt decrease also was small, partly because of the swivel. In addition, however, wave orbital motions past the AAND would give increased speed readings. A commonly encountered wave with a height of 2 ft and a period of 4 s would give a mean speed at a depth of 10 m of 3 cm/s, which is near the minimum recordable speed of the AAND.

The data from each deployment of the AAND current meter were examined for obvious errors. Editing often was needed to correct two lines of data joined, data fields displaced from their proper location, and missing or clearly spurious values. Meaningless data at the beginning and ends of data sets were retained in order to show the completeness of the data and to allow later time calibrations of the sets. The beginning and ending segments are readily recognized in the plots. Also, sometimes one or both channels failed during a deployment and gave zeroes after; these too are readily recognized. Some sets of speed readings are obviously mostly noise.

While in use, one AAND instrument developed a fault in which the recording system failed to record one bit of the direction reading properly, so that the entire record contained displaced and faulty direction readings—erratic bit recording in the direction channel was recognized in the DC-Top record starting

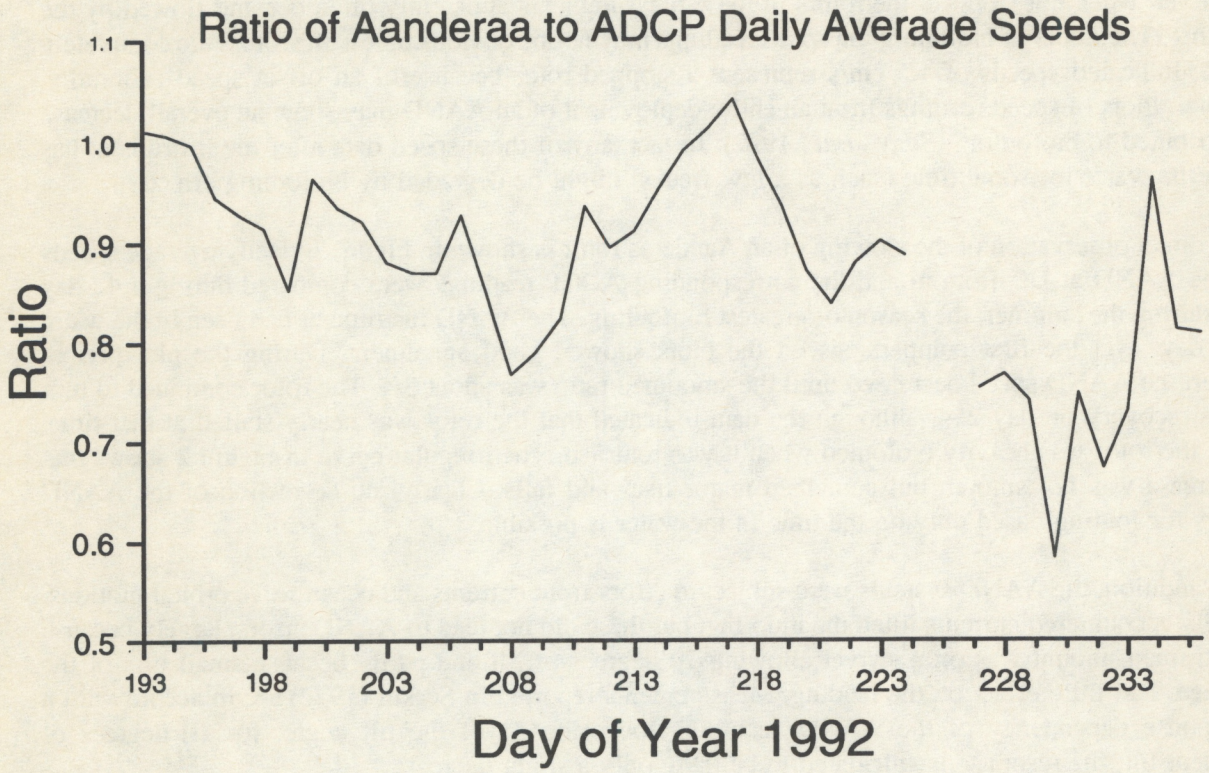

Ratio of Aanderaa to ADCP Daily Average Speeds
Ratio
1.1
1.0
0.9
0.8
0.7
0.6
0.5
193
198
203
208
213
218
223
228
233
Day of Year 1992

Figure 2

September 10, 1992 and the DT-Top recording beginning May 15, 1992. In addition, a bad bit recording developed during the HY-Bottom deployment beginning July 15, 1992. The BR-Bottom record beginning August 22, 1991 became stuck near 20 cm/s on October 20-24, 1992. These flaws should be considered in examining the data sets.

Accessory ADCP data after 4:00 a.m. on August 24, 1992 indicate that the instrument was moved by a storm, then overturned, and the ADCP current readings after that time are not valid.

4. ACKNOWLEDGMENTS

Most data herein were collected by AOML personnel as part of the SEFLOE II study. The data marked UM were provided by the University of Miami.

5. REFERENCES

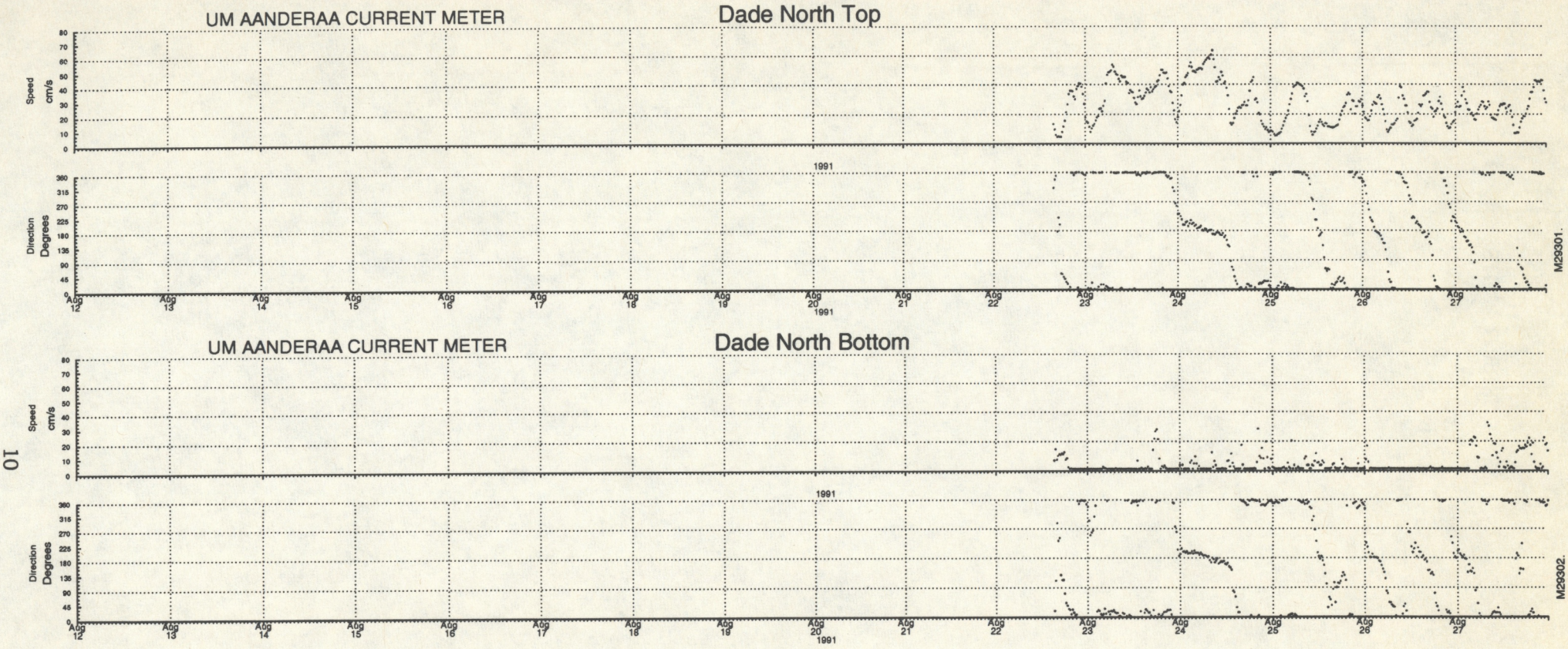
Aanderaa Instruments. *Operating Manual RCM 4/5 Recording Current Meter Models 4/5.* Bergen (1979).

RDI Instruments. *Acoustic Doppler Current Profiler Operation and Maintenance Manual.* RDI, San Diego (1988).

Serkin, H.C. The effects of tilt on a Savonius rotor exposed to a turbulent flow regime. University of Miami, MS Thesis (1972).

Shay, L.K., D.B. Olson, and B.R. Rosendahl. Preliminary results: SEFLOE II current meter moorings. University of Miami, Rosenstiel School of Marine and Atmospheric Science Report to the Atlantic Oceanographic and Meteorological Laboratory (1992).

6. CURRENT PLOTS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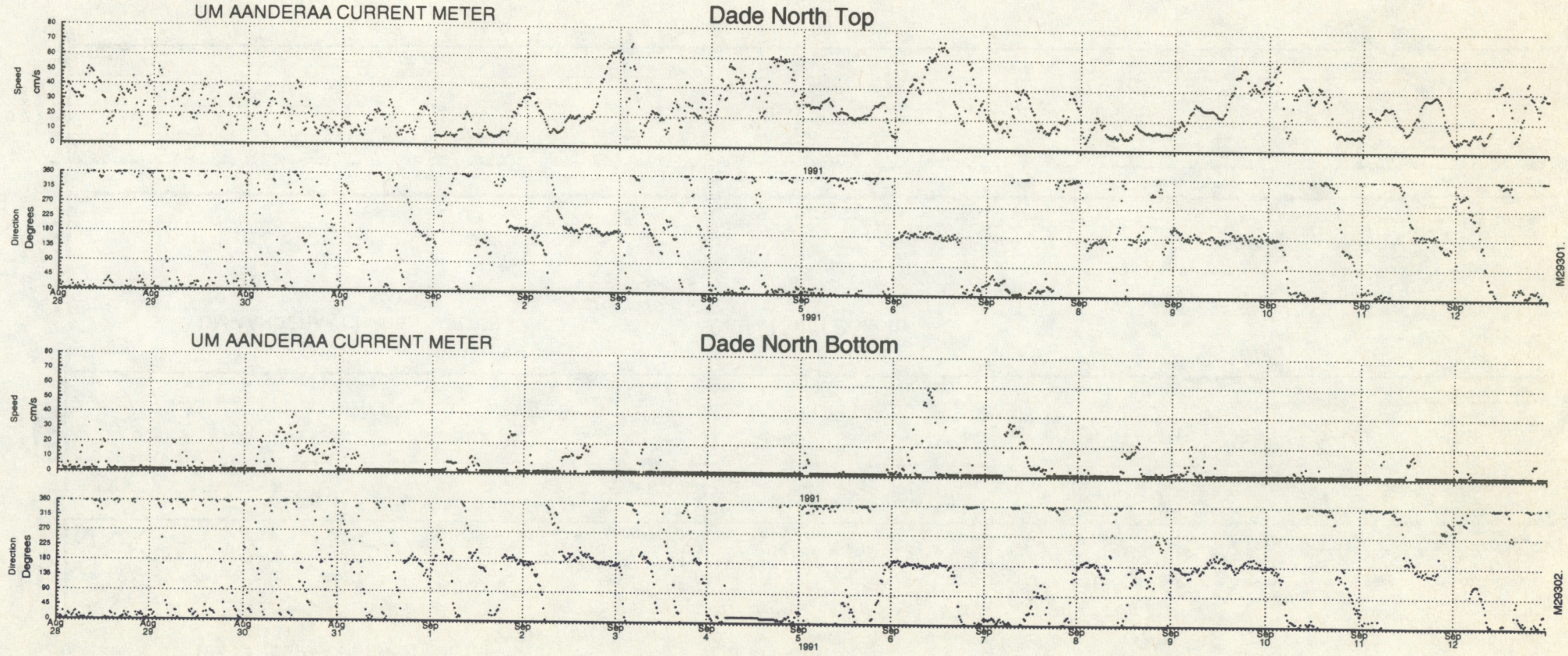
Dade North Top
Speed
cm/s
Direction
Degrees
Aug
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
1991
M29301.
UM AANDERAA CURRENT METER
Dade North Bottom
M29302.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Direction
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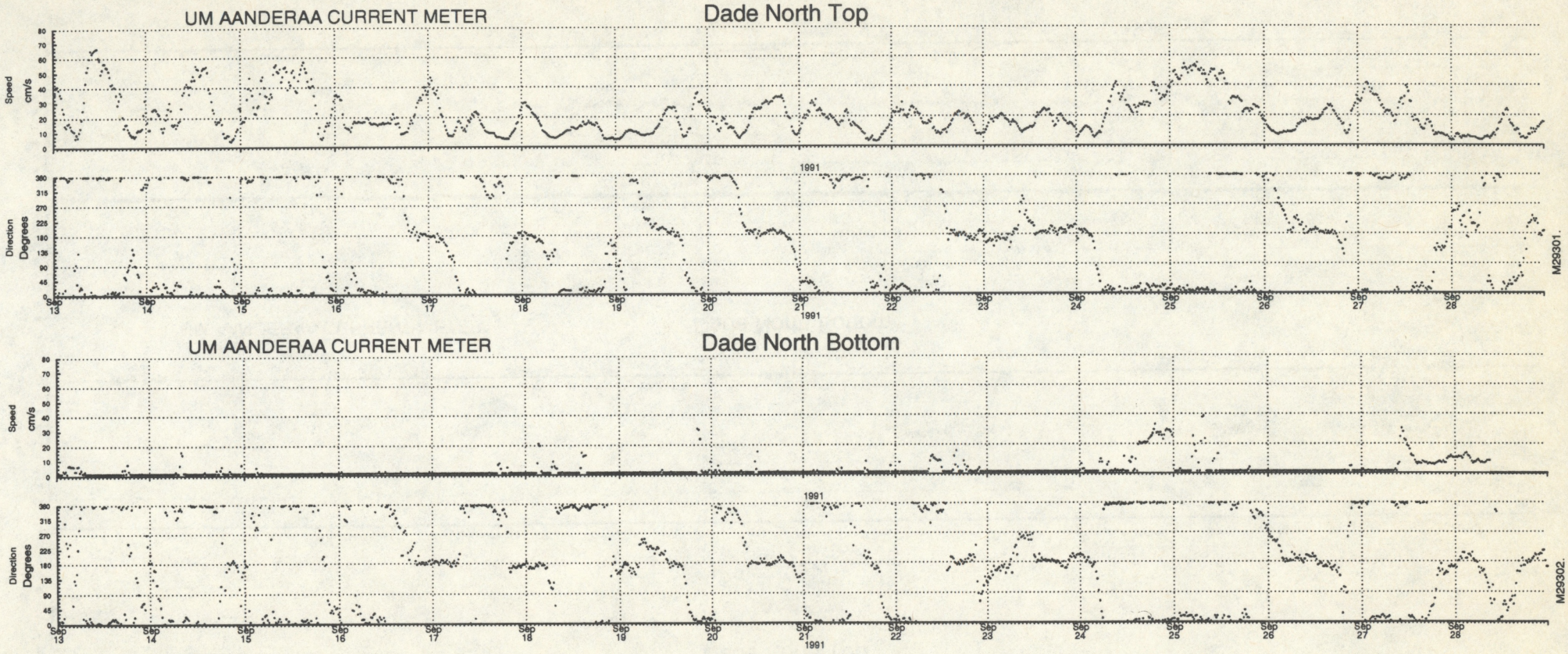
Direction
Degrees
1991
M29302.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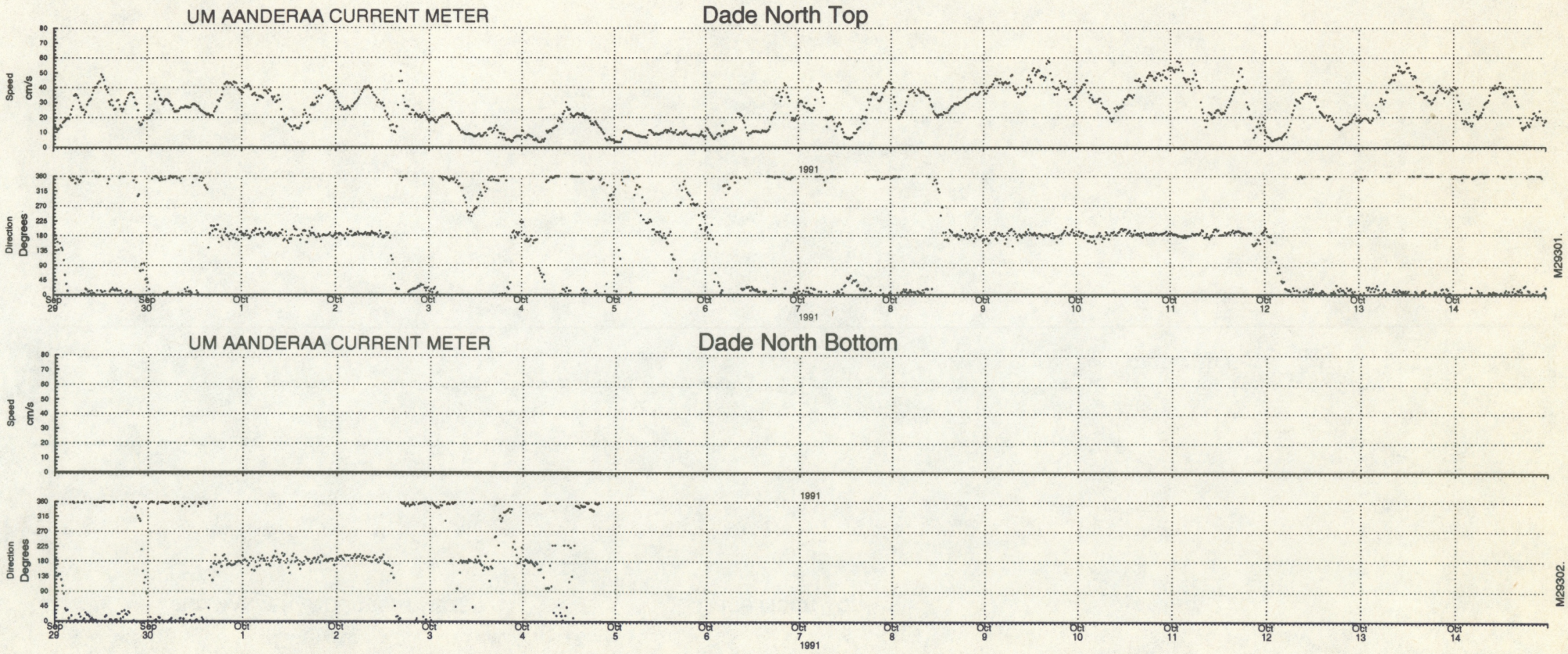
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Direction
Degrees
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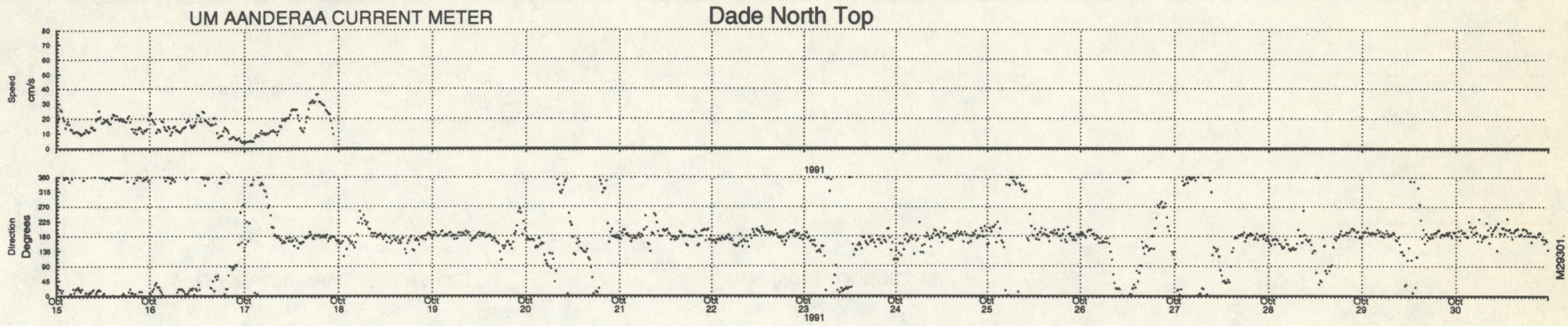
Oct 13
Oct 14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cm/s
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70
60
50
40
30
20
10
0
1991
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Degrees
360
315
270
225
180
135
90
45
0
Oct 15
Oct 16
Oct 17
Oct 18
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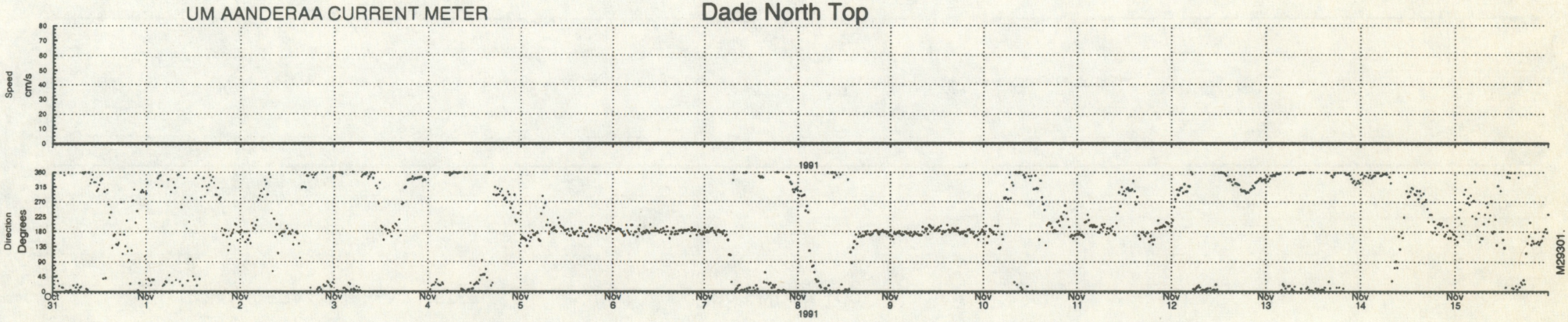
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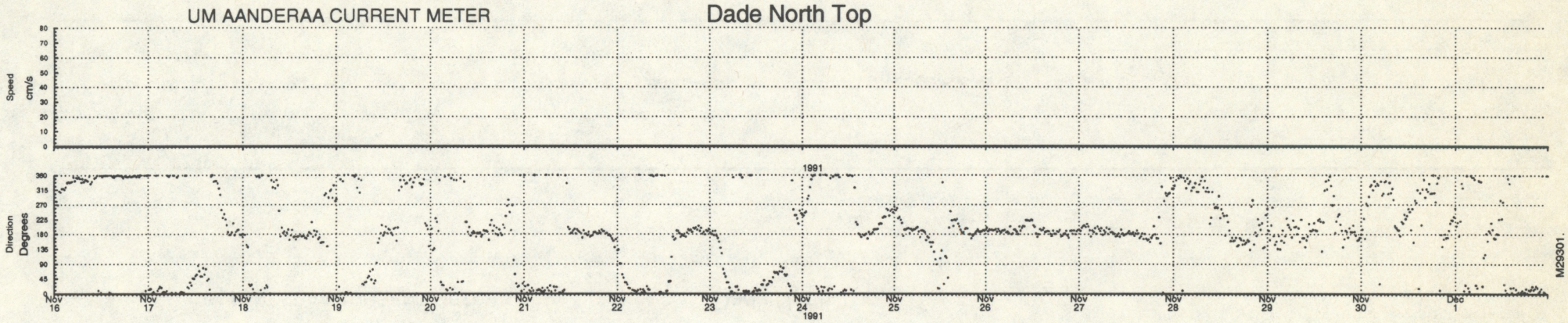
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180
135
90
45
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1991
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Nov 17
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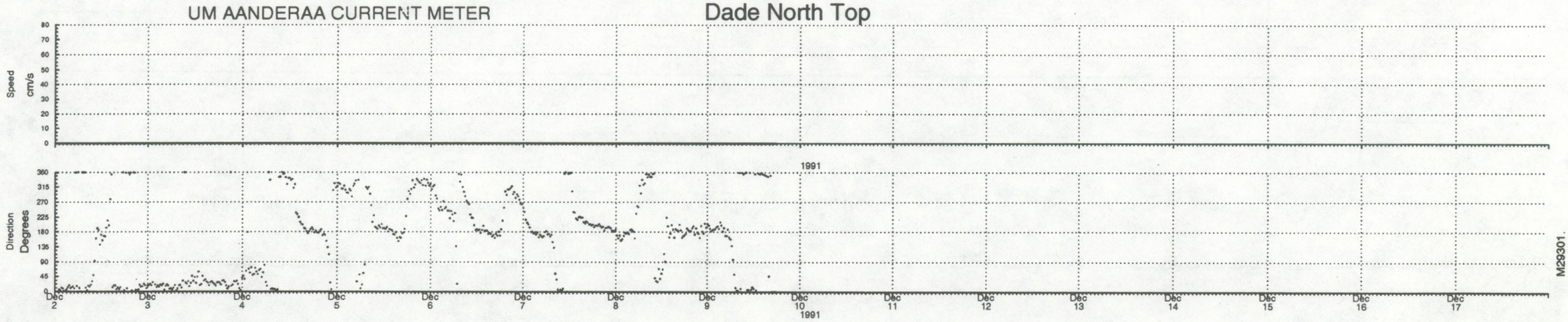
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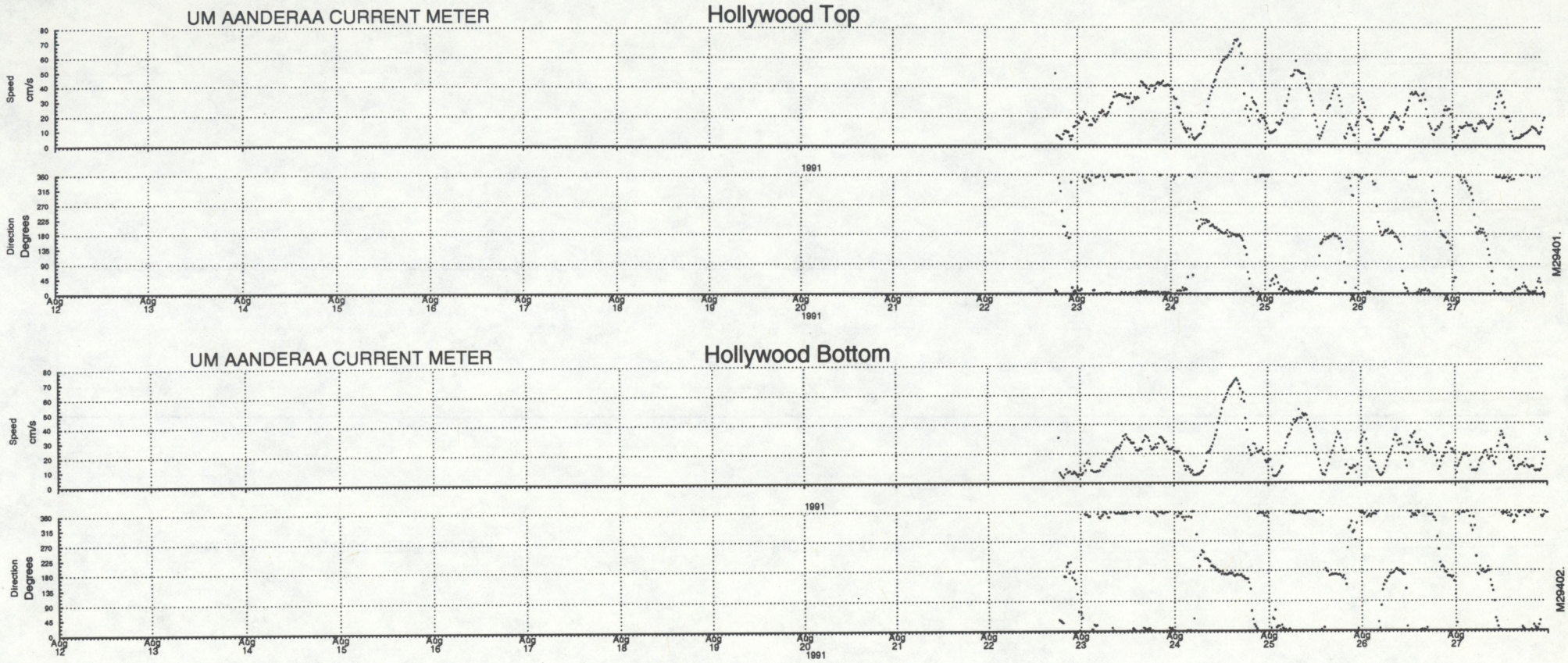
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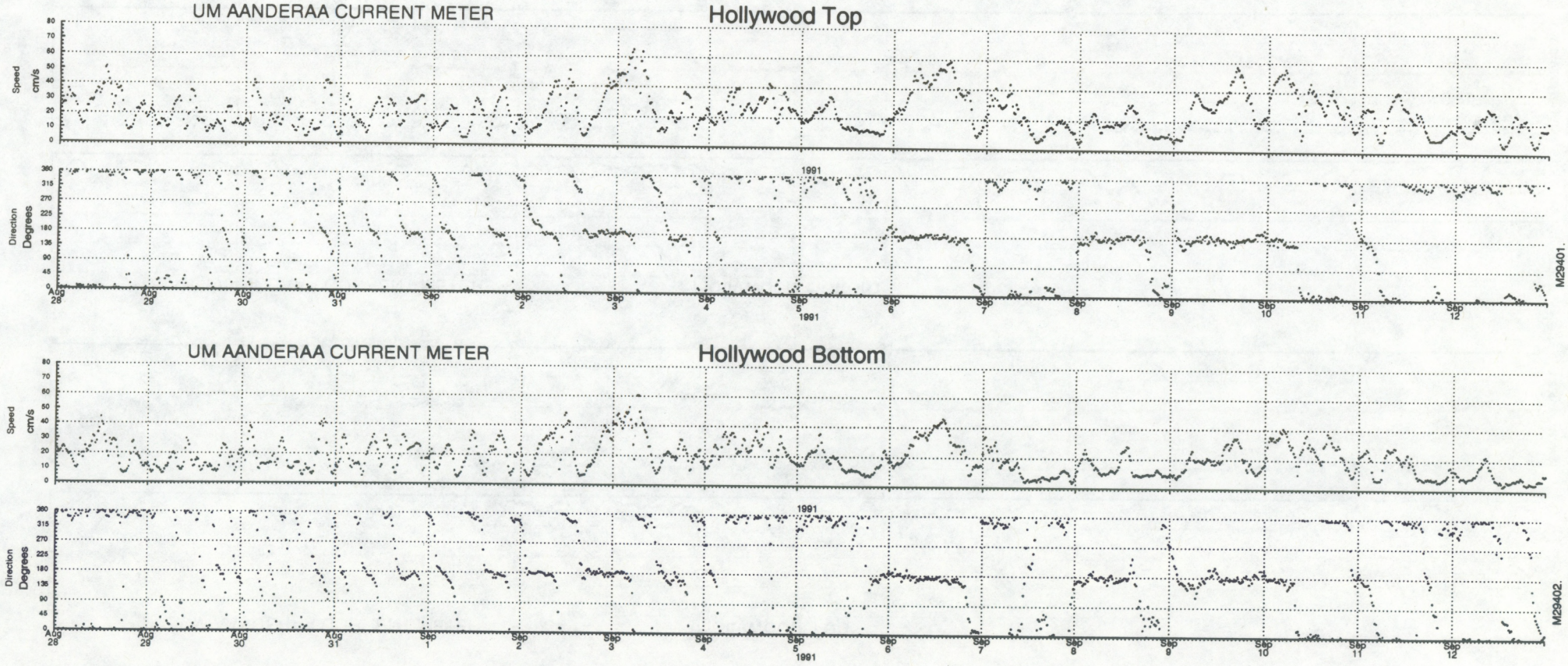
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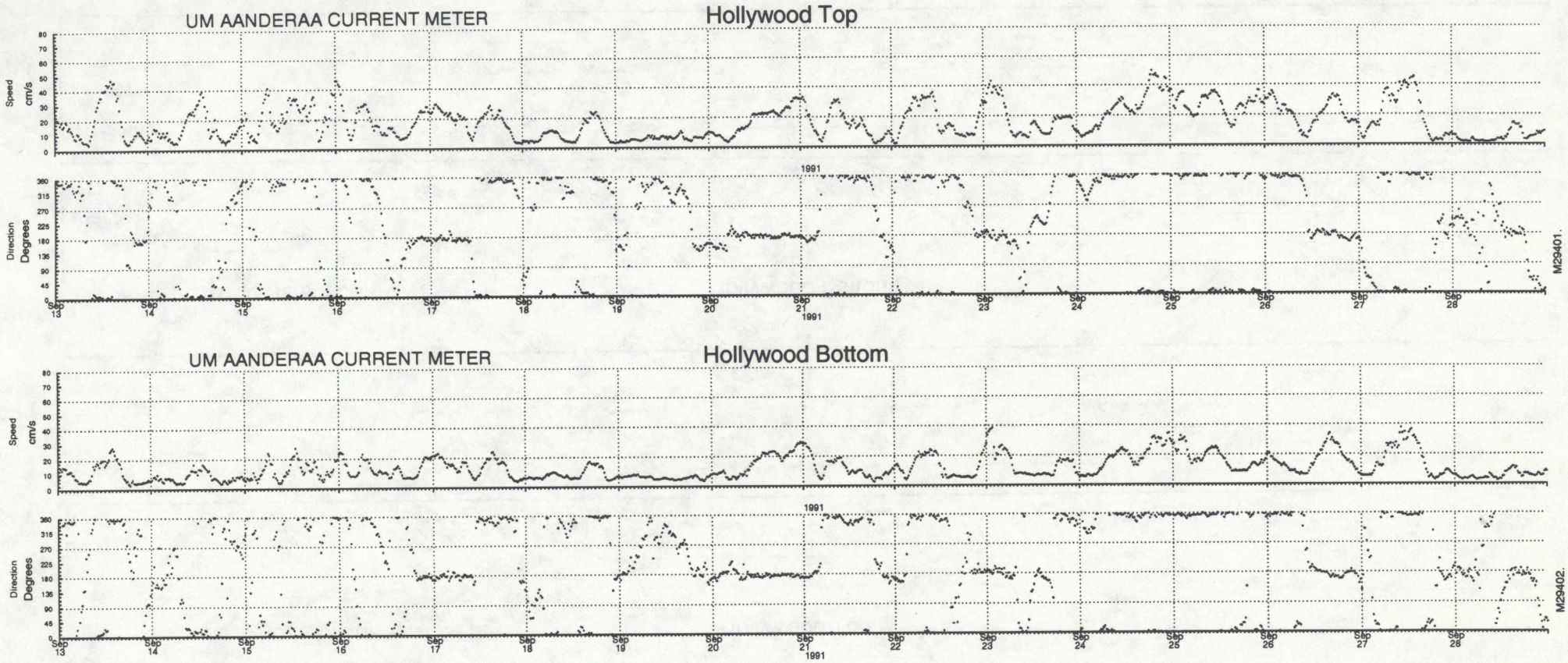
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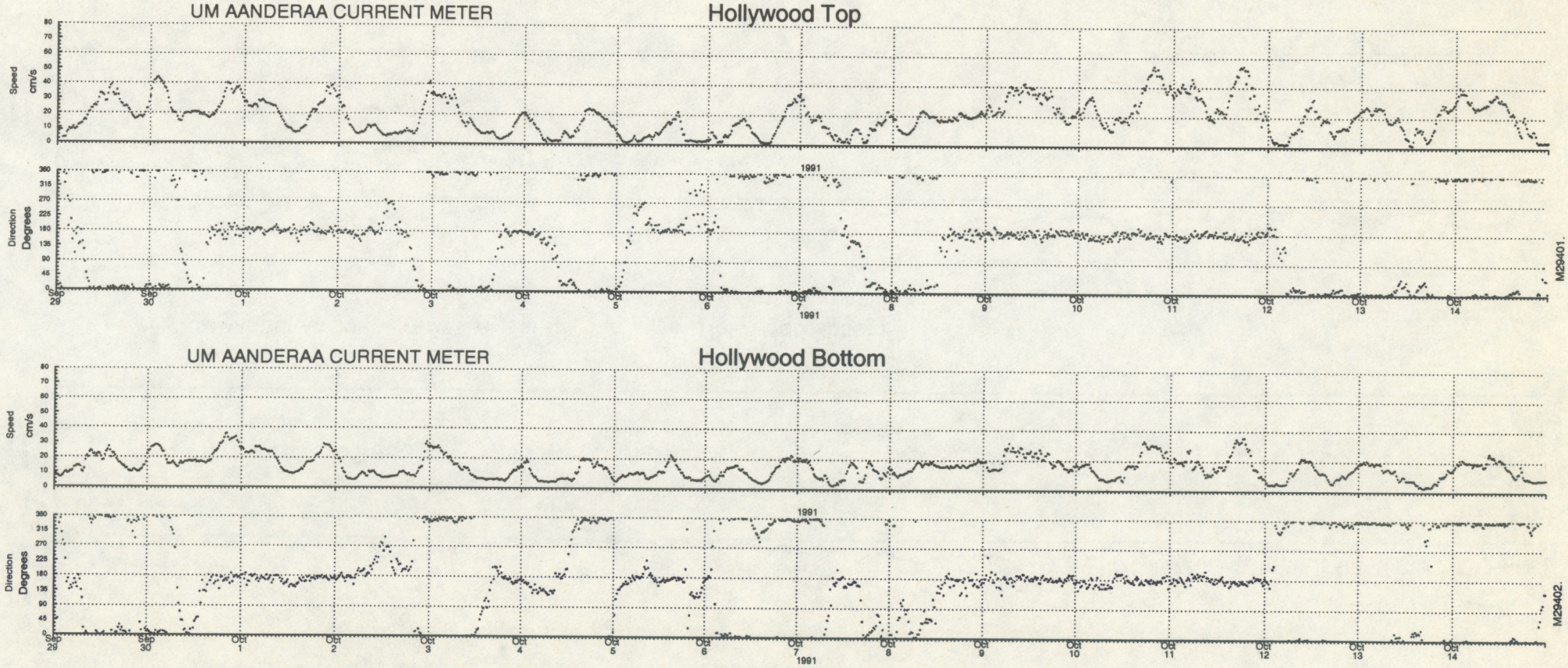
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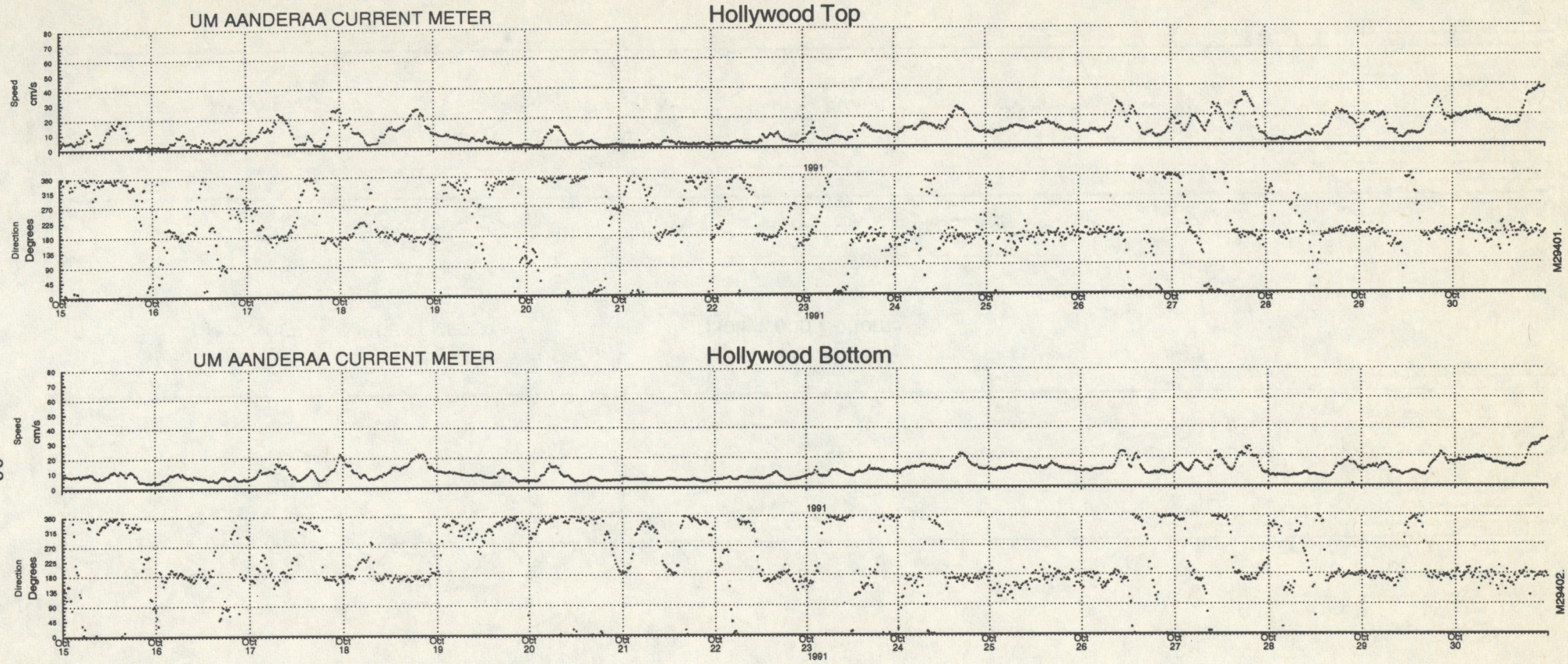
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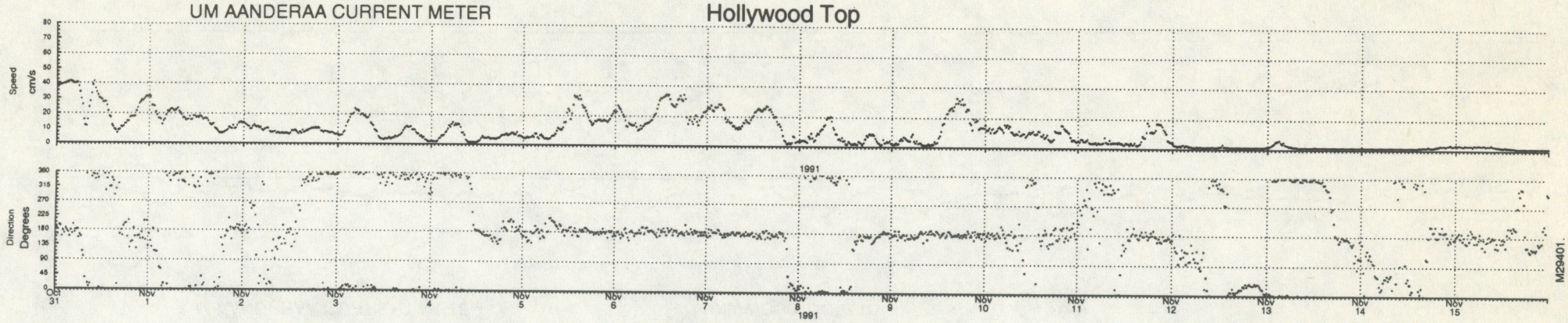
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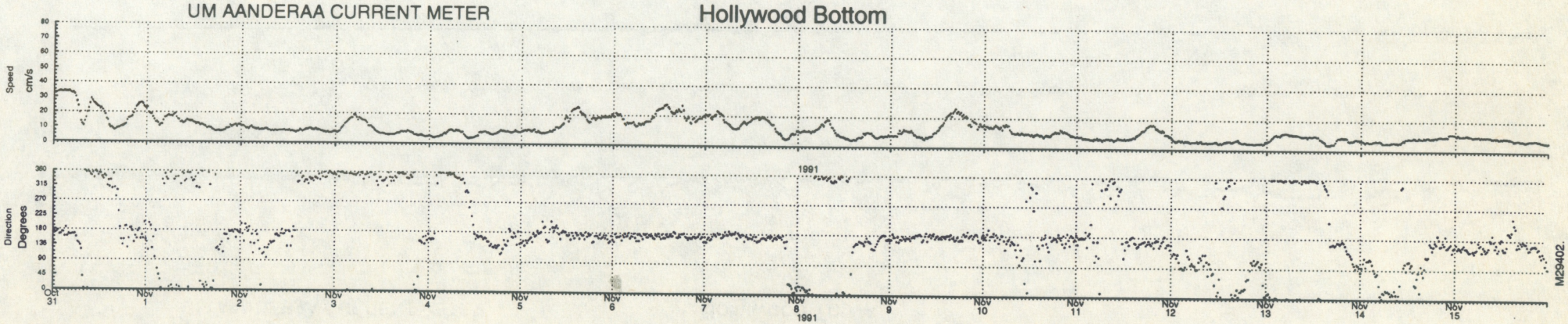
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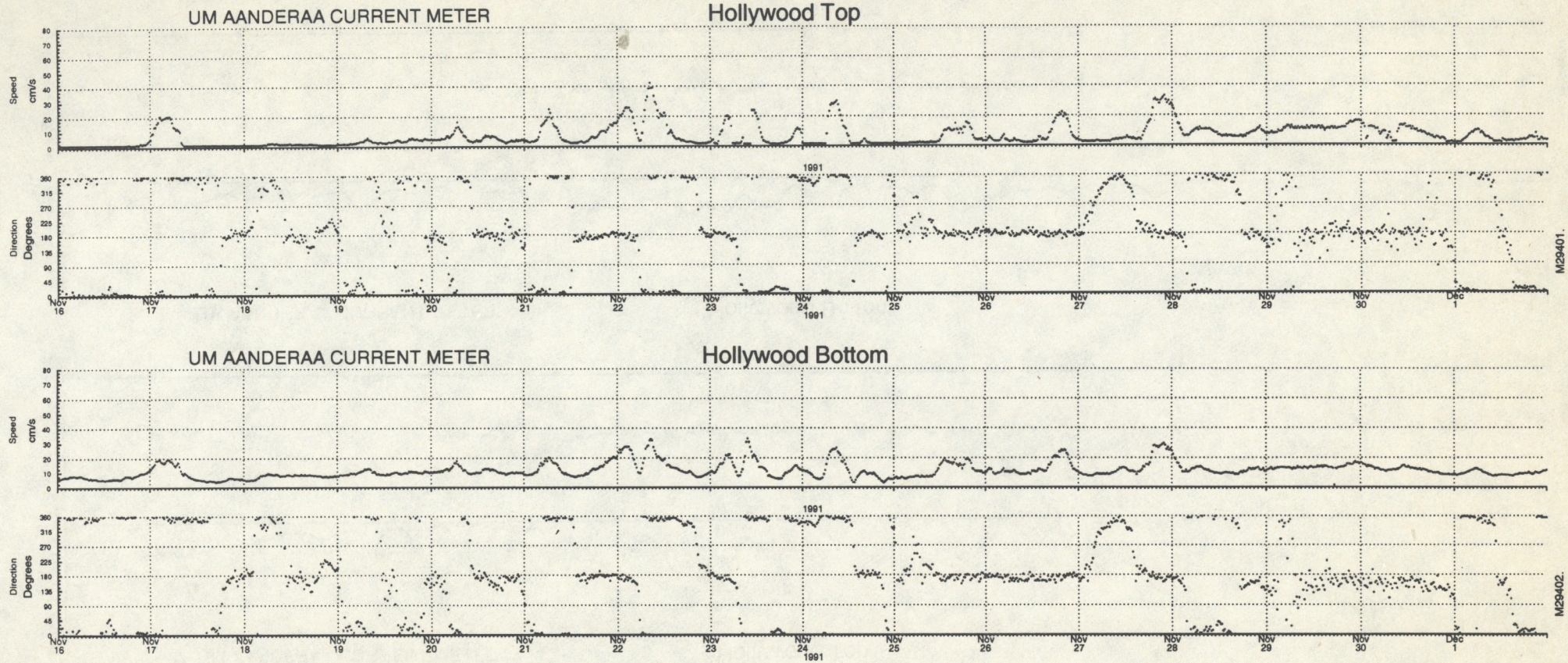
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Nov 27
Nov 28
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Nov 30
Dec 1
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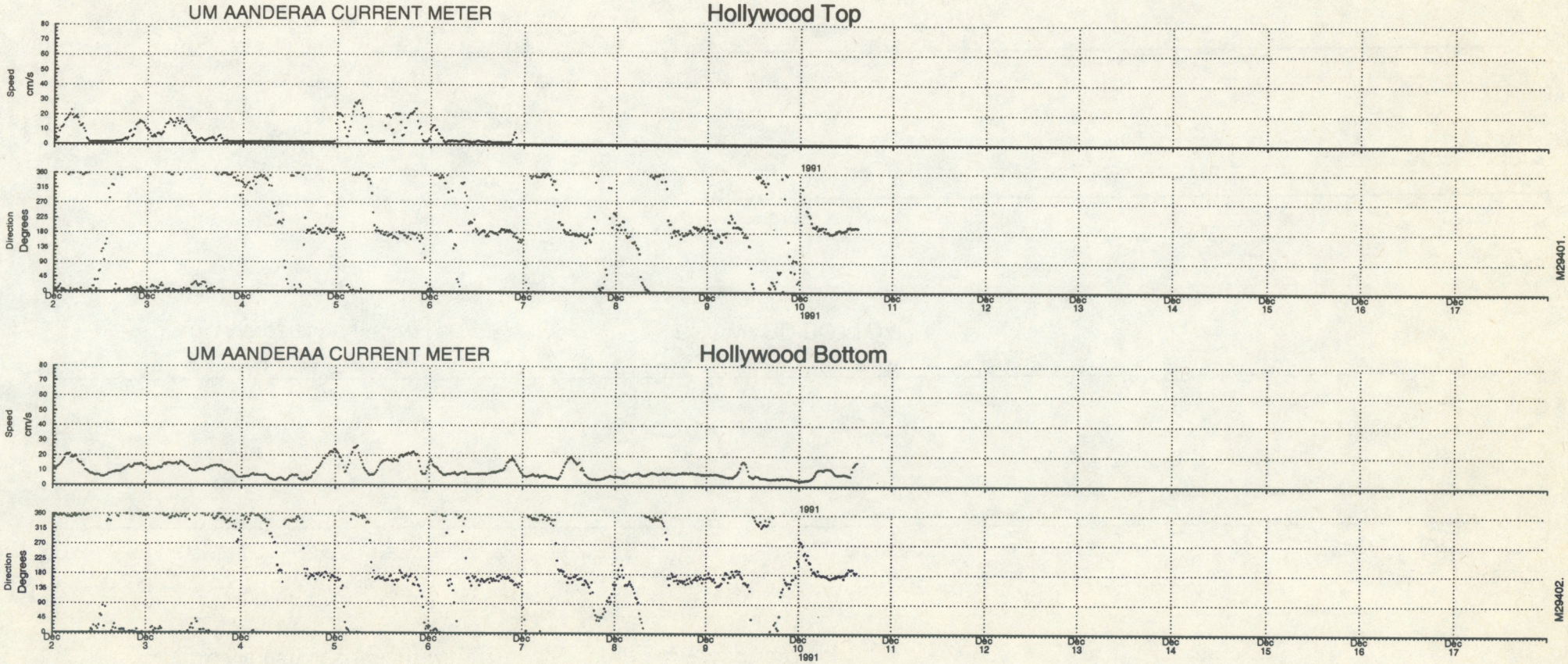
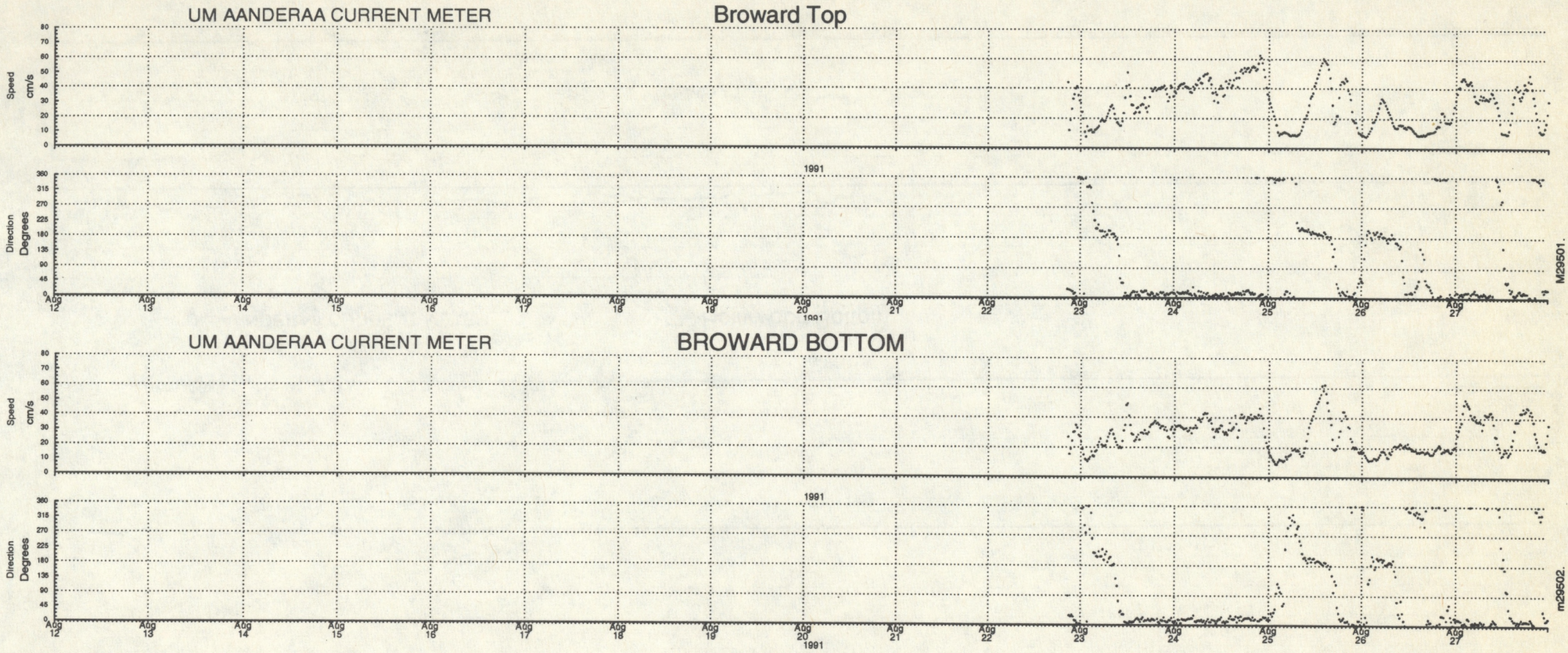

UM AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees
1991
Dec
M29401.
UM AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees
1991
Dec
M29402.


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Aug 12
Aug 13
Aug 14
Aug 15
Aug 16
Aug 17
Aug 18
Aug 19
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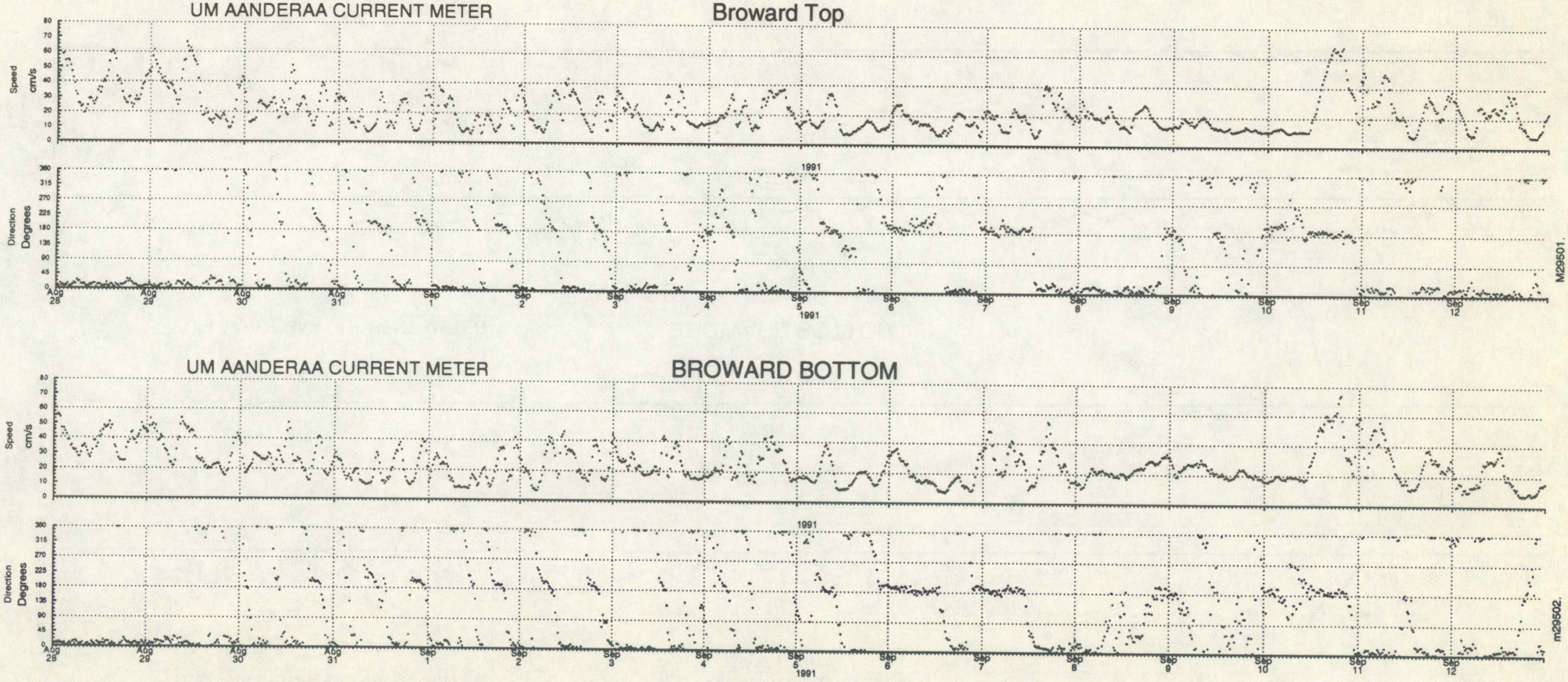
Aug 25
Aug 26
Aug 27
M29501.
UM AANDERAA CURRENT METER
BROWARD BOTTOM
m29502.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Broward Top
Speed
cm/s
Direction
Degrees
1991
M29501.
UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
m29502.
Aug 28
Aug 29
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Sep 1
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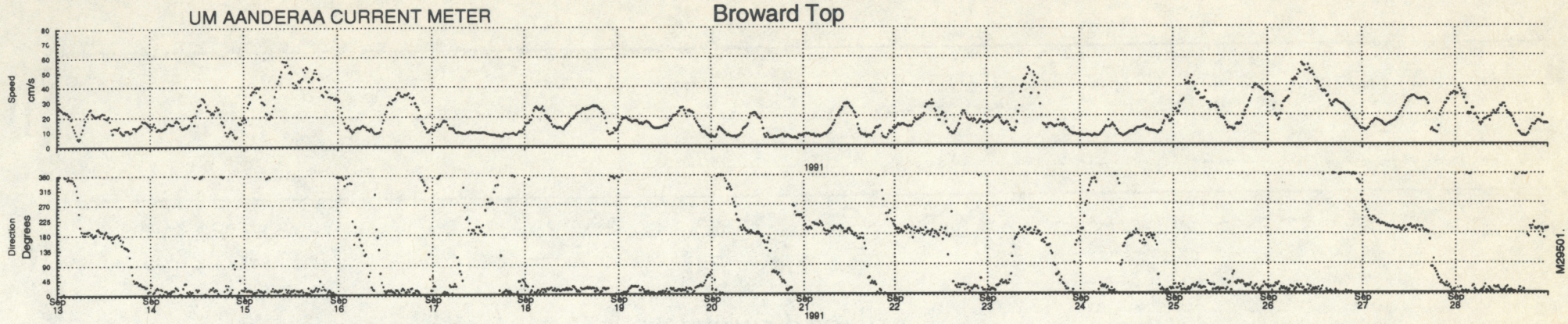
Sep 12


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Sep 13
Sep 14
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Sep 22
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Sep 24
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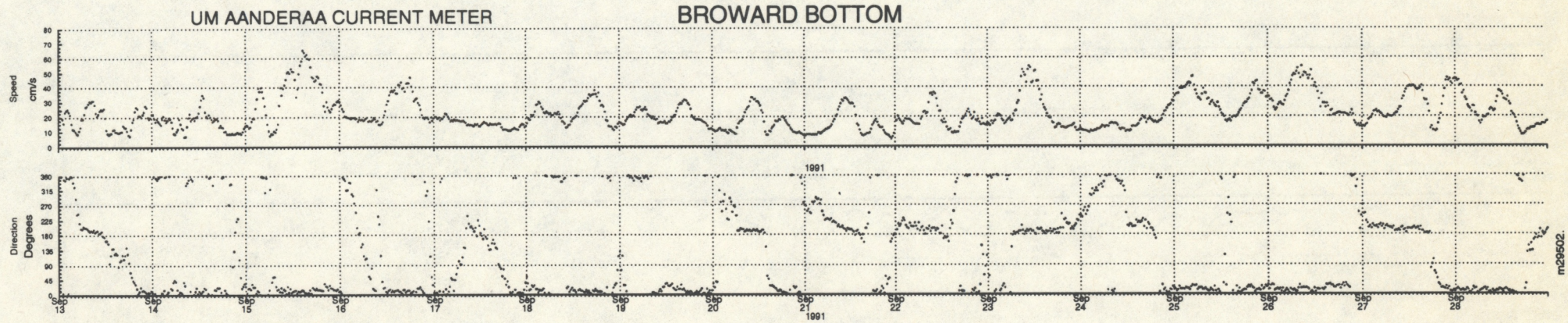
Sep 27
Sep 28
M29501.


UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
Sep 13
Sep 14
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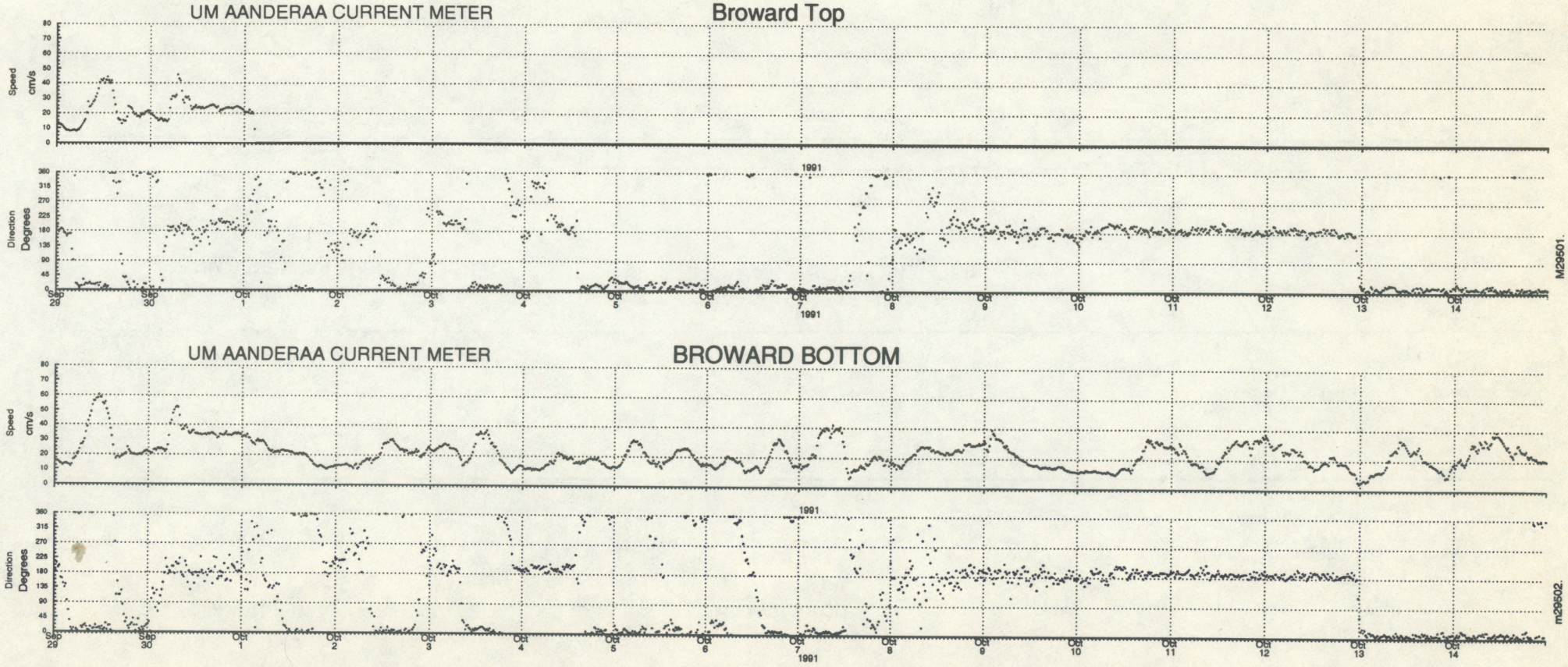
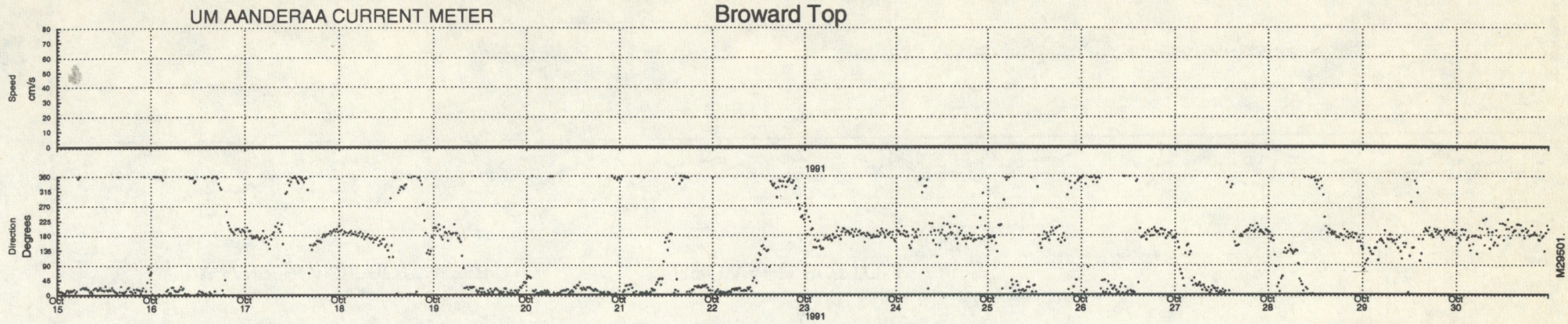
Sep 28
m29502.


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Sep 29
Sep 30
Oct 1
Oct 2
Oct 3
Oct 4
Oct 5
Oct 6
Oct 7
Oct 8
Oct 9
Oct 10
Oct 11
Oct 12
Oct 13
Oct 14
M29501.
UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
m29502.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Broward Top
Speed
cm/s
Direction
Degrees
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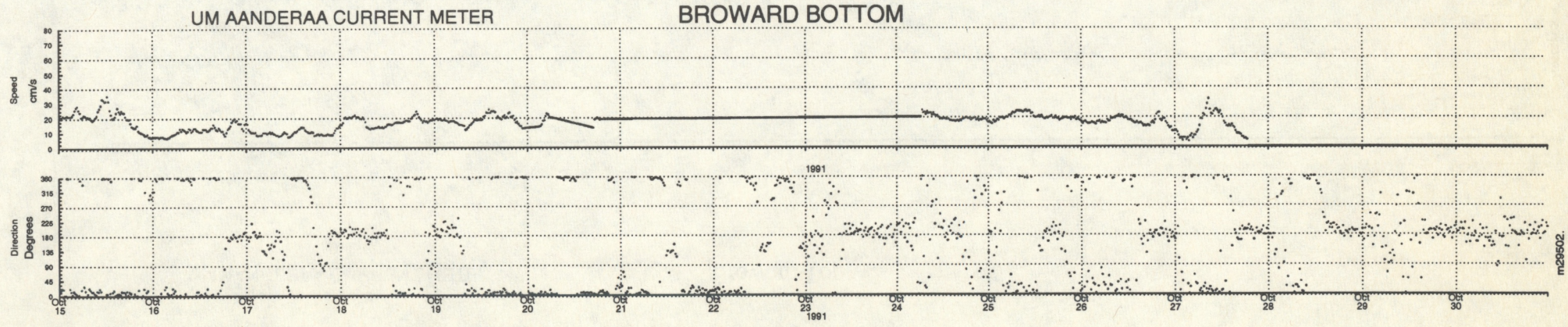
M29501.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BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
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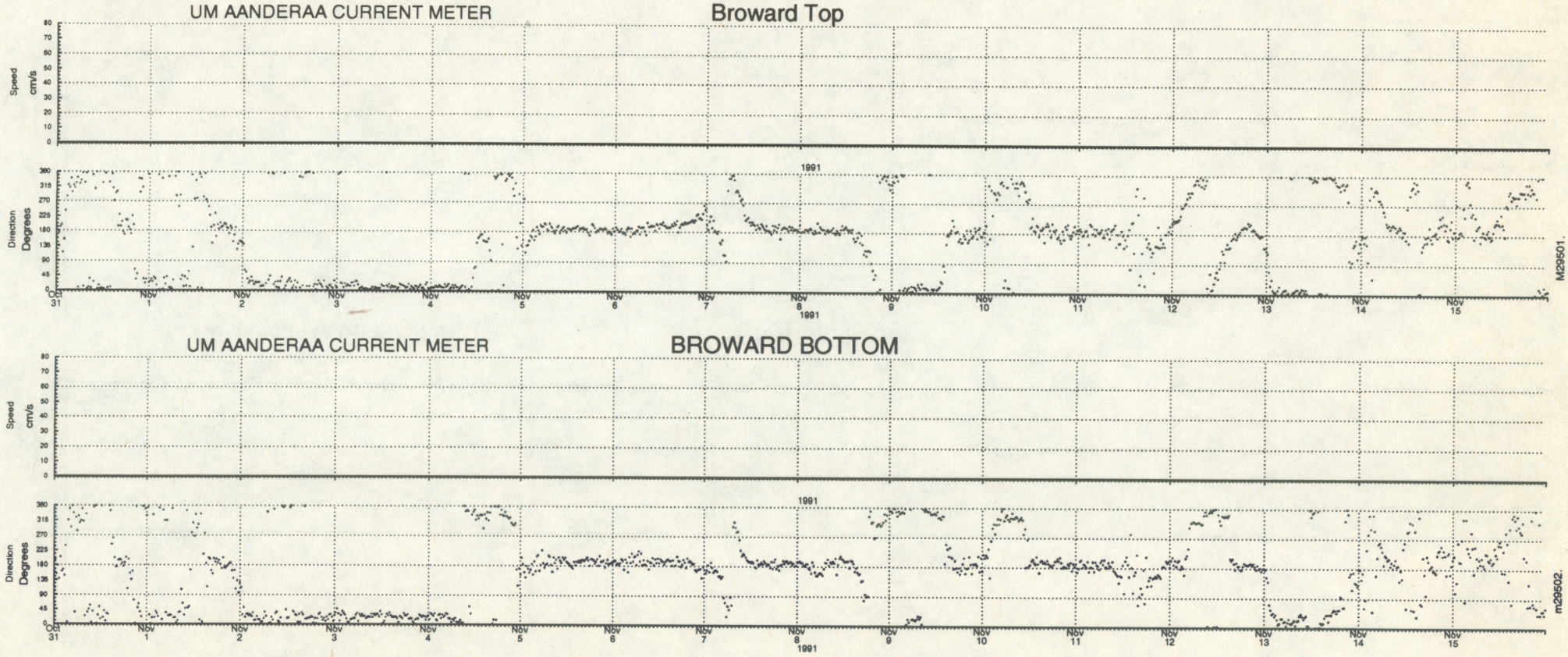
m29502.


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Oct 31
Nov 1
Nov 2
Nov 3
Nov 4
Nov 5
Nov 6
Nov 7
Nov 8
1991
Nov 9
Nov 10
Nov 11
Nov 12
Nov 13
Nov 14
Nov 15
M29501.
UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
Oct 31
Nov 1
Nov 2
Nov 3
Nov 4
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Nov 6
Nov 7
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1991
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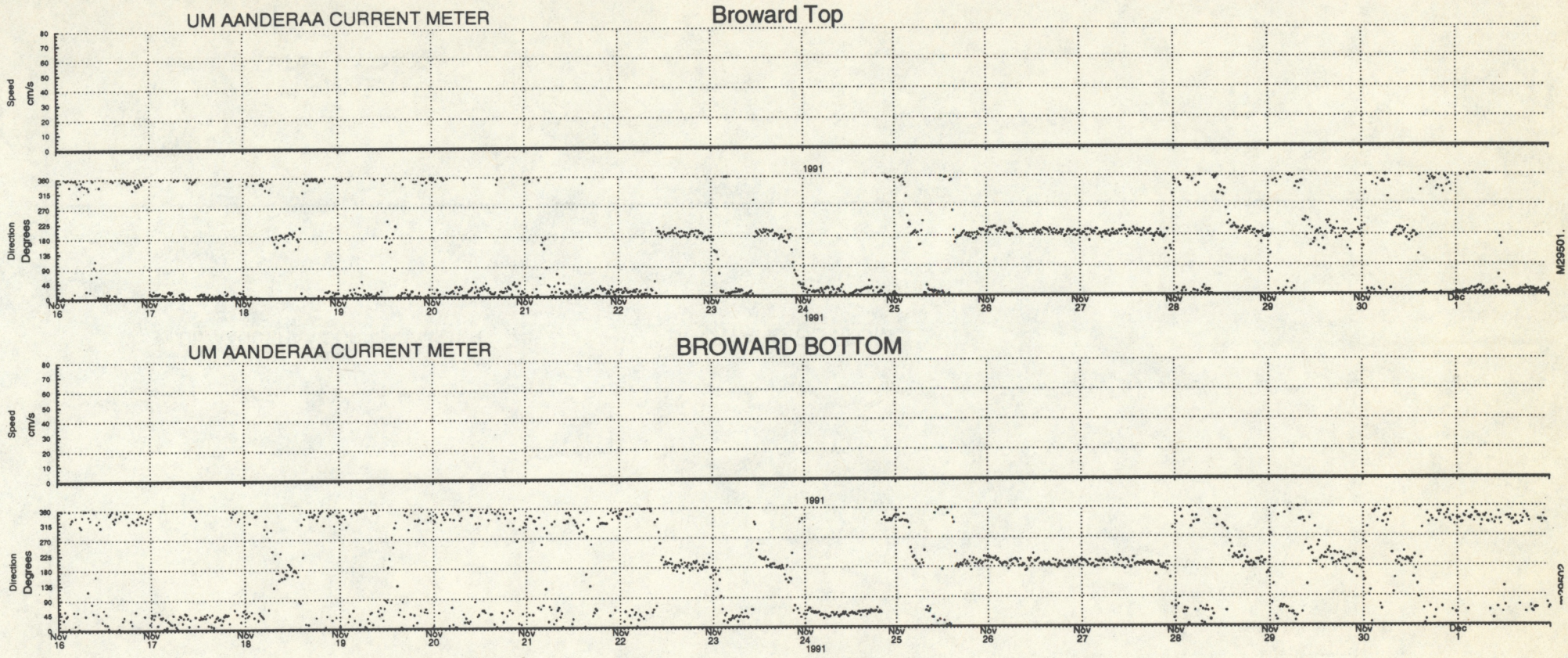
Nov 14
Nov 15
m29502.


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Nov 16
Nov 17
Nov 18
Nov 19
Nov 20
Nov 21
Nov 22
Nov 23
Nov 24
Nov 25
Nov 26
Nov 27
Nov 28
Nov 29
Nov 30
Dec 1
M29501
UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
Nov 16
Nov 17
Nov 18
Nov 19
Nov 20
Nov 21
Nov 22
Nov 23
Nov 24
Nov 25
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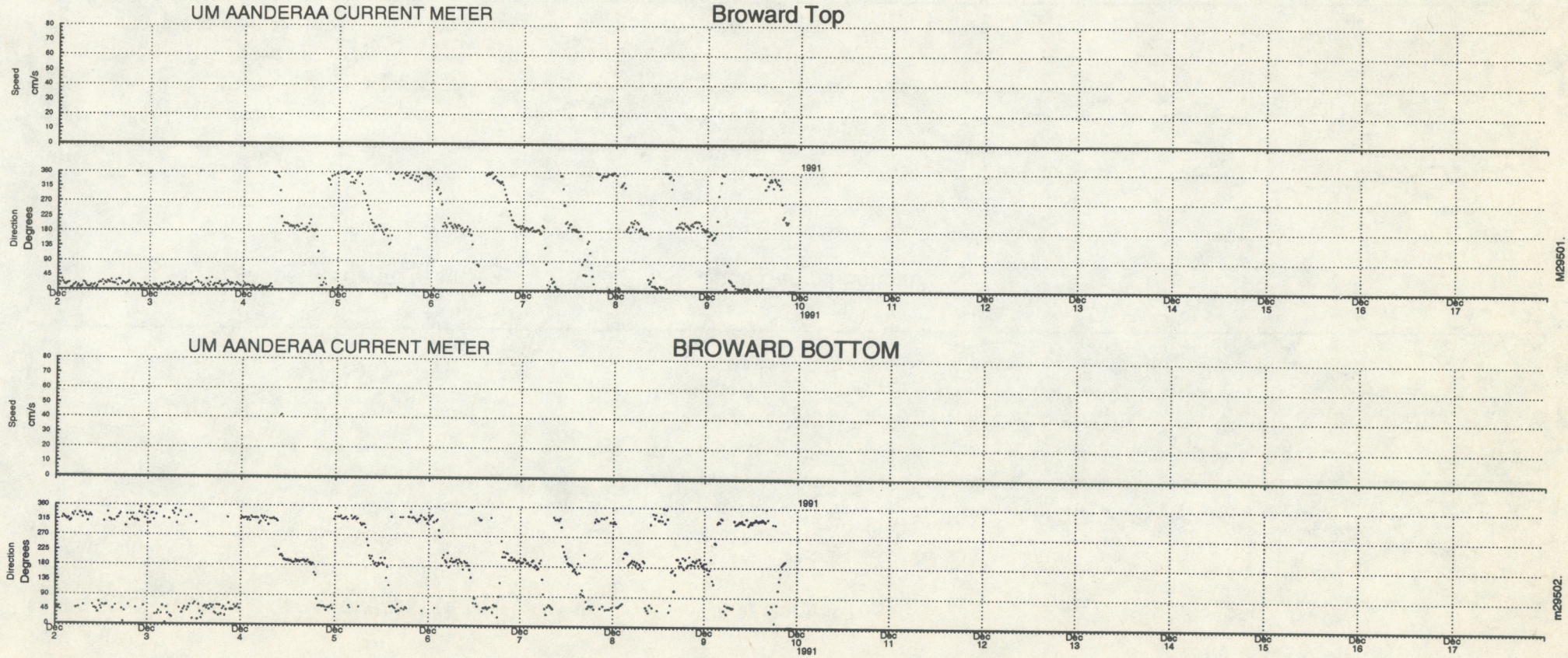
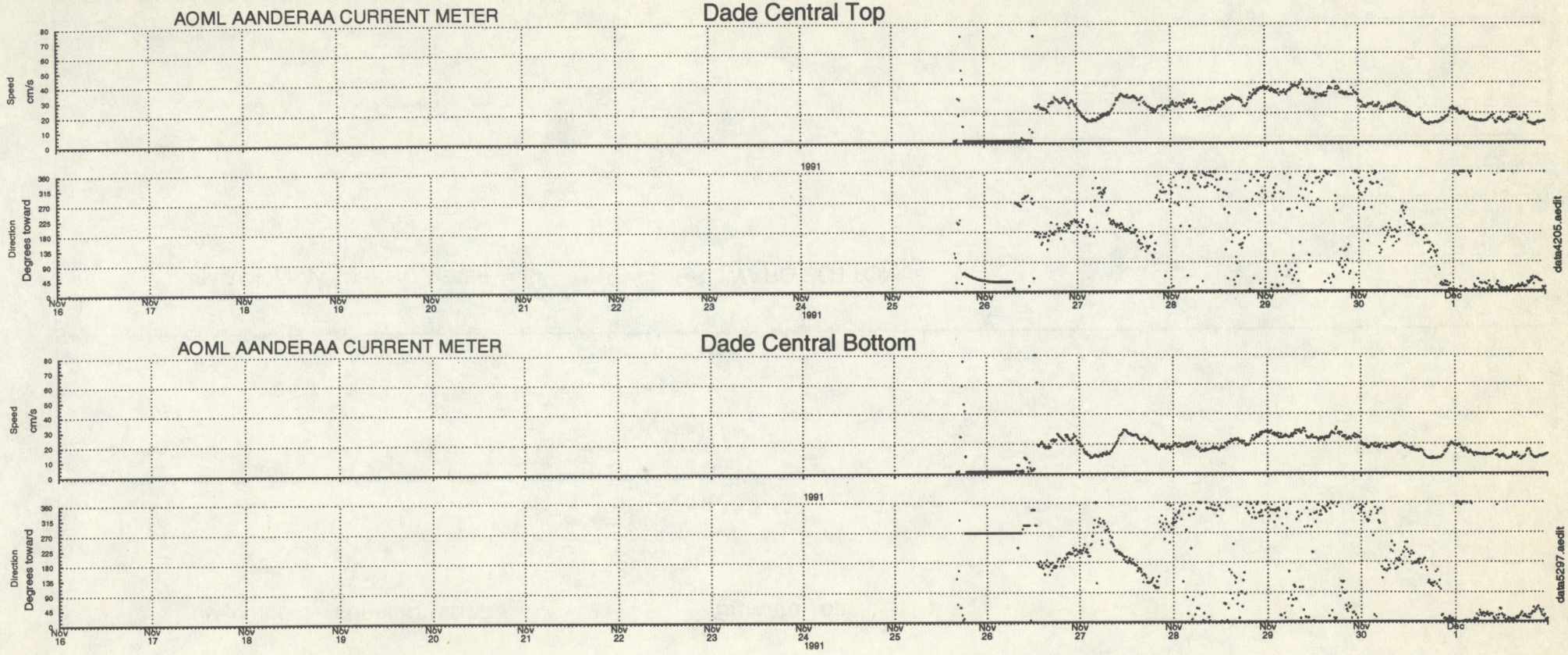
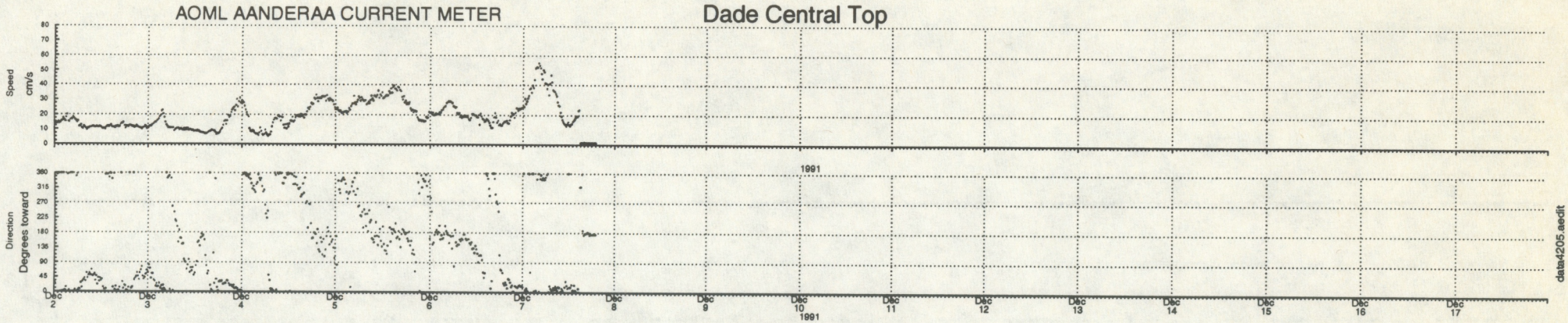
Nov 28
Nov 29
Nov 30
Dec 1


UM AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees
1991
Dec
M29501.
UM AANDERAA CURRENT METER
BROWARD BOTTOM
Speed
cm/s
Direction
Degrees
1991
Dec
m29502.


AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1991
data4205.aedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1991
data5297.aedit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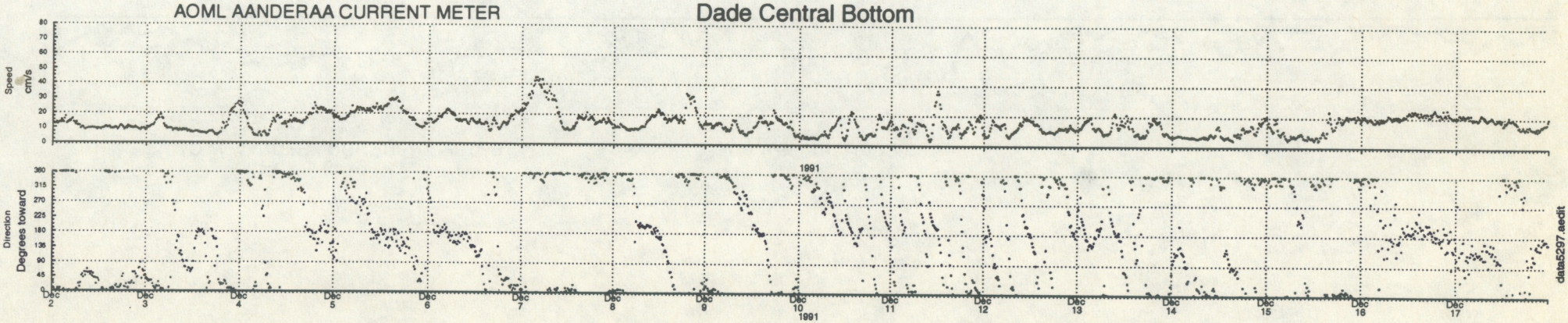
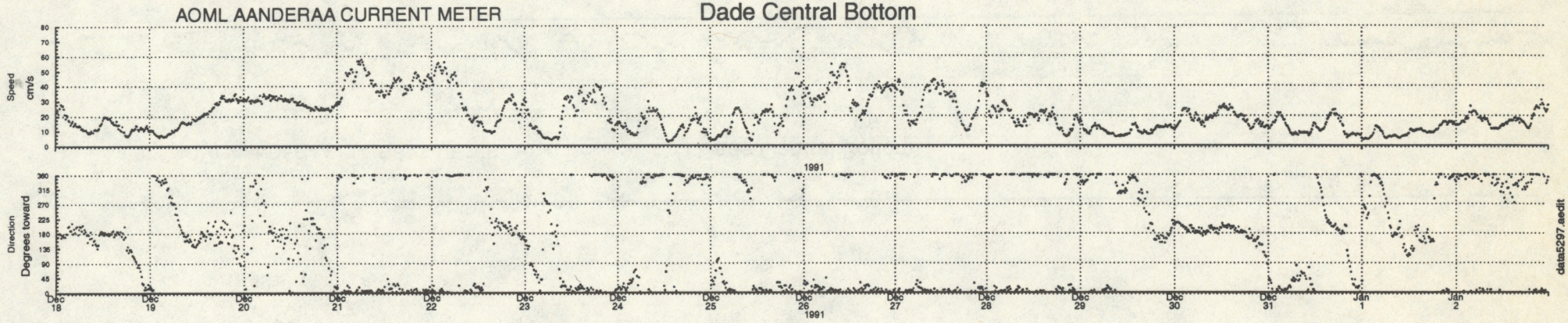
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1991
data4205.aedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1991
data5297.aedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1991
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
Dec 26
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Dec 27
Dec 28
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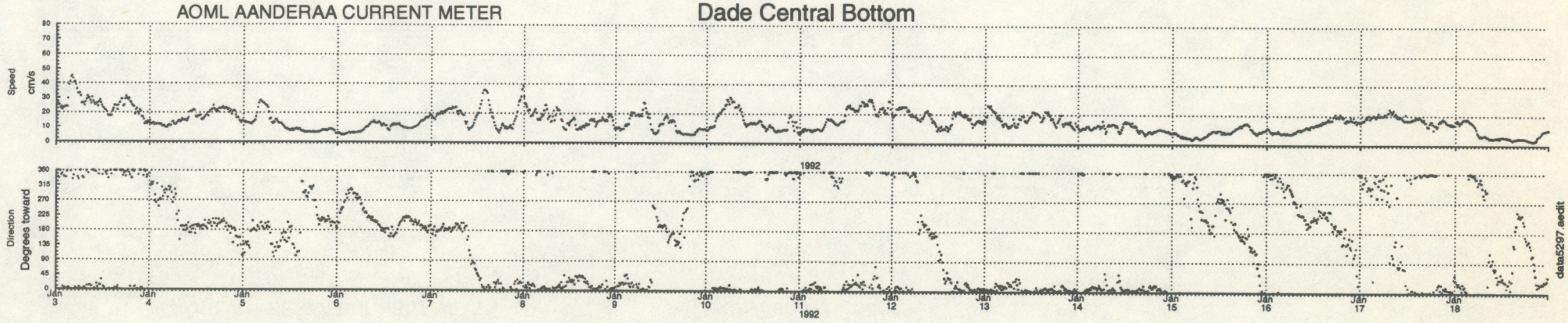
Dec 30
Dec 31
Jan 1
Jan 2
data5297.aedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Jan 3
Jan 4
Jan 5
Jan 6
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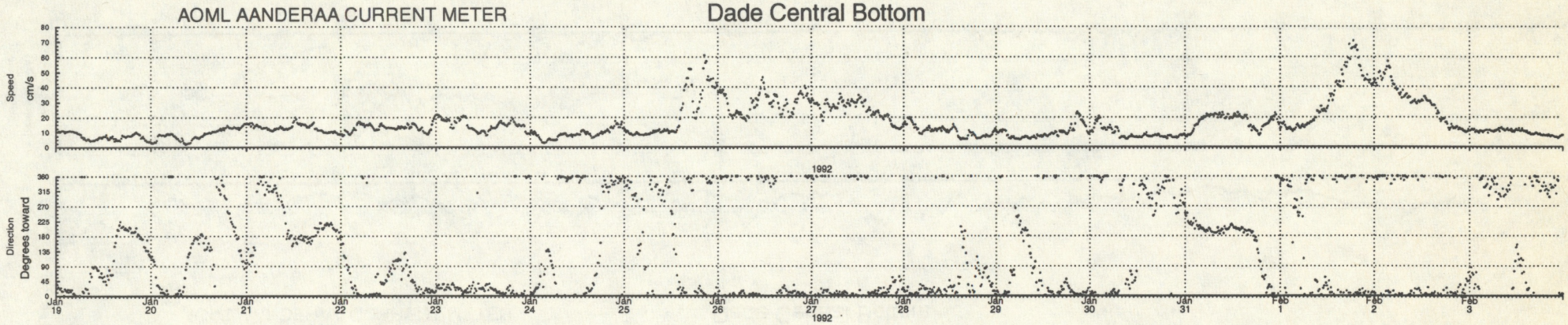
Jan 18
data5297.aedit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Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
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0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
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0
Jan 19
Jan 20
Jan 21
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Jan 30
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Feb 2
Feb 3
1992
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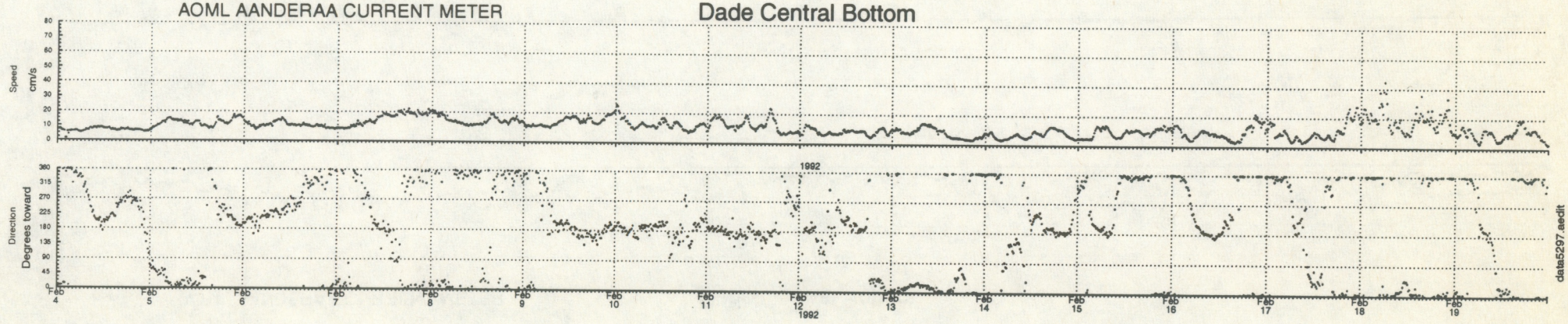
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
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70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Feb 4
Feb 5
Feb 6
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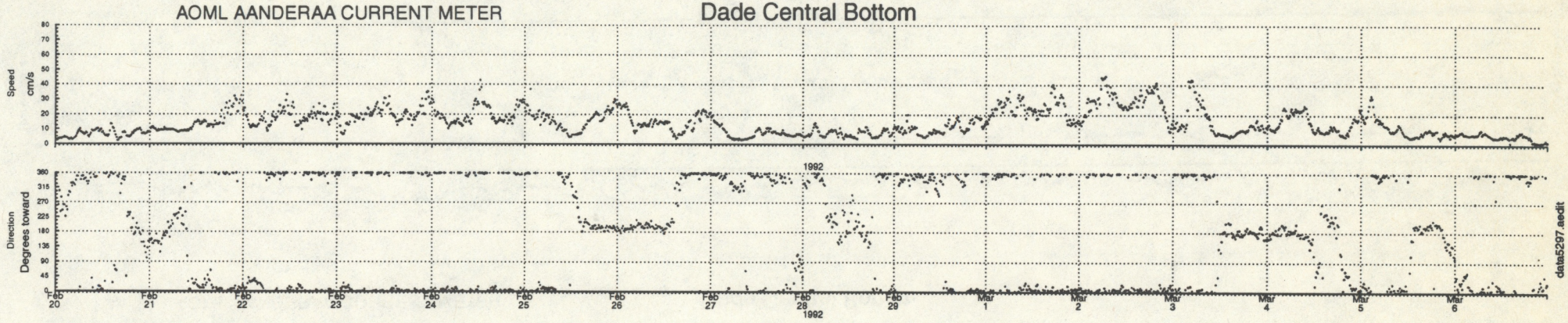
Feb 19
1992
data5297.aedit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Dade Central Bottom
Speed
cm/s
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70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
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315
270
225
180
135
90
45
0
Feb 20
Feb 21
Feb 22
Feb 23
Feb 24
Feb 25
Feb 26
Feb 27
Feb 28
1992
Feb 29
Mar 1
Mar 2
Mar 3
Mar 4
Mar 5
Mar 6
data5297.aedit

AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Mar
7
Mar
8
Mar
9
Mar
10
Mar
11
Mar
12
Mar
13
Mar
14
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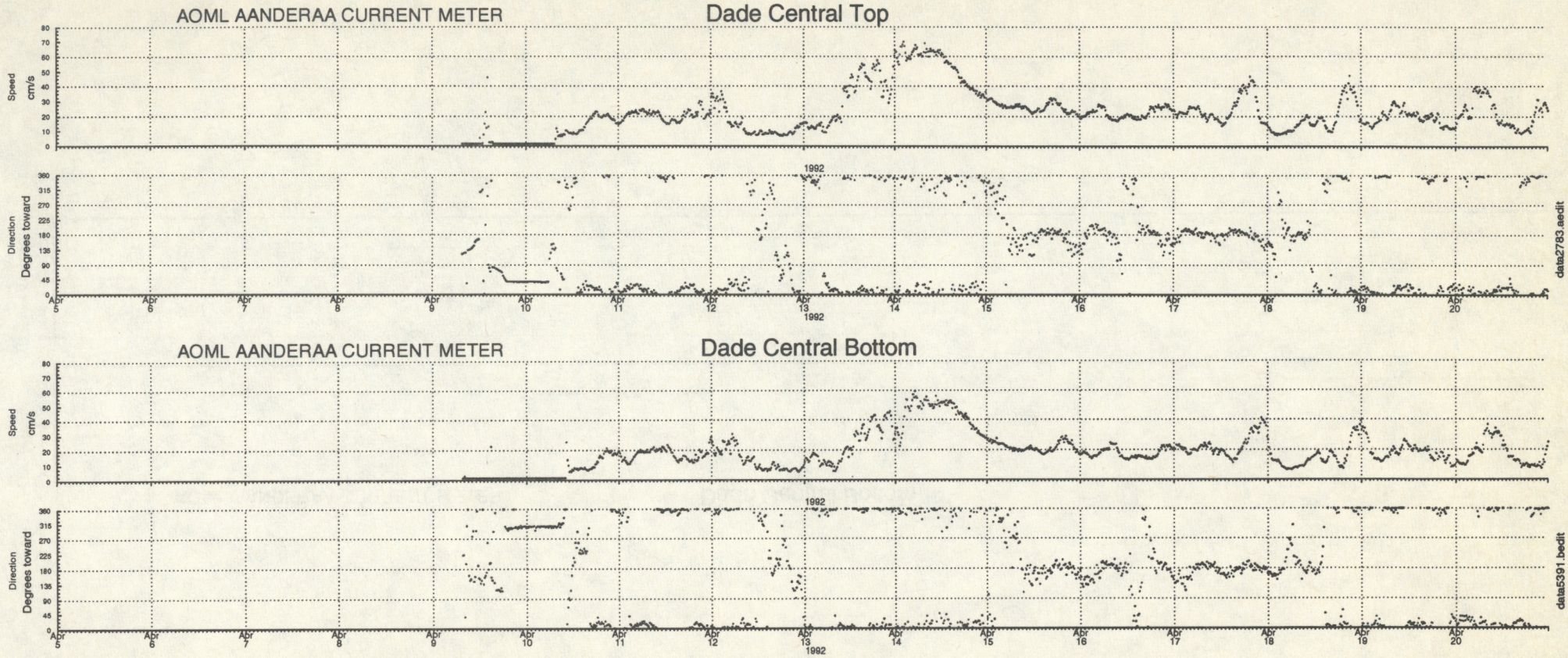
AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
data2783.aedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5391.bedit

AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
data2783.aadlt
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
data5391.badlt
1992
Apr 21
Apr 22
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Apr 25
Apr 26
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Apr 28
Apr 29
Apr 30
May 1
May 2
May 3
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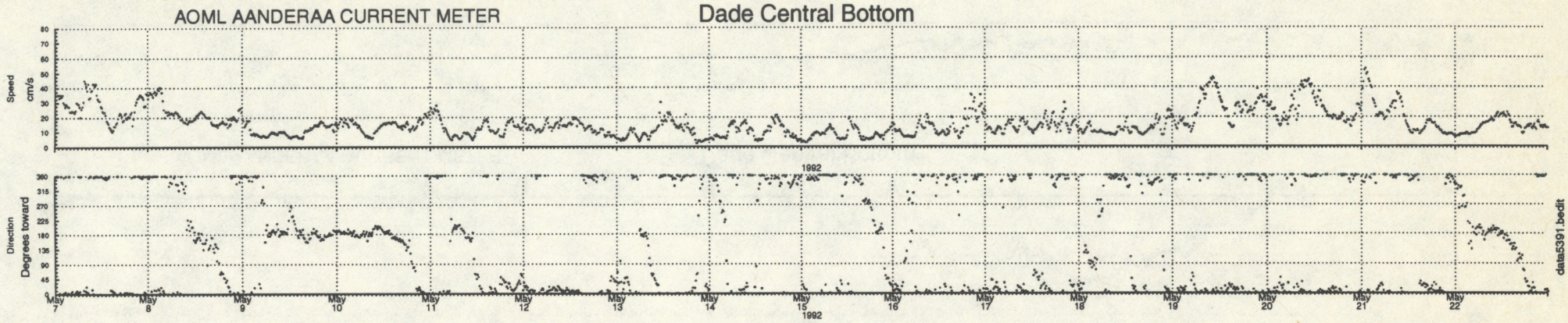
May 5
May 6


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
May 7
May 8
May 9
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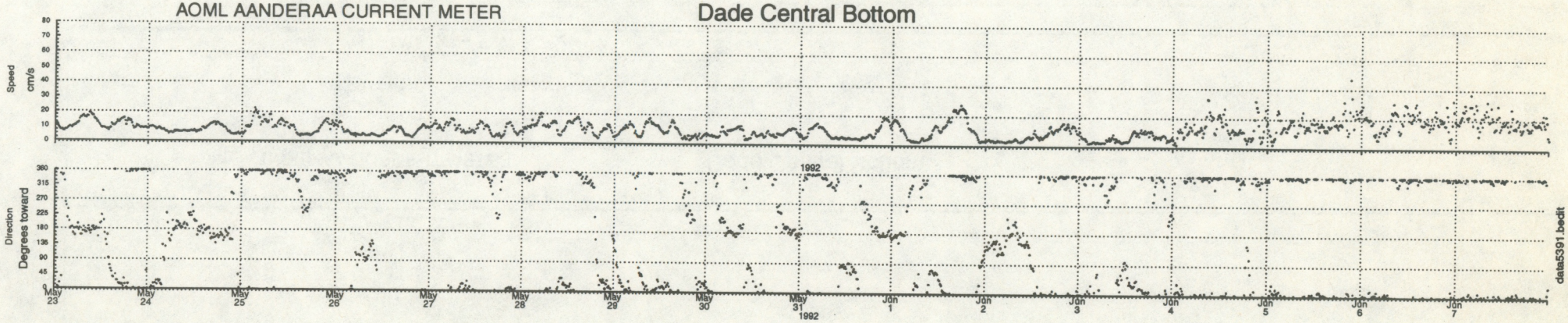
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Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
May 23
May 24
May 25
May 26
May 27
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May 29
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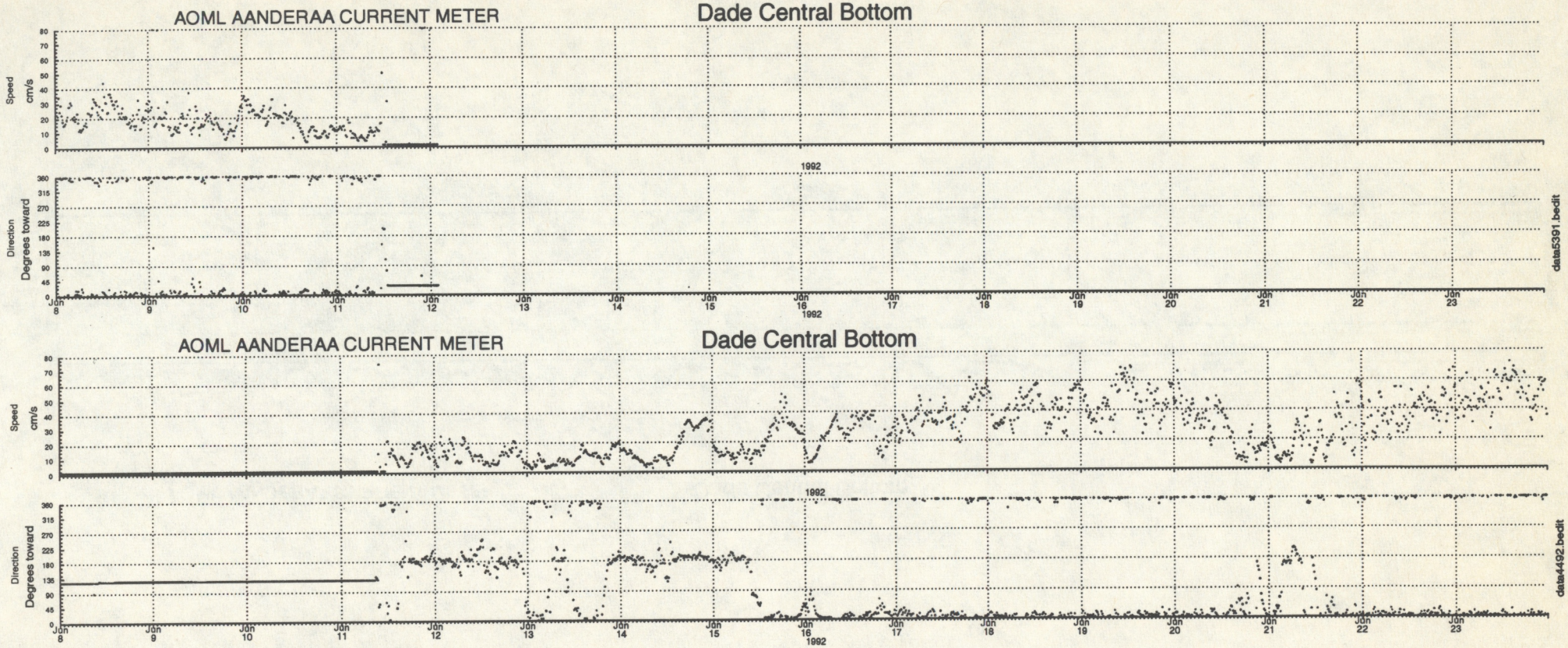
Jun 6
Jun 7
data5391.bedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
Jan 8
Jan 9
Jan 10
Jan 11
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
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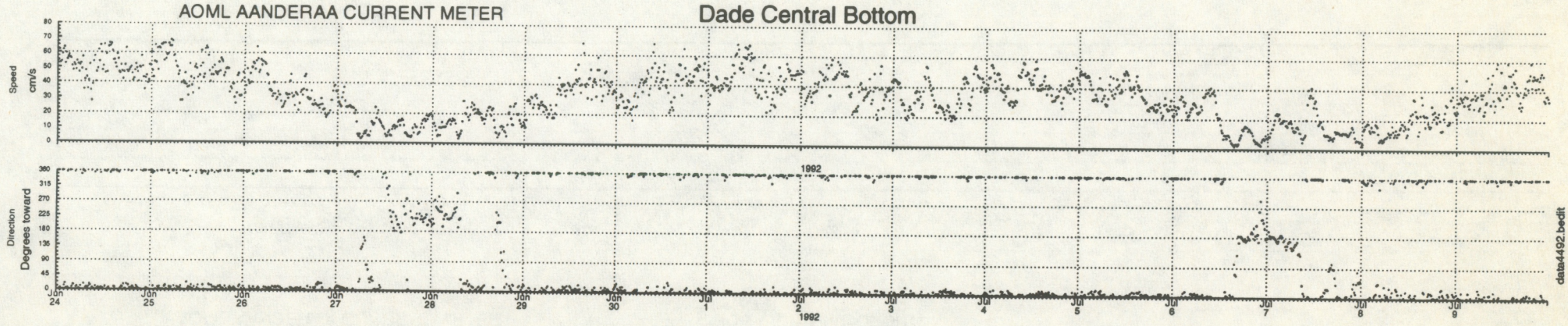
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data4492.bedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Jun 24
Jun 25
Jun 26
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Jul 1
Jul 2
1992
Jul 3
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Jul 6
Jul 7
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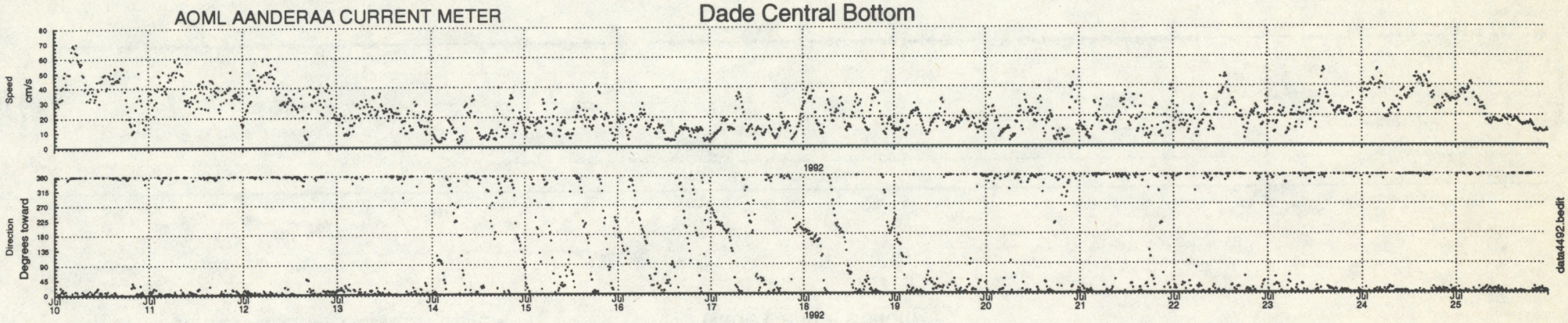
Jul 9
data4492.bedit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Dade Central Bottom
Speed
cm/s
80
70
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50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
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Jul 10
Jul 11
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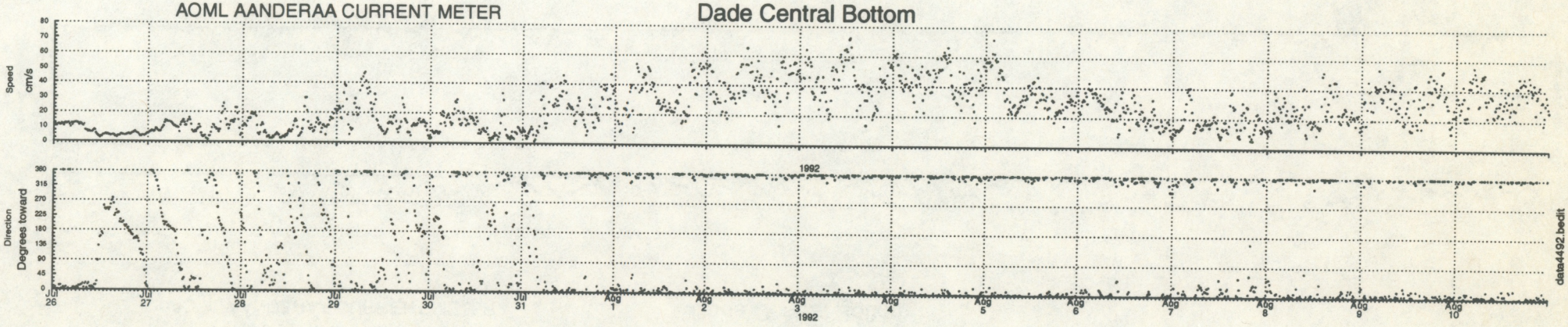
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Jul 26
Jul 27
Jul 28
Jul 29
Jul 30
Jul 31
Aug 1
Aug 2
Aug 3
1992
Aug 4
Aug 5
Aug 6
Aug 7
Aug 8
Aug 9
Aug 10
data4492.bedit

AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Aug 11
Aug 12
Aug 13
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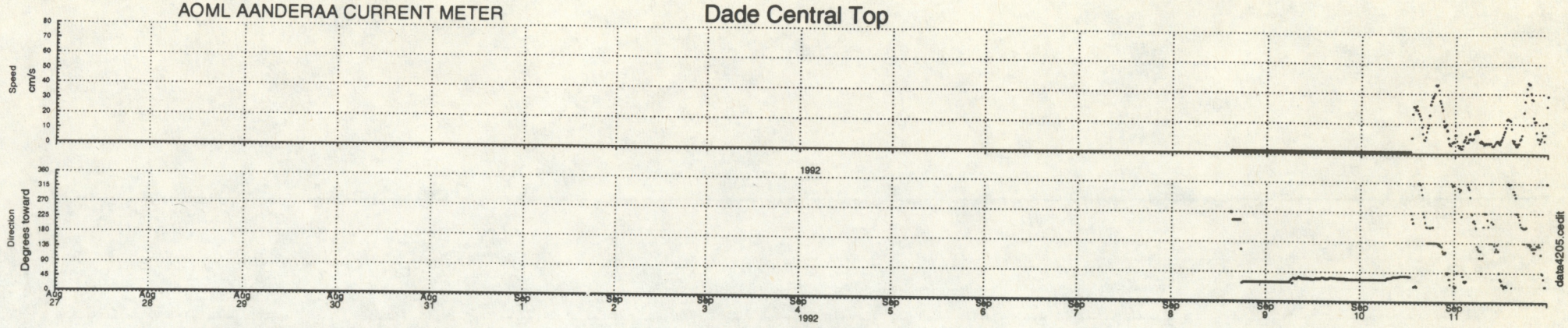
Aug 26
data492.bedit


AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
Aug 27
Aug 28
Aug 29
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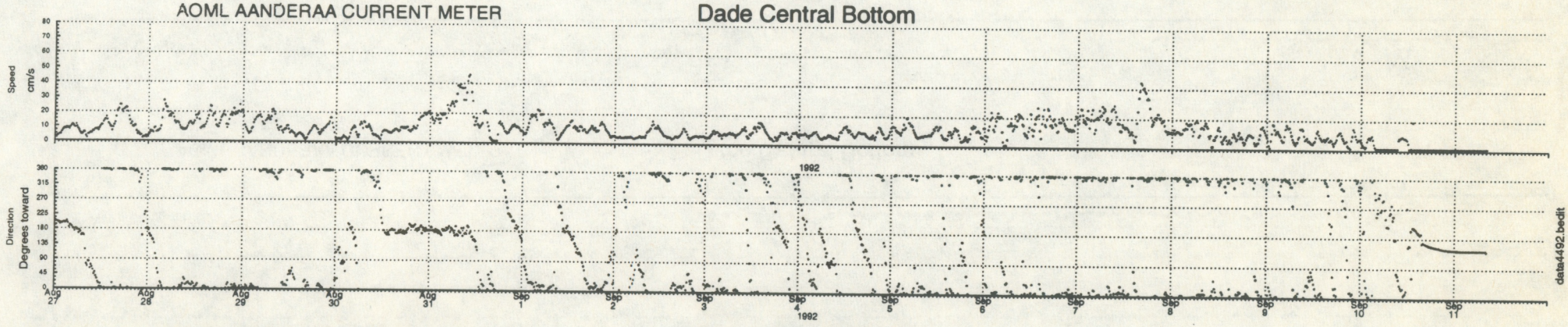
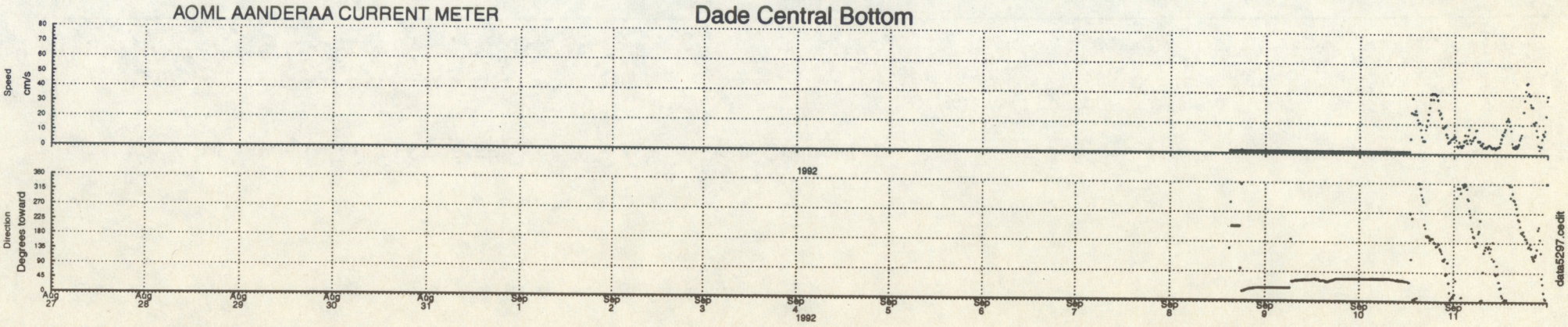
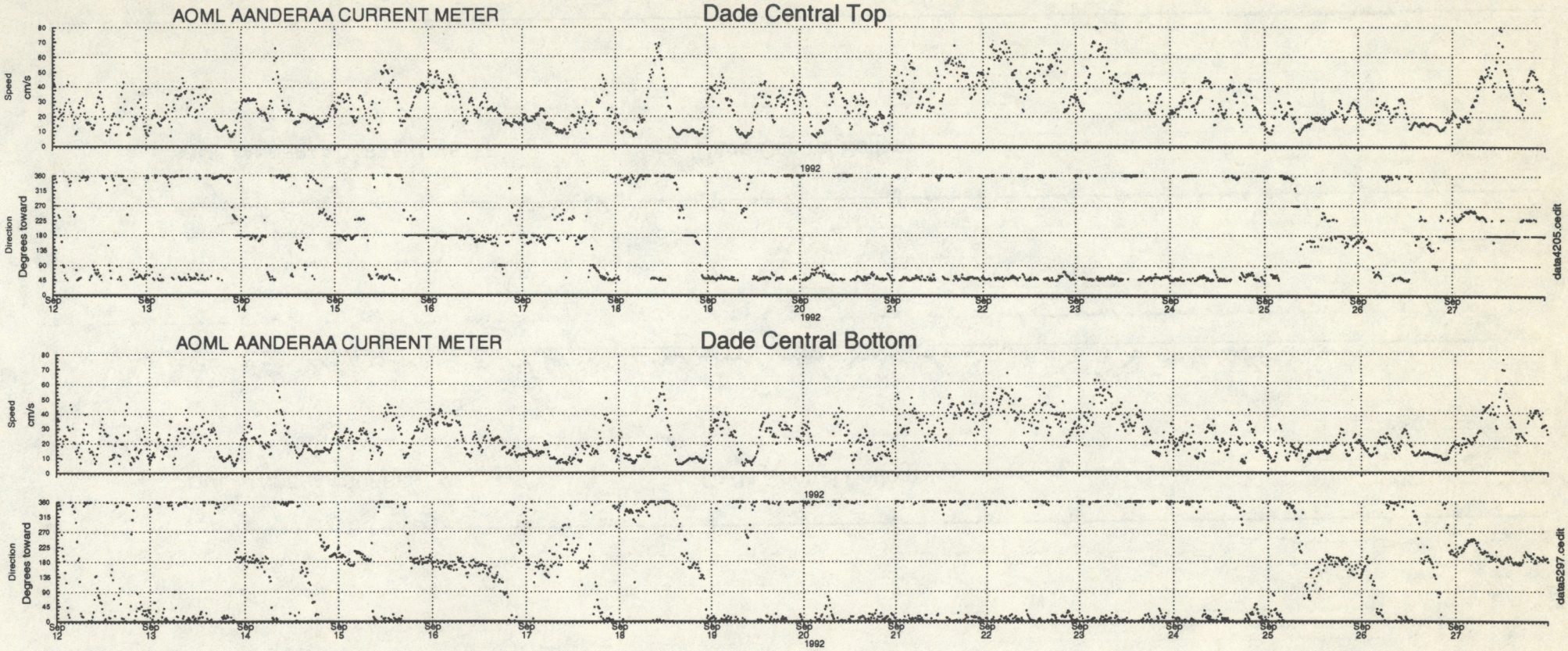
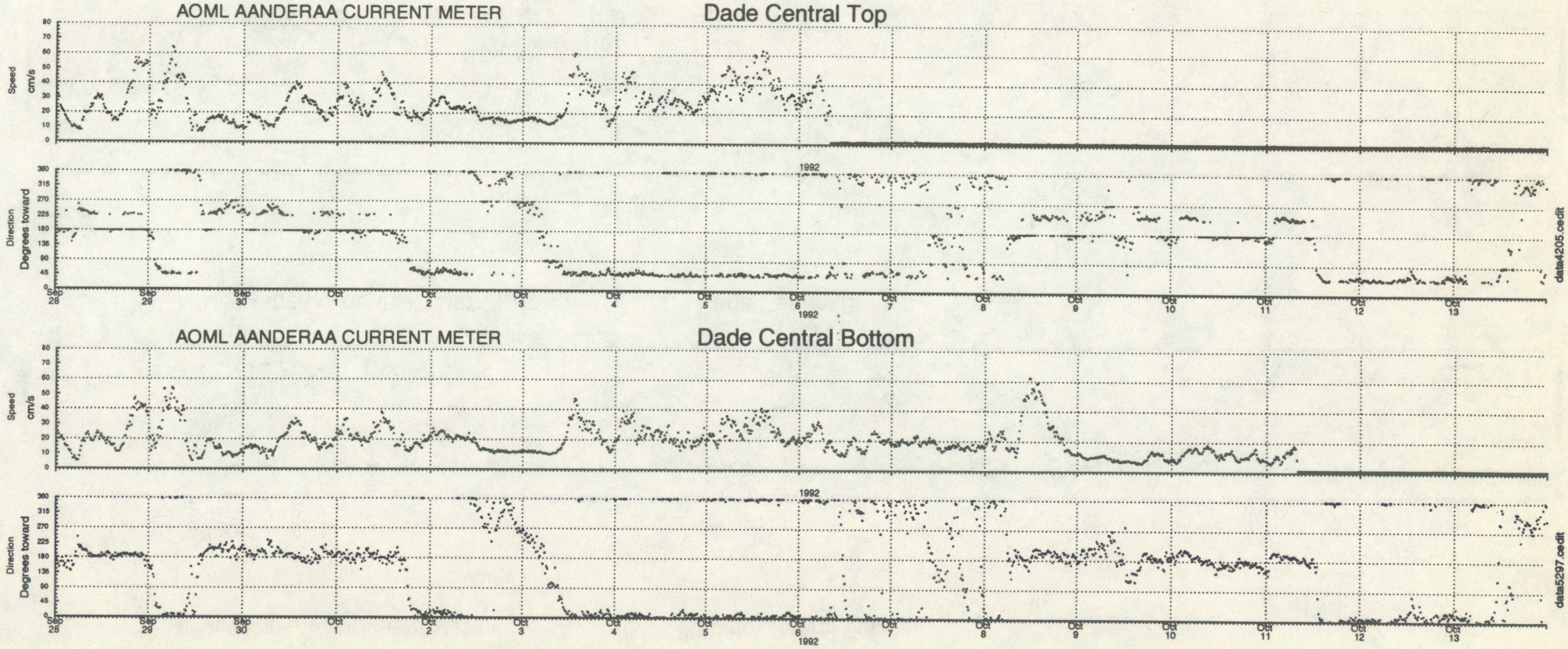
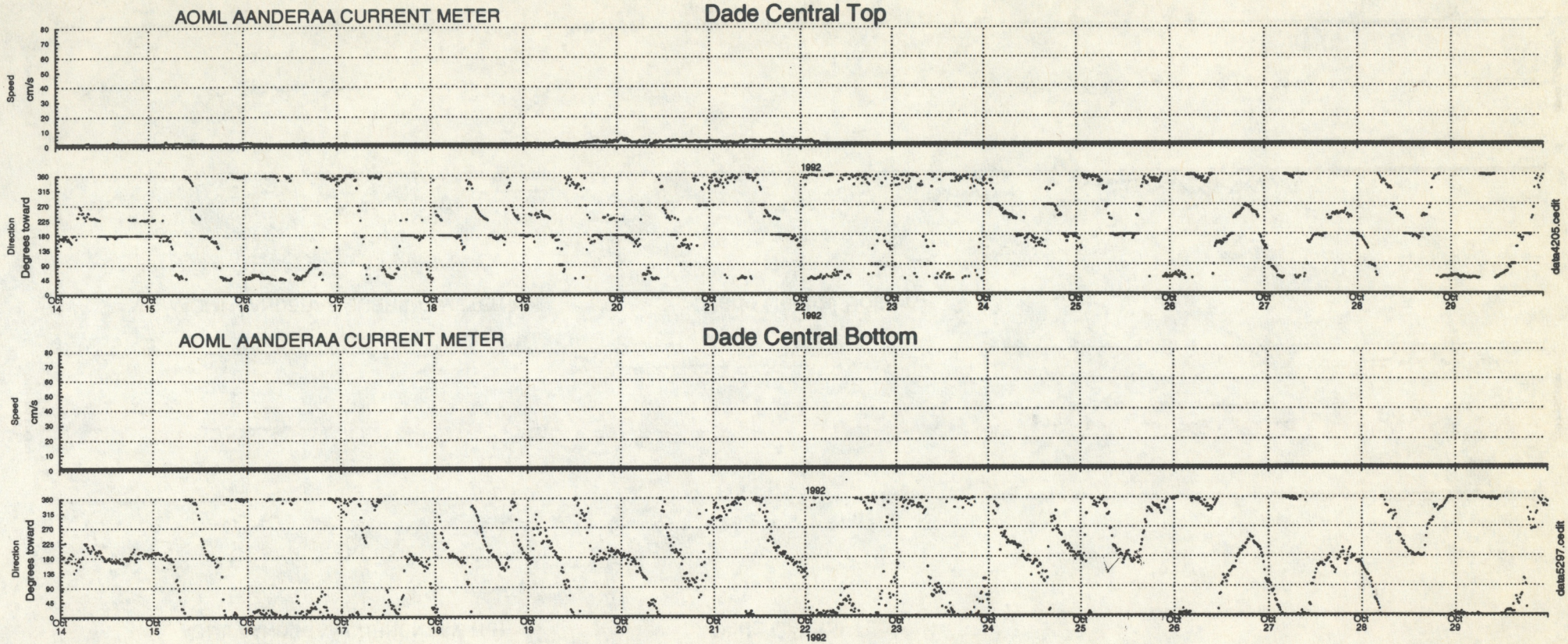
data4205.cedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
Aug 27
Aug 28
Aug 29
Aug 30
Aug 31
Sep 1
Sep 2
Sep 3
Sep 4
Sep 5
Sep 6
Sep 7
Sep 8
Sep 9
Sep 10
Sep 11
data4492.bedit

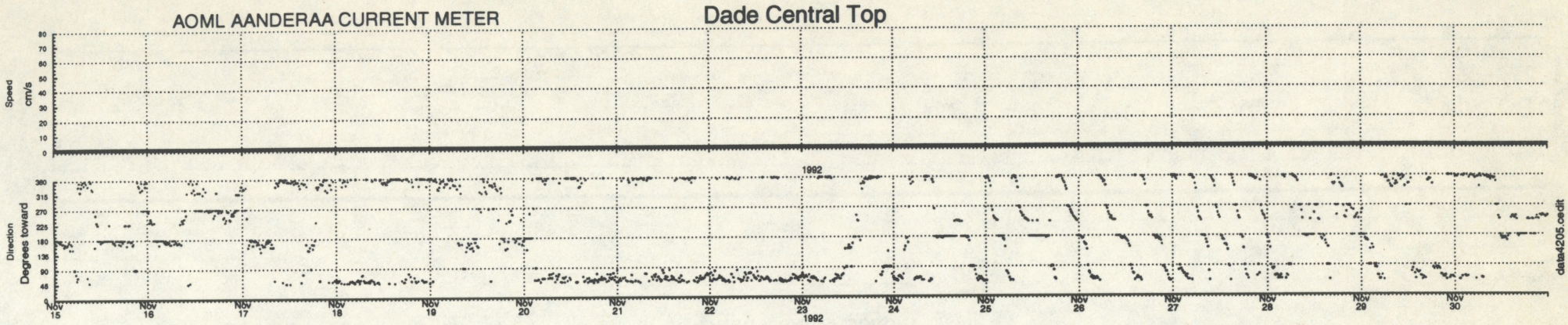

AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
Aug 27
Aug 28
Aug 29
Aug 30
Aug 31
Sep 1
Sep 2
Sep 3
Sep 4
Sep 5
Sep 6
Sep 7
Sep 8
Sep 9
Sep 10
Sep 11
data5297.cedit

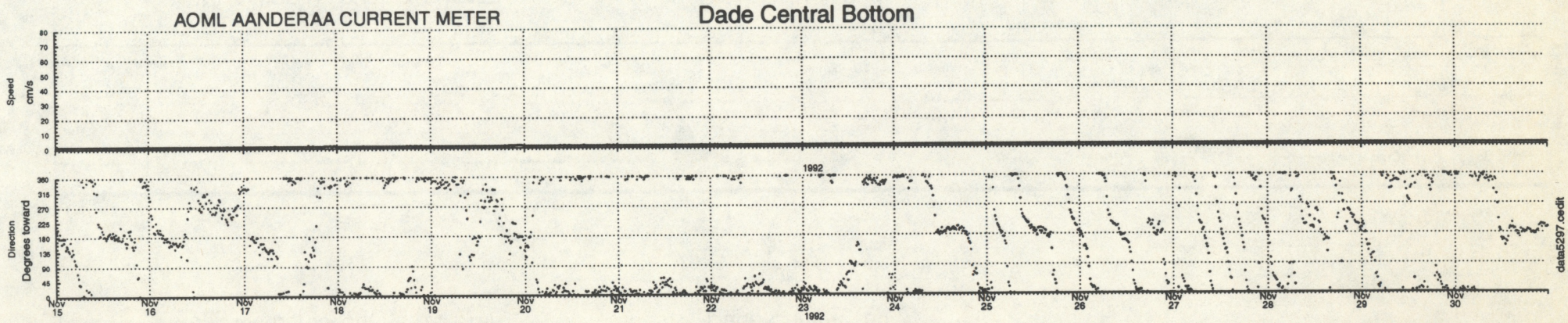

AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.cedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.cedit


AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
Sep 28
Sep 29
Sep 30
Oct 1
Oct 2
Oct 3
Oct 4
Oct 5
Oct 6
Oct 7
Oct 8
Oct 9
Oct 10
Oct 11
Oct 12
Oct 13
data4205.cedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.cedit


AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.oedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.oedit

AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
OCT
31
NOV
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1992
data4205.cadlt
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
data5297.cadlt


AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
Nov 15
Nov 16
Nov 17
Nov 18
Nov 19
Nov 20
Nov 21
Nov 22
Nov 23
Nov 24
Nov 25
Nov 26
Nov 27
Nov 28
Nov 29
Nov 30
data4205.cedit


AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
Nov 15
Nov 16
Nov 17
Nov 18
Nov 19
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Nov 21
Nov 22
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Nov 27
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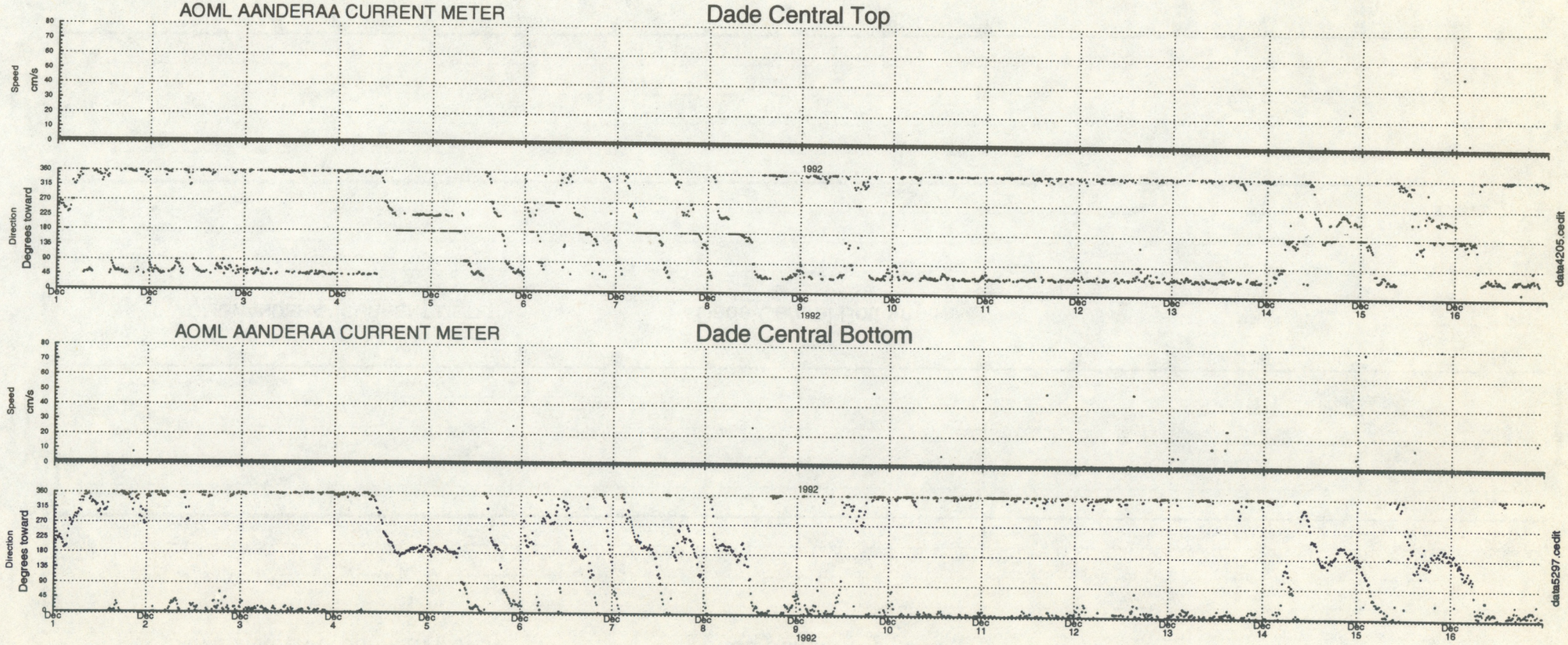
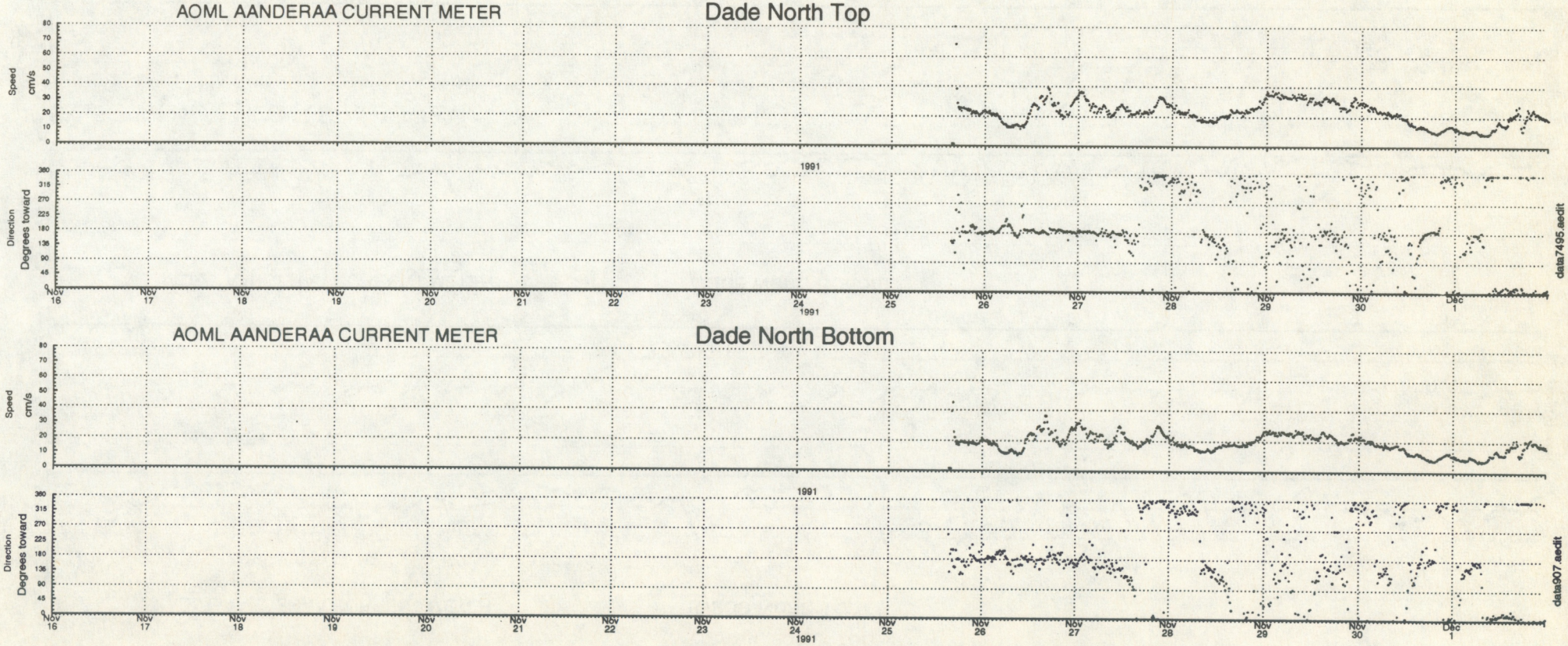
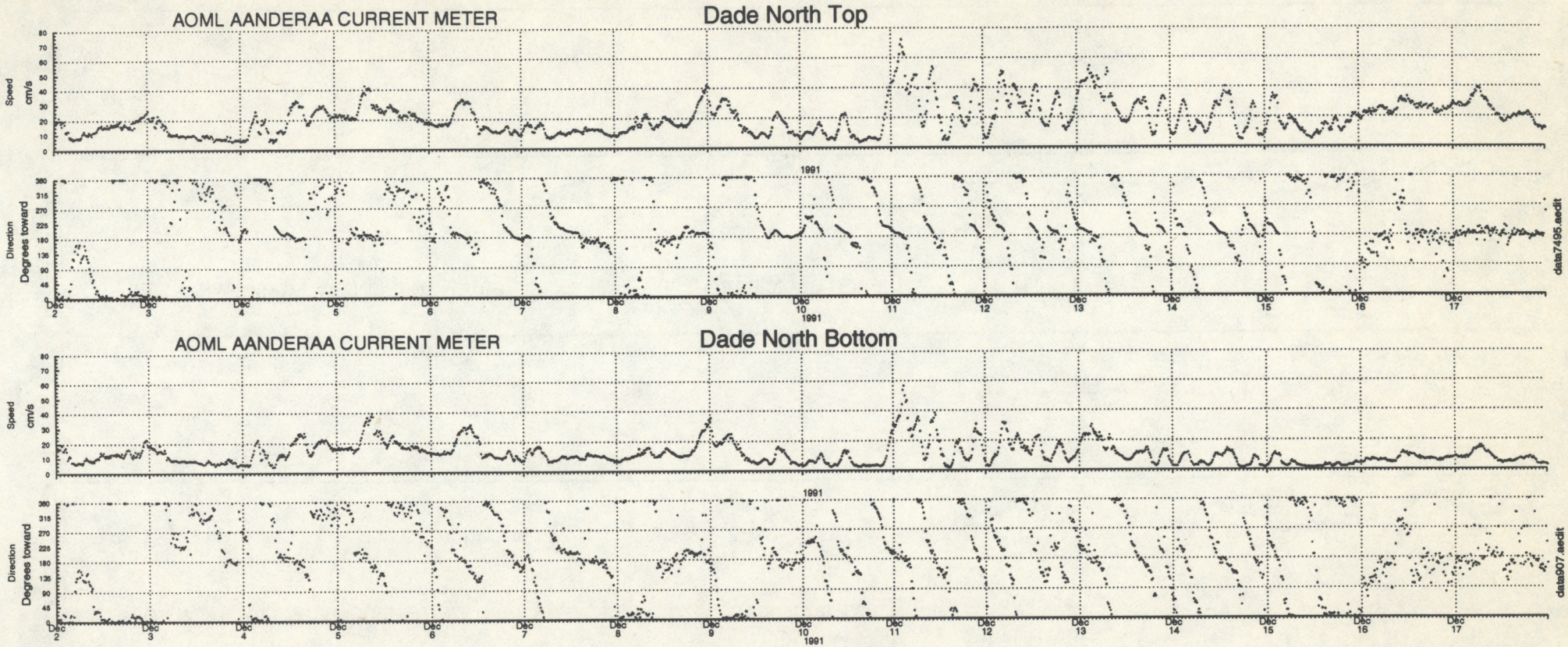
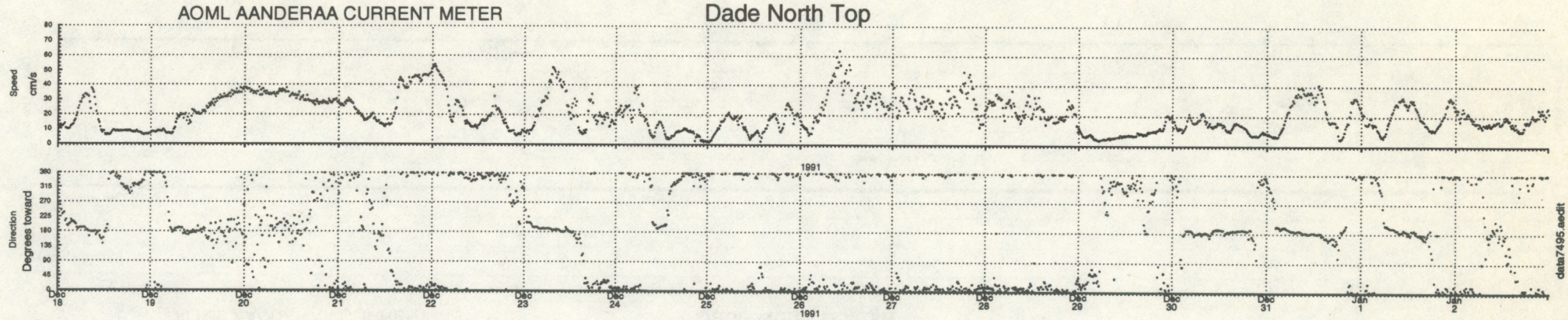
Nov 29
Nov 30
data5297.cedit

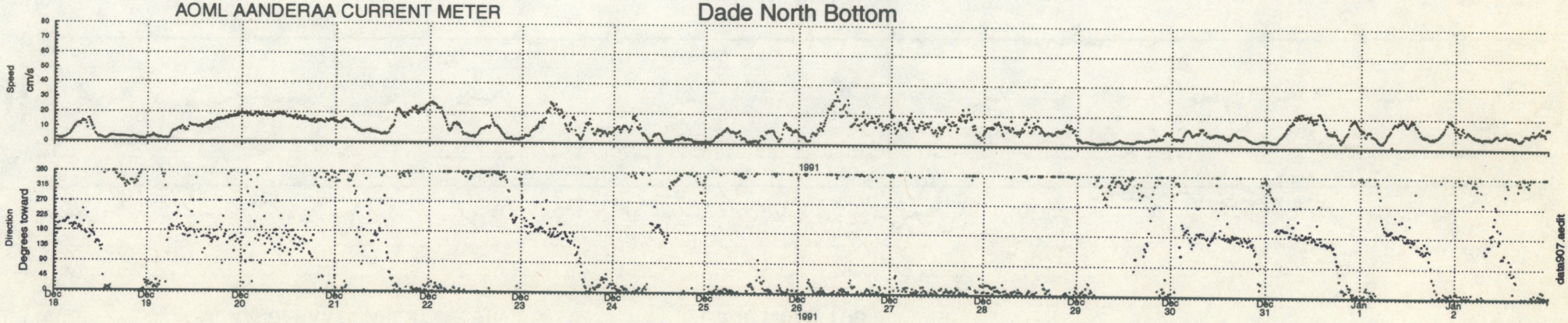

AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.cedit
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.cedit

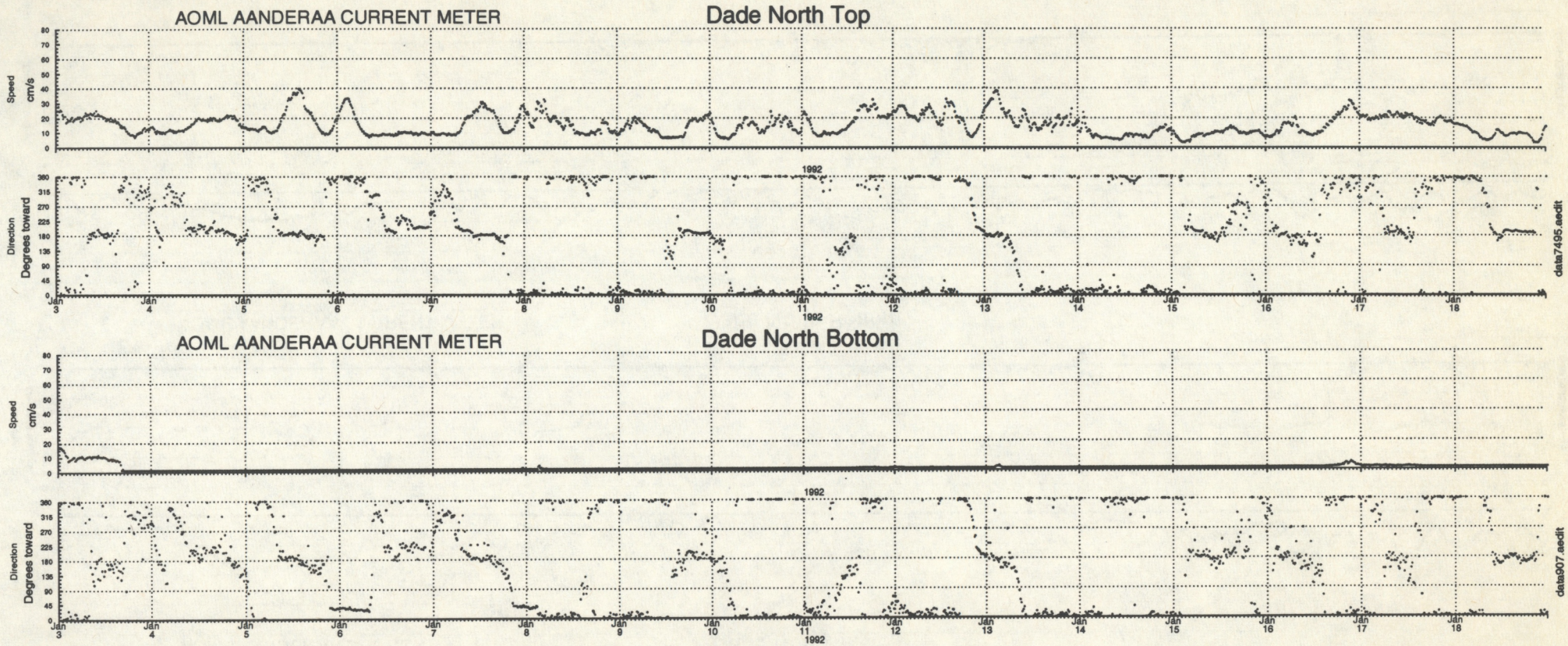
AOML AANDERAA CURRENT METER
Dade Central Top
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Dec 17
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
1992
Dec 26
Dec 27
Dec 28
Dec 29
Dec 30
Dec 31
Jan 1
data4205.cdf
AOML AANDERAA CURRENT METER
Dade Central Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Dec 17
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
1992
Dec 26
Dec 27
Dec 28
Dec 29
Dec 30
Dec 31
Jan 1
data5297.cdf

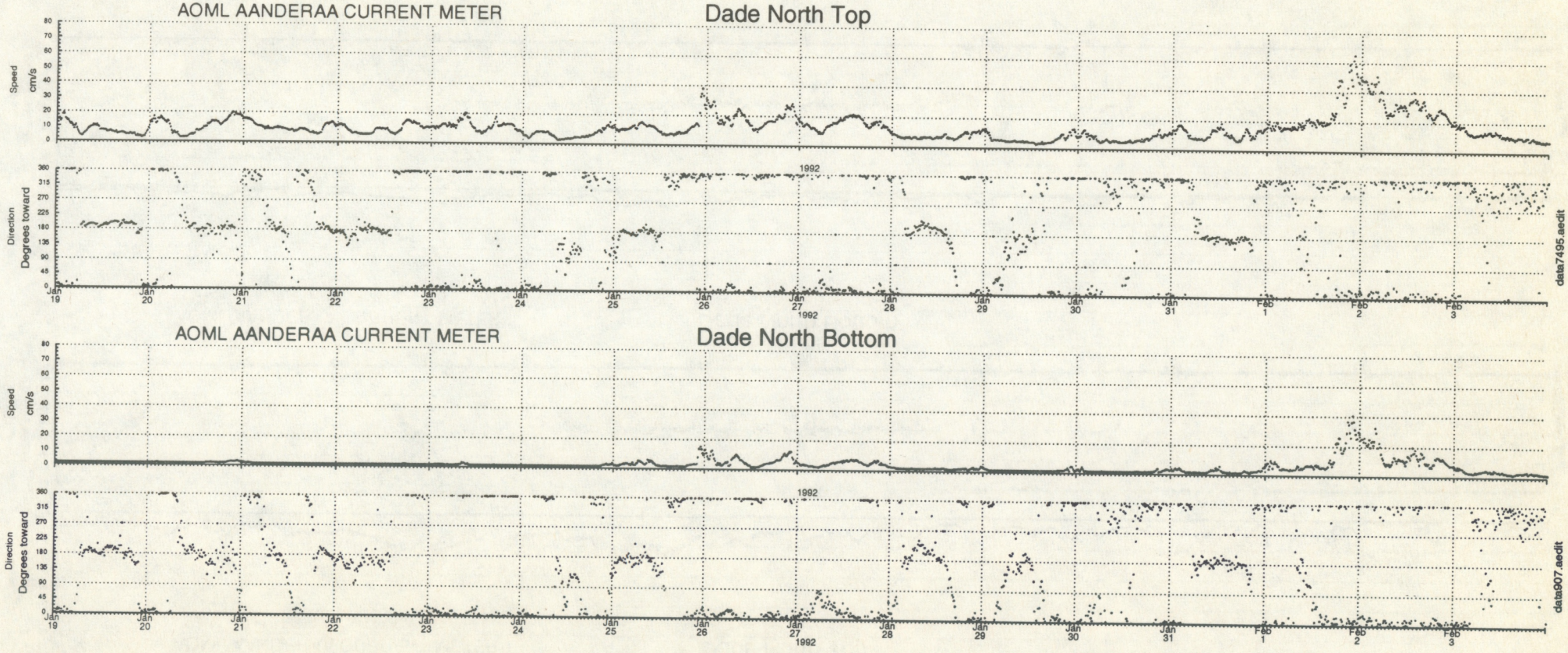

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
Nov 16
Nov 17
Nov 18
Nov 19
Nov 20
Nov 21
Nov 22
Nov 23
Nov 24
1991
Nov 25
Nov 26
Nov 27
Nov 28
Nov 29
Nov 30
Dec 1
data7495.aedit
AOML AANDERAA CURRENT METER
Dade North Bottom
data907.aedit

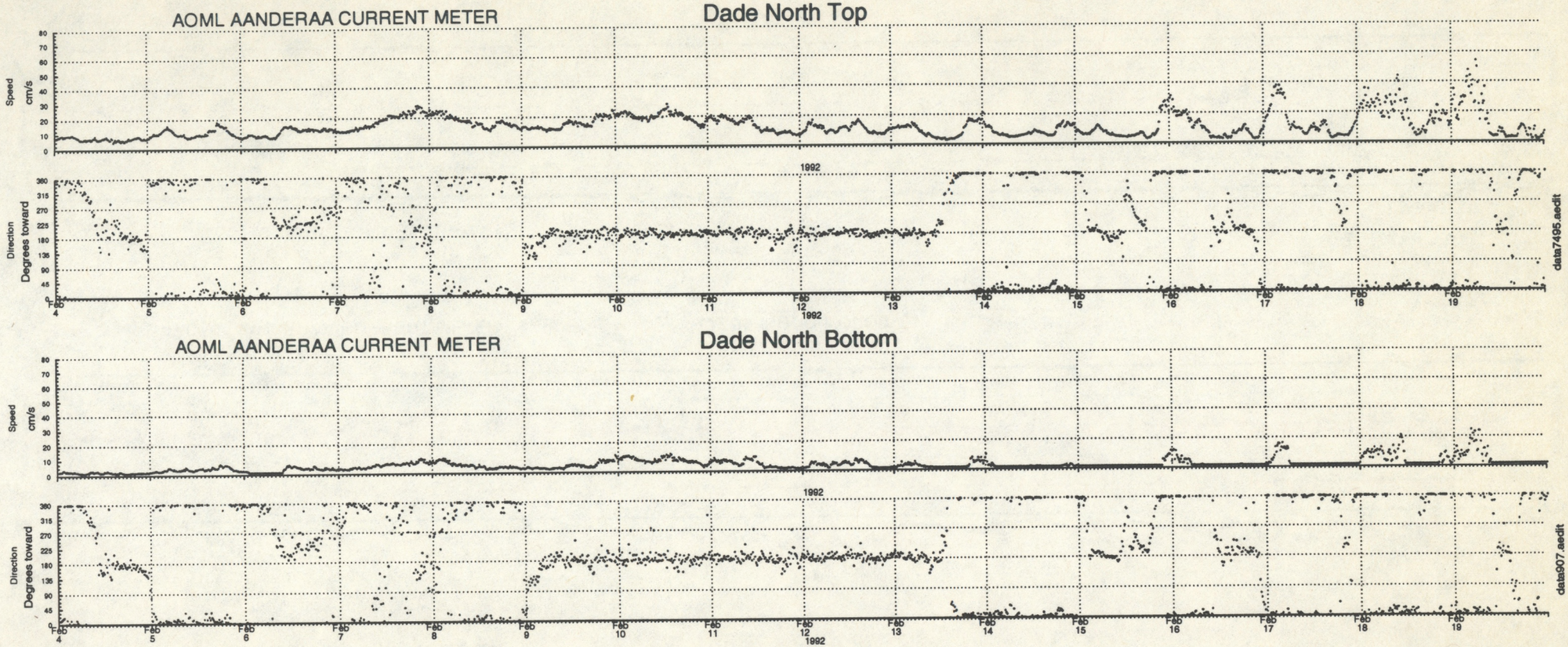

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1991
data7495.aedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1991
data907.aedit


AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1991
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
Dec 26
Dec 27
Dec 28
Dec 29
Dec 30
Dec 31
Jan 1
Jan 2
data7495.aedit

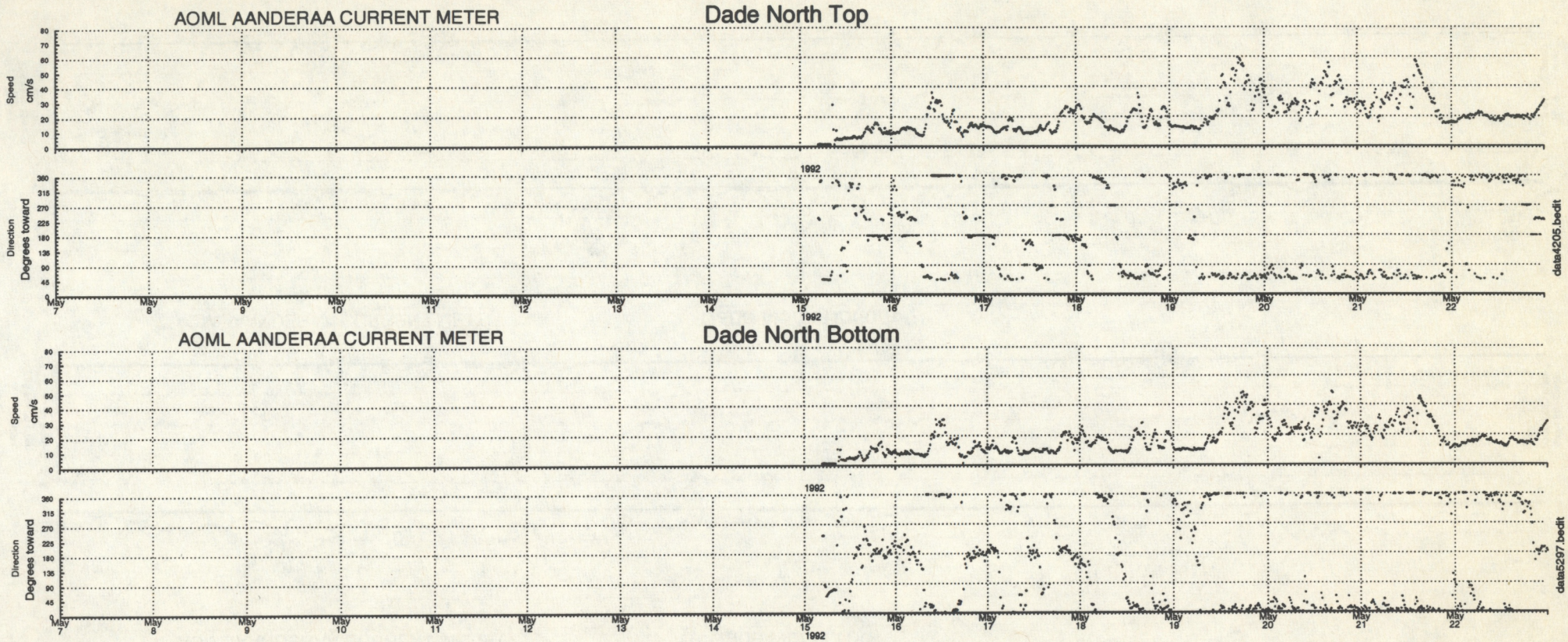

AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1991
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
Dec 26
Dec 27
Dec 28
Dec 29
Dec 30
Dec 31
Jan 1
Jan 2
data907.aedit

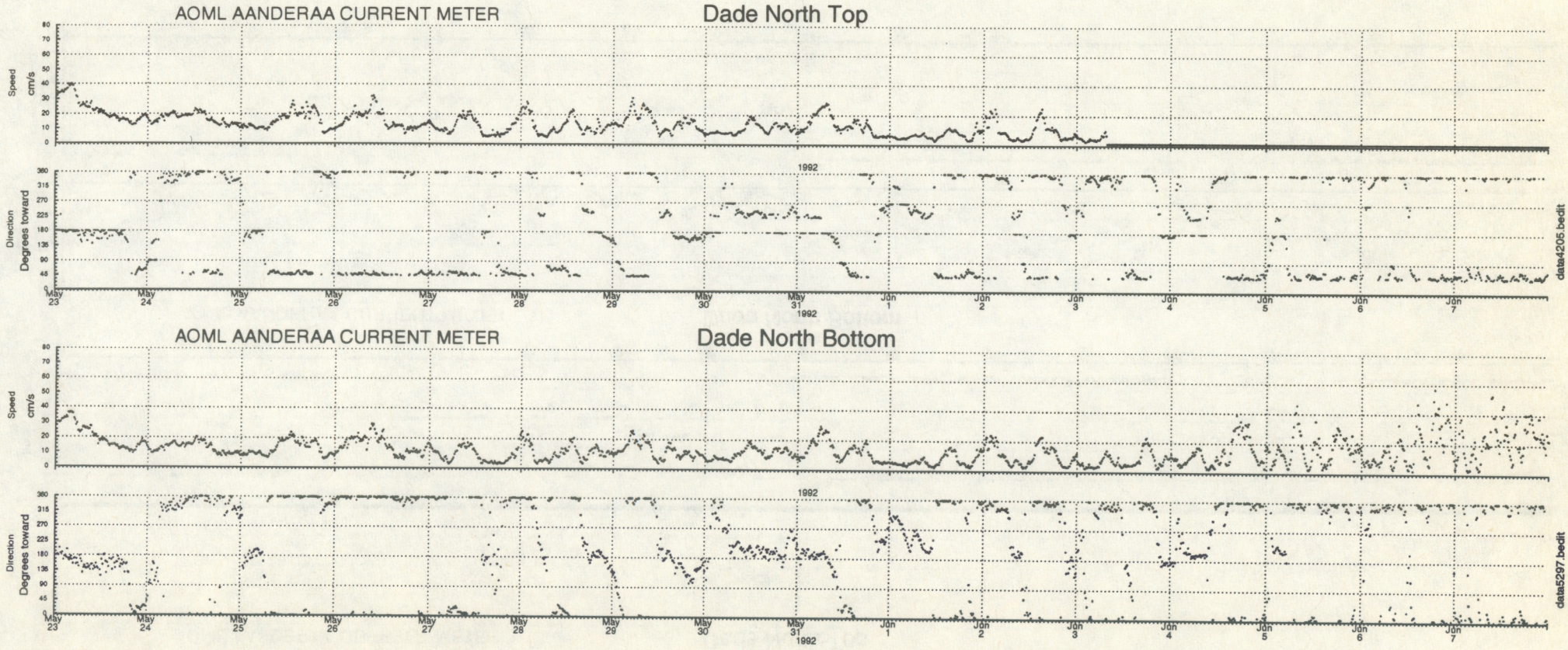

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.aedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data907.aedit

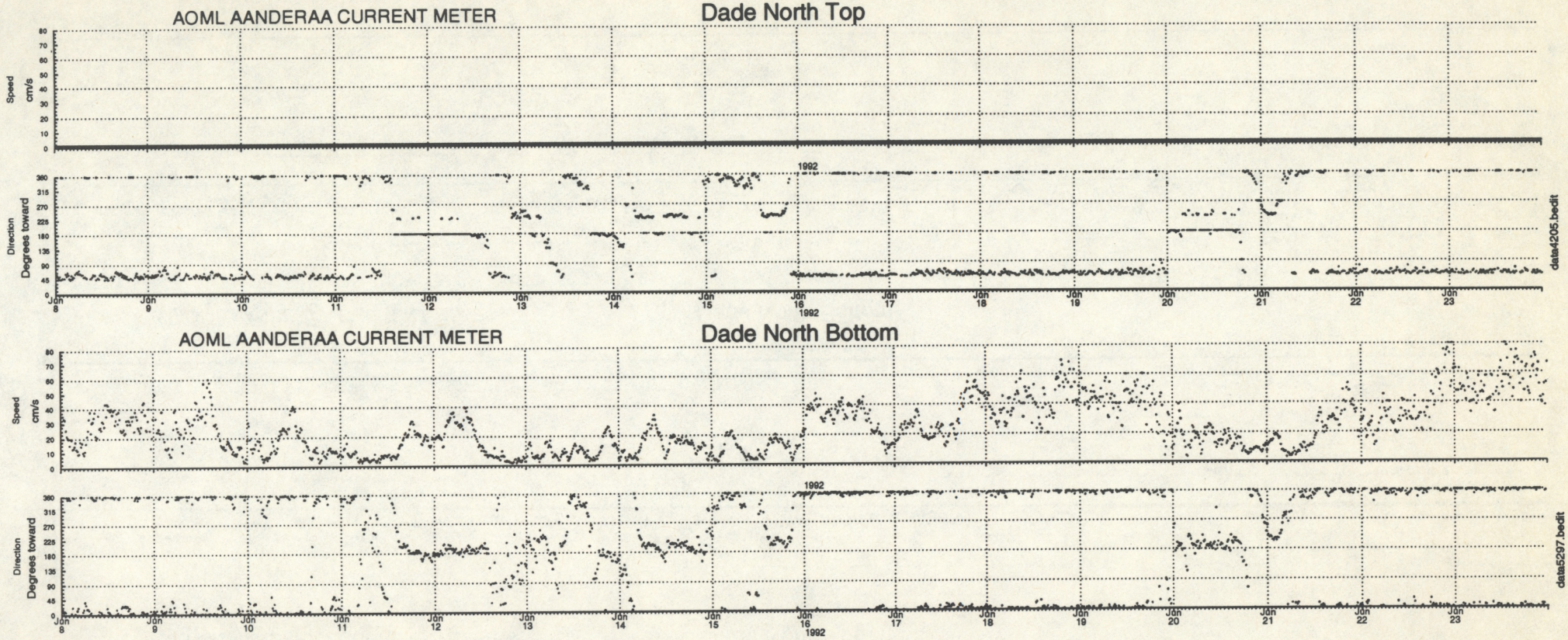

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.aedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data907.aedit

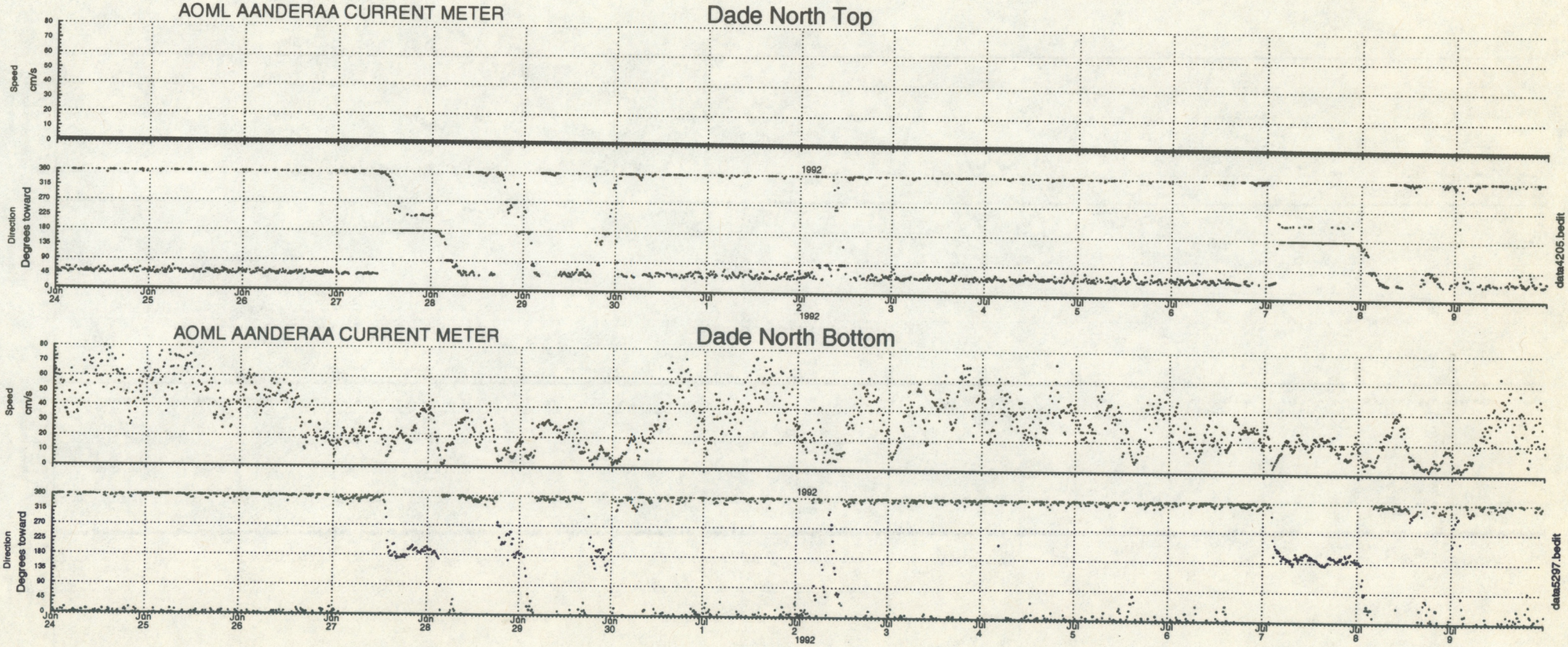

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.aedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data907.aedit

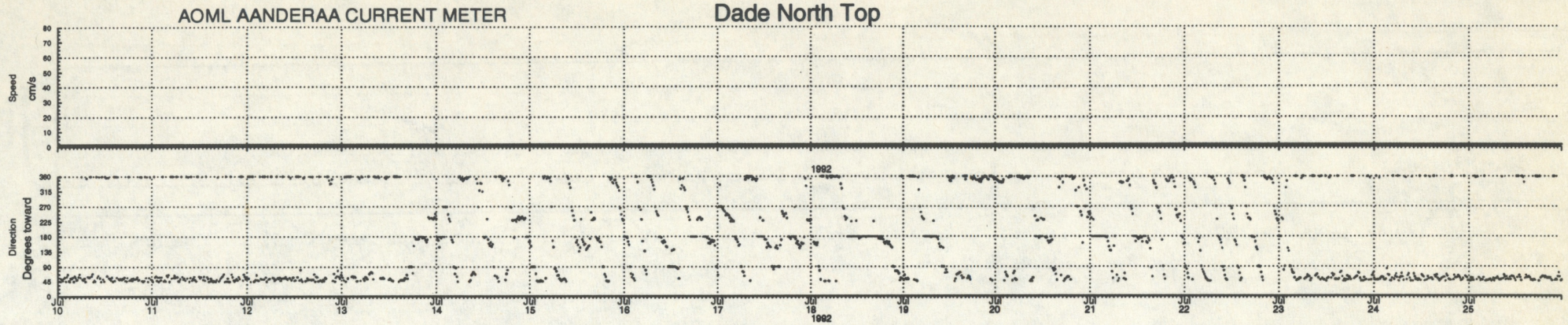
AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
data7495.aadit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
data907.aadit

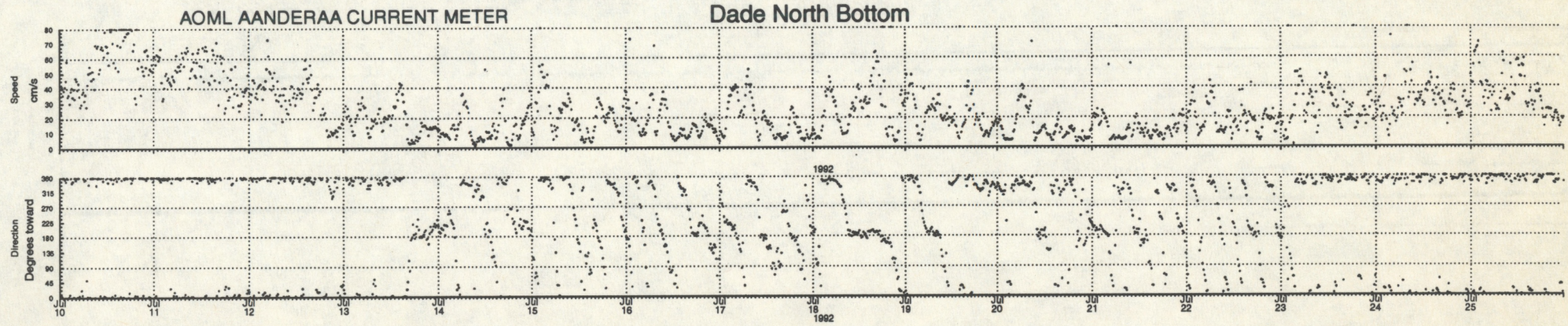

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
May 7
May 8
May 9
May 10
May 11
May 12
May 13
May 14
May 15
May 16
May 17
May 18
May 19
May 20
May 21
May 22
data4205.bedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit

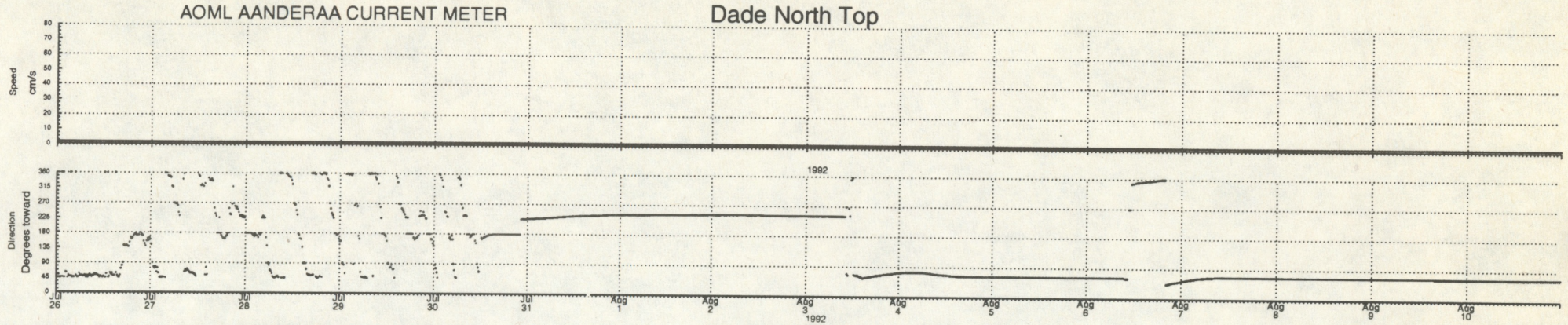

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
May 23
May 24
May 25
May 26
May 27
May 28
May 29
May 30
May 31
Jun 1
Jun 2
Jun 3
Jun 4
Jun 5
Jun 6
Jun 7
data4205.bedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit

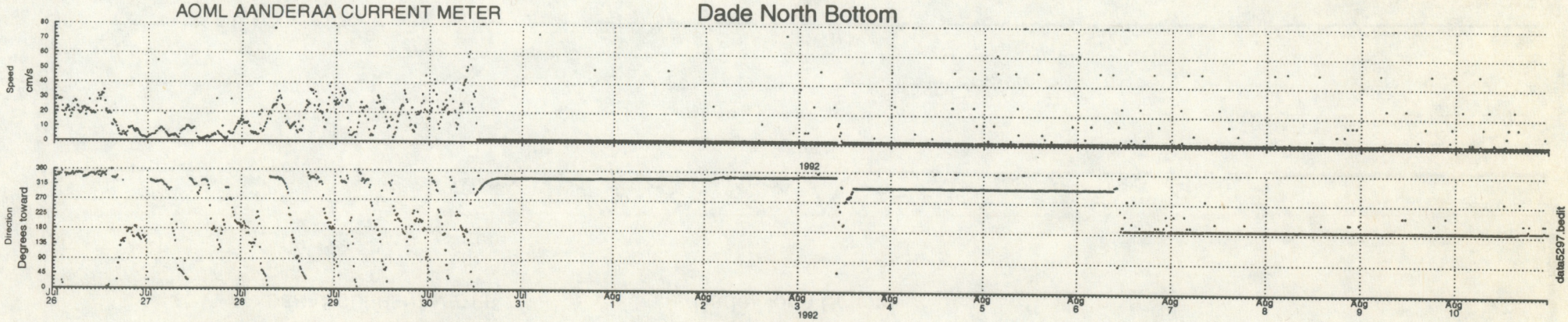

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.bedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit

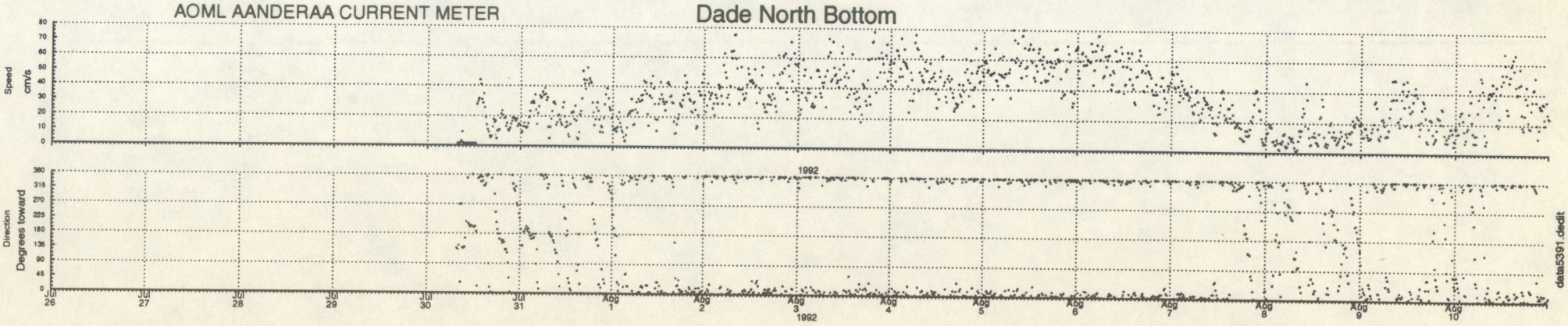

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.bedit
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit

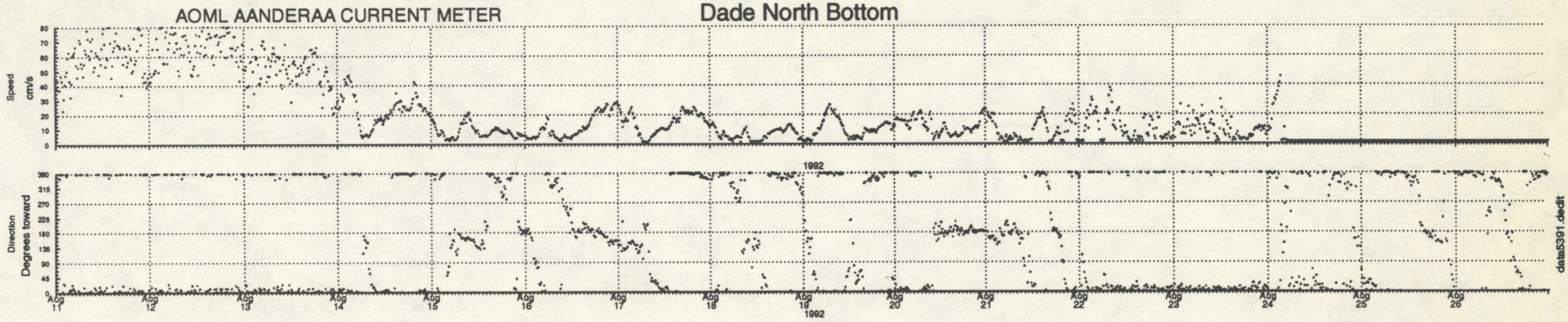

AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.bedit


AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit


AOML AANDERAA CURRENT METER
Dade North Top
Speed
cm/s
Direction
Degrees toward
1992
data4205.bedit


AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5297.bedit

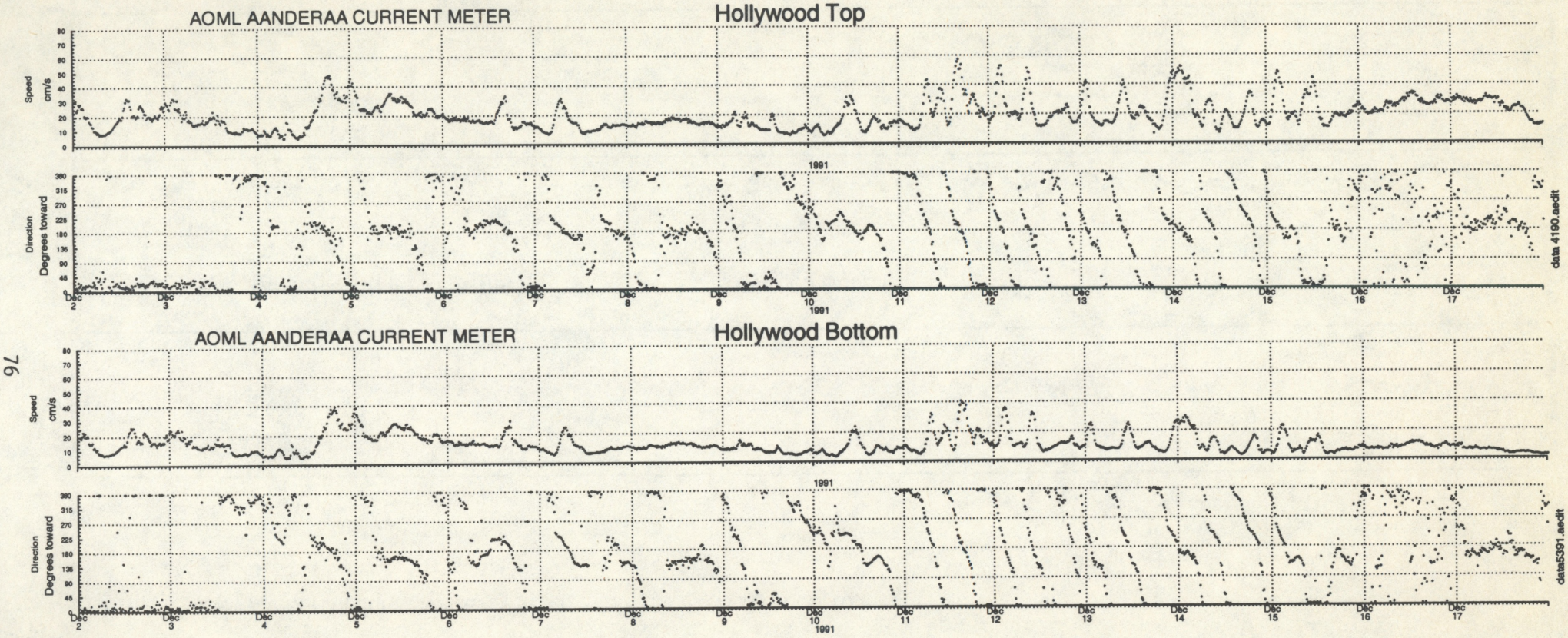

AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5391.dedit

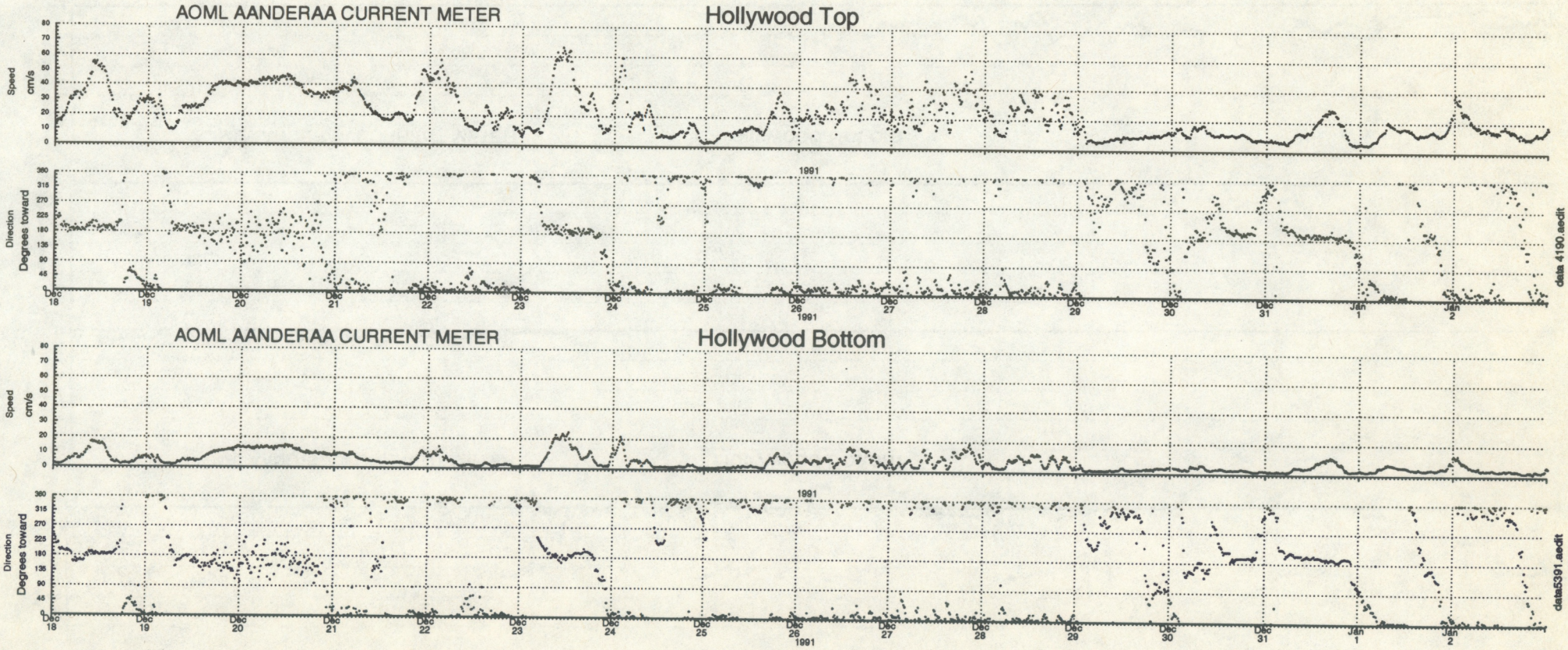

AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Aug 11
Aug 12
Aug 13
Aug 14
Aug 15
Aug 16
Aug 17
Aug 18
Aug 19
1992
Aug 20
Aug 21
Aug 22
Aug 23
Aug 24
Aug 25
Aug 26
data5391.dedit

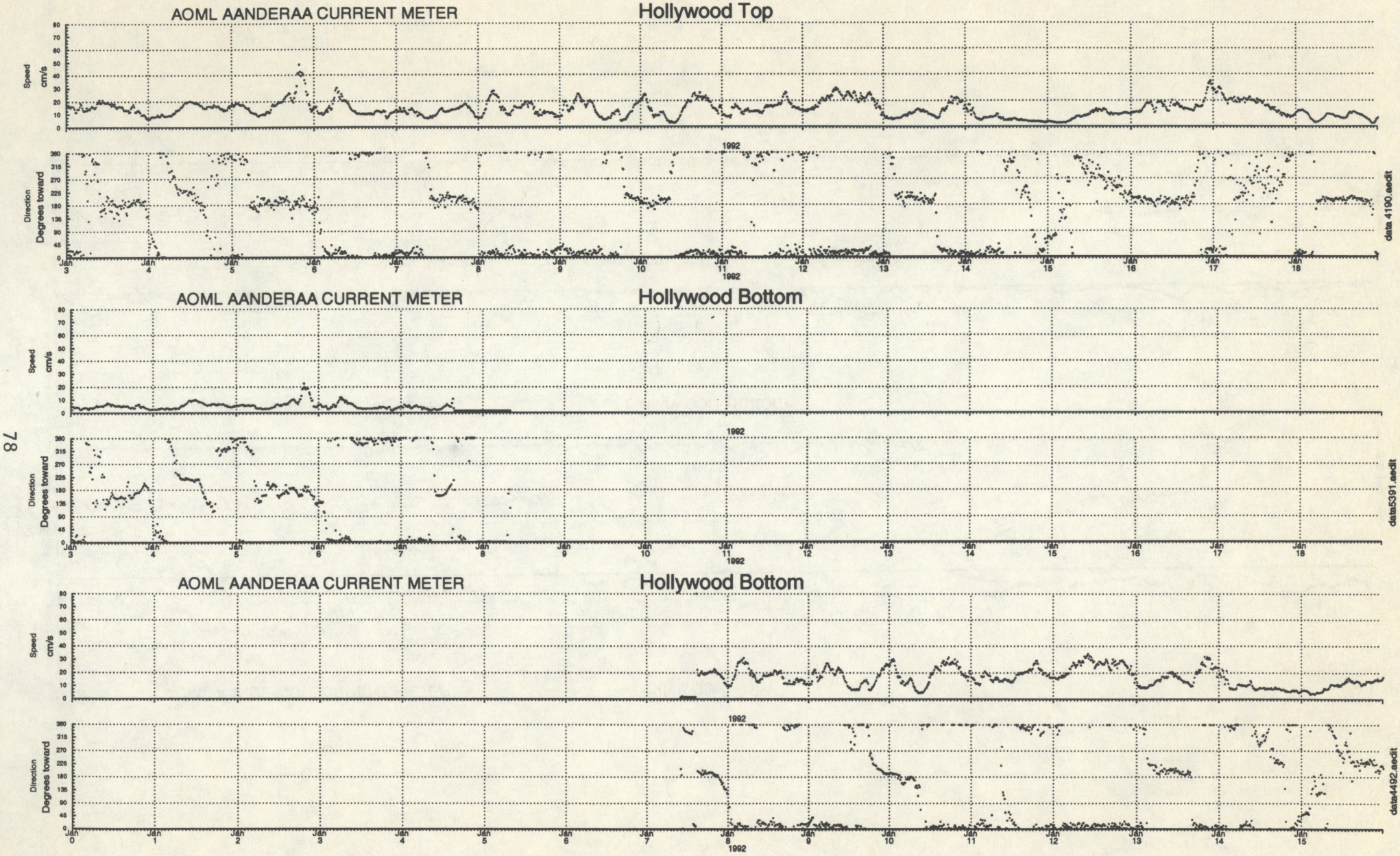
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Aug 27
Aug 28
Aug 29
Aug 30
Aug 31
Sep 1
Sep 2
Sep 3
Sep 4
1992
Sep 5
Sep 6
Sep 7
Sep 8
Sep 9
Sep 10
Sep 11
data5391.dadt

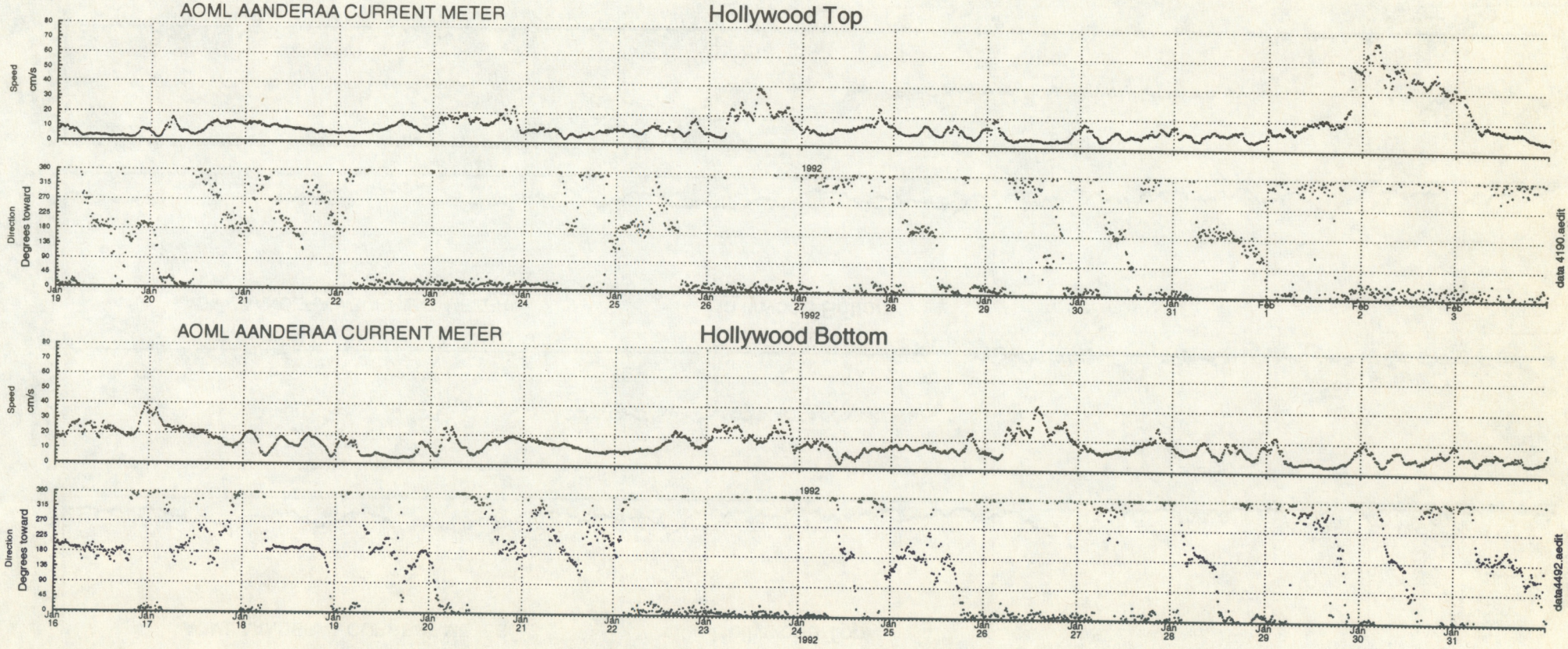
AOML AANDERAA CURRENT METER
Dade North Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Sep 12
Sep 13
Sep 14
Sep 15
Sep 16
Sep 17
Sep 18
Sep 19
Sep 20
1992
Sep 21
Sep 22
Sep 23
Sep 24
Sep 25
Sep 26
Sep 27
data5391.dadit

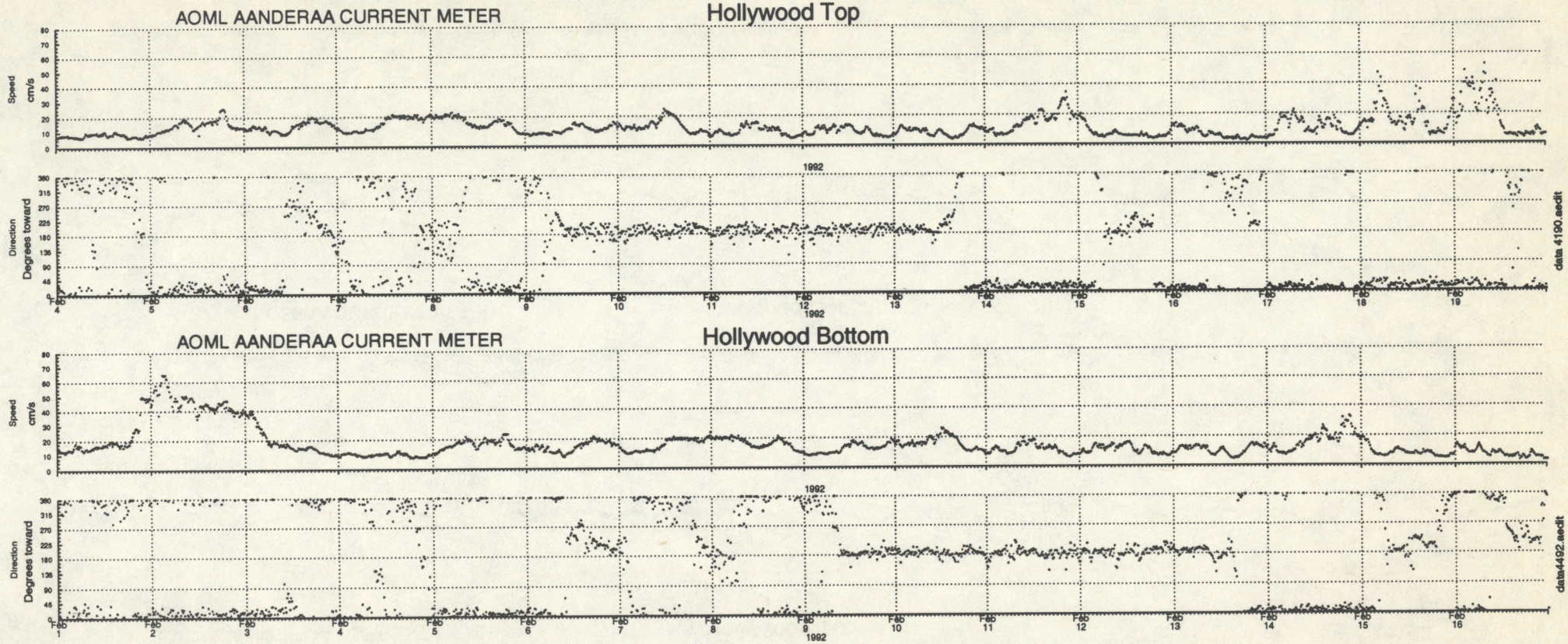
AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
NOV 16
NOV 17
NOV 18
NOV 19
NOV 20
NOV 21
NOV 22
NOV 23
NOV 24
1991
NOV 25
NOV 26
NOV 27
NOV 28
NOV 29
NOV 30
DEC 1
data 4190.aadit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1991
data5391.aadit

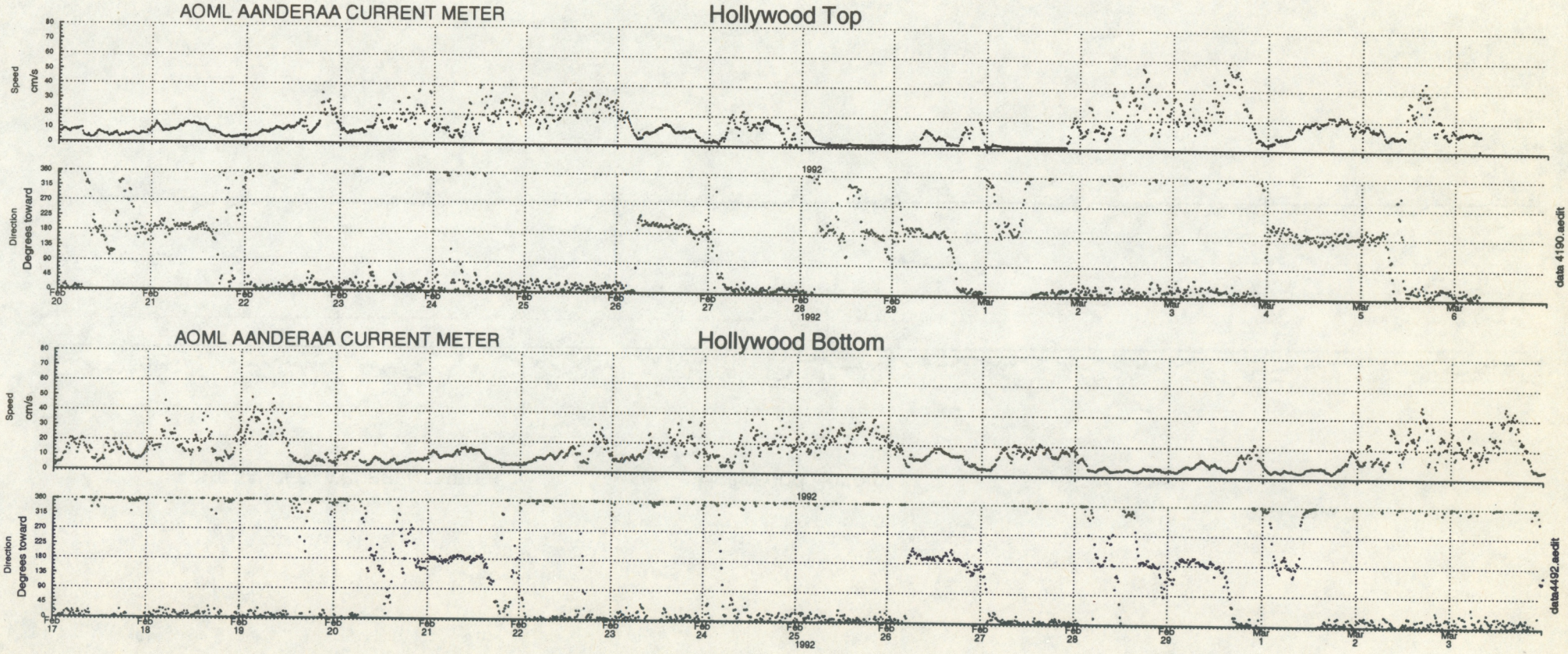

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1991
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1991
data5391.aedit

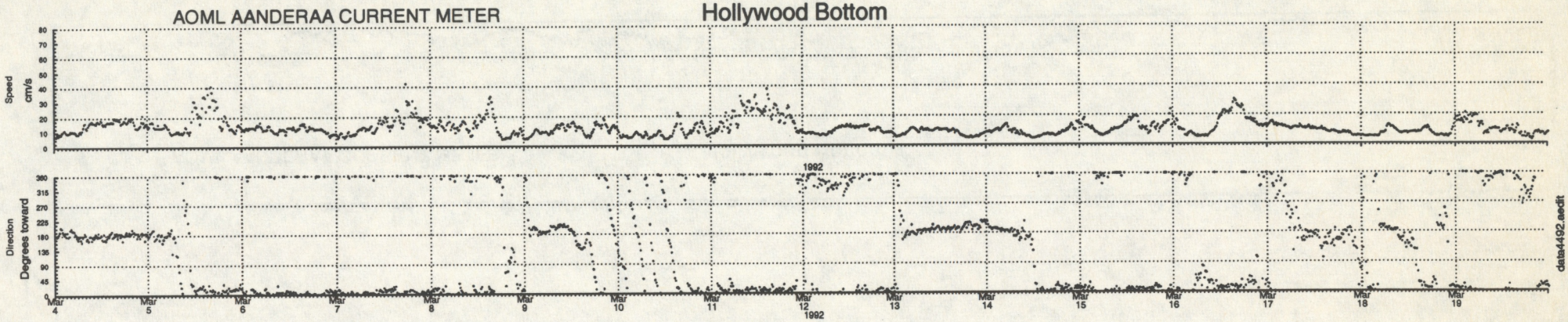

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1991
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1991
data5391.aedit

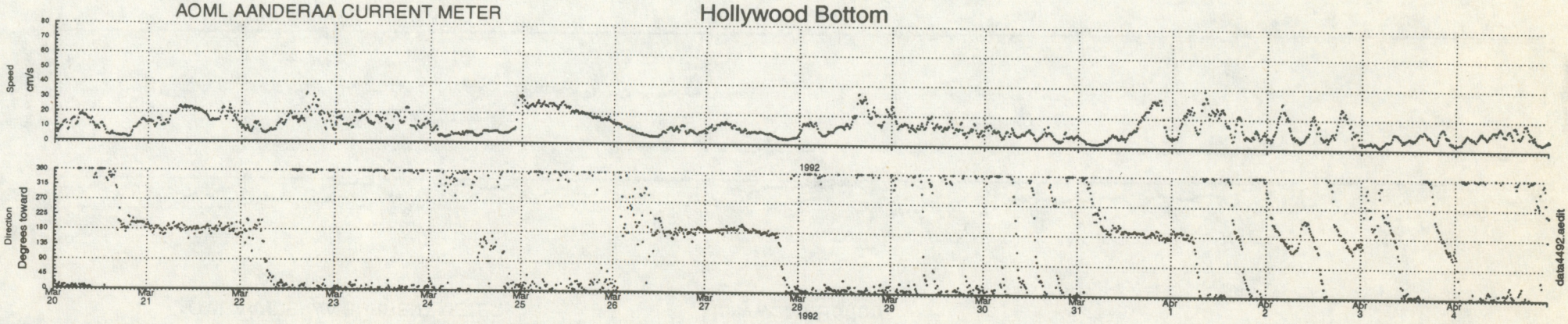

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
1992
Direction
Degrees toward
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
1992
Direction
Degrees toward
data5391.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
1992
Direction
Degrees toward
data4492.aedit


AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1992
data4492.aedit

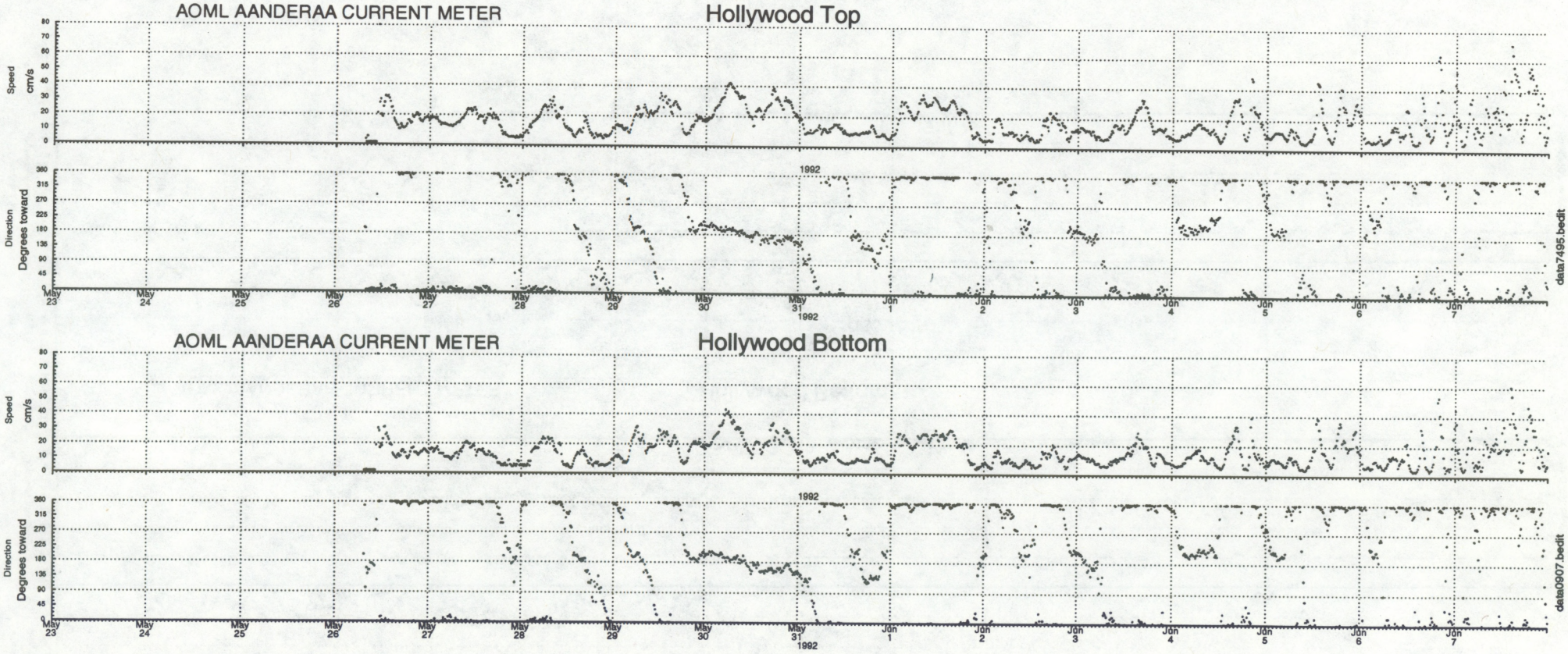

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1992
data4492.aedit

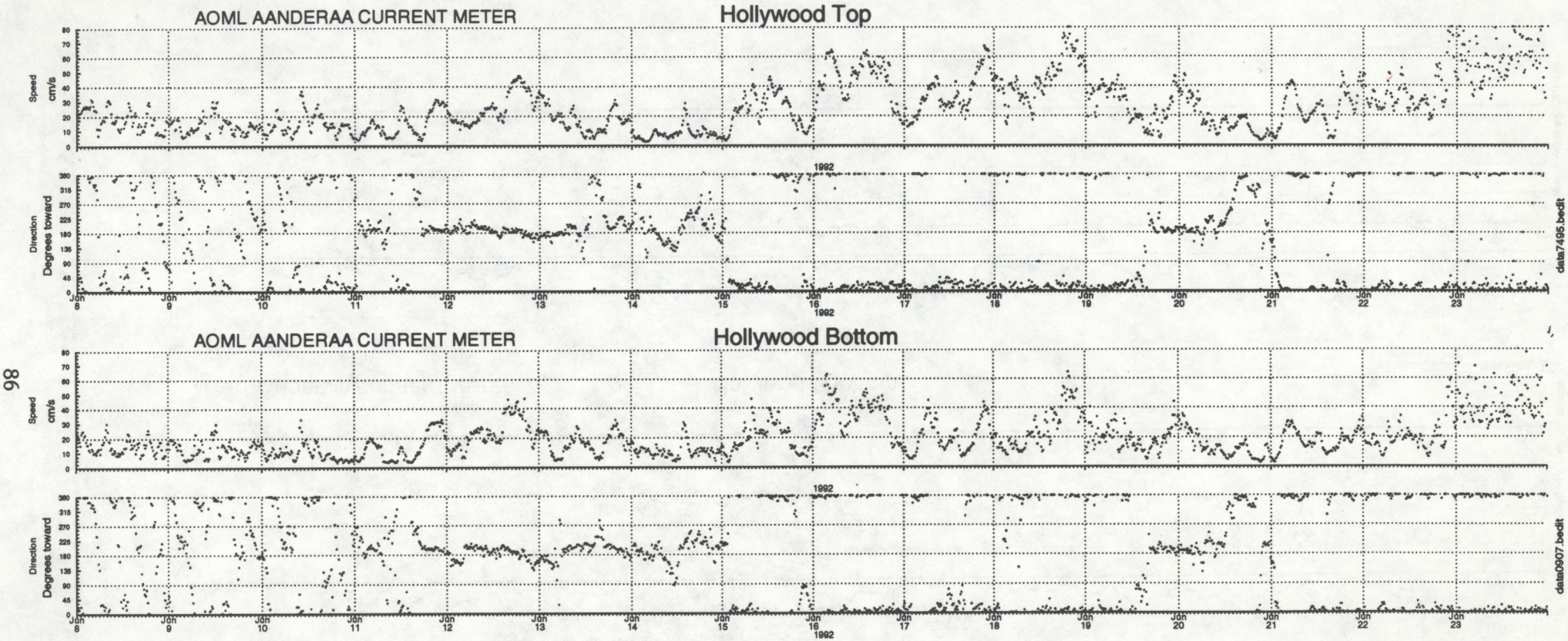

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data 4190.aedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1992
data4492.aedit


AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Mar 4
Mar 5
Mar 6
Mar 7
Mar 8
Mar 9
Mar 10
Mar 11
Mar 12
1992
Mar 13
Mar 14
Mar 15
Mar 16
Mar 17
Mar 18
Mar 19
data4492.aedit

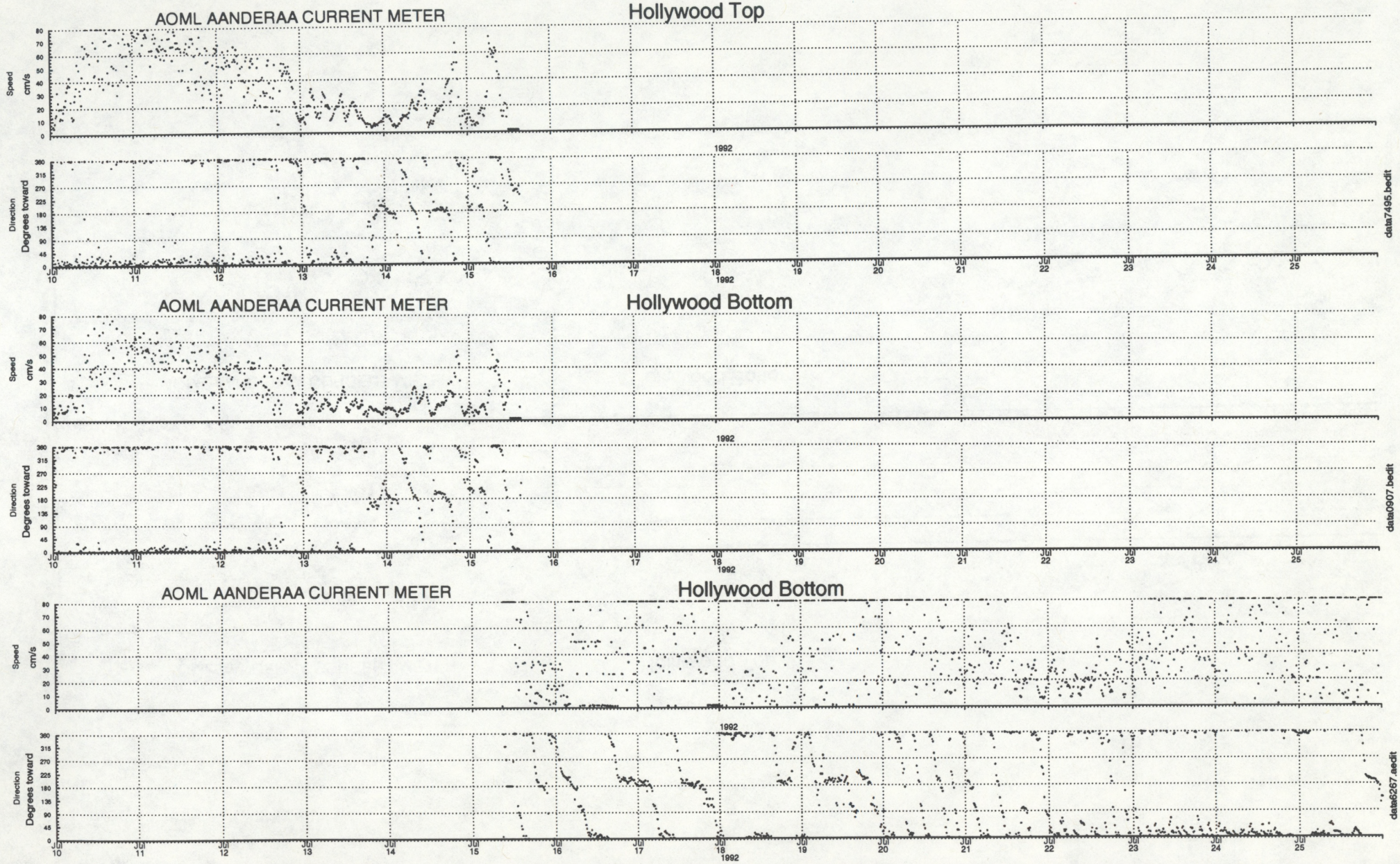

AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Mar 20
Mar 21
Mar 22
Mar 23
Mar 24
Mar 25
Mar 26
Mar 27
Mar 28
1992
Mar 29
Mar 30
Mar 31
Abr 1
Abr 2
Abr 3
Abr 4
data4492.aedit

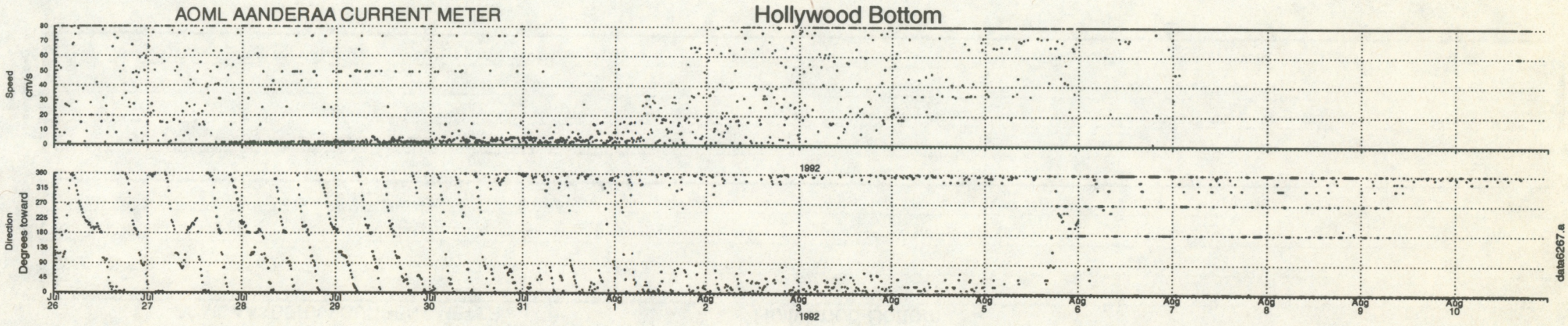
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Apr
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1992
data492.aadit

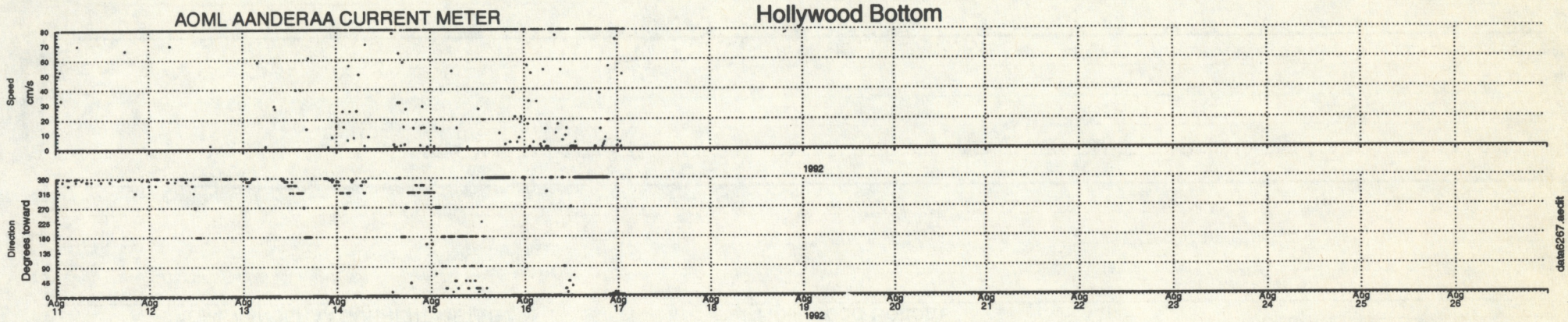

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
May 23
May 24
May 25
May 26
May 27
May 28
May 29
May 30
May 31
Jun 1
Jun 2
Jun 3
Jun 4
Jun 5
Jun 6
Jun 7
data7495.bedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
data0907.bedit


AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.bedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1992
data0907.bedit

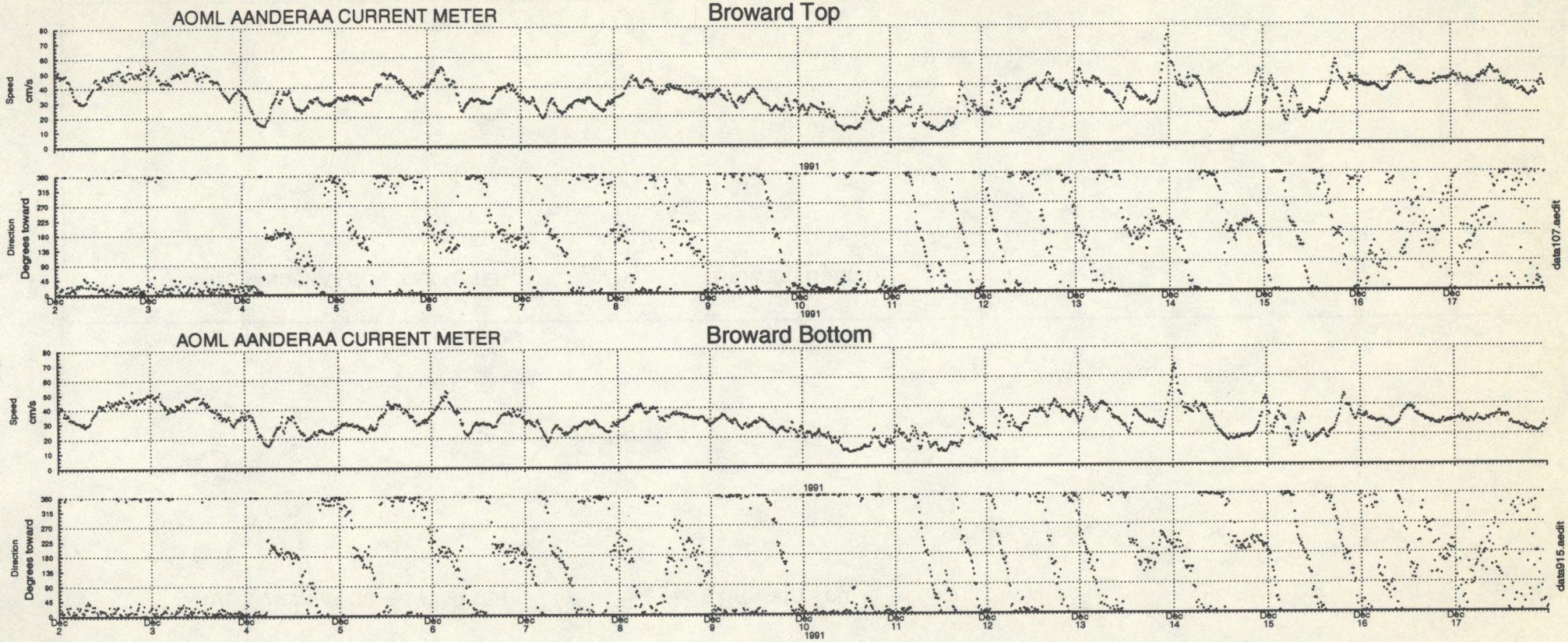
AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.bedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
Direction
Degrees toward
1992
data0907.bedit

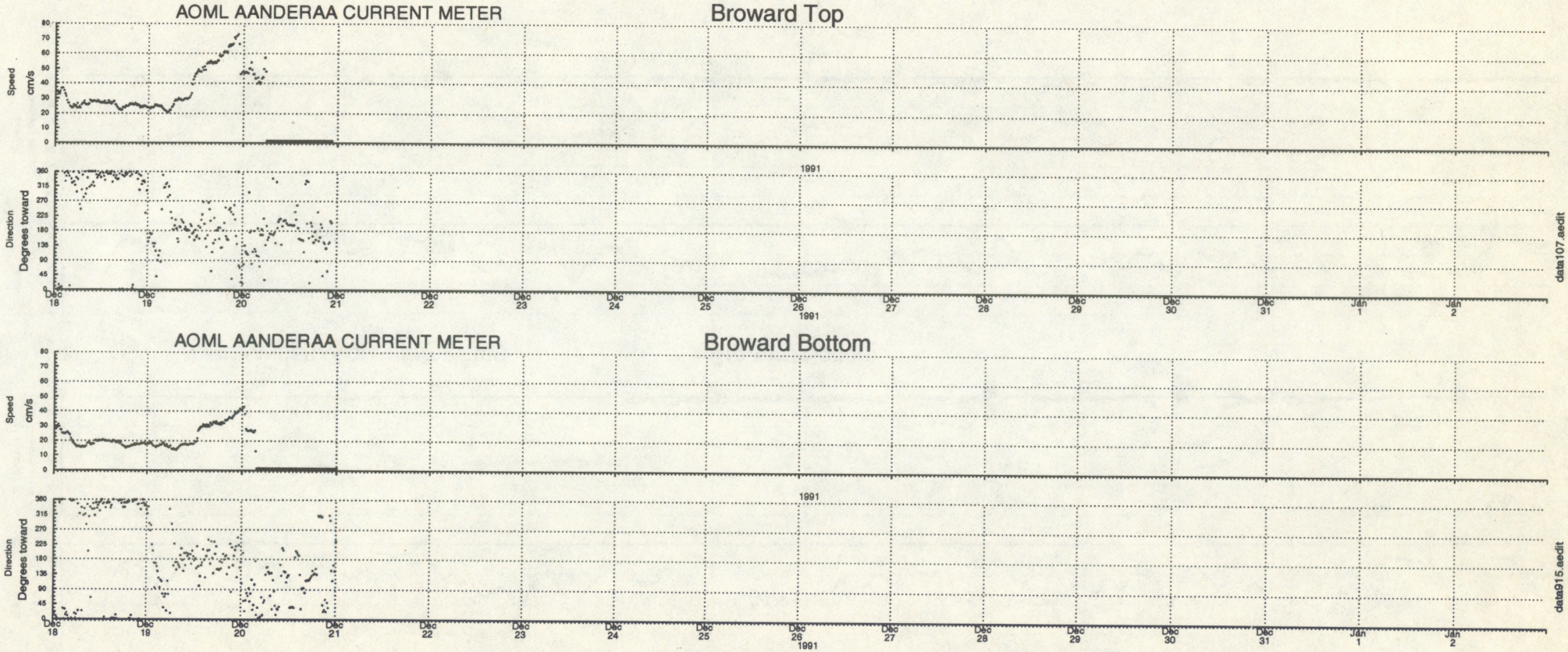

AOML AANDERAA CURRENT METER
Hollywood Top
Speed
cm/s
Direction
Degrees toward
1992
data7495.bedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
data0907.bedit
AOML AANDERAA CURRENT METER
Hollywood Bottom
data6267.aedit

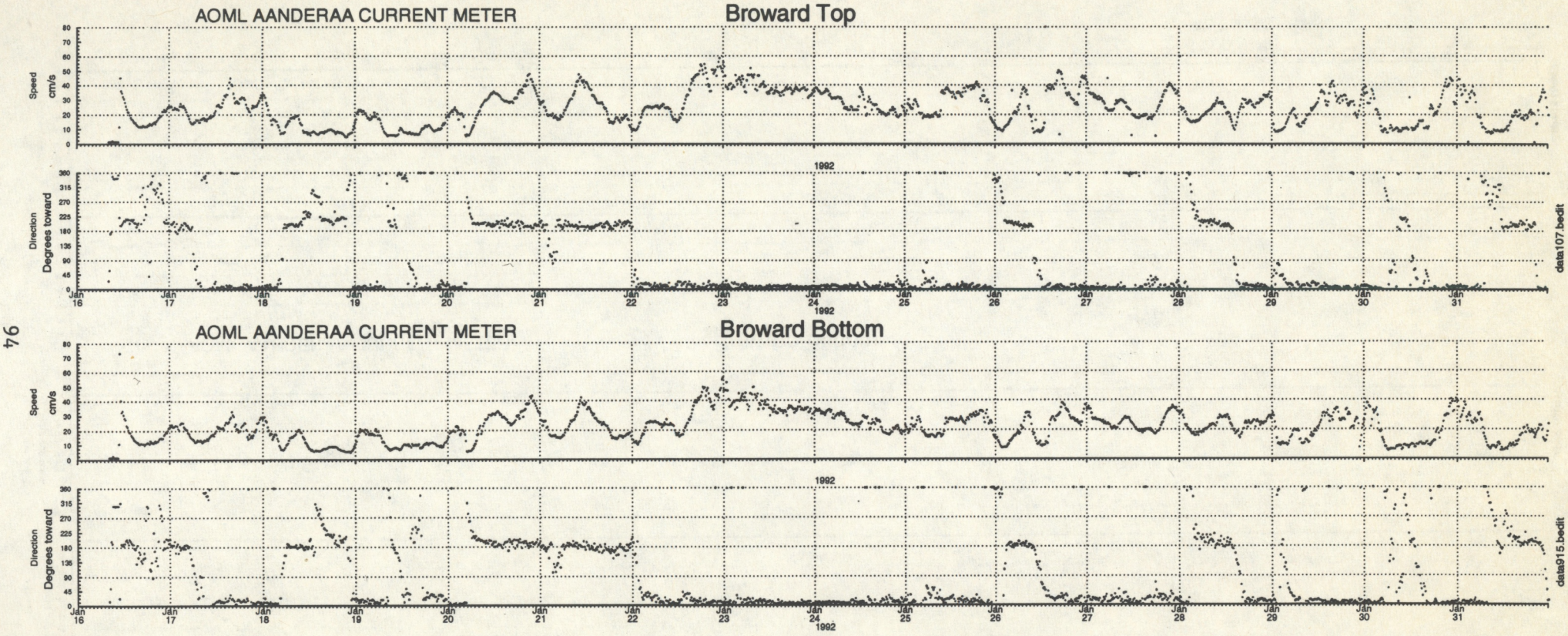

AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Jul 26
Jul 27
Jul 28
Jul 29
Jul 30
Jul 31
Aug 1
Aug 2
Aug 3
Aug 4
Aug 5
Aug 6
Aug 7
Aug 8
Aug 9
Aug 10
1992
data6267.a

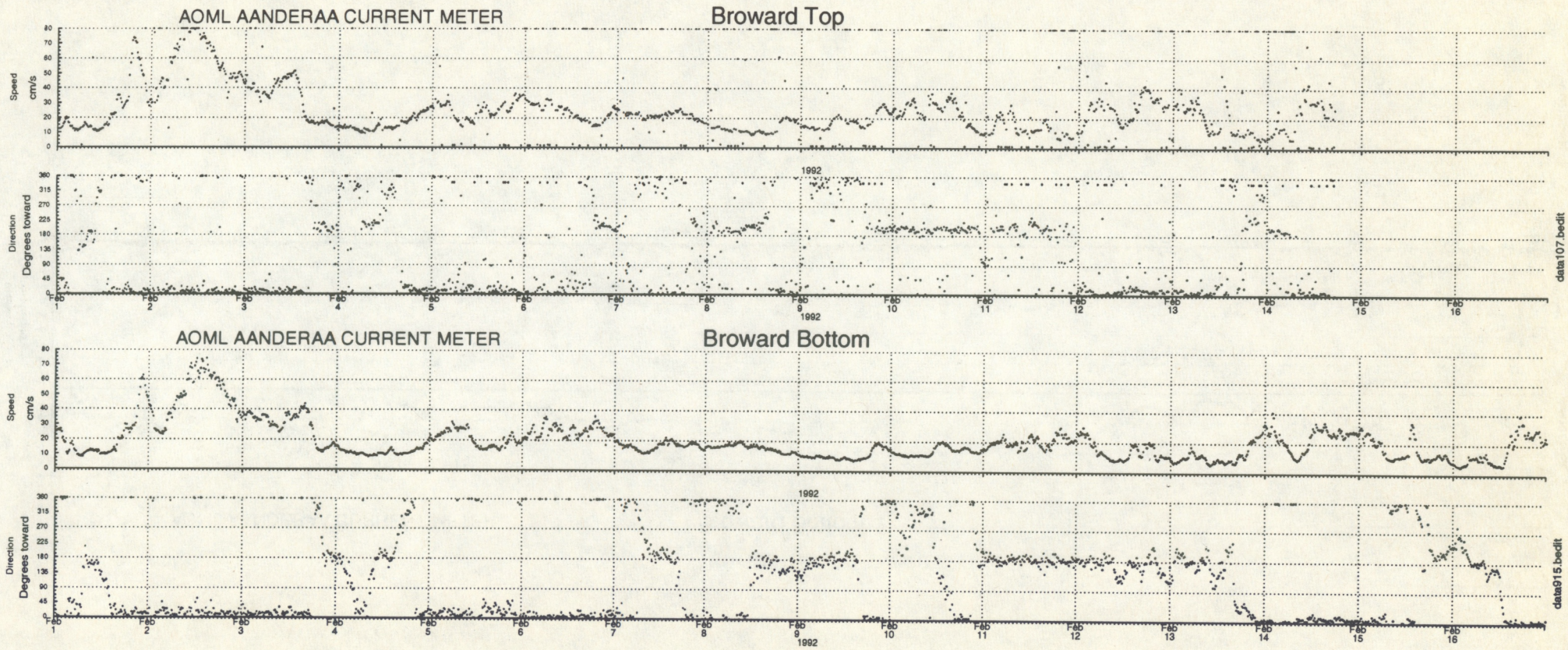

AOML AANDERAA CURRENT METER
Hollywood Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Aug 11
Aug 12
Aug 13
Aug 14
Aug 15
Aug 16
Aug 17
Aug 18
Aug 19
1992
Aug 20
Aug 21
Aug 22
Aug 23
Aug 24
Aug 25
Aug 26
1992
data6267.aedit

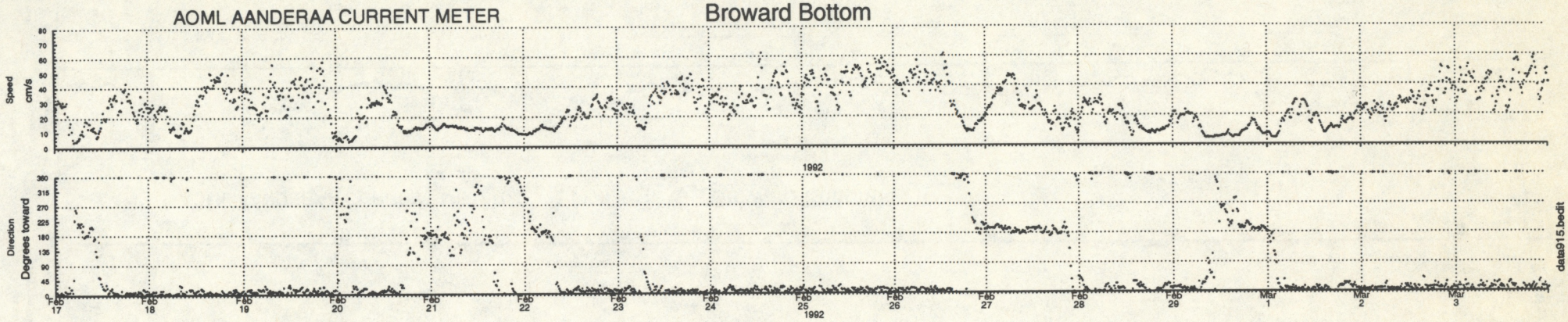
AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
data107.aadit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
data915.aadit
1991
NOV 16
NOV 17
NOV 18
NOV 19
NOV 20
NOV 21
NOV 22
NOV 23
NOV 24
NOV 25
NOV 26
NOV 27
NOV 28
NOV 29
NOV 30
DEC 1


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
1991
data107.aedit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1991
data915.aedit


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
1991
data107.aedit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1991
data915.aedit
Dec 18
Dec 19
Dec 20
Dec 21
Dec 22
Dec 23
Dec 24
Dec 25
Dec 26
Dec 27
Dec 28
Dec 29
Dec 30
Dec 31
Jan 1
Jan 2


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
1992
data107.bedit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1992
data915.bedit


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
1992
Feb
data107.bedit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1992
Feb
data915.bedit


AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Feb 17
Feb 18
Feb 19
Feb 20
Feb 21
Feb 22
Feb 23
Feb 24
Feb 25
1992
Feb 26
Feb 27
Feb 28
Feb 29
Mar 1
Mar 2
Mar 3
data915.bedit

AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Mar
4
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1992
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14
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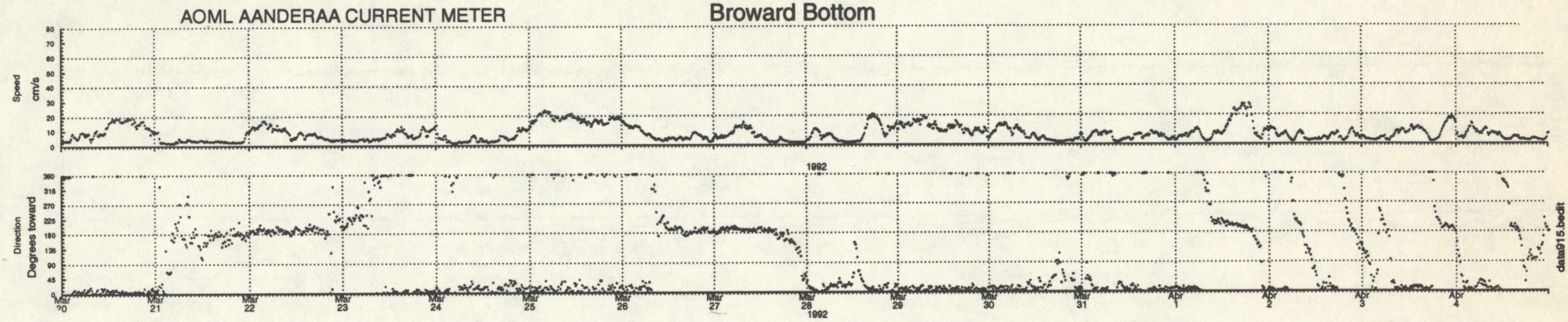
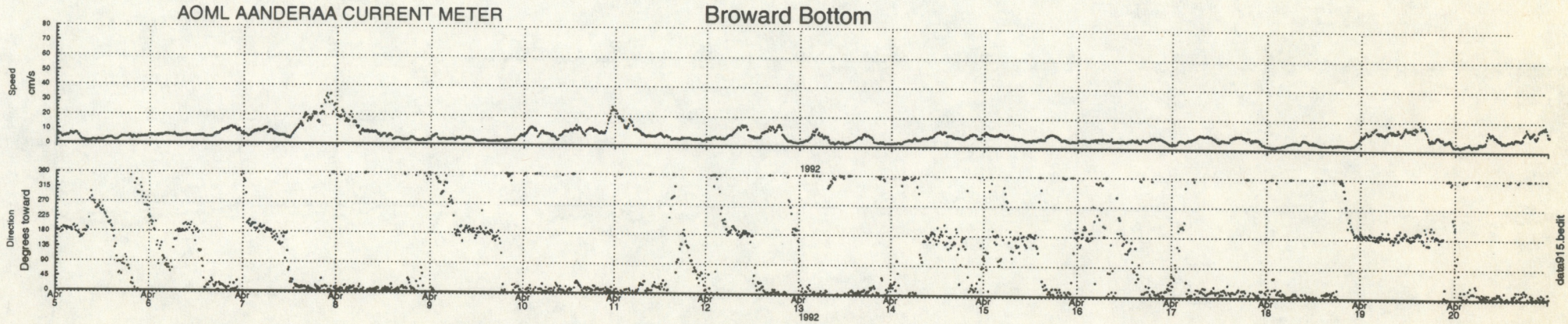
data915.bedit


AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Mar 20
Mar 21
Mar 22
Mar 23
Mar 24
Mar 25
Mar 26
Mar 27
Mar 28
1992
Mar 29
Mar 30
Mar 31
Apr 1
Apr 2
Apr 3
Apr 4
data915.bedit


AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
1992
Apr 5
Apr 6
Apr 7
Apr 8
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Apr 10
Apr 11
Apr 12
Apr 13
1992
Apr 14
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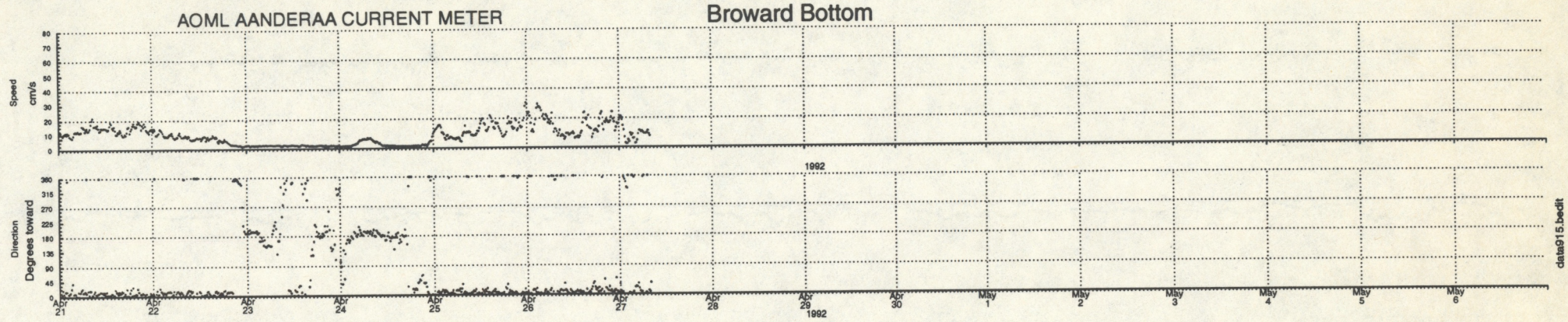
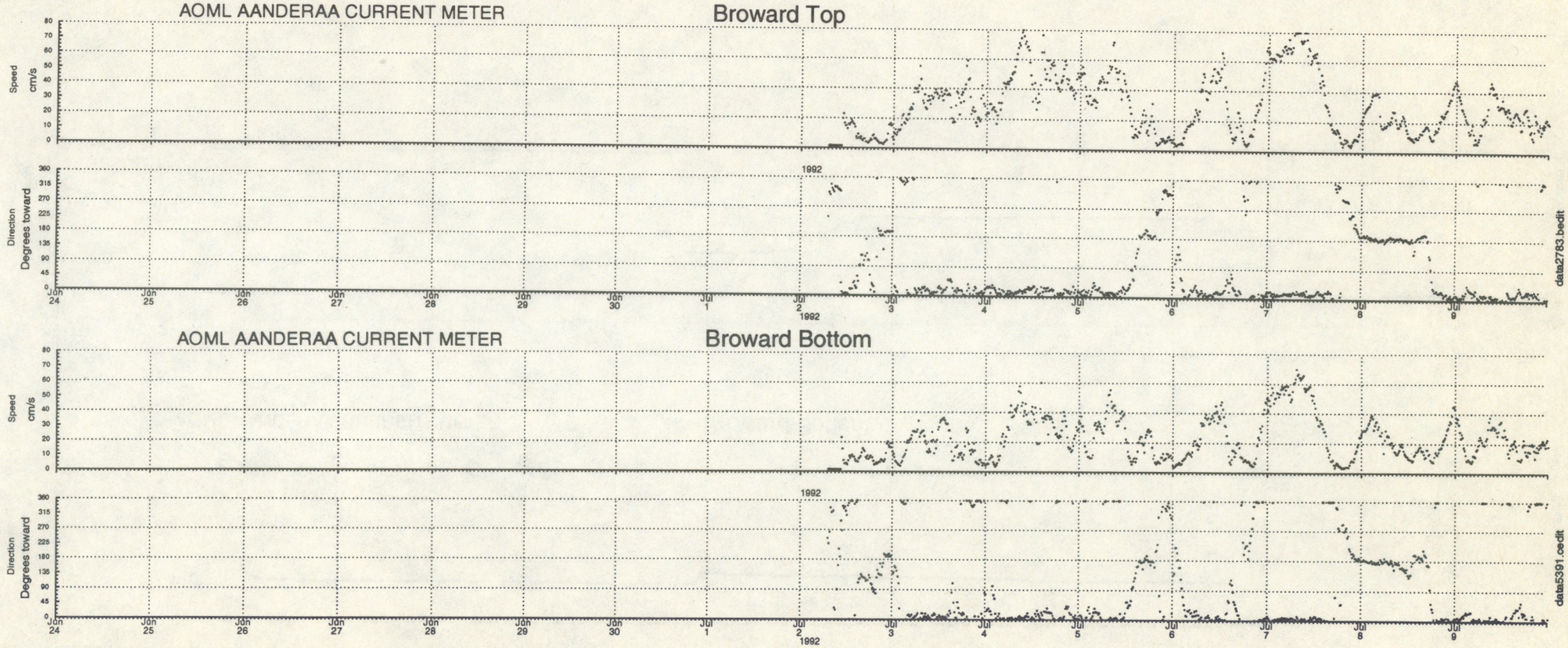
Apr 17
Apr 18
Apr 19
Apr 20
data915.bedit


AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
80
70
60
50
40
30
20
10
0
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Apr 21
Apr 22
Apr 23
Apr 24
Apr 25
Apr 26
Apr 27
Apr 28
Apr 29
1992
Apr 30
May 1
May 2
May 3
May 4
May 5
May 6
1992
data915.bedit


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
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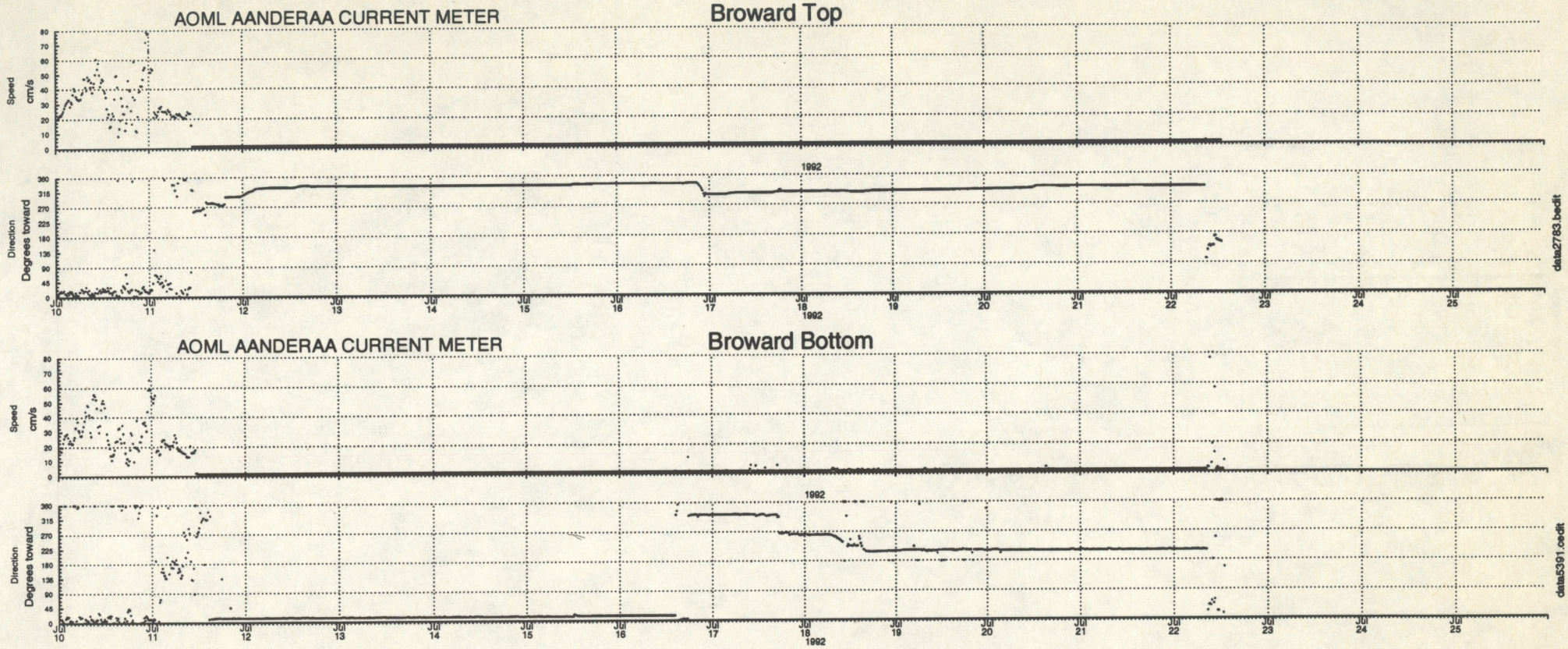
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5391.oedit


AOML AANDERAA CURRENT METER
Broward Top
Speed
cm/s
Direction
Degrees toward
1992
data2783.bedit
AOML AANDERAA CURRENT METER
Broward Bottom
Speed
cm/s
Direction
Degrees toward
1992
data5391.oedit

NOS ADCP CURRENT METER
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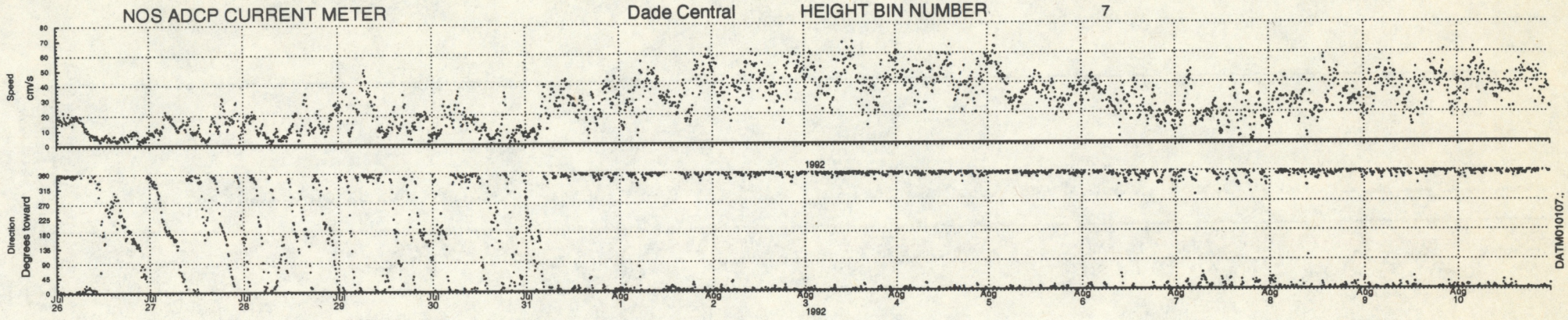
HEIGHT BIN NUMBER 7
DATM010107
Speed
cm/s
Direction
Degrees toward
1992


NOS ADCP CURRENT METER
Dade Central
HEIGHT BIN NUMBER 7
Speed
cm/s
80
70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Jul 26
Jul 27
Jul 28
Jul 29
Jul 30
Jul 31
Aug 1
Aug 2
Aug 3
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Aug 6
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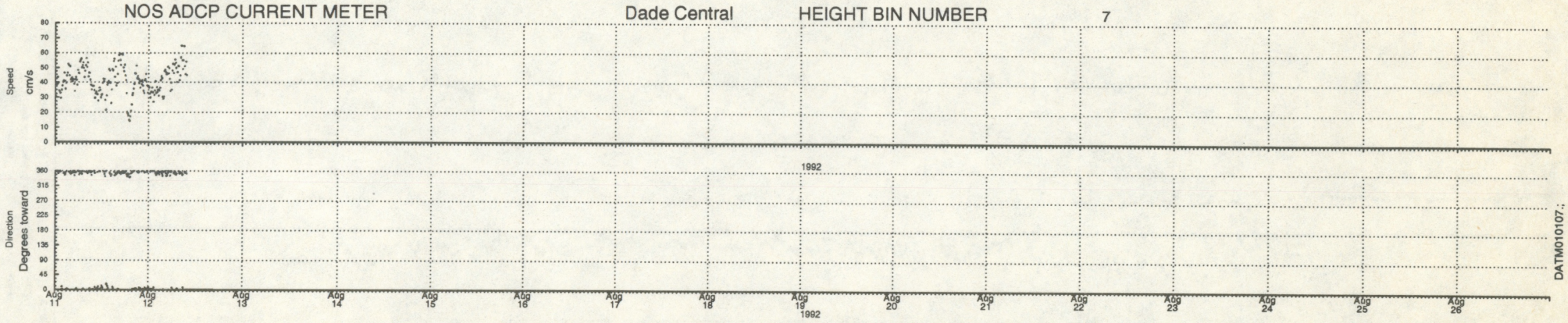
Aug 9
Aug 10
1992
DATM010107


NOS ADCP CURRENT METER
Dade Central
HEIGHT BIN NUMBER 7
Speed
cm/s
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70
60
50
40
30
20
10
0
1992
Direction
Degrees toward
360
315
270
225
180
135
90
45
0
Aug 11
Aug 12
Aug 13
Aug 14
Aug 15
Aug 16
Aug 17
Aug 18
Aug 19
1992
Aug 20
Aug 21
Aug 22
Aug 23
Aug 24
Aug 25
Aug 26
DATM010107.

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