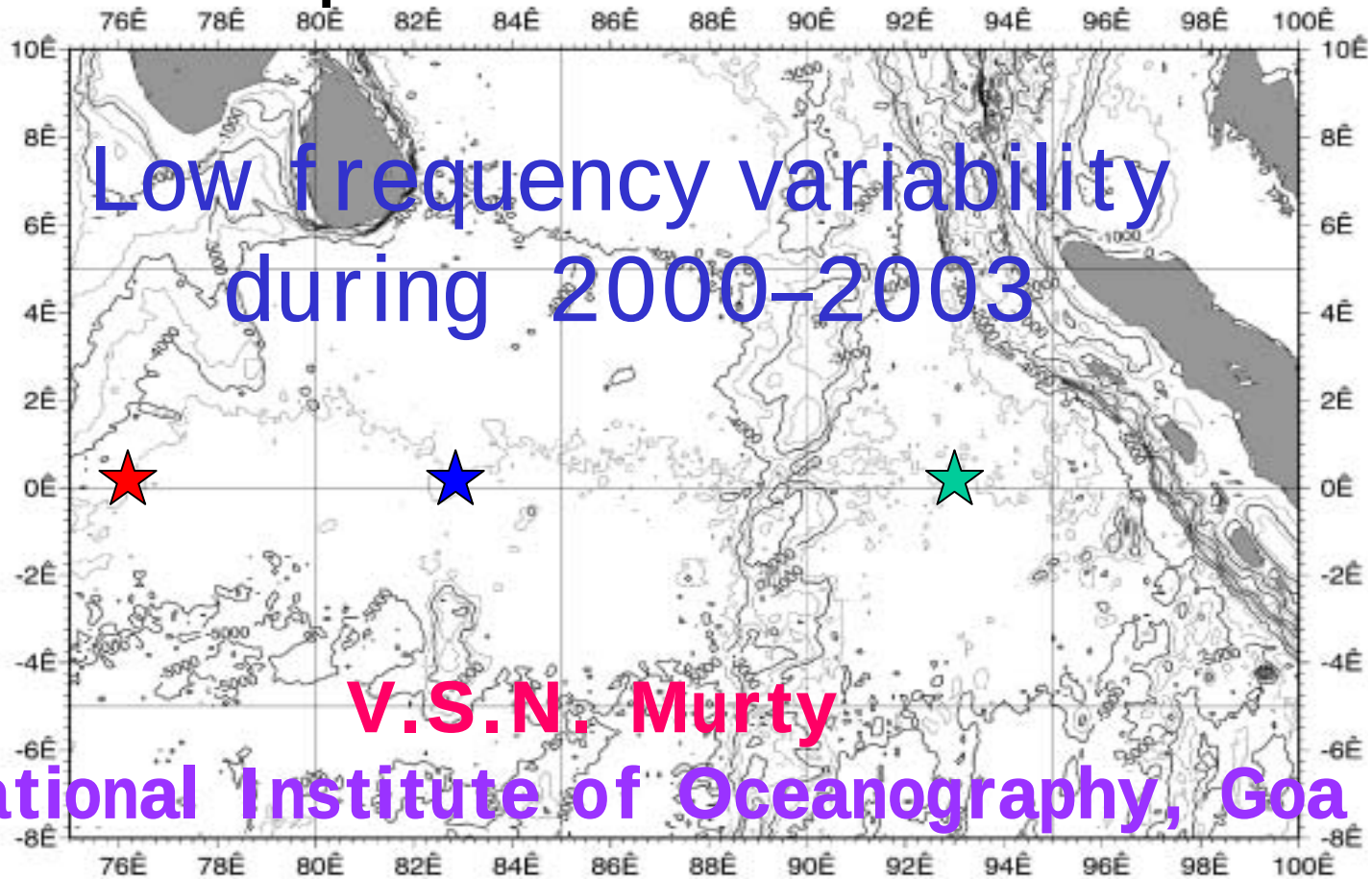
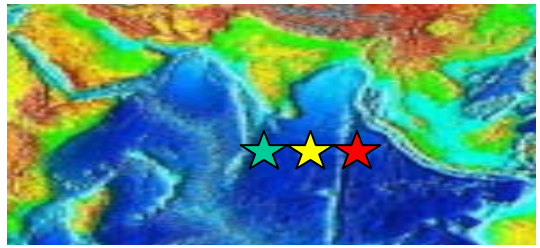
Long-term current measurements in the equatorial Indian Ocean:



V.S.N. Murty

National Institute of Oceanography, Goa

Ocean Observing System (OOS) Program: Status of Deep-sea Current meter moorings during 2000 –2004



Station No.	Duration of the moorings D: Deployment R: Recovery			
	I	II	III	IV
EQCM 1 [Equator, 93°E]	D 13 Feb. 2000 R 21 Dec. 2000	D 23 Dec. 2000 R 30 Mar. 2002	D 01 Apr. 2002 R 23 Sep. 2003	D 25 Sep. 2003 R 05 Nov. 2004 D 07 Nov. 2004
EQCM 2 [Equator, 83°E]		D 14 Dec. 2000 R 24 Mar. 2002	D 26 Dec. 2002 R 17 Sep. 2003	D 19 Sep. 2003 R 24 Oct. 2004 D 26 Oct. 2004
EQCM 3 [Equator, 76°E]			D 20 Mar. 2002 R 08 Sep. 2003	Location shifted
EQCM 3-a [Equator, 77°E]			D 10 Sep. 2003 R 17 Oct. 2004	D 18 Oct. 2004 R ……..

All the moorings have 6 RCMs at 6 levels & 1 up-looking ADCP at 100 m.

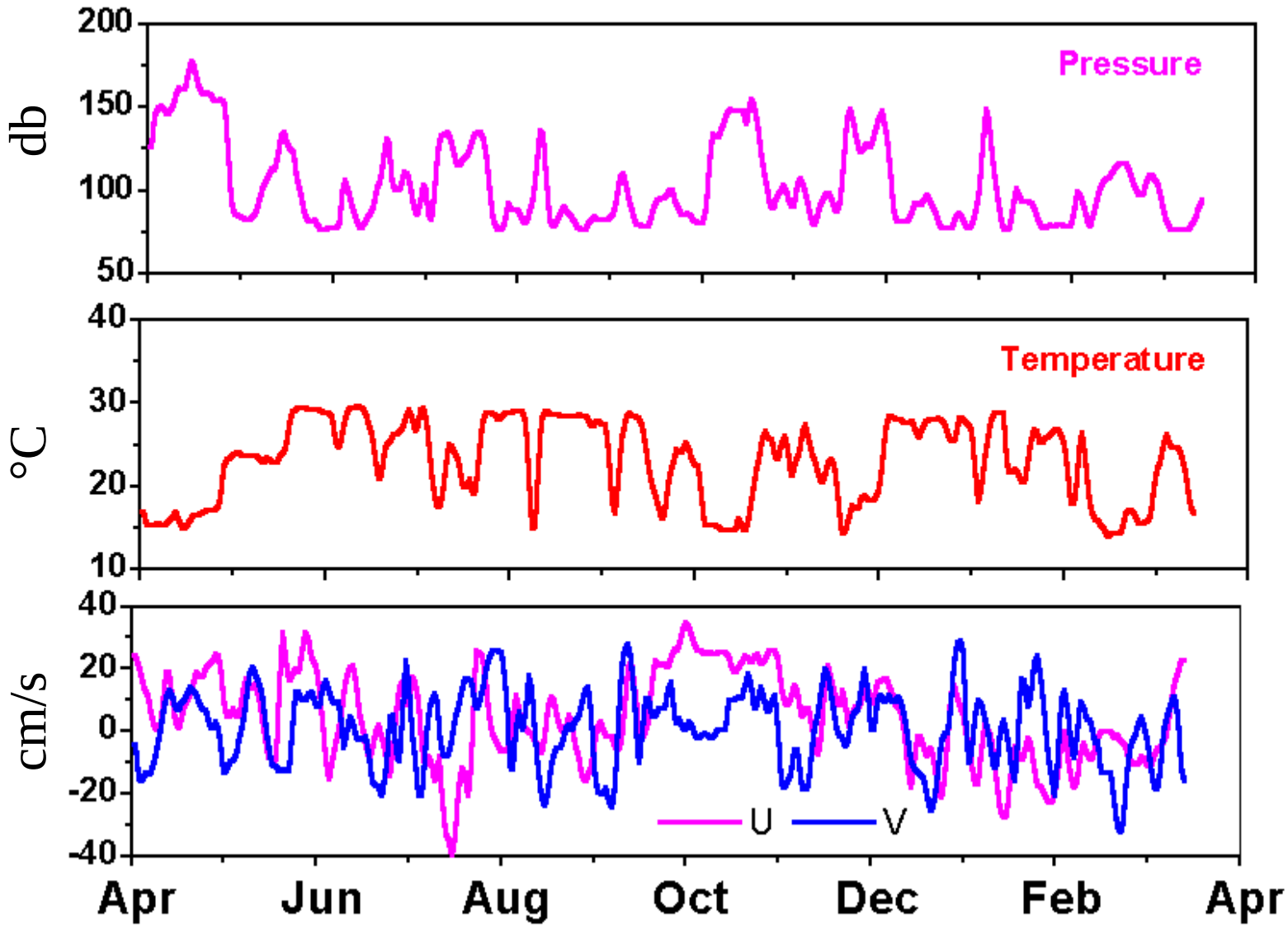
The nominal depths of RCMs are 100, 300, 500, 1000, 2000 & 4000 m.

Mean & SD of u & v over the duration of the mooring

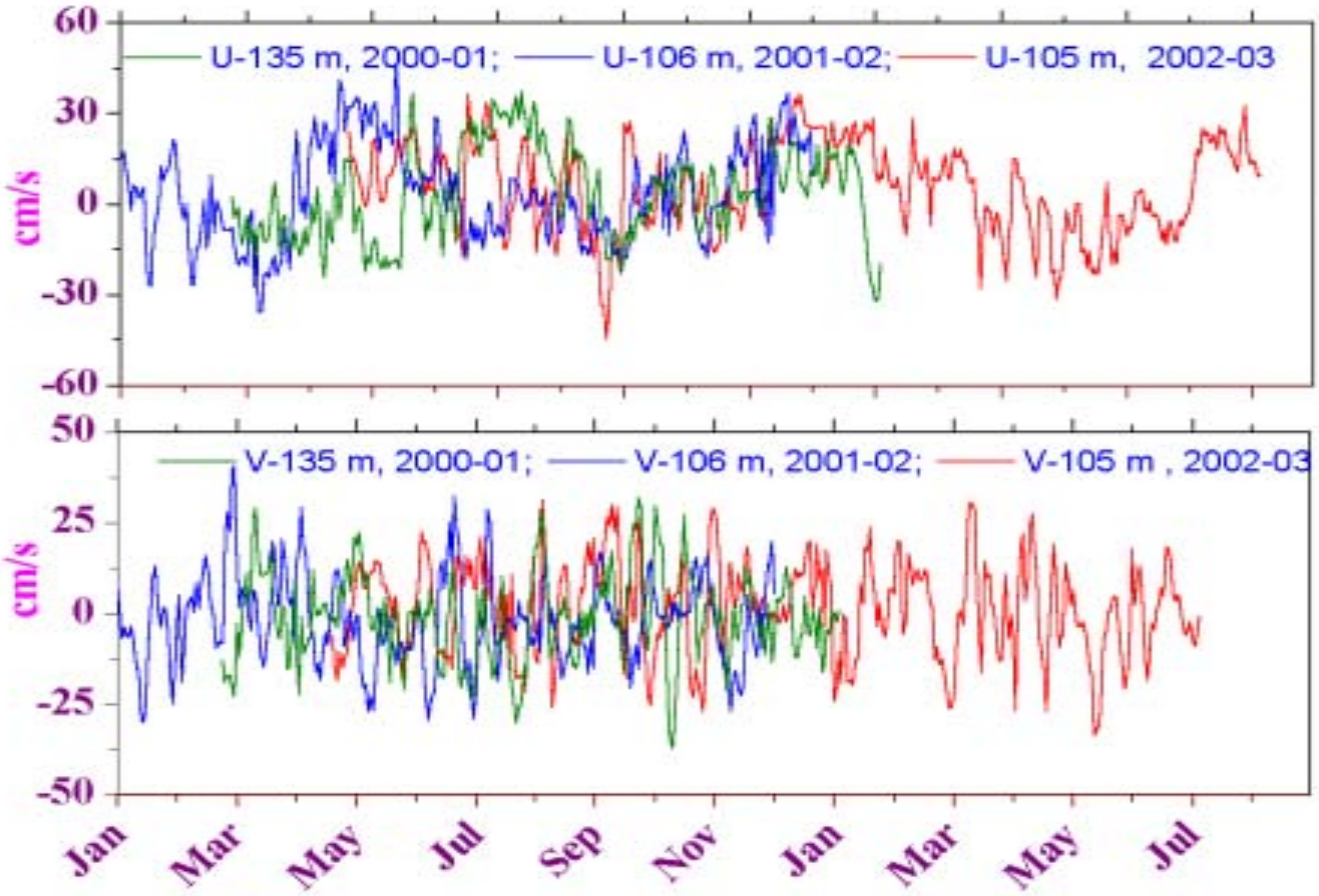
Mooring location	Data (Days)	Duration	Depth (m)	U (cm/s)		V (cm/s)	
				Mean	Std-dev	Mean	Std-dev
93°E	1083	2000-03	100	3.74	14.24	-0.41	11.73
93	772	2000-03	300	-2.40	10.51	0.55	8.84
93	871	2000-03	500	-1.23	8.49	0.71	7.65
93	1181	2000-03	1000	-0.15	7.29	-0.07	6.79
93	1182	2000-03	2000	-0.82	4.15	-0.25	5.08
93	1108	2000-03	4000	-0.76	2.59	0.17	3.20
83	486	2001-03	100	4.28	25.38	1.32	12.33
83	758	2001-03	300	-2.57	14.07	-0.81	7.50
83	816	2001-03	500	0.33	16.44	-0.54	7.54
83	816	2001-03	1000	-1.78	11.79	0.53	6.93
83	534	2001-03	2000	-0.87	7.40	0.08	4.05
83	662	2001-03	4000	-0.43	2.71	0.63	2.63
76	434	2002-03	419	-5.29	15.22	-0.48	6.43
76	434	2002-03	645	-0.32	17.73	-0.49	6.69
76	434	2002-03	822	0.17	15.10	-0.92	6.06
76	92	2002-03	1314	-2.39	12.49	1.12	5.90
76	434	2002-03	2036	-1.17	7.78	-1.29	3.98
76	268	2003-02	4015	0.96	3.43	0.18	3.53

NIO

Daily variation of Pressure, temperature, currents at 0°,93°E during 2002-03



Variation of U & V at 100 m depth (93°E): 2000-03



135 m: 2000-01

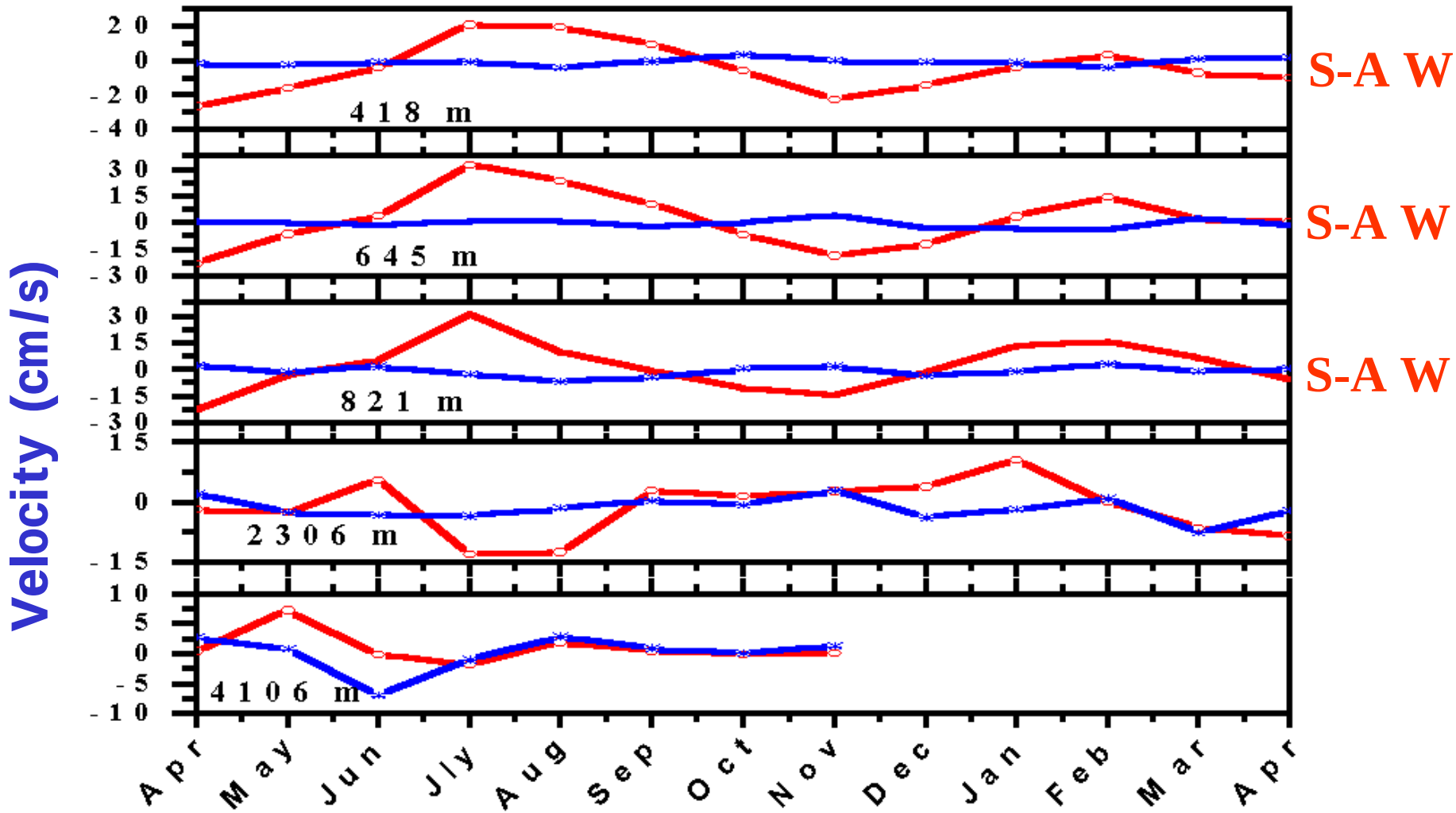
106 m: 2001-02

105 m: 2002-03

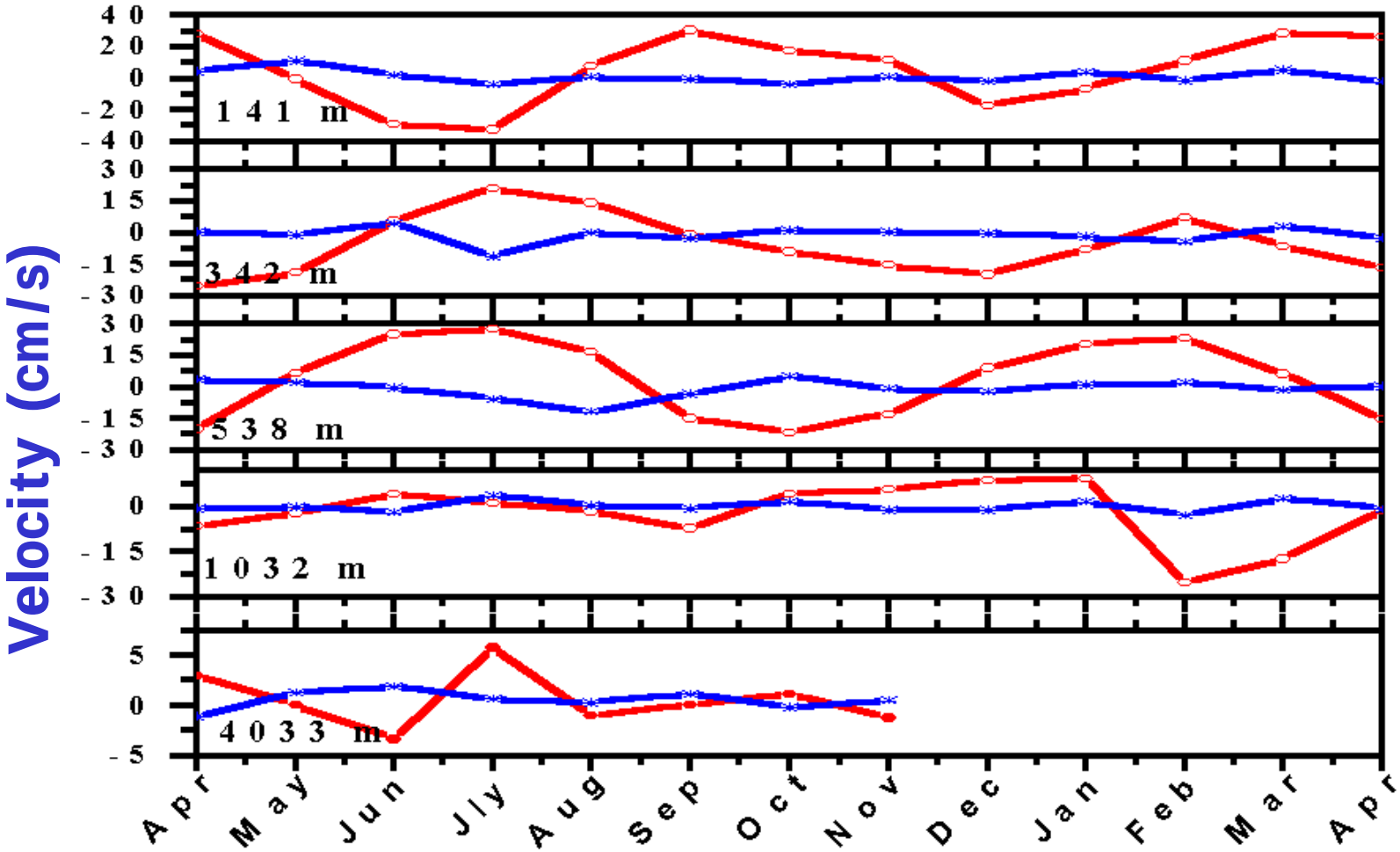
Zonal velocity shows low frequency variation- comprising the equatorial Jets and monsoon currents

Meridional velocity shows considerable intraseasonal variability – comprising of 10-20 day period (biweekly) and 20-30 day period oscillations.

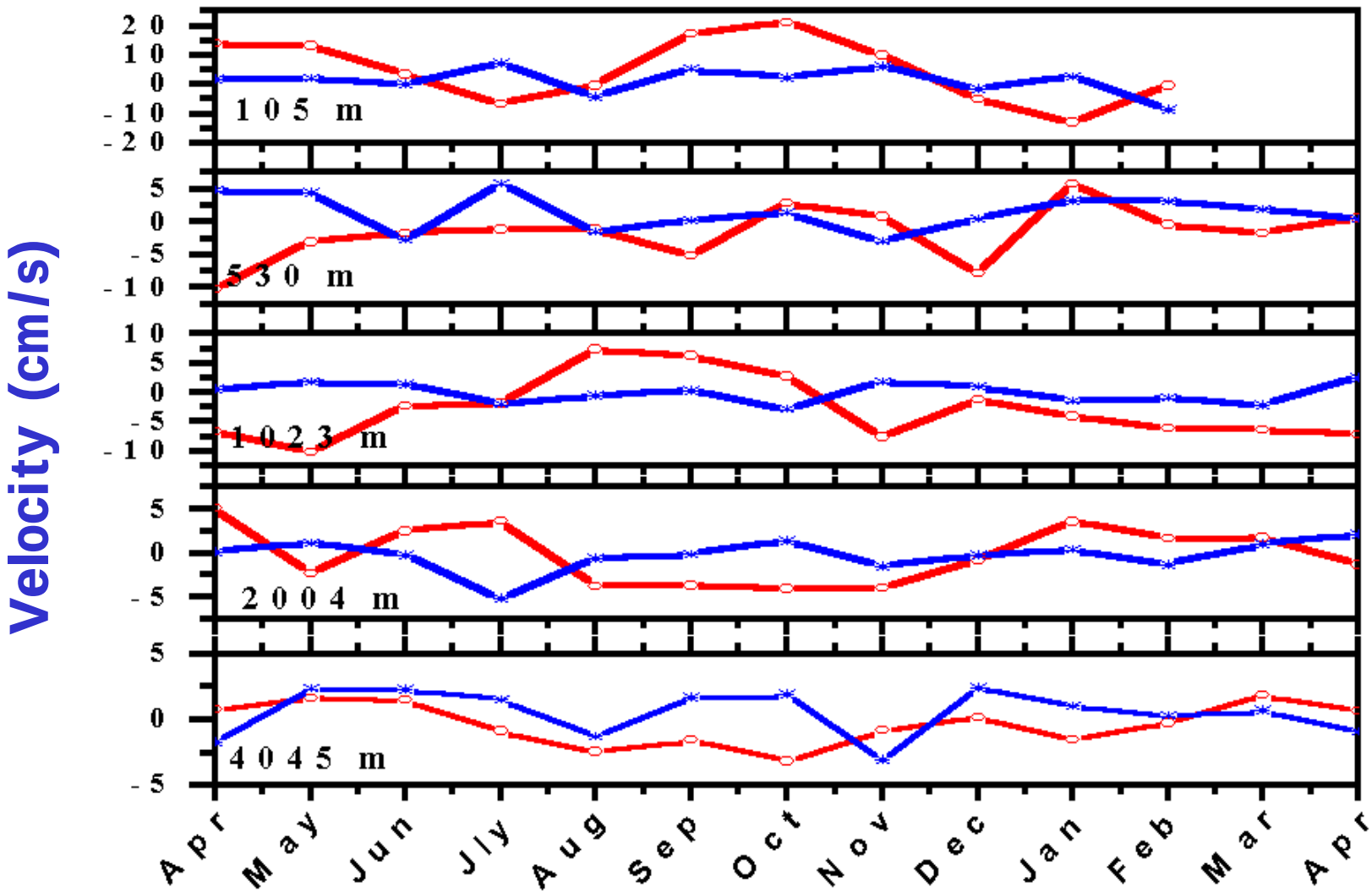
Monthly variation of u&v at 76°E: 2002-03



Monthly variation of u&v at 83°E: 2002-03

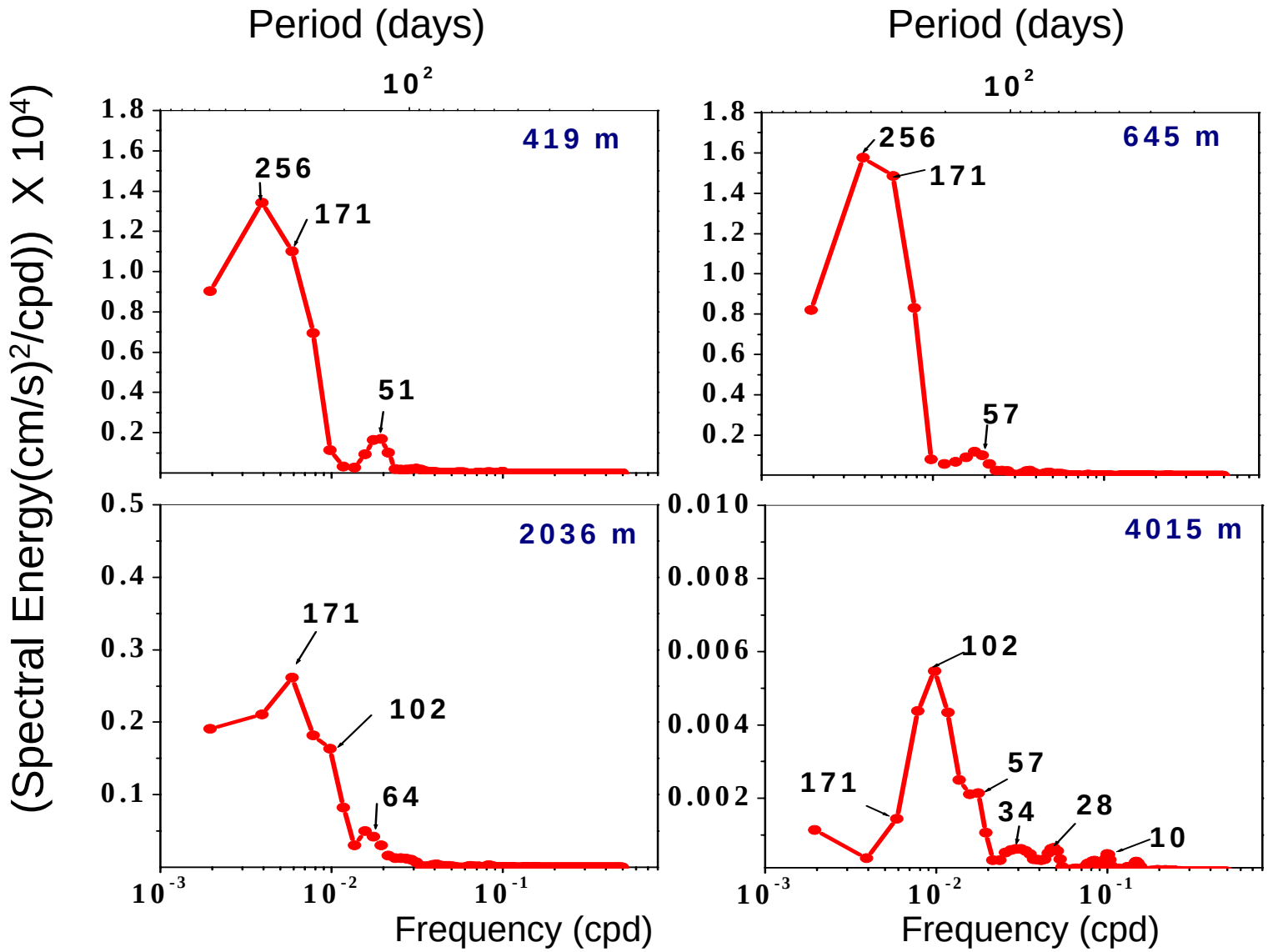


Monthly variation of u&v at 93°E: 2002-03

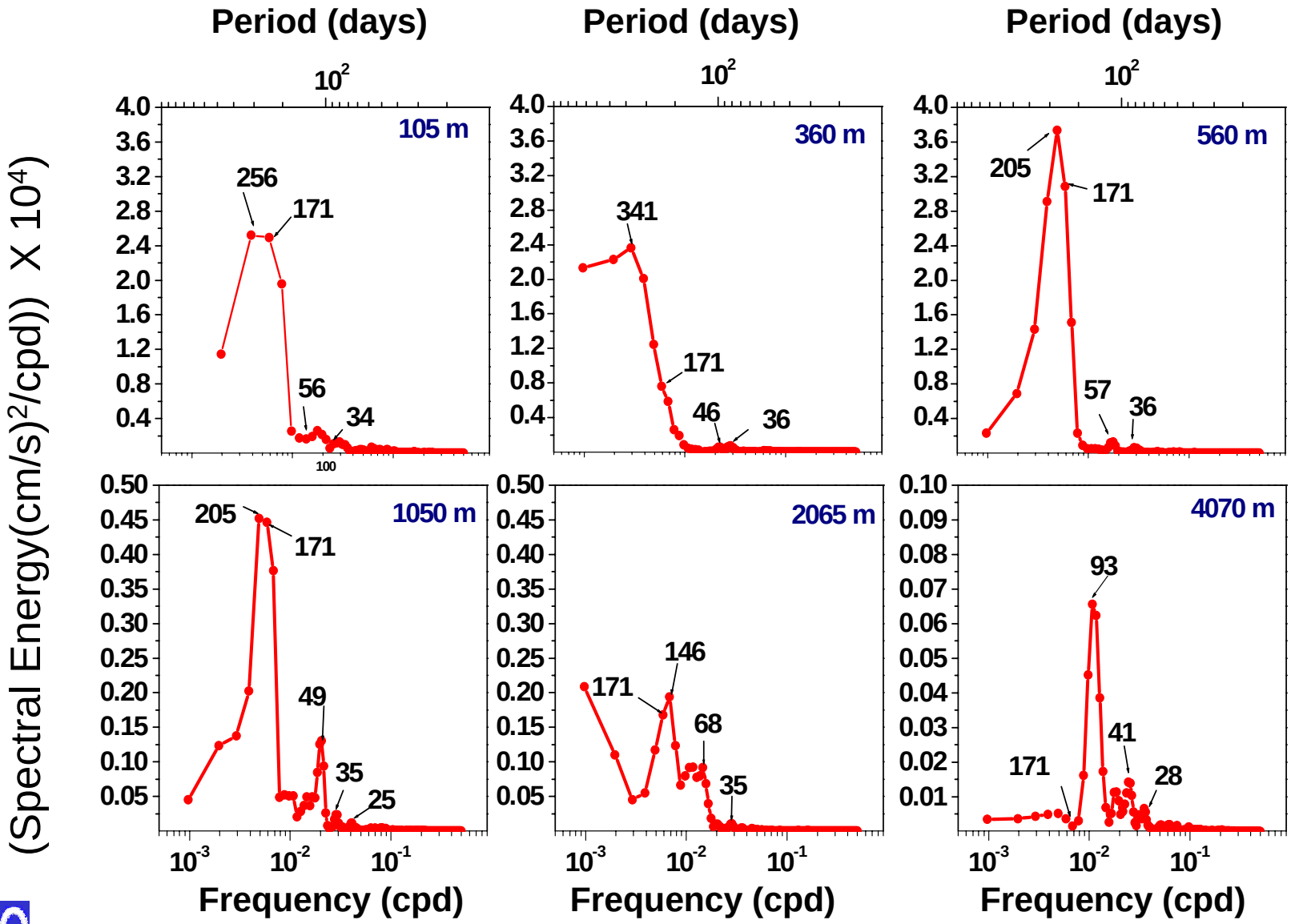


S-A W

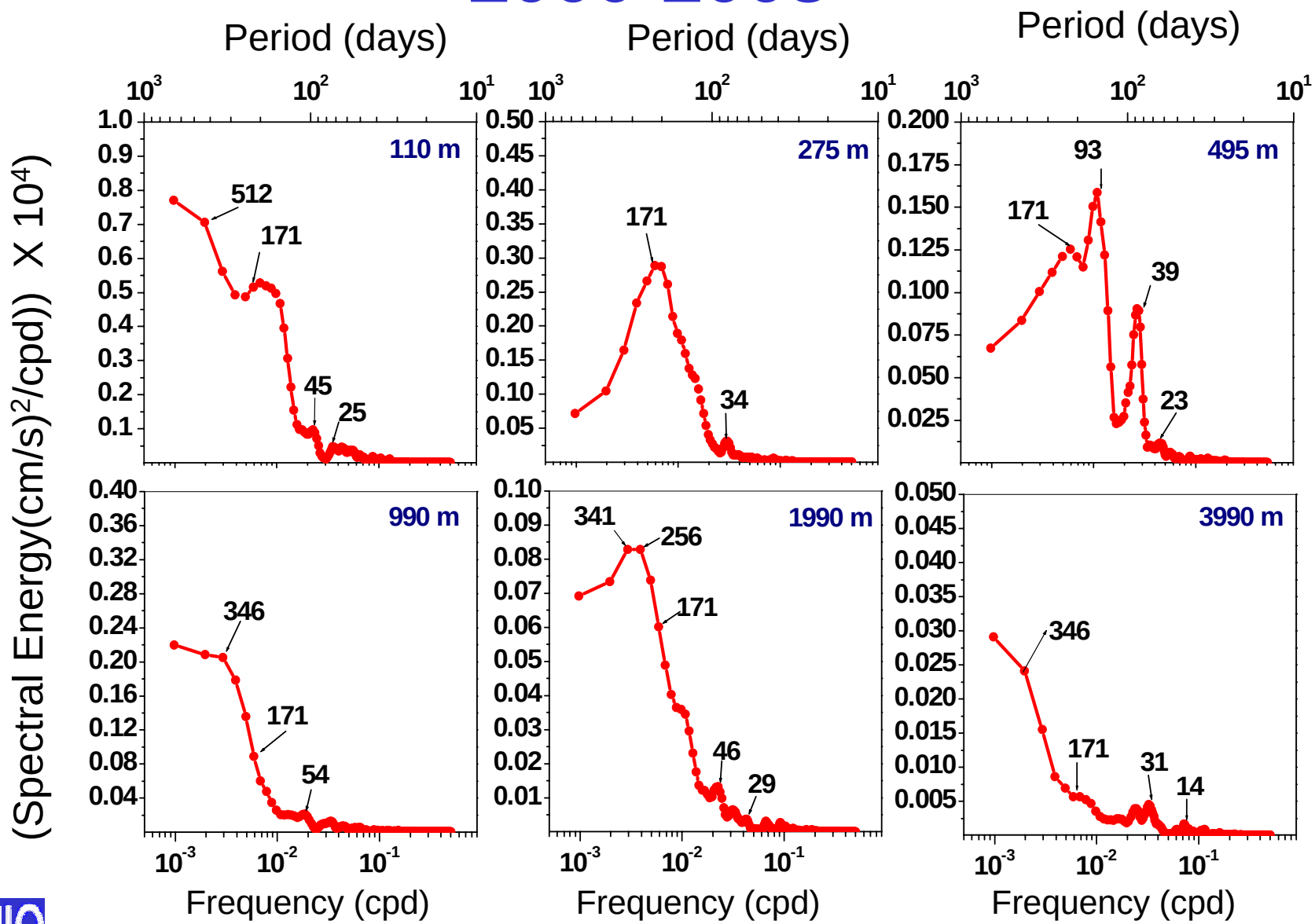
Power spectra for *U* (cm/s) at 0, 76°E 2002-2003



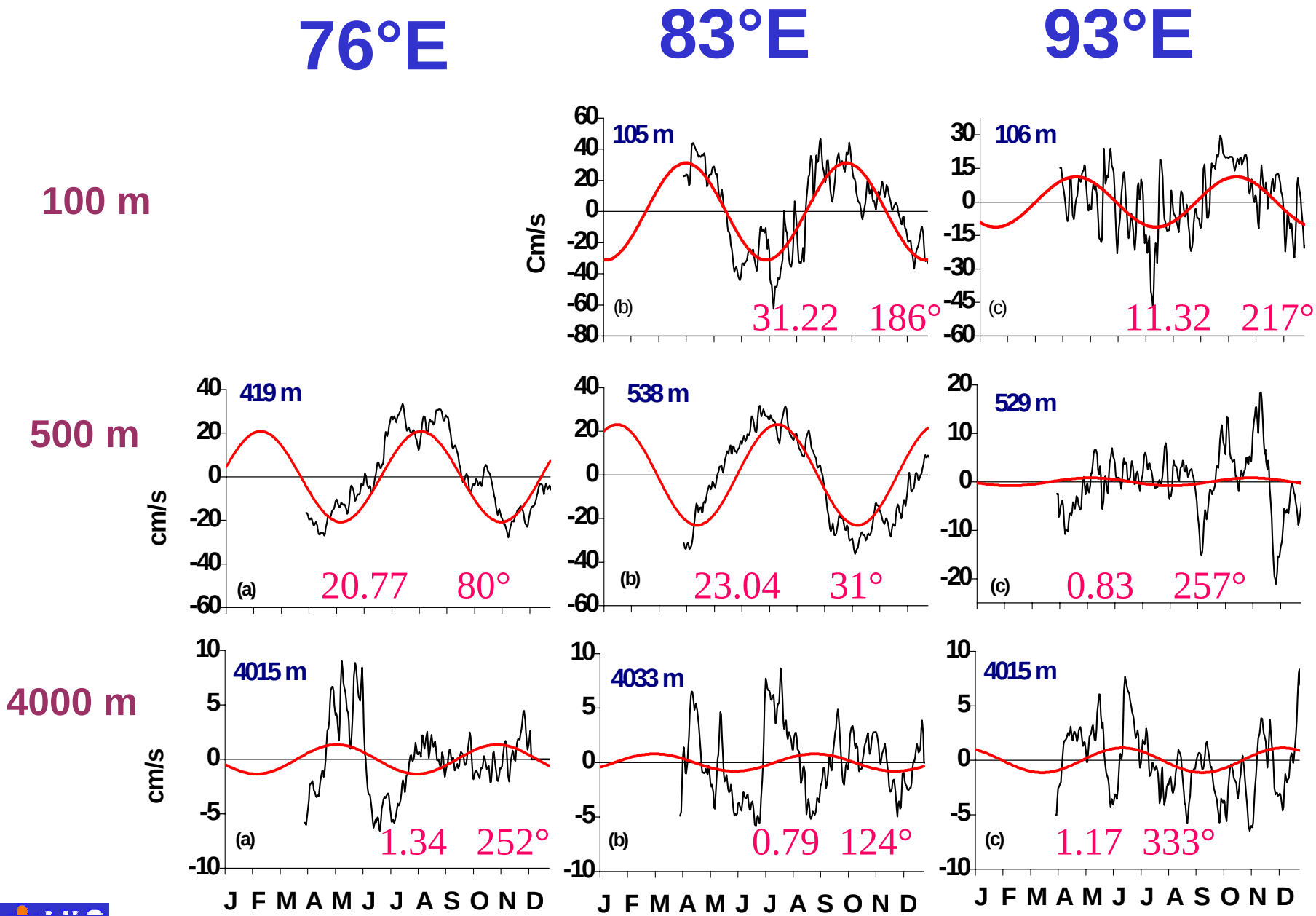
Power spectra for *U* (cm/s) at 0, 83°E 2001-2003



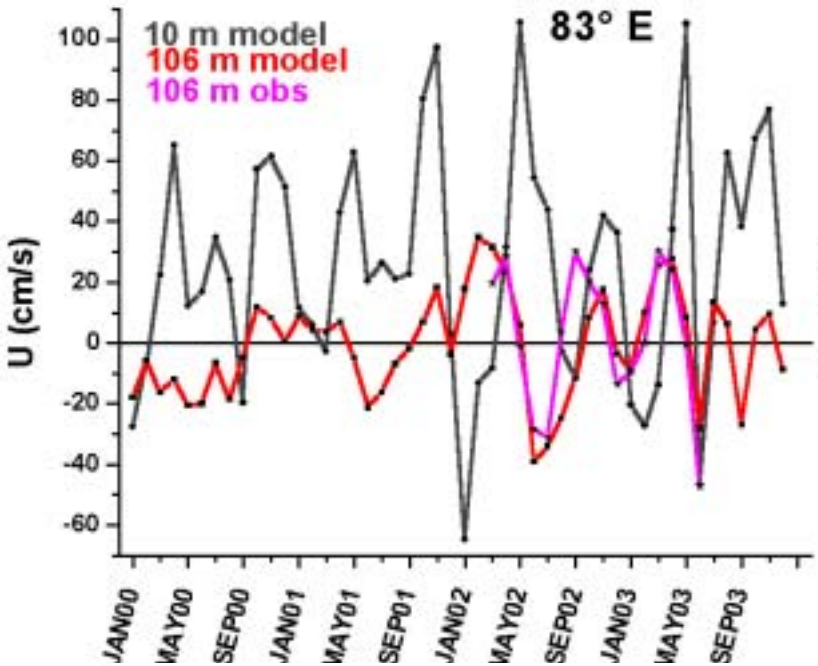
Power spectra for *U* (cm/s) at 0, 93°E 2000-2003

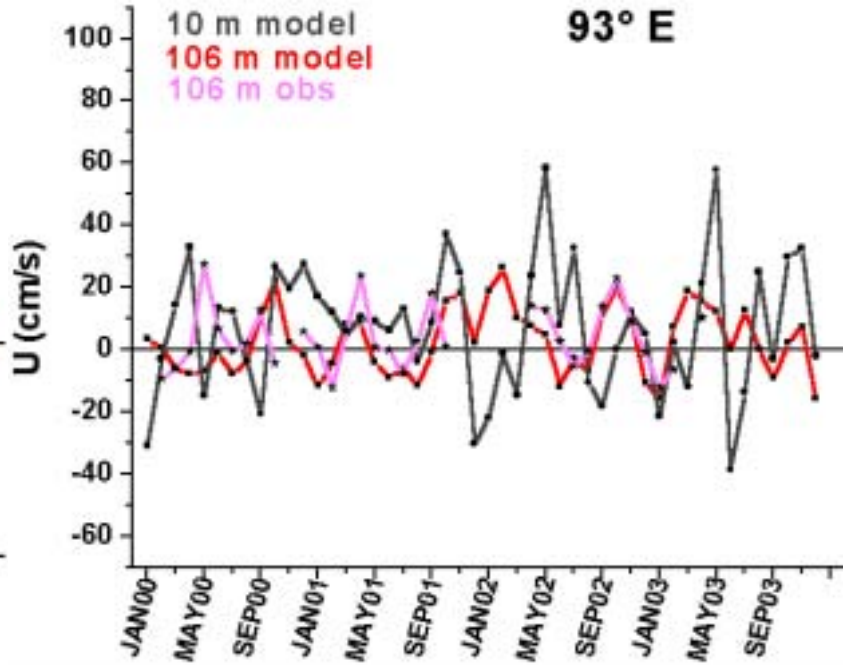


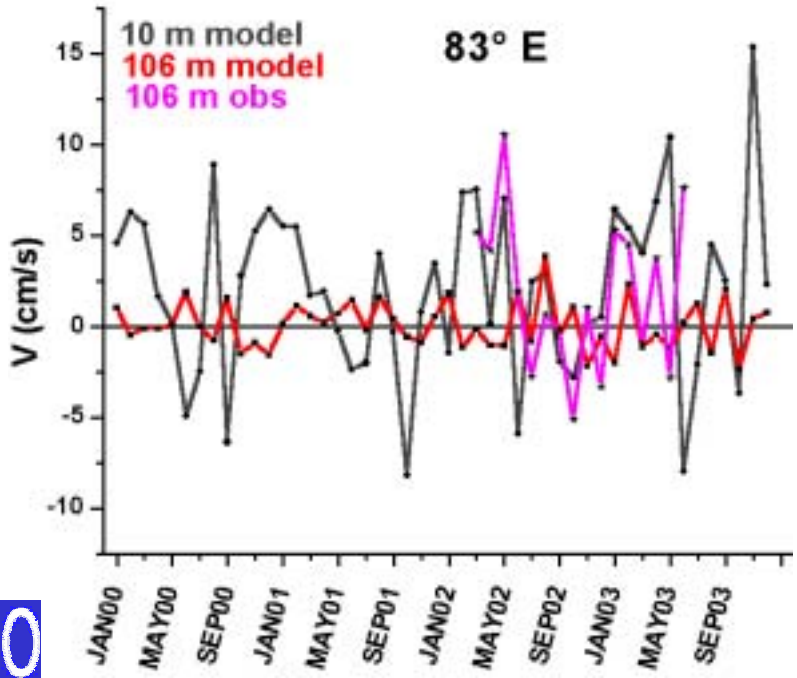
Amplitude and phase of the semi-annual wave

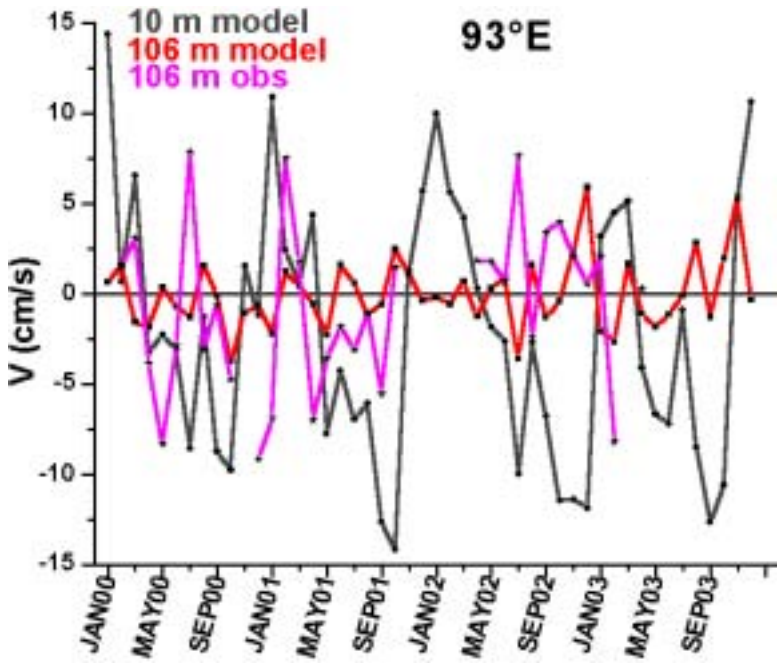


Comparison of Model and Observed U &V at 83 E and 93E



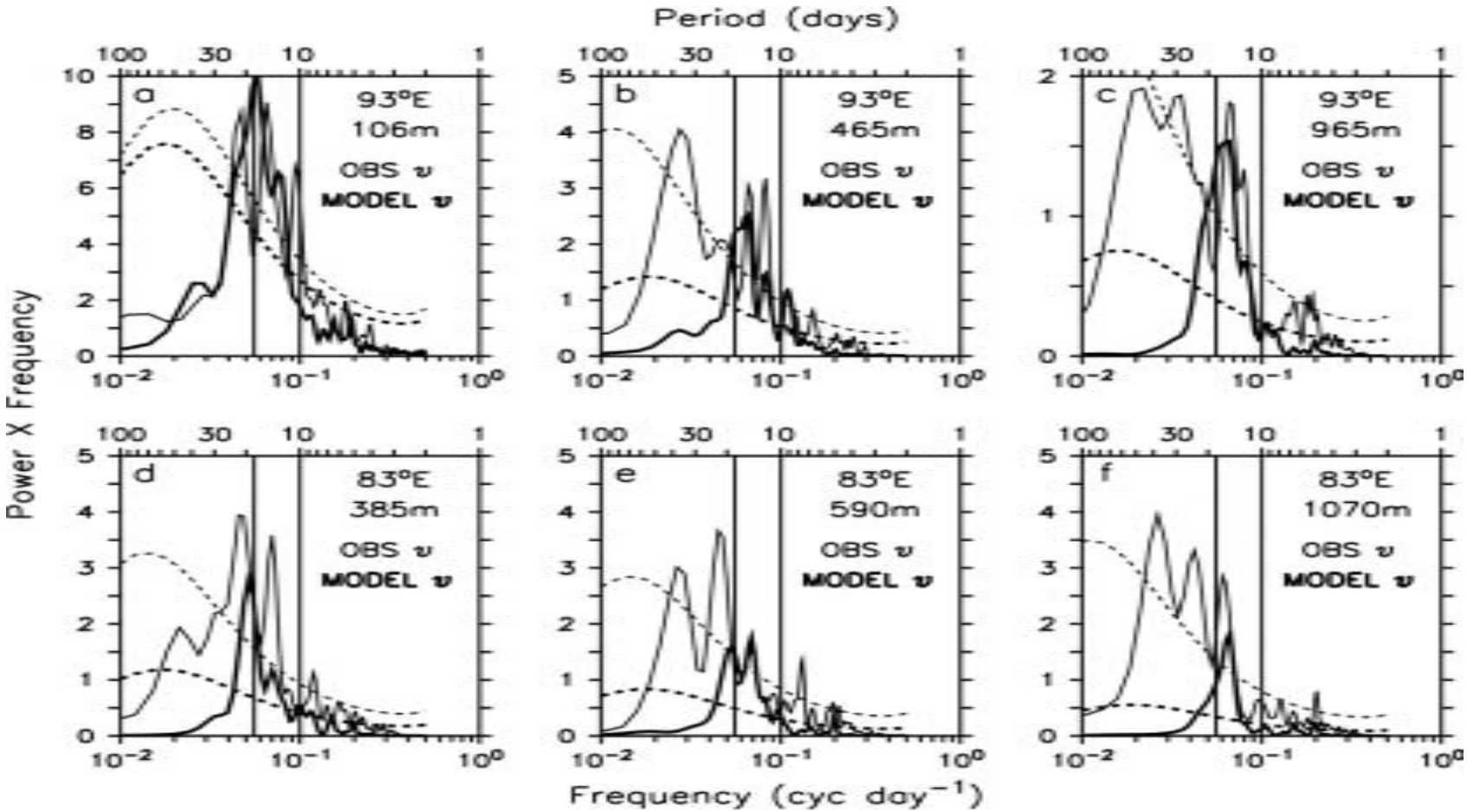






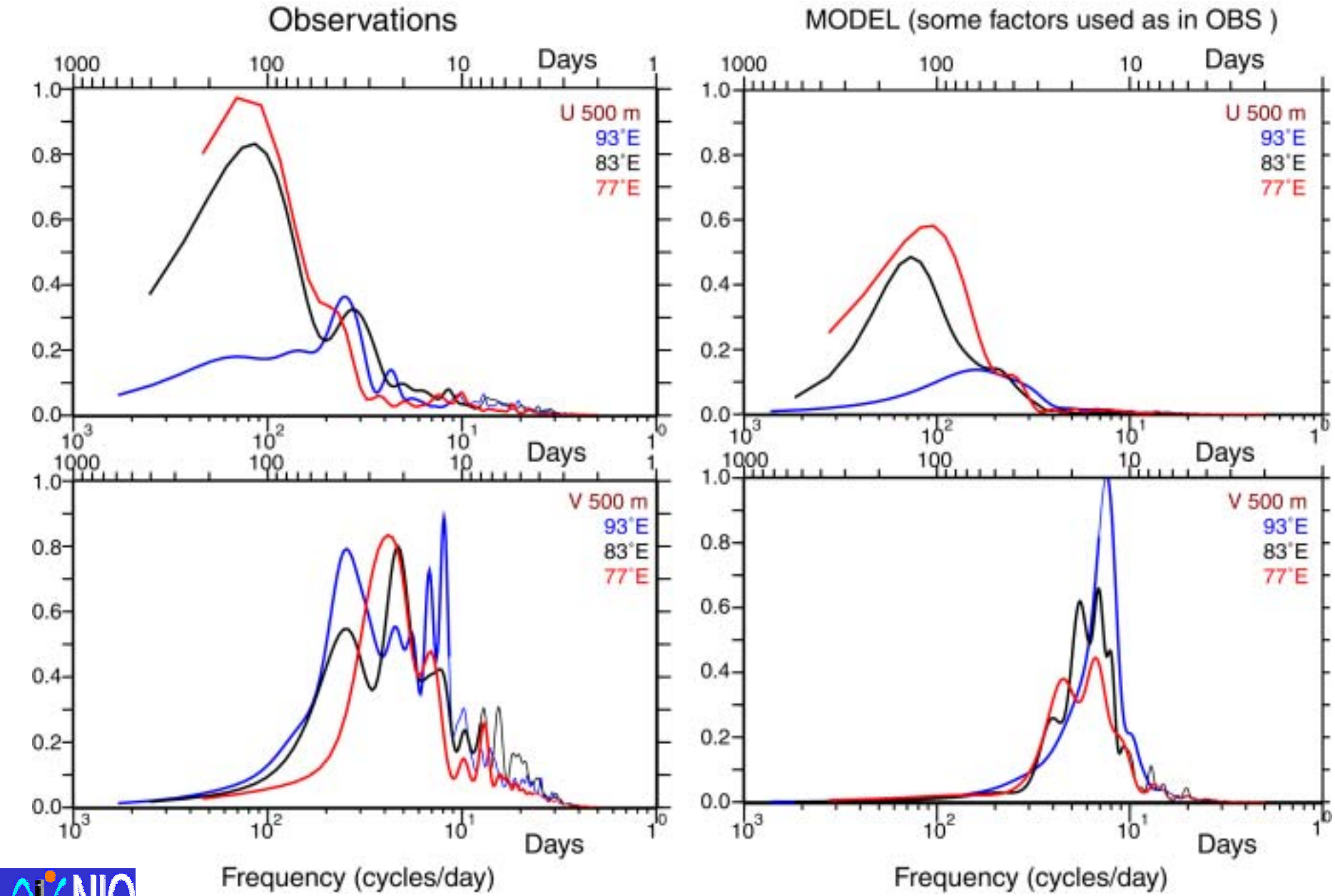
NIO

Comparison of Model and Observed V at 93E & 83E



Biweekly mode (10-20 day period) variability in meridional velocity. This mode is well resolved in the OGCM results. *[Sengupta et al. 2004. J. Geophy. Res., 109]*

Comparison of observed & model U & V spectra at 500 m



Salient features

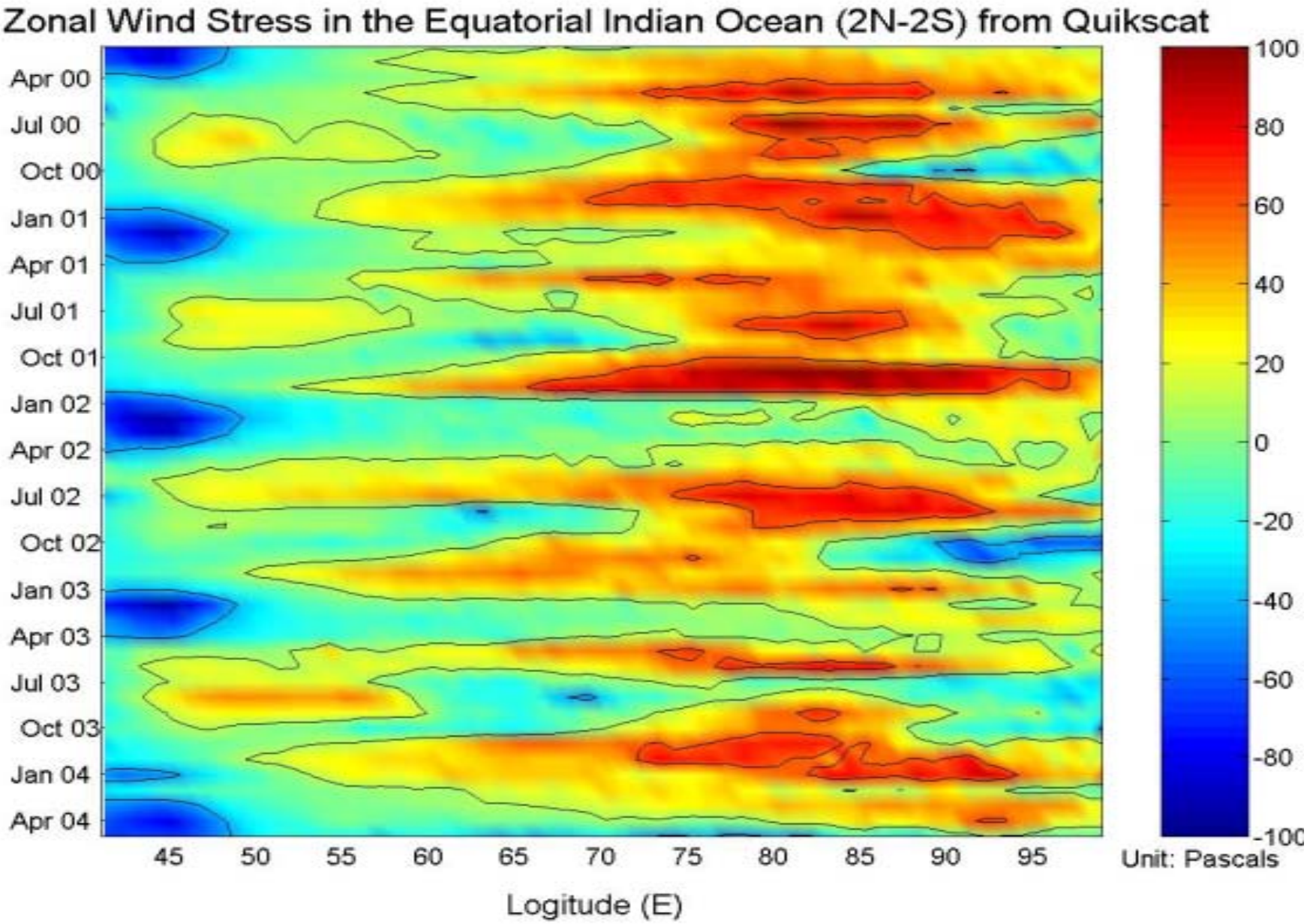
1. Identification of
   (a) biweekly mode (10-20 day period) variability in **V** which has been validated from OGCM results, and
   (b) a monthly mode (22-25 day period) variability in **V**

2. The analyses revealed that
   (a) Semi-annual wave penetrates up to 2000 m at 76E, up to 1000 m at 83E and only up to 300 m at 93E. This observation is well compared with model results.

   At 93E, the below 500 m, spectral energy is dominant at annual wave period.

   At 76E and 83E, at deeper depths spectral energy is dominant at lower periods (below semi-annual period).

thank you


Zonal Wind Stress in the Equatorial Indian Ocean (2N-2S) from Quikscat
Apr 00
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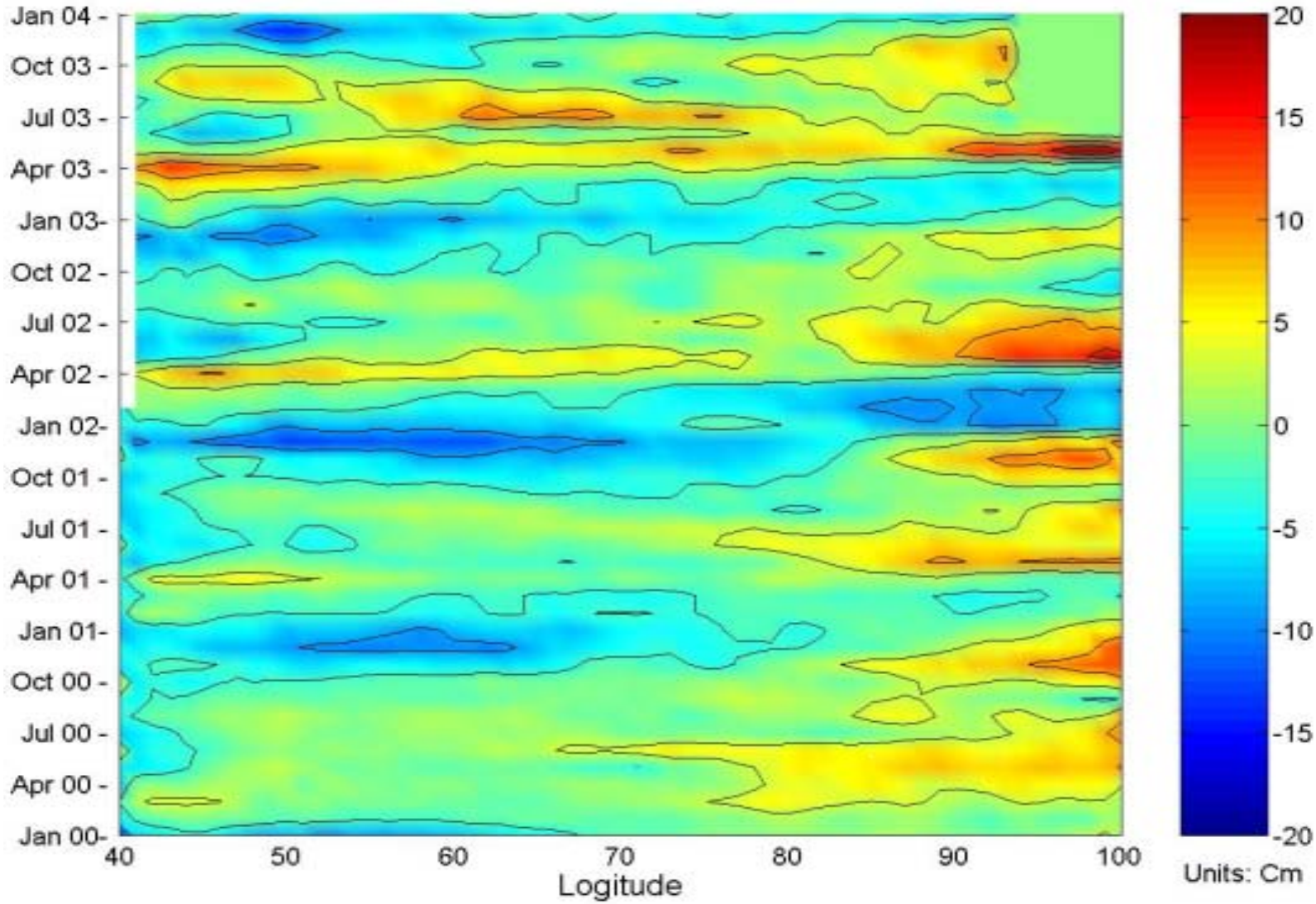
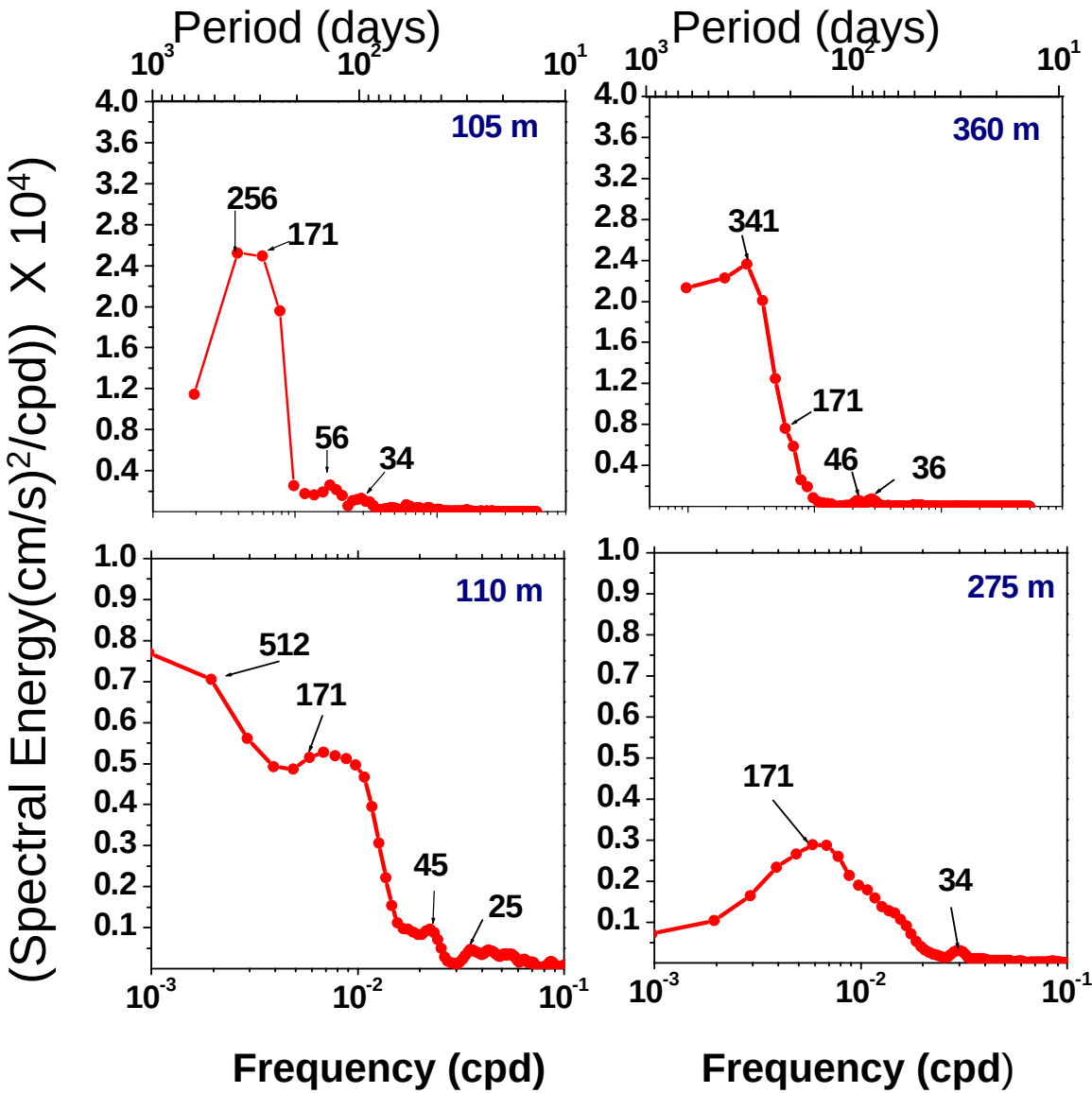
Jan 02
Apr 02
Jul 02
Oct 02
Jan 03
Apr 03
Jul 03
Oct 03
Jan 04
Apr 04
45
50
55
60
65
70
75
80
85
90
95
Logitude (E)
100
80
60
40
20
0
-20
-40
-60
-80
-100
Unit: Pascals

T/P SSHA in the equatorial Indian Ocean (2N-2S)



Power spectra for *U* (cm/s) at 100 m & 300 m



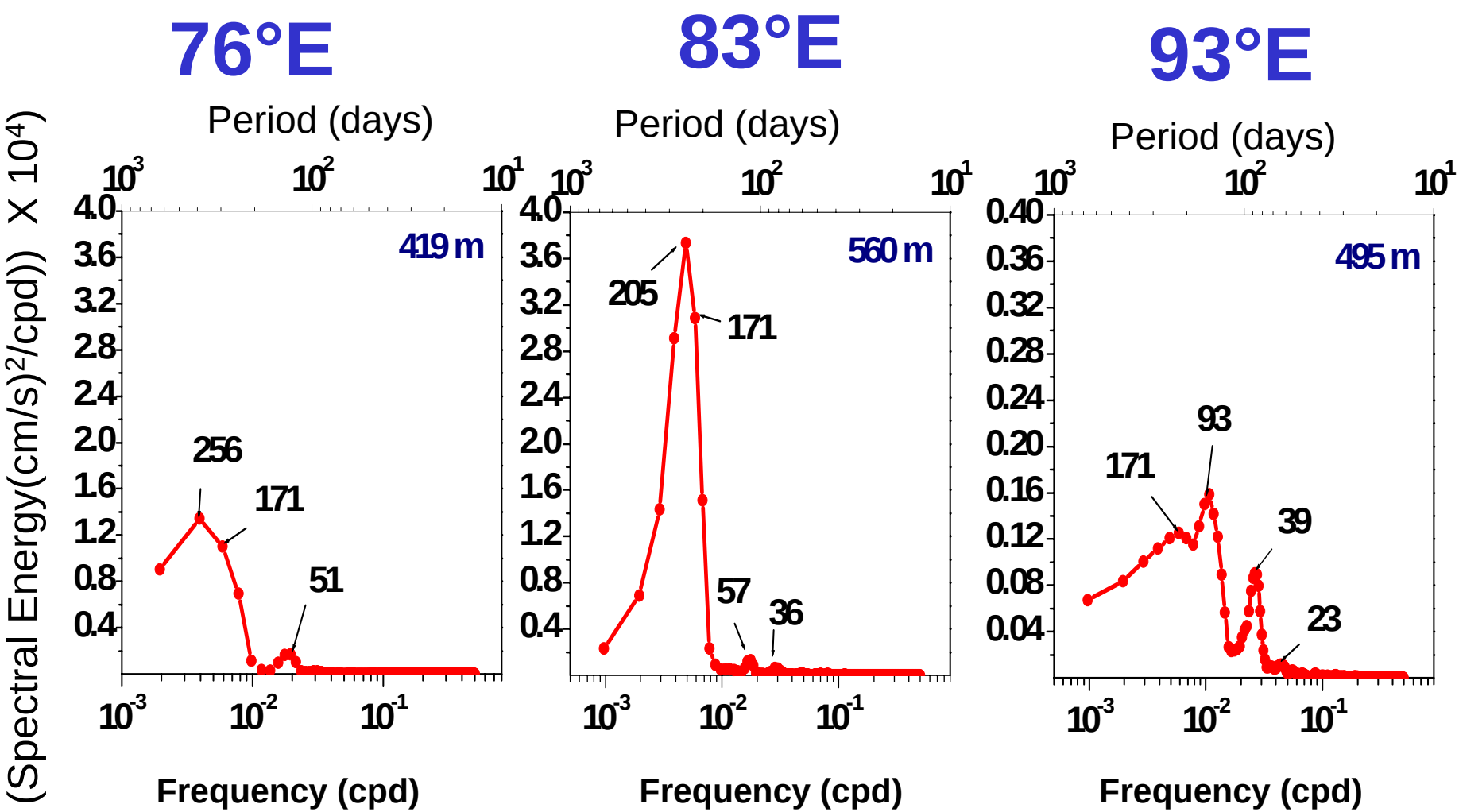
83°E

2001-03

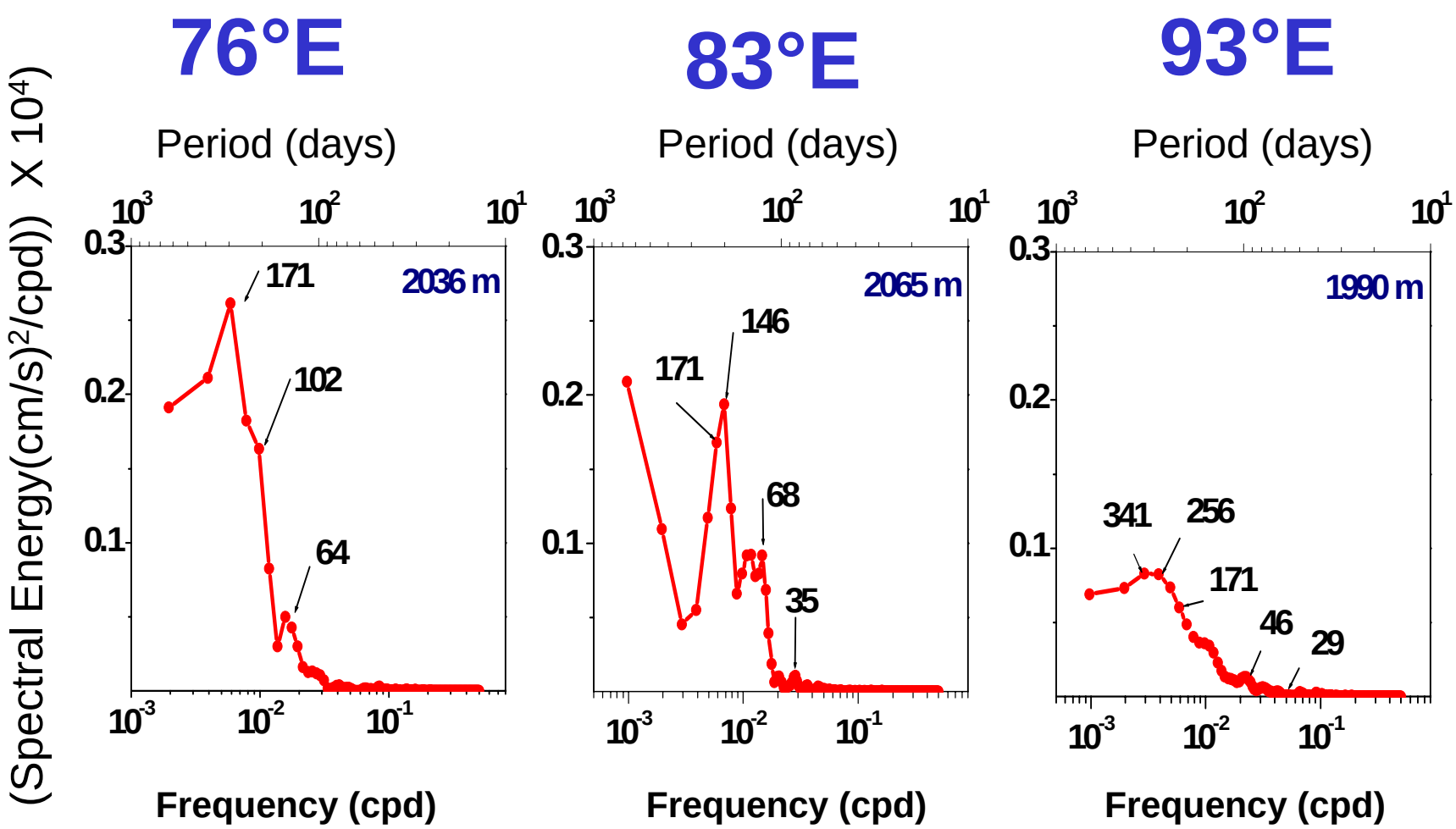
93°E

2000-03

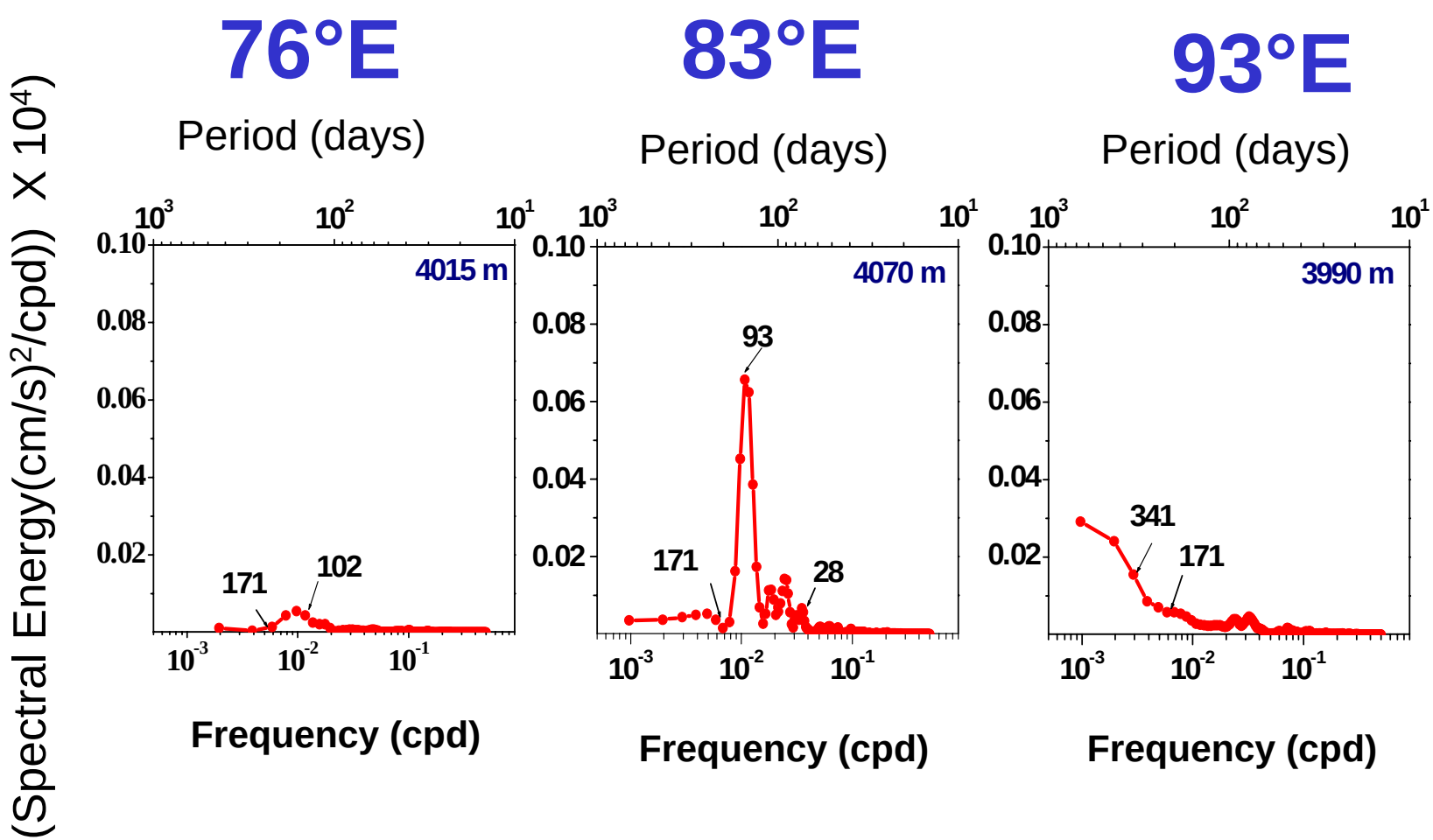
Power spectra for *U* (cm/s) at 500 m 2002-03



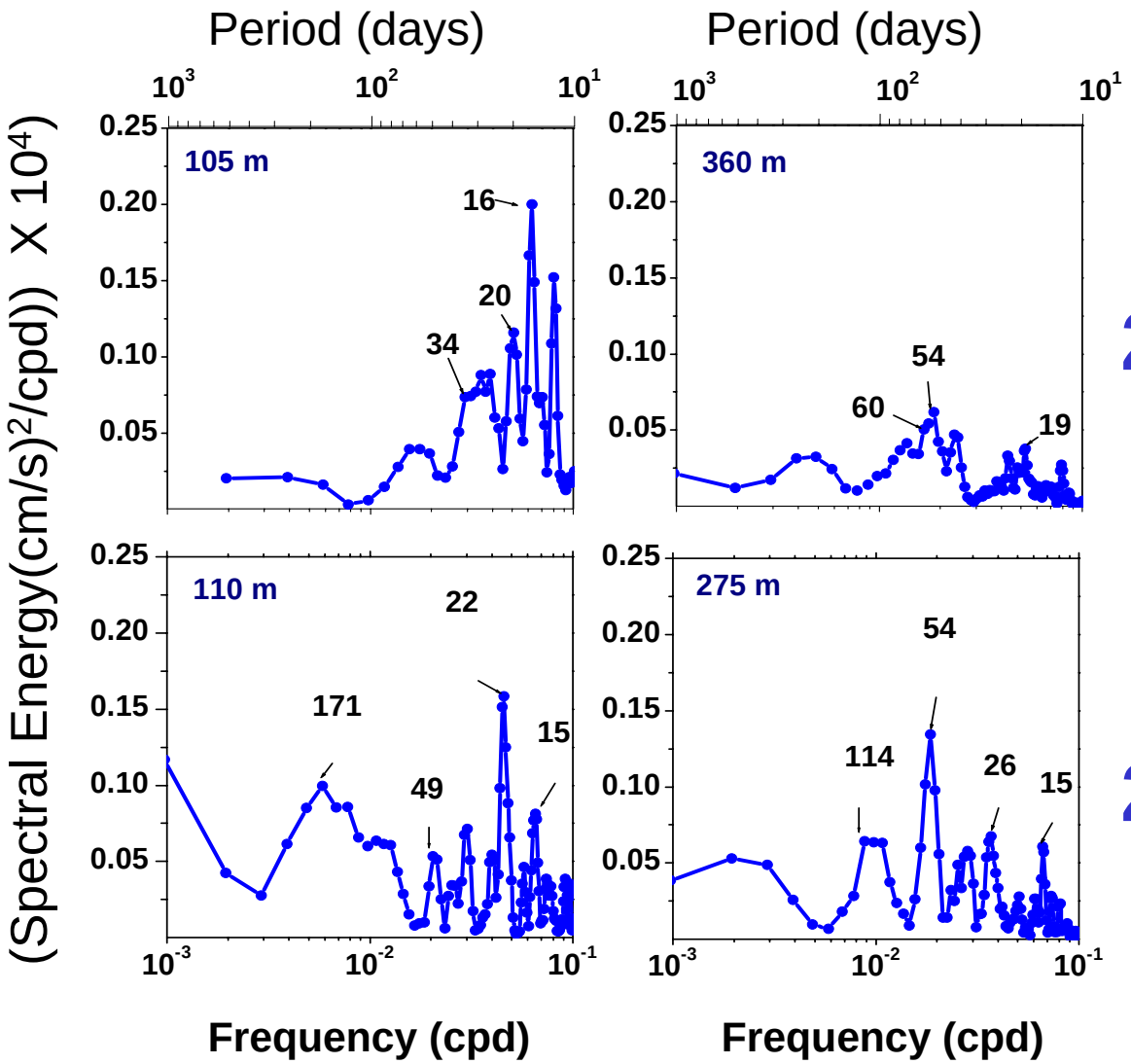
Power spectra for *U* (cm/s) at 2000 m 2002-03



Power spectra for *U* (cm/s) at 4000 m 2002-03



Power spectra for *V* (cm/s) at 100 m & 300 m



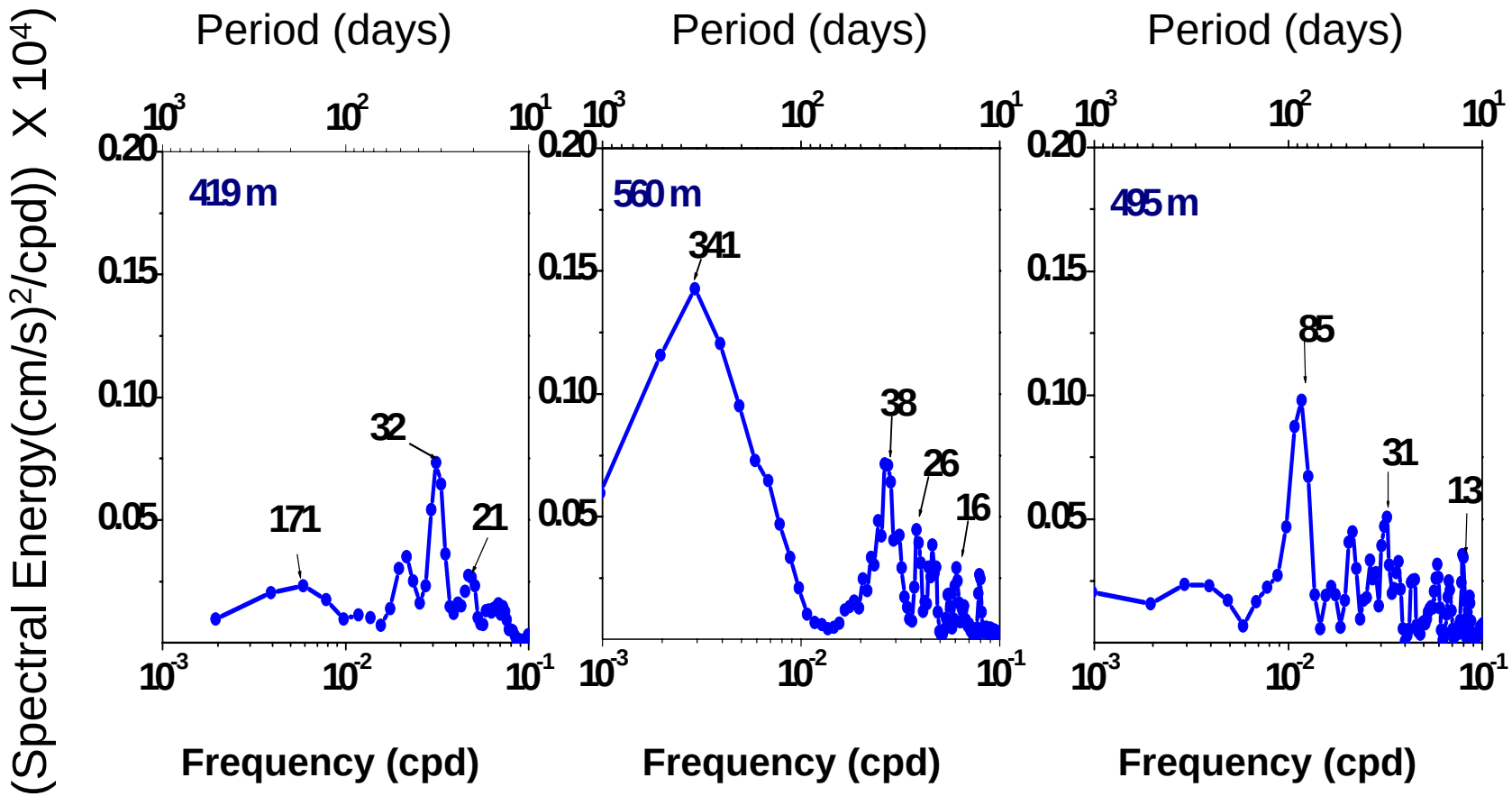
83°E

2001-03

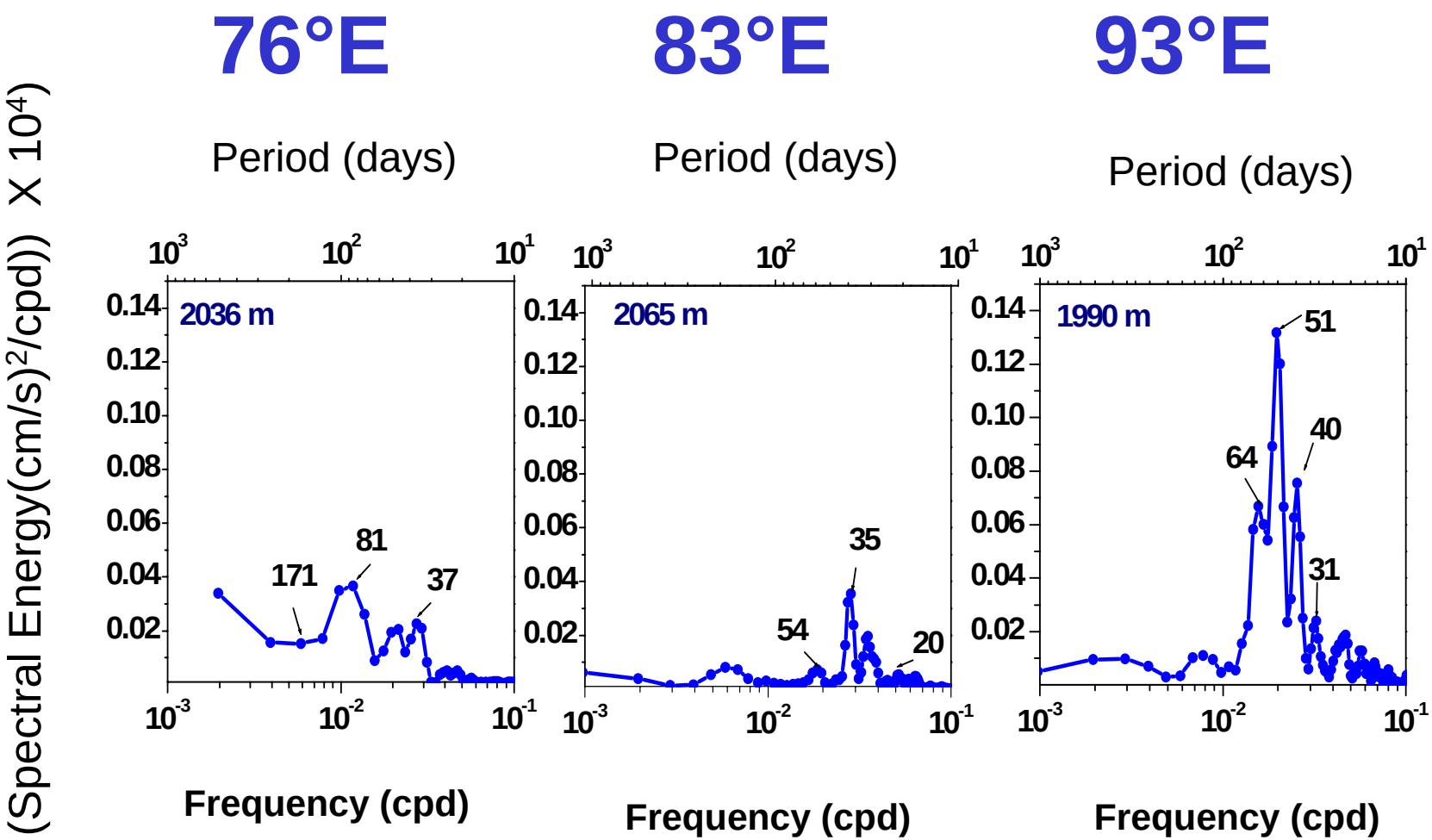
93°E

2000-03

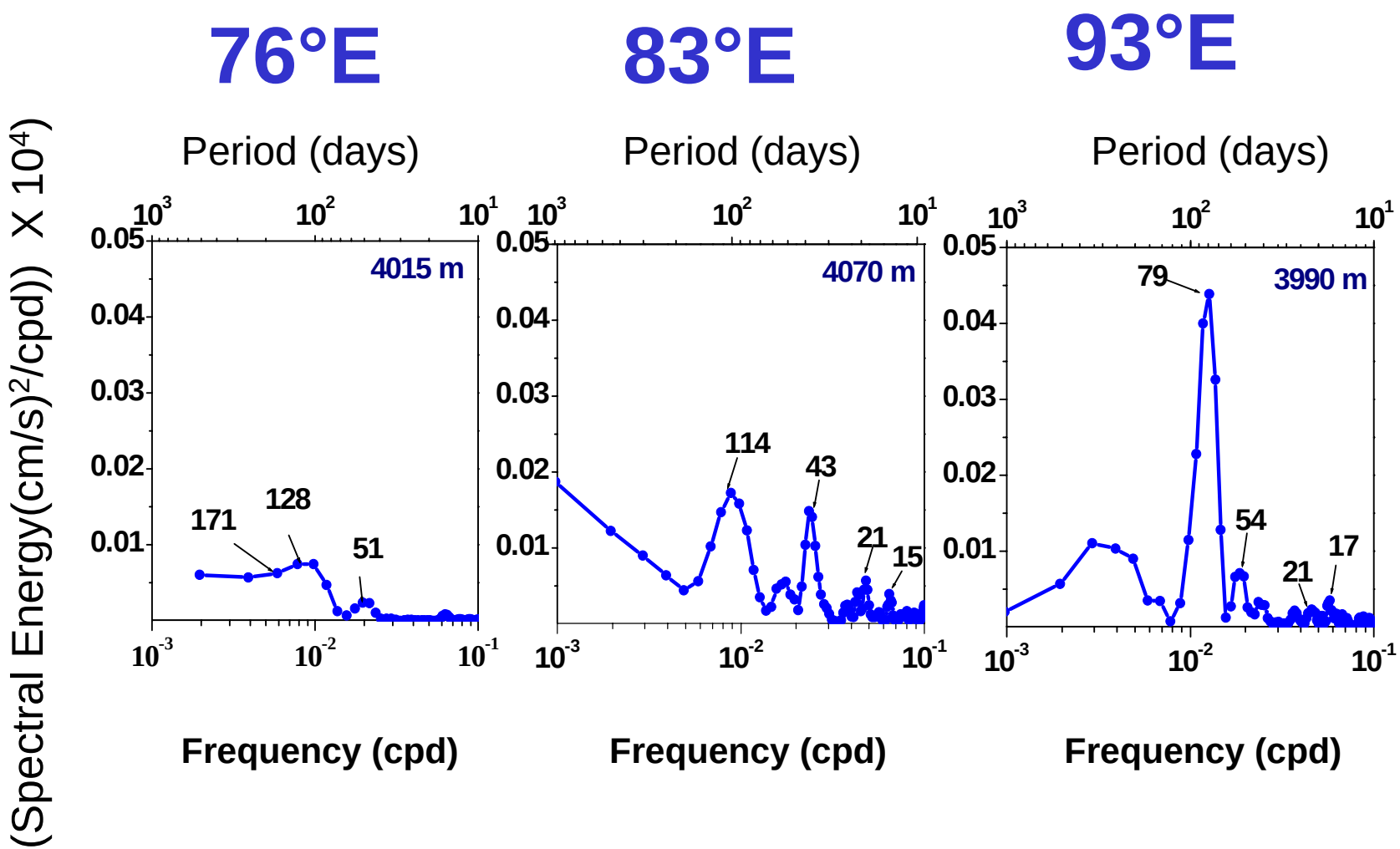
Power spectra for *V* (cm/s) at 500 m 2002-03



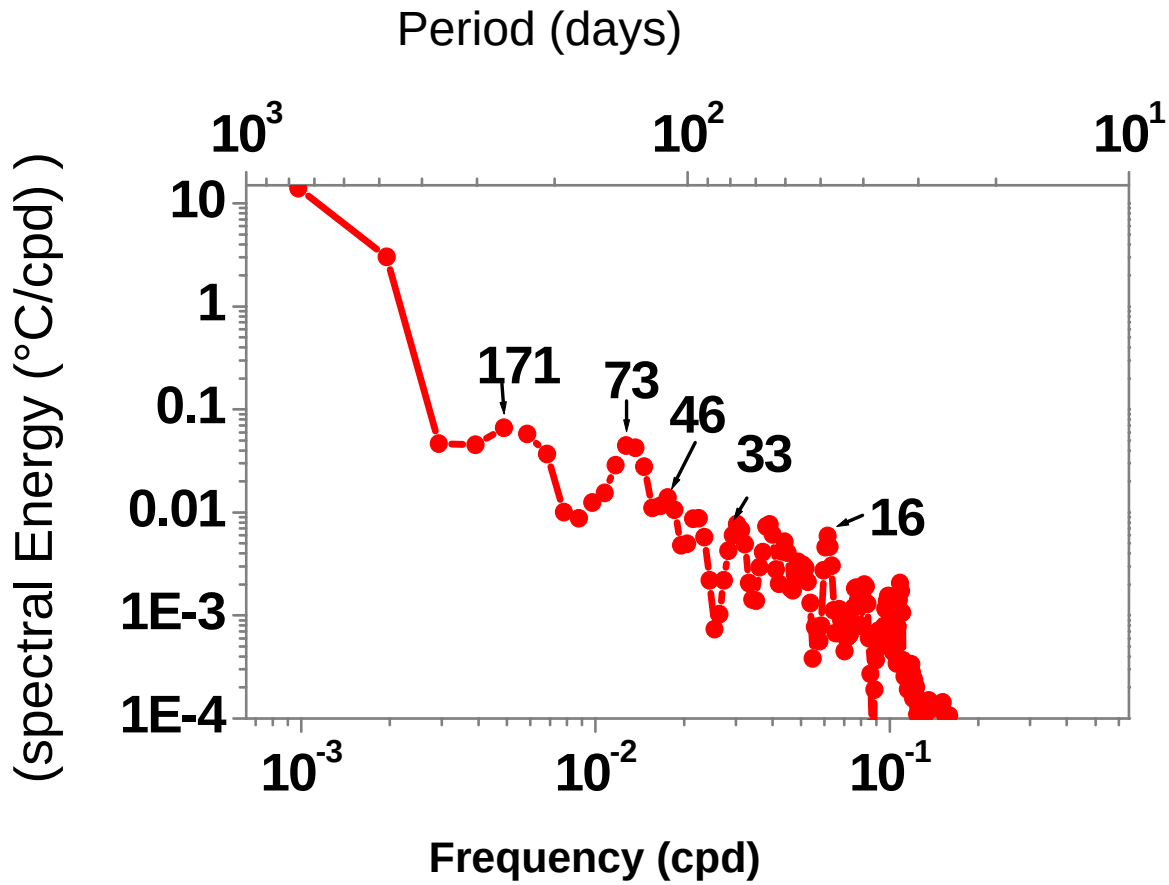
Power spectra for *V* (cm/s) at 2000 m 2002-03



Power spectra for *V* (cm/s) at 4000 m 2002-03



Power spectra for temperature (°c) at 0, 93°C at 100 m

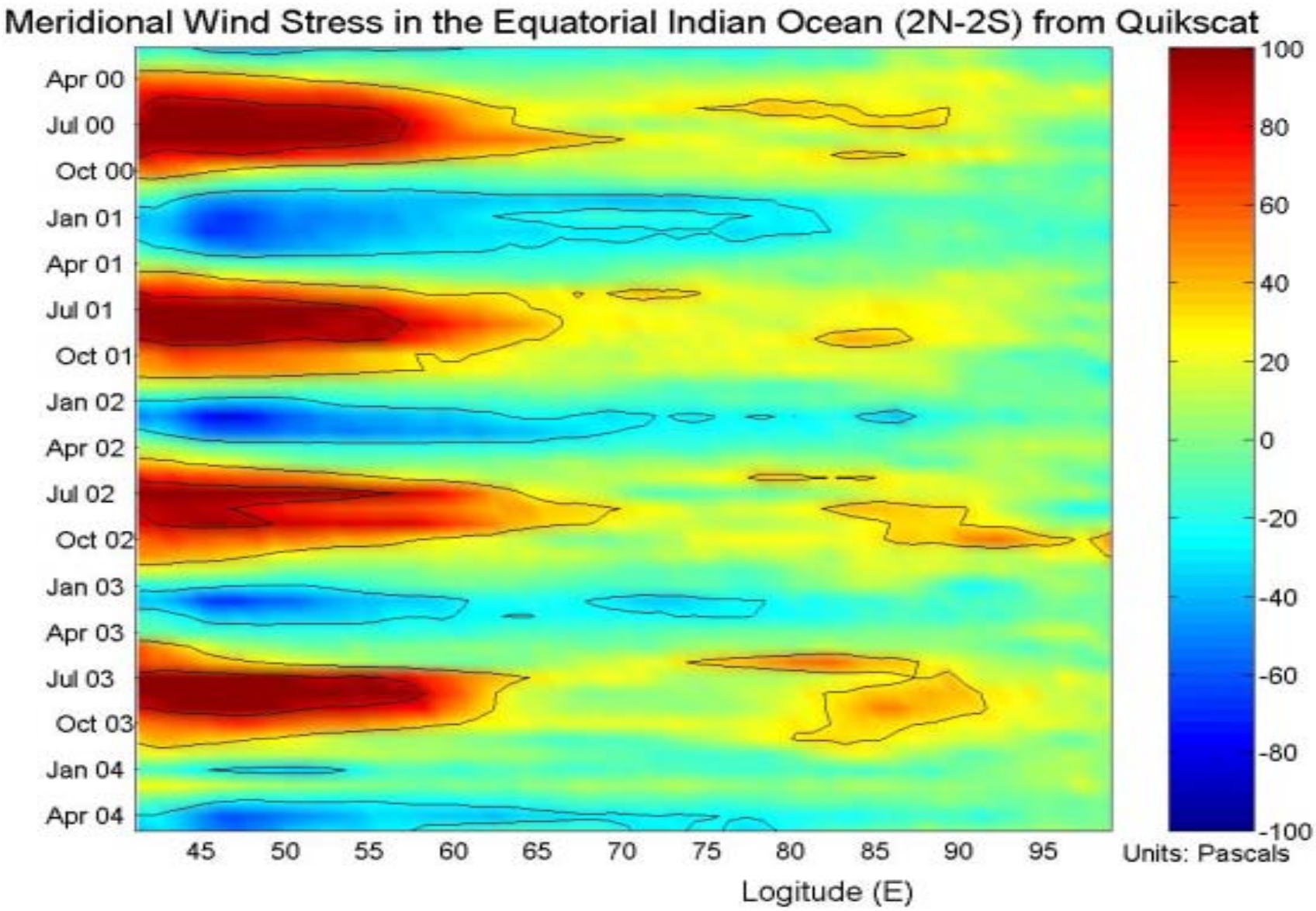


Amplitude and phase of the semi-annual variation of zonal and meridional velocity at equator, 93°E during 2000-03. Phases are relative to 1st January.

Year	Location	Depth (m)	Zonal Amp(cm/s)	Phase	Meridional Amp(cm/s)	Phase
2000-01	93°E	135	7.04	311	3.06	111
		280	9.85	45	2.12	130
		983	6.80	102	1.39	5
		1996	0.44	141	1.02	73
		3995	0.91	338	0.55	28
2001-02	93°E	106	8.84	207	2.58	105
		264	7.31	26	1.97	49
		462	2.17	308	3.07	149
		966	1.36	104	0.28	356
		1969	2.18	38	0.55	82
		3968	0.45	169	0.22	153
2002-03	93°E	106	11.32	217	0.24	279
		529	0.83	257	0.57	185
		1032	6.19	120	0.84	344
		2004	1.58	30	2.05	224
		4015	1.17	333	0.33	343

Amplitude and phase of the semi-annual variation of zonal and meridional velocity at 93°, 83° and 76°E during 2002-03 in the equatorial Indian Ocean. Phases are relative to 1st January.

Year	Location	Depth (m)	Zonal Amp(cm/s)	Phase	Meridional Amp(cm/s)	Phase
2002-03	93°E	106	11.32	217	0.24	279
		529	0.83	257	0.57	185
		1032	6.19	120	0.84	344
		2004	1.58	30	2.05	224
		4015	1.17	333	0.33	343
2002-03	83°E	105	31.22	186	1.83	245
		342	16.34	68	2.28	239
		538	23.04	31	5.64	249
		1032	6.51	337	0.71	109
		4033	0.79	124	0.77	10
2002-03	76°E	419	20.77	80	1.56	232
		645	22.23	71	1.02	176
		822	17.98	47	3.09	271
		2036	5.58	248	2.36	169
		4015	1.34	252	2.28	16


Meridional Wind Stress in the Equatorial Indian Ocean (2N-2S) from Quikscat
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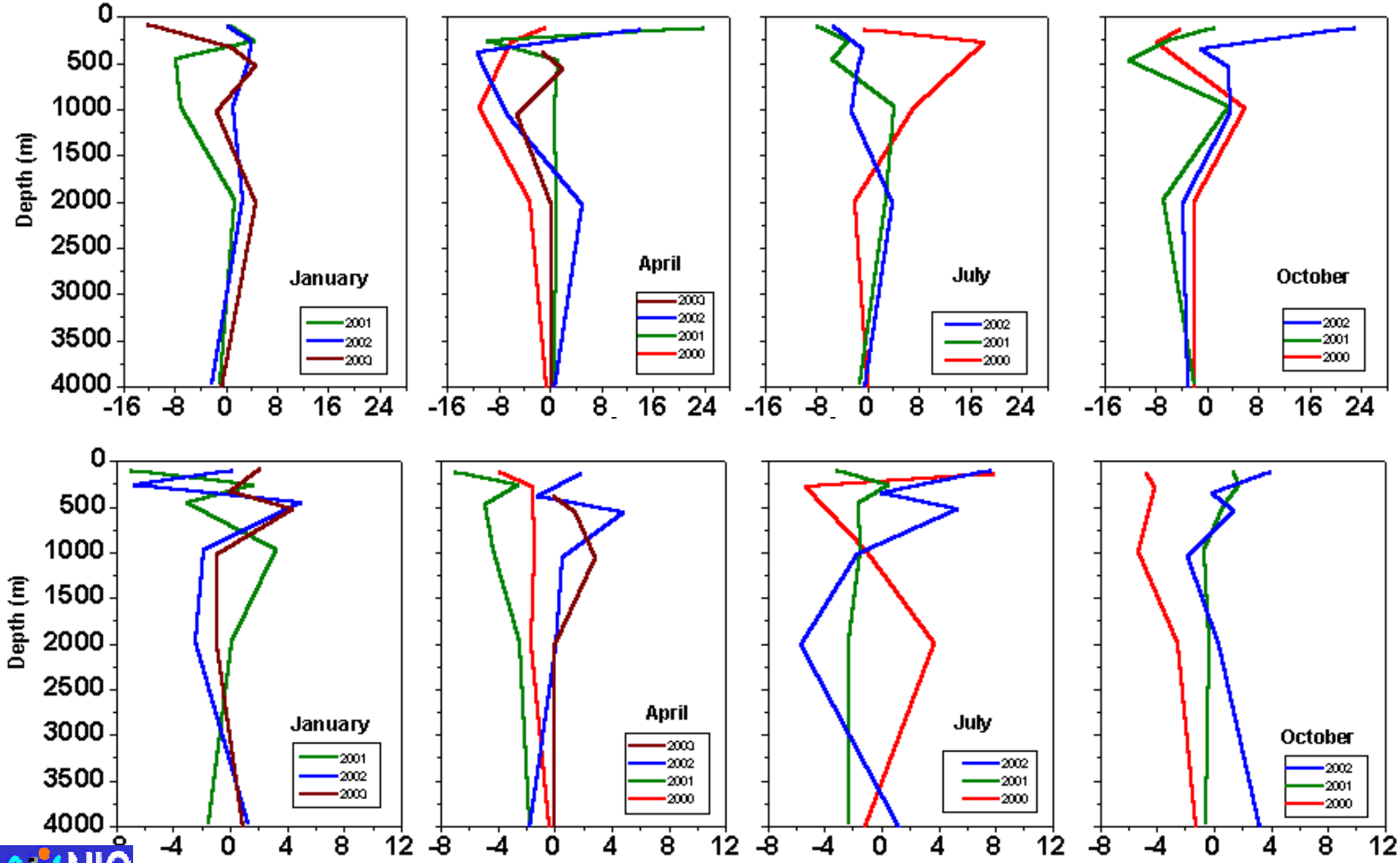
Jul 02
Oct 02
Jan 03
Apr 03
Jul 03
Oct 03
Jan 04
Apr 04
45
50
55
60
65
70
75
80
85
90
95
Logitude (E)
100
80
60
40
20
0
-20
-40
-60
-80
-100
Units: Pascals

Monthly mean profiles of u (top) & v (bottom) at 93°E



Model u velocity (cm/s): 2002 (top) and 2003 (bottom)