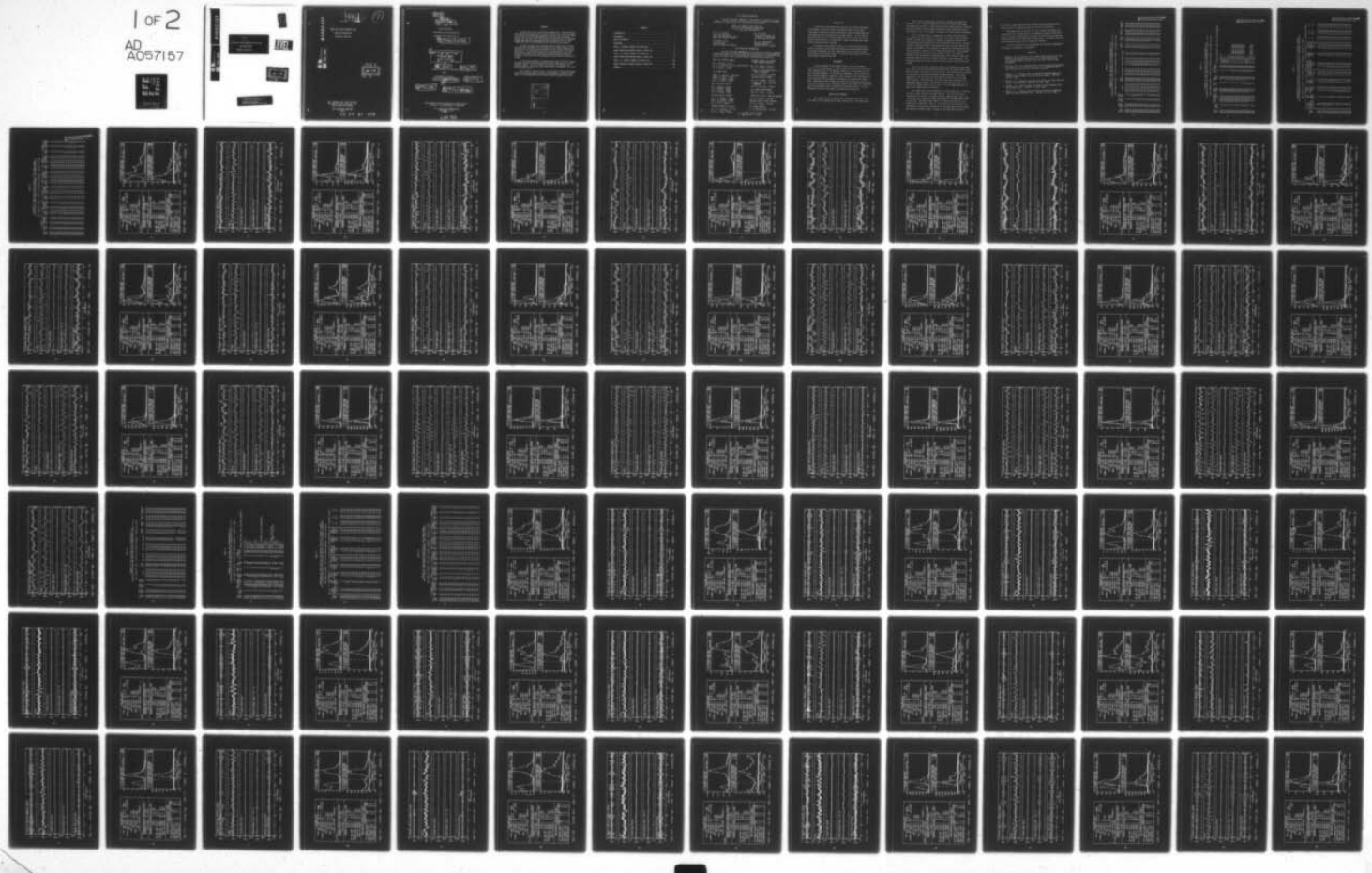
AD-A057 157 STEVENS INST OF TECH HOBOKEN N J DAVIDSON LAB F/G 8/3
RADAR AND TUCKER WAVEMETER DATA FROM SEA-LAND MCLEAN VOYAGES 35--ETC(U)
AUG 78 J F DALZELL N00024-74-C-5451
UNCLASSIFIED SIT-DL-77-1935 SSC-SL-7-19 NL

1 OF 2
AD A057157



LEVEL II

SL-7-19

RADAR AND TUCKER WAVEMETER DATA FROM SEA-LAND McLEAN VOYAGES 35 AND 36E

SHIP STRUCTURE COMMITTEE
1978

18 SSC

19 SL-7-19

9 TECHNICAL REPORT,

on

Project SR-1221

"Correlation and Verification of

Wavemeter Data from the SL-7"

14 SIT-DL-77-1935

6 RADAR AND TUCKER WAVEMETER DATA

FROM SEA-LAND McLEAN

VOYAGES 35 AND 36E.

by

10 J. F. Dalzell

Stevens Institute of Technology

11 Aug 78

under

Department of the Navy
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U. S. Coast Guard Headquarters
Washington, D.C.
1978

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ABSTRACT

So that more precise correlations between full scale observations and analytical and model results could be carried out, one of the objectives of the instrumentation program for the SL-7 class container ships was the provision of instrumental measures of the wave environment. To this end, two wave meter systems were installed on the S.S. SEA-LAND McLEAN. Raw data was collected from both systems during the second (1973-1974) and third (1974-1975) winter data collecting seasons.

It was the purpose of the present work to reduce this raw data, to develop and implement such corrections as were found necessary and feasible, and to correlate and evaluate the final results from the two wave meters. In carrying out this work it was necessary to at least partly reduce several other channels of recorded data, so that, as a by-product, reduced results were also obtained for midship bending stresses, roll, pitch, and two components of acceleration on the ship's bridge.

As the work progressed it became evident that the volume of documentation required would grow beyond the usual dimensions of a single technical report. For this reason the analyses, the methods, the detailed results, discussions, and conclusions are contained in a series of ten related reports.

This report is one of the six in the series in which the detailed results of the data reduction process are presented. Included in this report is the reduced data from the Second Season Voyages 35 and 36E.

CONTENTS

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INTRODUCTION

It was one of the objectives of the SL-7 full-scale instrumentation program to provide a direct instrumental measure of the wave environment so that more precise correlations could be made between full-scale observations, and analytical and model results. To this end the ship was fitted with a micro-wave radar relative wave meter and various motion sensing devices. A "Tucker Meter" pressure actuated wave height sensing system was also installed.

The purpose of the present project is to reduce and analyze the resulting radar and Tucker meter data obtained on the SEA-LAND McLEAN in the second (1973-1974) and third (1974-1975) winter recording seasons. The purpose of the present report is to present the reduced data from the Second Season Voyages 35 and 36E.

BACKGROUND

Since the purpose of the present report is only to document a portion of the reduced data, it should be noted that details of the experiments themselves, and of the analyses leading up to the present results, are contained elsewhere. To be specific, References 1 and 2 contain, for both recording seasons in question, a full account of the instrumentation, basic recording, and the nominal circumstances surrounding the present data. References 3 and 5 contain the detail of the reduction of the original data to digital form. Reference 4 contains the detail of the analyses and of the procedures used in generating the present results. Finally, Reference 6 contains the summary, discussion and conclusions.

NOTES ON THE CONTENTS

Each voyage leg was processed, and is presented, as a unit. The first part of the presentation for each voyage leg is a four-part table.

Parts a and b of each table contain the log-book data extracted from Ref. 1 or 2. With the exception of the first column of each page, the meaning of each entry is that established by Teledyne Materials Research. The first column is the run number assigned to each interval during the digitization at D.L. This number is retained for identification throughout.

Part c of each table is a comparison of results from the present digitization with that at TMR. Five columns are stress results obtained at TMR. Stresses are presented in thousands of pounds per square inch. The columns marked 6 through 8 are from the present digitization. Column 6 "range of recorded extremes" was computed from the first pass analysis by scaling the extremes in each interval and subtracting the smallest extreme from the largest. Column 7 is $2\sqrt{2}$ times the process rms. This estimate should compare with the value given by TMR for "rms P to T stress,". Column 8 is the difference of the sample mean of the interval noted, from the sample mean of the first interval digitized in each voyage leg. The remaining columns are various ratios of present results to those obtained by TMR.

Part d of the tables involves indices of the magnitude of raw radar, roll, pitch, vertical and transverse acceleration, and Tucker meter signals. The first index in each case is 4.0 x the rms. The second and third indices are the positive and negative extremes for each channel. The extremes observed for roll and pitch were corrected for electrical zero on tape before scaling. The extremes for all other items were corrected to the sample mean before scaling. The senses of pitch and Tucker meter are not correct for reasons noted in Ref. 4, and it is to be emphasized that all data is raw (uncorrected for anything).

The second part of the presentation for each voyage leg is a series of charts, a pair of charts for each interval. The first of the pair includes plots of spectra of midship vertical bending stress, roll, corrected radar wave elevation, Tucker meter wave, and the mean dynamic head at frame 119. The "mean dynamic head" is a partial correction of the Tucker meter as detailed in Ref. 4. At the left of the first chart is a tabulation of various data; portions of the log book data from the tables, two indices of midship stress, a summary of the magnitude of motions,

and finally a table summarizing wave height statistics obtained from spectra as well as peak-trough analyses of the time histories.

The second chart of the pair for each interval are sample time histories for five of the channels of information treated in the first chart. As noted in Reference 4, there was at the end of data reduction 16-1/2 minutes of valid radar wave elevation data. To produce the charts an 8-1/2 minute portion of this sample was selected.

A fuller discussion of the background and conventions employed in the charts is presented in the Appendix.

REFERENCES

1. Wheaton, J.W. and Boentgen, R.R., "Second Season Results from Ship Response Instrumentation Aboard the SL-7 Class Containership S.S. SEA-LAND McLEAN in North Atlantic Service," SL-7-9, 1976, AD-A034162.

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3. Dalzell, J.F., "Original Radar and Standard Tucker Wavemeter SL-7 Containership Data Reduction and Correlation Sample," SSC-277, SL-7-14. 1978.

4. Dalzell, J.F., "Wavemeter Data Reduction Method and Initial Data for the SL-7 Containership," SSC-278, SL-7-15. 1978.

5. Dalzell, J.F., "Modified Radar and Standard Tucker Wavemeter SL-7 Containership Data," SSC-279, SL-7-20. 1978.

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TABLE Ia

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 1 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 EAST

D.L. RUN NO.	TMR TAPE NO.	TMR INDX NO.	TMR INTV NO.	DATE	TIME (GMT)	LATITUDE	LONGITUDE	COURSE	SPEED KT.	PROP RPM	DRAFT FT.	SEA/AIR TEMP
1405	165	2	5	02-12-74	2000	40-25 N	71-01 W	079	32.4	132.5	30.00	43/34
1409	165	3	9	02-12-74	2400	40-25 N	71-01 W	079	32.3	132.0	30.00	43/36
1413	165	4	13	02-13-74	0400	40-25 N	71-01 W	079	32.4	132.4	30.00	46/34
1417	165	5	17	02-13-74	0800	40-25 N	71-01 W	079	32.3	132.3	30.04	51/36
1421	165	6	21	02-13-74	1200	42-35 N	55-02 W	079	32.1	131.0	30.10	44/35
1429	165	8	29	02-13-74	2000	42-35 N	55-02 W	079	32.3	132.0	30.18	47/35
1433	165	9	33	02-13-74	2400	42-35 N	55-02 W	079	32.4	132.4	30.24	34/35
1437	165	10	37	02-14-74	0400	42-35 N	55-02 W	079	32.3	132.0	30.22	57/36
1442	165	11	42	02-14-74	0800	42-35 N	55-02 W	079	32.3	132.0	30.22	57/35
1445	165	12	45	02-14-74	1200	45-05 N	38-25 W	079	32.1	131.4	30.20	54/45
1449	165	13	49	02-14-74	1600	45-05 N	38-25 W	079	32.3	132.0	30.18	54/47
1501	167	14	1	02-14-74	2000	45-05 N	38-25 W	079	32.1	131.2	30.11	43/48
1505	167	15	5	02-14-74	2400	45-05 N	38-25 W	079	32.2	131.5	30.10	52/47
1513	167	17	13	02-15-74	0800	45-05 N	38-25 W	077	31.9	130.5	29.92	52/48
1517	167	18	17	02-15-74	1200	47-09 N	21-59 W	076	31.9	130.5	29.80	52/54
1525	167	20	25	02-15-74	2400	47-09 N	21-59 W	080	17.2	70.0	29.70	50/50
1529	167	21	29	02-16-74	0400	47-09 N	21-59 W	075	17.3	72.0	29.69	52/50
1533	167	22	33	02-16-74	0800	47-09 N	21-59 W	075	17.3	72.0	29.70	52/49
1537	167	23	37	02-16-74	1200	48-36 N	11-29 W	075	16.5	65.0	29.76	51/53
1541	167	24	41	02-16-74	1600	48-36 N	11-29 W	075	19.7	82.0	29.74	50/49
1545	167	25	45	02-16-74	2000	48-36 N	11-29 W	075	26.2	107.0	29.73	50/49

TABLE Ib

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 2 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 EAST

D.L. RUN NO.	SEA STATE	<REL WIND> DIR/SPEED /(KT)	REL WAVE DIR	WAVE HT. FT.	REL SWELL DIR	<-SWELL-> HT FT.	LENGTH FT.	VISUAL WEATHER /TMR LOG-BOOK COMMENTS
1405	5	124P/20	124P	2	124P	3	150	PT CLDY /
1409	5	124P/20	124P	3	79P	5	150	OCAST /
1413	5	124P/20	124P	3	79P	5	150	OCAST /
1417	5	124P/20	124P	3	124P	5	150	OCAST /
1421	5	124P/20	124P	3	124P	5	150	OCAST /
1429	6	135P/25	135P	4	90P	6	150	PT CLDY /
1433	4	169P/15	169P	6	124P	8	200	PT CLDY /
1437	5	169P/20	169P	6	124P	10	200	PT CLDY /HEAVY ROLL
1442	7	146P/30	146P	6	124P	10	200	PT CLDY /HEAVY ROLL
1445	8	124P/35	124P	5	124P	10	200	PT CLDY /HEAVY ROLL
1449	8	146P/35	146P	5	124P	8	200	PT CLDY /HEAVY ROLL
1501	9	124P/45	124P	6	124P	10	200	PT CLDY /HEAVY ROLL
1505	9	124P/45	124P	6	124P	10	200	PT CLDY /HEAVY ROLL
1513	9	111P/45	111P	10	122P	15	250	PT CLDY /HEAVY ROLL
1517	10	121P/55	121P	20	121P	25	300	PT CLDY /HEAVY ROLL
1525	10	125P/55	125P	20	80P	20	250	OCAST /
1529	9	120P/45	120P	20	75P	20	250	OCAST /
1533	9	97P/45	97P	20	75P	20	250	PT CLDY /
1537	9	97P/45	97P	20	75P	20	250	PT CLDY./HEAVY ROLL
1541	10	97P/55	97P	20	75P	20	300	PT CLDY /HEAVY ROLL
1545	9	97P/45	97P	4	75P	6	300	PT CLDY /

TABLE Ic

COMPARISON OF TMR RESULTS FOR MIDSHIP VERTICAL BENDING STRESS
WITH CORRESPONDING RAW DIGITIZATION RESULTS AT DAVIDSON LABORATORY

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 EAST

	<----------TMR RESULTS---------->					<----D.L. DIGITIZATION--->			<--COLUMN RATIOS-->		
D.L. RUN NO.	NO. WAVE INDUCED CYCLES (1)	NO. 1ST MODE BURSTS (2)	MAX P-TO-T STRESS KPSI (3)	RMS P-TO-T STRESS KPSI (4)	MAX 1ST MODE STRESS KPSI (5)	RANGE OF RECORDED EXTREMES KPSI (6)	2.83X (SAMPLE RMS) KPSI (7)	REL MEAN STRESS KPSI (8)	(7) / (4)	(6) / (3+5)	(6) / (3)
1405	120	0	3.18	1.37	0.00	4.60	1.47	0.21	1.07	1.45	1.45
1409	84	9	4.70	2.63	0.86	7.09	2.97	-0.20	1.13	1.28	1.51
1413	99	4	6.99	2.12	0.79	8.06	3.44	-0.19	1.63	1.04	1.15
1417	126	10	6.85	2.72	1.16	8.45	4.12	0.22	1.51	1.05	1.23
1421	165	3	3.74	1.83	0.97	7.60	3.27	-0.15	1.79	1.61	2.03
1429	97	11	7.92	3.24	0.99	11.06	4.04	-0.03	1.25	1.24	1.40
1433	105	4	9.51	3.27	0.80	10.38	4.27	-0.09	1.31	1.01	1.09
1437	105	26	7.19	3.55	1.70	10.57	4.36	-0.45	1.23	1.19	1.47
1442	114	23	10.19	4.58	2.00	16.33	6.03	-0.20	1.32	1.34	1.60
1445	71	23	17.74	5.48	1.23	18.20	7.46	0.19	1.36	0.96	1.03
1449	63	23	13.62	5.49	1.14	14.25	6.75	-0.11	1.23	0.96	1.05
1501	62	9	11.51	4.73	1.22	18.12	6.72	-0.05	1.42	1.42	1.57
1505	74	31	15.15	5.00	1.34	17.37	6.65	0.44	1.33	1.05	1.15
1513	58	44	13.11	6.52	1.63	17.92	7.90	0.73	1.21	1.22	1.37
1517	59	42	18.22	6.73	2.21	20.04	8.42	0.97	1.25	0.98	1.10
1525	67	18	14.83	6.74	1.36	17.84	7.30	0.98	1.08	1.10	1.20
1529	76	17	12.13	5.74	1.10	13.05	5.79	1.16	1.01	0.99	1.08
1533	82	26	10.52	5.62	1.14	11.61	5.29	1.23	0.94	1.00	1.10
1537	58	33	15.26	7.08	1.41	17.25	7.46	0.84	1.05	1.04	1.13
1541	61	33	11.42	5.81	1.35	11.00	5.81	0.78	1.00	0.86	0.96
1545	44	23	7.76	4.37	1.39	9.88	4.85	-0.30	1.11	1.08	1.27

TABLE Id

SUMMARY OF RAW DIGITIZATION RESULTS FOR RADAR RANGE
ROLL, PITCH, DECK HOUSE ACCELERATIONS, AND TUCKER METER

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 EAST

	<--- RADAR --->			<--- ROLL ---->			<--- PITCH --->			<--VERT ACCEL->			<--LAT ACCEL-->			<-- TUCKER -->		
D.L. RUN NO.	4.0 (RMS) FT	RECORDED EXTREMES FT		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) FT	RECORDED EXTREMES FT	
1405	15.	14.	-14.	5.6	5.	-4.	0.6	-0.5	-1.7	0.11	0.1	-0.1	0.14	0.1	-0.1	2.	2.	-1.
1409	24.	21.	-18.	15.5	13.	-9.	0.8	0.2	-1.1	0.15	0.1	-0.1	0.36	0.2	-0.3	3.	4.	-3.
1413	25.	22.	-23.	12.4	11.	-10.	0.7	0.1	-1.1	0.12	0.1	-0.1	0.26	0.3	-0.2	3.	4.	-3.
1417	28.	21.	-22.	10.0	12.	-5.	1.0	0.5	-1.3	0.22	0.2	-0.2	0.21	0.2	-0.2	3.	3.	-2.
1421	22.	20.	-22.	7.2	8.	-6.	0.9	0.4	-1.5	0.16	0.2	-0.2	0.16	0.2	-0.2	2.	2.	-2.
1429	33.	30.	-30.	14.5	12.	-13.	1.0	0.4	-1.5	0.23	0.2	-0.2	0.33	0.3	-0.2	5.	5.	-4.
1433	36.	30.	-28.	17.9	13.	-12.	1.1	0.4	-1.8	0.25	0.2	-0.2	0.40	0.3	-0.3	9.	8.	-6.
1437	34.	29.	-37.	13.4	13.	-10.	1.5	1.0	-2.2	0.35	0.3	-0.3	0.31	0.3	-0.3	8.	7.	-6.
1442	45.	39.	-40.	23.8	23.	-14.	2.1	1.6	-2.3	0.44	0.4	-0.3	0.49	0.4	-0.5	12.	9.	-8.
1445	48.	35.	-43.	28.2	30.	-24.	1.7	1.0	-2.2	0.35	0.3	-0.3	0.59	0.6	-0.6	17.	15.	-9.
1449	42.	35.	-33.	28.1	25.	-14.	1.6	0.9	-2.1	0.33	0.3	-0.2	0.61	0.4	-0.5	13.	10.	-8.
1501	42.	50.	-29.	23.6	19.	-16.	1.3	0.9	-1.6	0.30	0.3	-0.3	0.53	0.4	-0.4	14.	14.	-11.
1505	44.	36.	-31.	25.3	26.	-18.	1.5	1.0	-1.9	0.35	0.3	-0.3	0.55	0.5	-0.5	16.	14.	-10.
1513	42.	32.	-33.	33.9	38.	-14.	1.6	1.4	-1.7	0.31	0.3	-0.3	0.68	0.4	-0.5	18.	16.	-10.
1517	43.	37.	-36.	31.6	27.	-17.	1.4	1.0	-1.5	0.31	0.3	-0.3	0.67	0.5	-0.5	16.	12.	-12.
1525	44.	44.	-44.	29.6	24.	-18.	1.0	0.4	-1.3	0.26	0.3	-0.2	0.66	0.5	-0.4	14.	16.	-8.
1529	42.	34.	-32.	22.0	22.	-13.	0.9	0.4	-1.2	0.26	0.3	-0.2	0.50	0.4	-0.4	9.	7.	-7.
1533	39.	32.	-42.	19.1	20.	-10.	0.9	0.3	-1.3	0.26	0.2	-0.2	0.45	0.4	-0.3	9.	8.	-7.
1537	40.	36.	-30.	29.1	26.	-14.	1.1	0.8	-1.5	0.30	0.3	-0.3	0.68	0.5	-0.5	12.	10.	-7.
1541	39.	39.	-28.	34.0	29.	-14.	1.0	0.4	-1.3	0.22	0.2	-0.2	0.72	0.5	-0.5	13.	13.	-7.
1545	28.	20.	-23.	23.1	20.	-12.	0.8	0.3	-1.3	0.11	0.1	-0.1	0.50	0.4	-0.3	8.	11.	-5.

LOG BOOK DATA

DATE AND TIME	02-12-74 2000
POSITION	40-25 N 71-01 W
COURSE AND SPEED	079 . 32.4 KNOTS
SEA STATE	5
WAVE HEIGHT	2 FEET
" REL DIR	124 PORT
SWELL HEIGHT	3 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

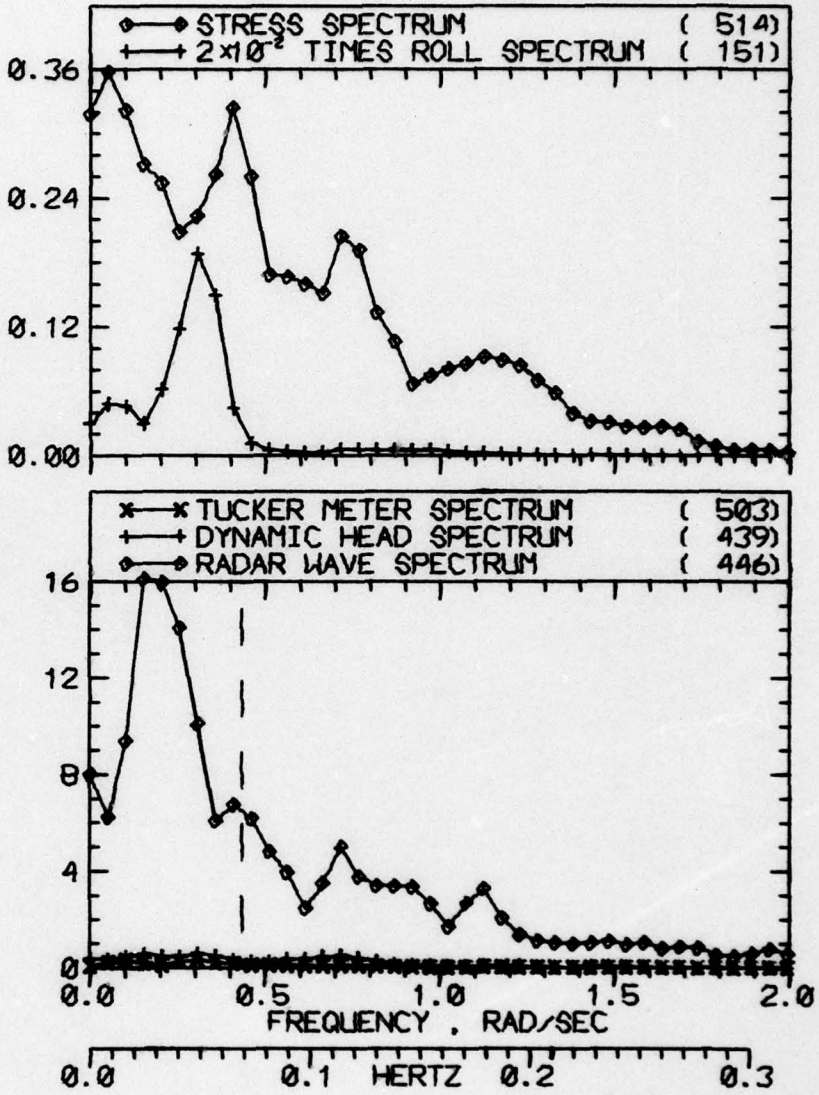
MAXIMUM PK-TR	3.2 KPSI
4.0 X RMS	2.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

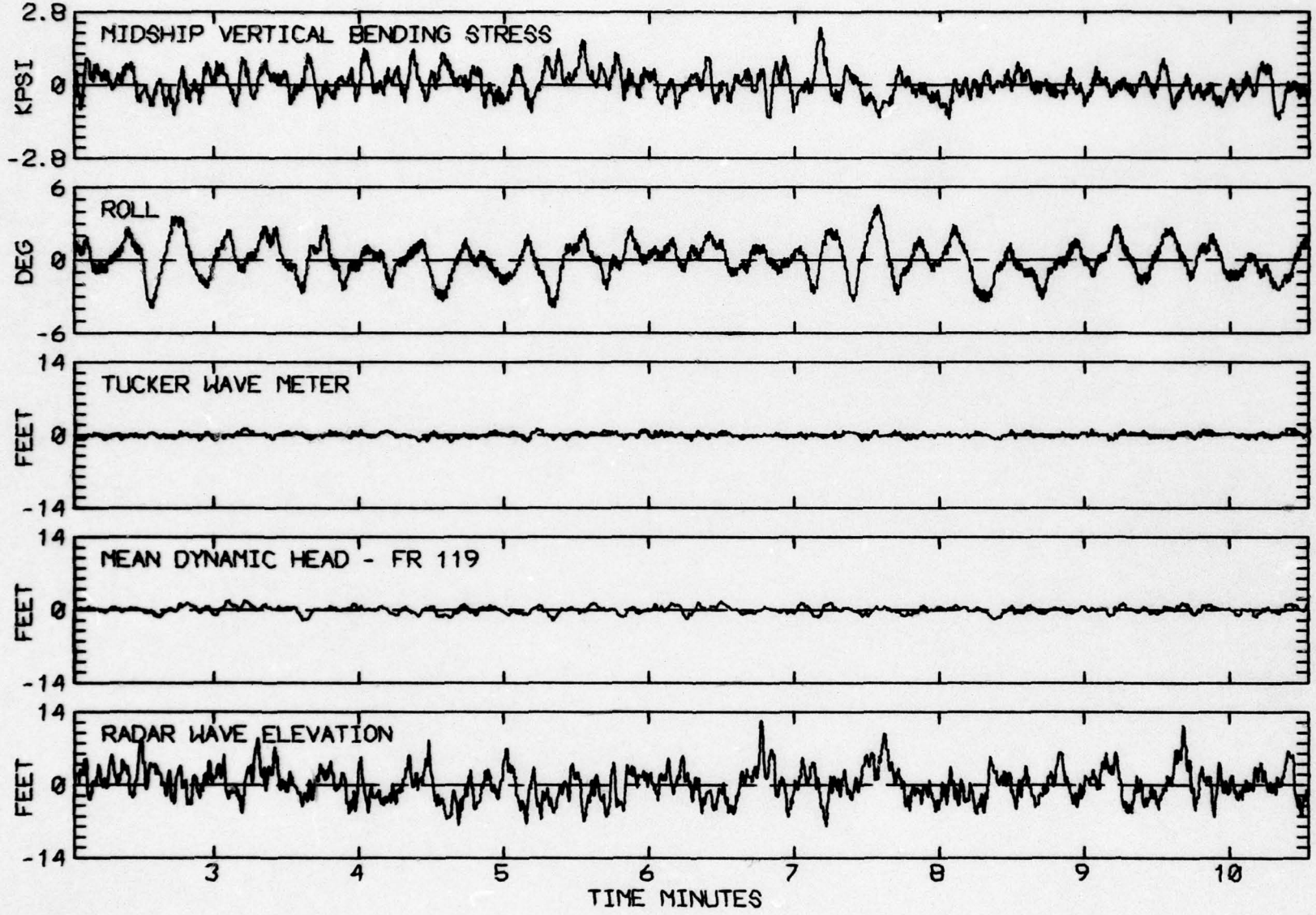
ROLL	5.7 DEG
PITCH	0.63 DEG
DK HSE VERT ACCEL	0.11 G
DK HSE LAT ACCEL	0.14 G
RADAR SLANT RANGE	15.3 FEET
VERTICAL RANGE	13.3 FEET
DISPL AT RADAR	5.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	939	525	224
MAXIMUM HEIGHT	1.5	3.3	16.4
10TH HIGHEST HTS	1.2	1.8	11.9
3RD HIGHEST HTS	0.9	1.2	8.7
4.0 RMS(SPECTRA)	1.9	2.6	11.7



RUN 1405 -- VOYAGE 35E -- TAPE 165 -- INDEX 2 -- INTERVAL 5



RUN 1405 -- VOYAGE 35E -- TAPE 165 -- INDEX 2 -- INTERVAL 5

LOG BOOK DATA

DATE AND TIME	02-12-74 2400
POSITION	40-25 N 71-01 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	12⁴ PORT
SWELL HEIGHT	5 FEET
" REL DIR	79 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

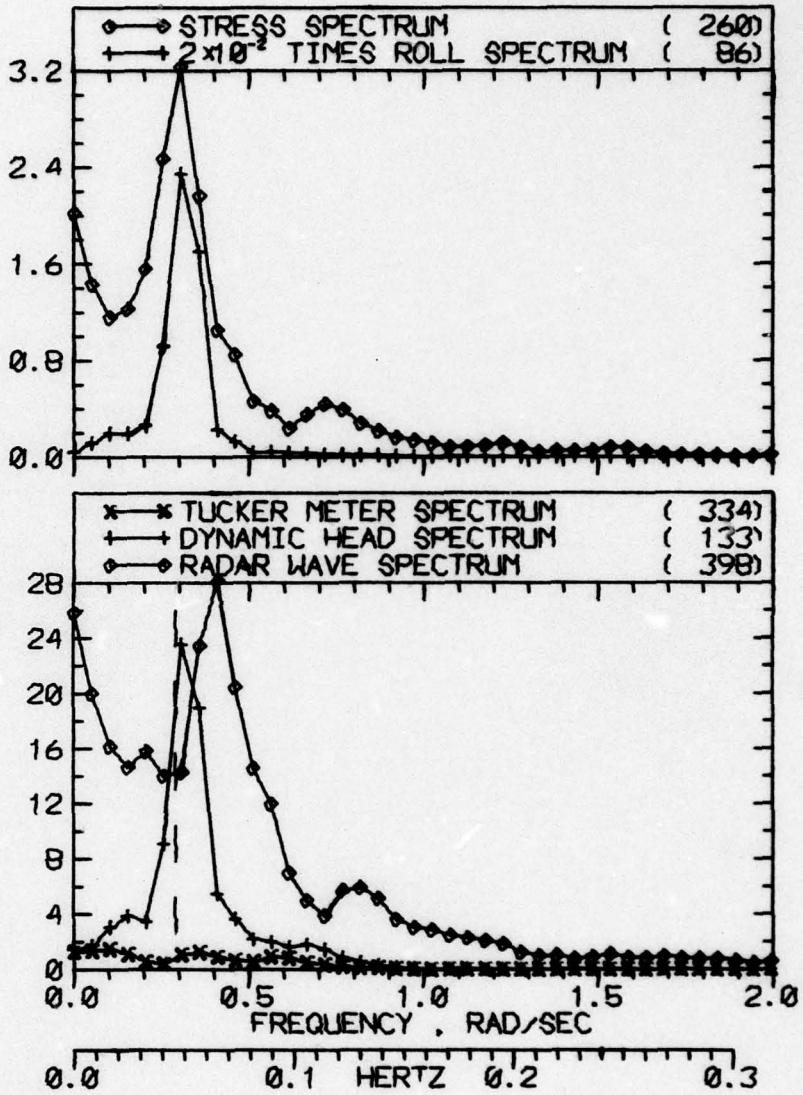
MAXIMUM PK-TR	4.7 KPSI
4.0 X RMS	4.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

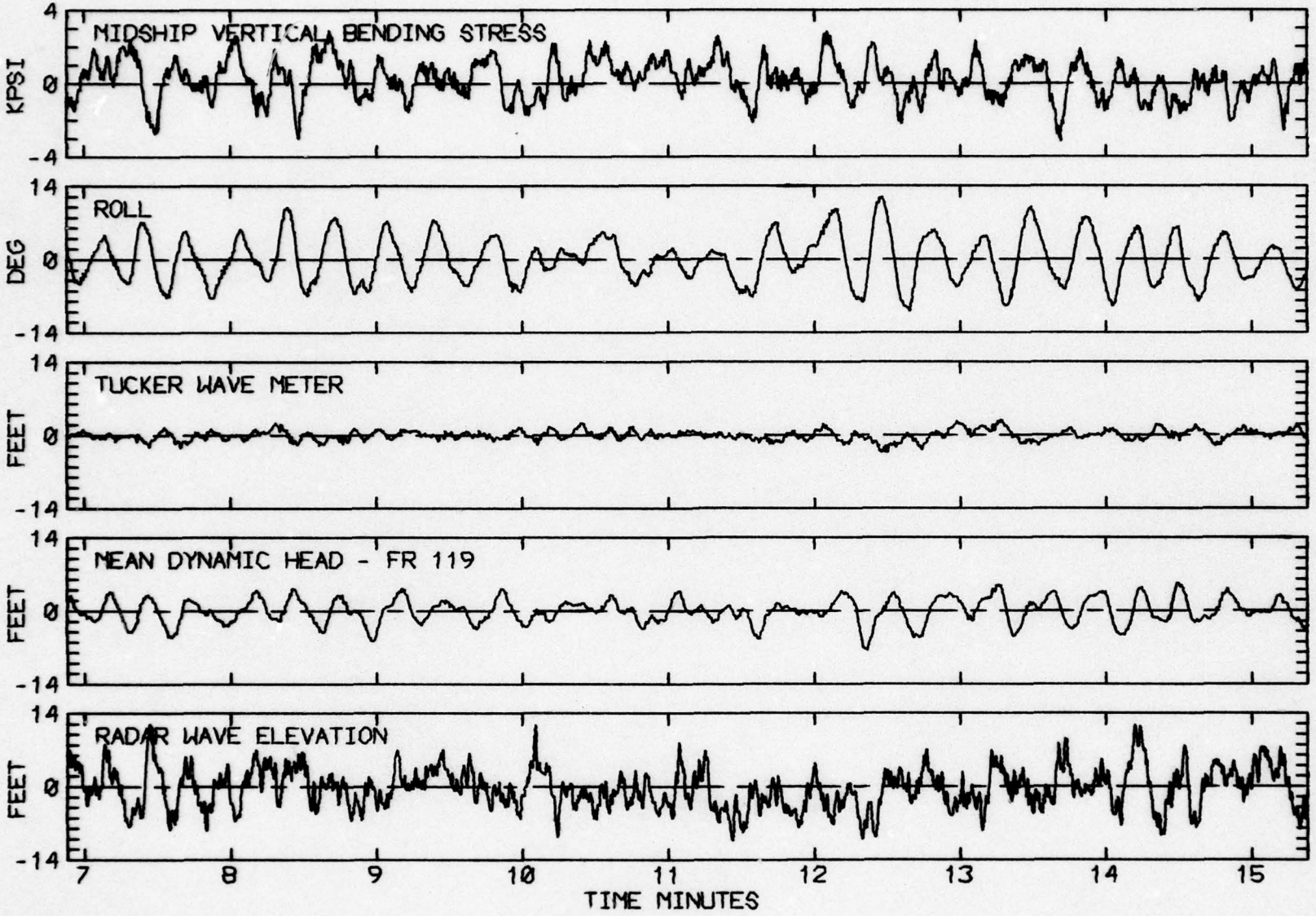
ROLL	16.2 DEG
PITCH	0.76 DEG
DK HSE VERT ACCEL	0.15 G
DK HSE LAT ACCEL	0.36 G
RADAR SLANT RANGE	24.2 FEET
VERTICAL RANGE	19.3 FEET
DISPL AT RADAR	11.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	479	168	206
MAXIMUM HEIGHT	3.0	11.5	21.3
10TH HIGHEST HTS	2.1	7.7	14.5
3RD HIGHEST HTS	1.5	5.2	10.9
4.0 RMS(SPECTRA)	3.5	8.4	15.4



RUN 1409 -- VOYAGE 35E -- TAPE 165 -- INDEX 3 -- INTERVAL 9



RUN 1409 -- VOYAGE 35E -- TAPE 165 -- INDEX 3 -- INTERVAL 9

LOG BOOK DATA

DATE AND TIME	02-13-74 0400
POSITION	40-25 N 71-01 W
COURSE AND SPEED	079 . 32.4 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	124 PORT
SWELL HEIGHT	5 FEET
" REL DIR	79 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

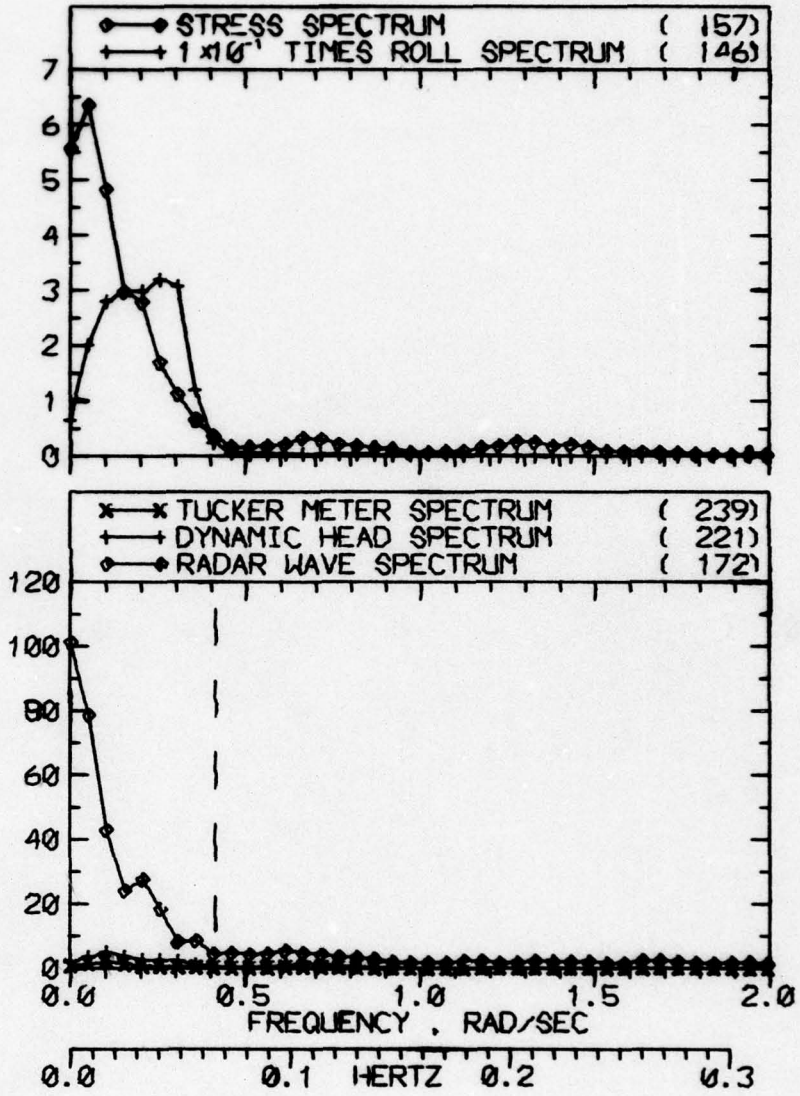
MAXIMUM PK-TR	7.0 KPSI
4.0 X RMS	4.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

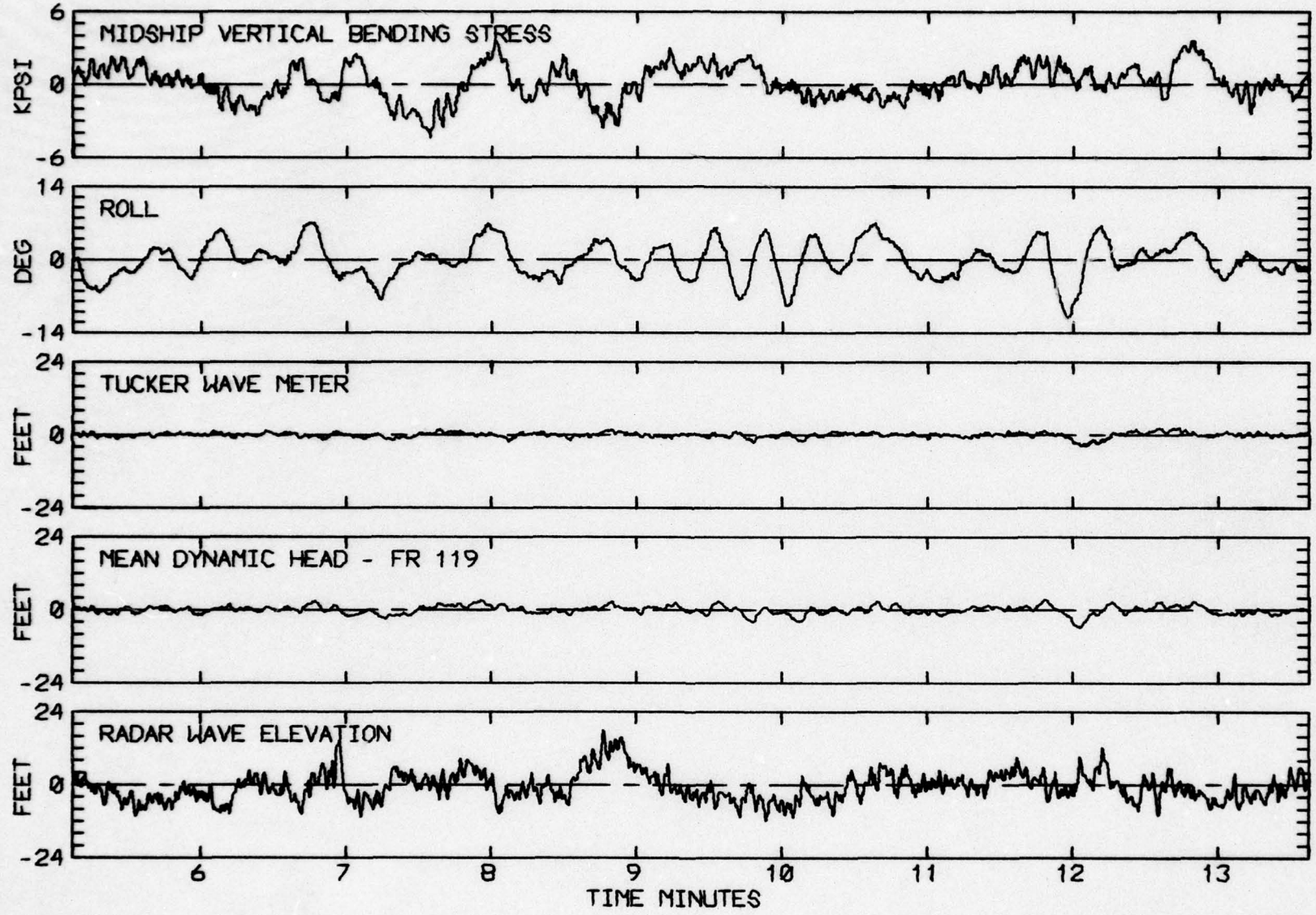
ROLL	12.6 DEG
PITCH	0.73 DEG
DK HSE VERT ACCEL	0.12 G
DK HSE LAT ACCEL	0.26 G
RADAR SLANT RANGE	24.9 FEET
VERTICAL RANGE	18.6 FEET
DISPL AT RADAR	6.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	597	238	180
MAXIMUM HEIGHT	2.5	6.1	25.1
10TH HIGHEST HTS	1.8	3.8	14.0
3RD HIGHEST HTS	1.3	2.4	10.6
4.0 RMS(SPECTRA)	3.0	4.8	17.2



RUN 1413 -- VOYAGE 35E -- TAPE 165 -- INDEX 4 -- INTERVAL 13



RUN 1413 -- VOYAGE 35E -- TAPE 165 -- INDEX 4 -- INTERVAL 13

LOG BOOK DATA

DATE AND TIME	02-13-74 0800
POSITION	40-25 N 71-01 W
COURSE AND SPEED	079 , 32.3 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	124 PORT
SWELL HEIGHT	5 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

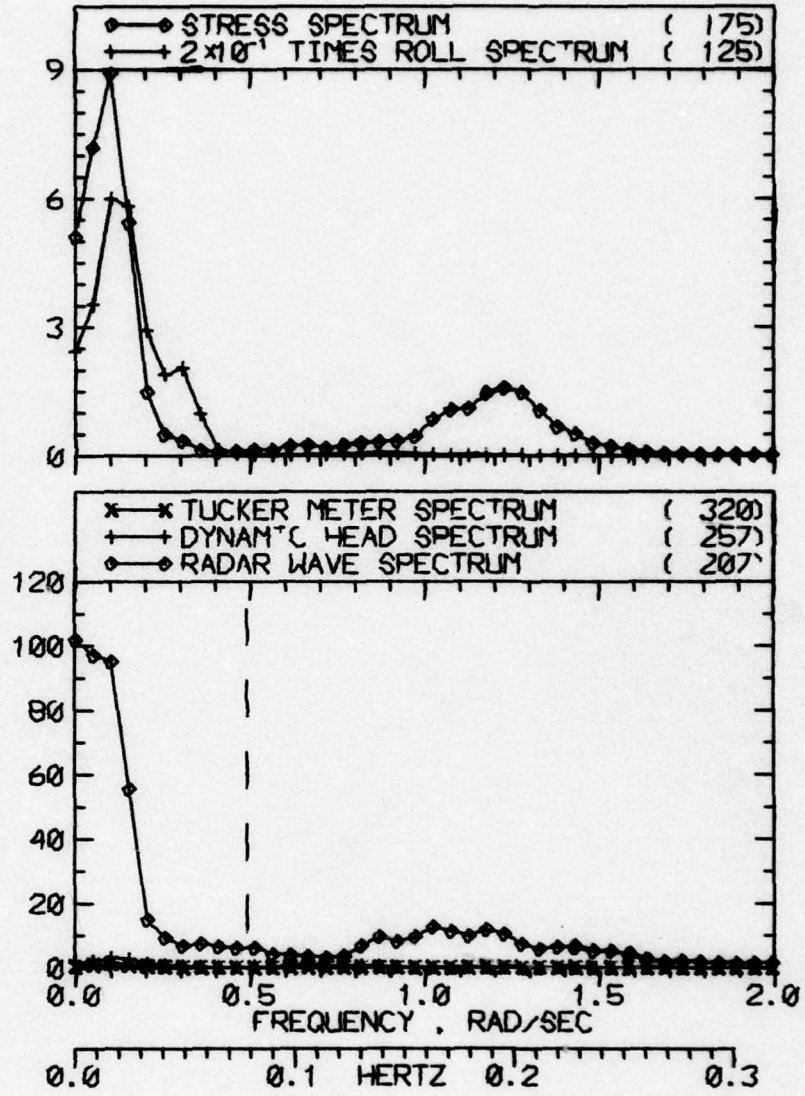
MAXIMUM PK-TR	6.9 KPSI
4.0 X RMS	5.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

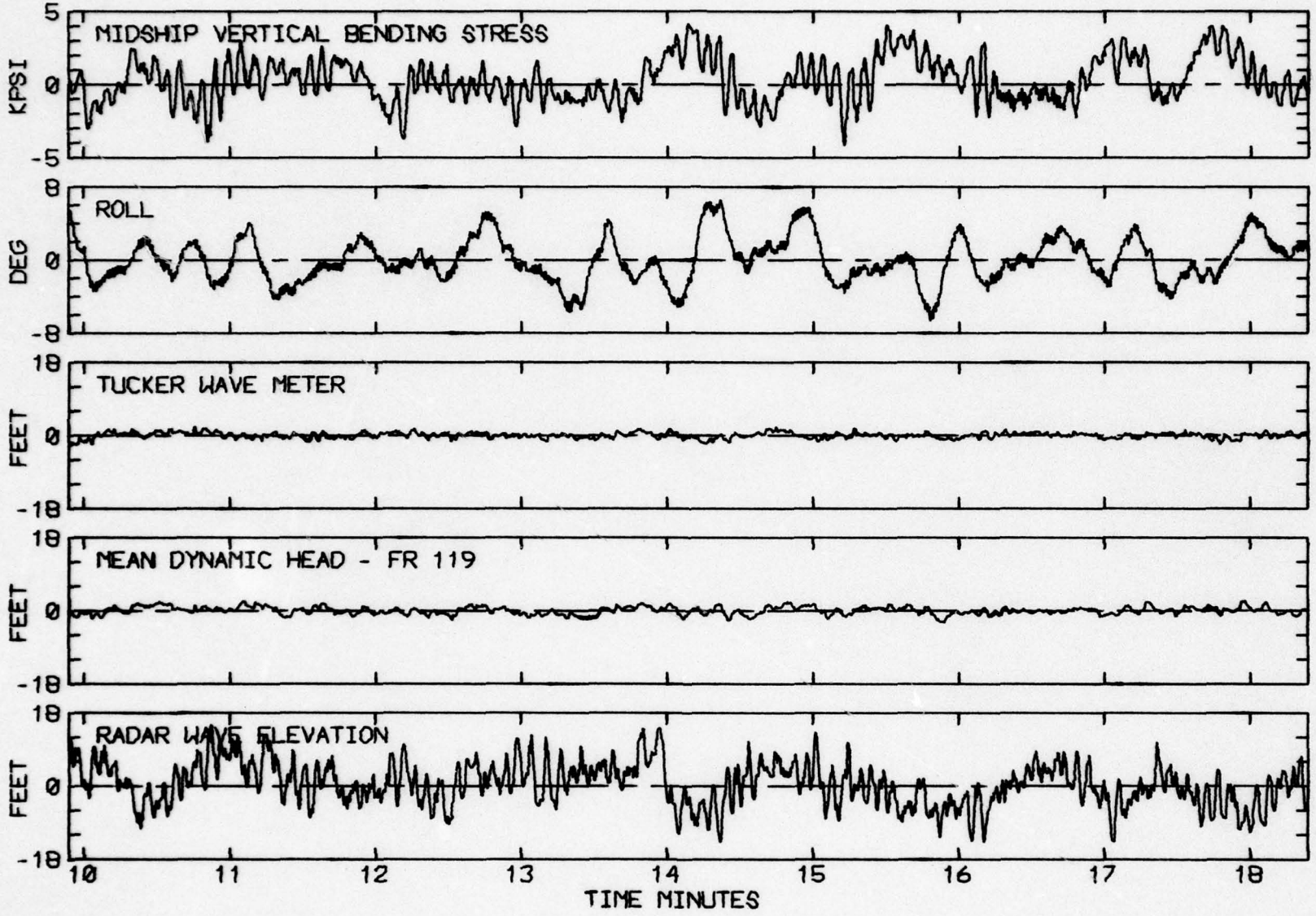
ROLL	10.2 DEG
PITCH	1.04 DEG
DK HSE VERT ACCEL	0.22 G
DK HSE LAT ACCEL	0.21 G
RADAR SLANT RANGE	28.0 FEET
VERTICAL RANGE	24.0 FEET
DISPL AT RADAR	8.3 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	604	331	189
MAXIMUM HEIGHT	2.9	4.1	19.1
10TH HIGHEST HTS	1.9	2.8	15.8
3RD HIGHEST HTS	1.4	2.0	13.4
4.0 RMS(SPECTRA)	2.8	3.9	21.1



RUN 1417 -- VOYAGE 35E -- TAPE 165 -- INDEX 5 -- INTERVAL 17



RUN 1417 -- VOYAGE 35E -- TAPE 165 -- INDEX 5 -- INTERVAL 17

LOG BOOK DATA

DATE AND TIME	02-13-74 1200
POSITION	42-35 N 55-02 W
COURSE AND SPEED	079 . 32.1 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	124 PORT
SWELL HEIGHT	5 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

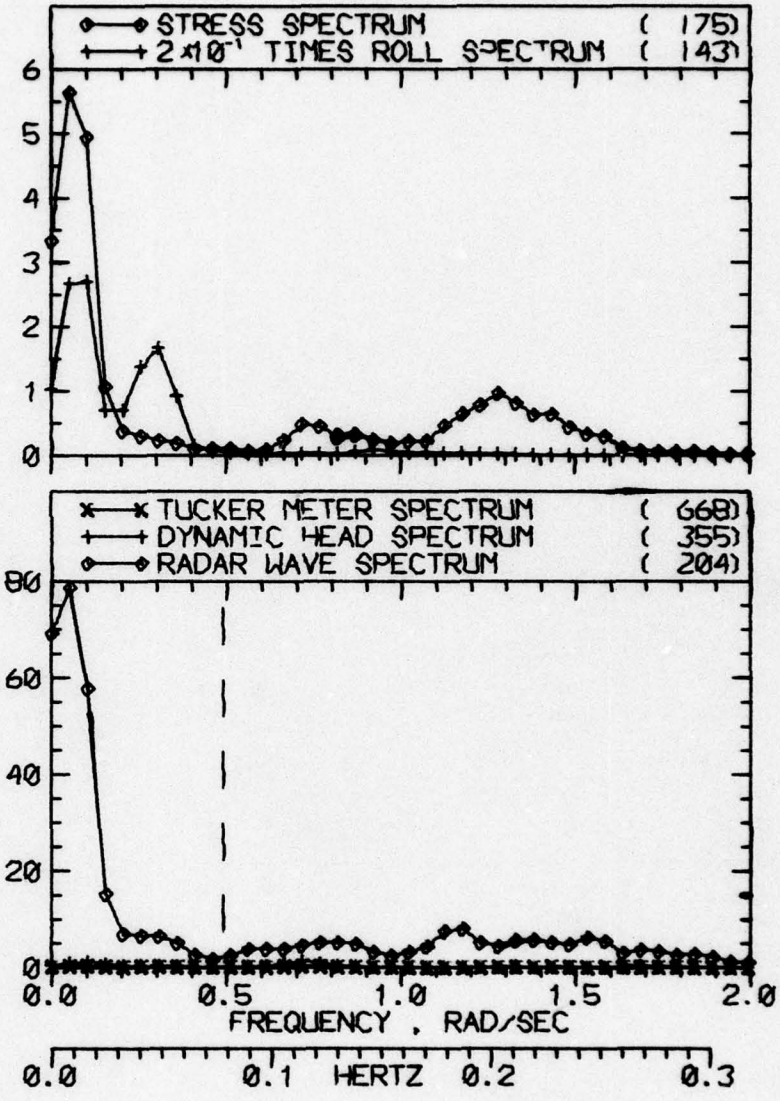
MAXIMUM PK-TR	3.7 KPSI
4.0 X RMS	4.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

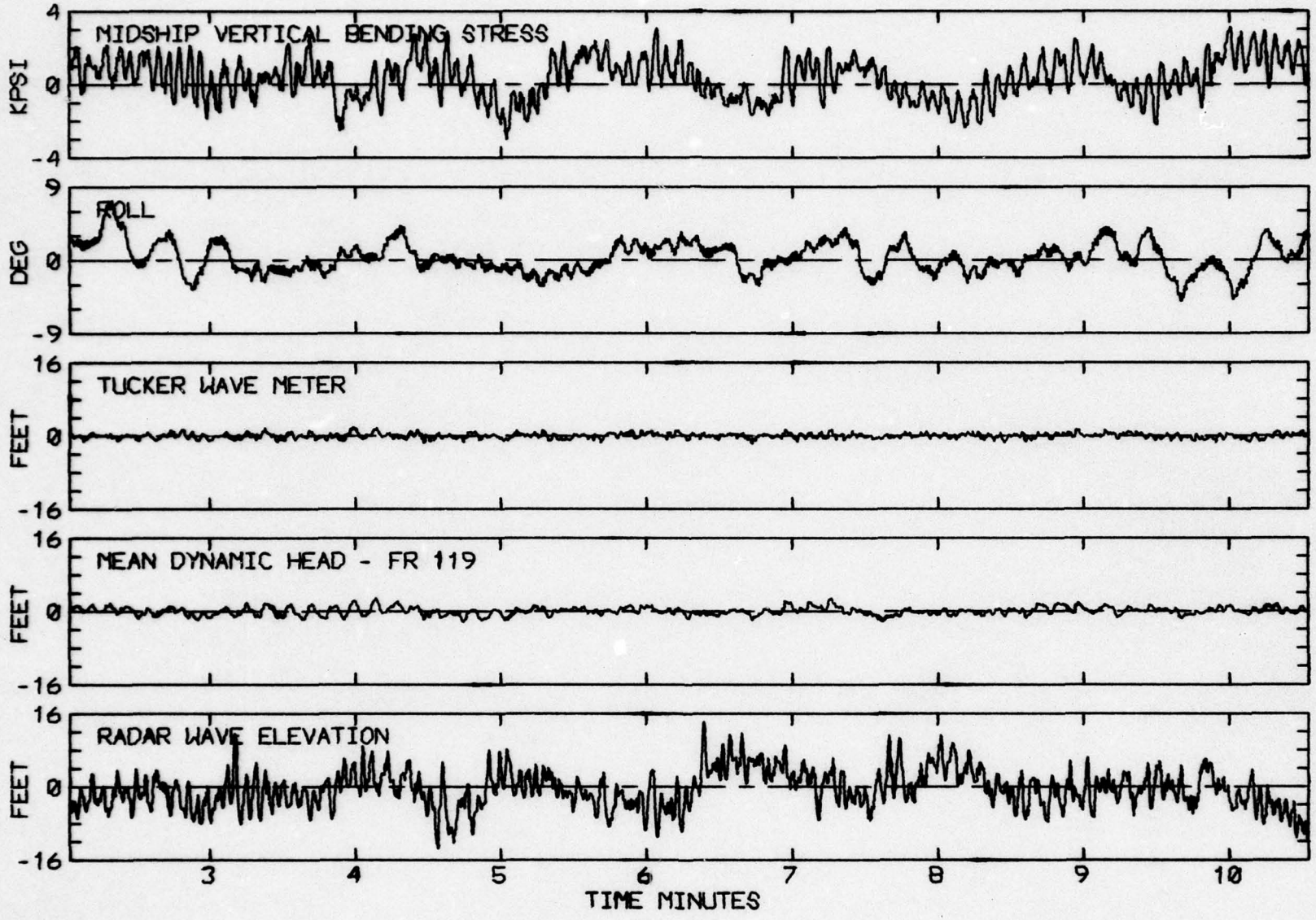
ROLL	7.1 DEG
PITCH	0.88 DEG
DK HSE VERT ACCEL	0.16 G
DK HSE LAT ACCEL	0.16 G
RADAR SLANT RANGE	22.0 FEET
VERTICAL RANGE	19.6 FEET
DISP AT RADAR	7.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	800	465	193
MAXIMUM HEIGHT	2.4	3.3	19.7
10TH HIGHEST HTS	1.7	2.6	15.0
3RD HIGHEST HTS	1.3	1.7	11.9
4.0 RMS(SPECTRA)	2.2	3.1	17.2



RUN 1421 -- VOYAGE 35E -- TAPE 165 -- INDEX 6 -- INTERVAL 21



RUN 1421 -- VOYAGE 35E -- TAPE 165 -- INDEX 6 -- INTERVAL 21

LOG BOOK DATA

DATE AND TIME	02-13-74 2000
POSITION	42-35 N 55-02 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	6
WAVE HEIGHT	4 FEET
" REL DIR	135 PORT
SWELL HEIGHT	6 FEET
" REL DIR	90 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

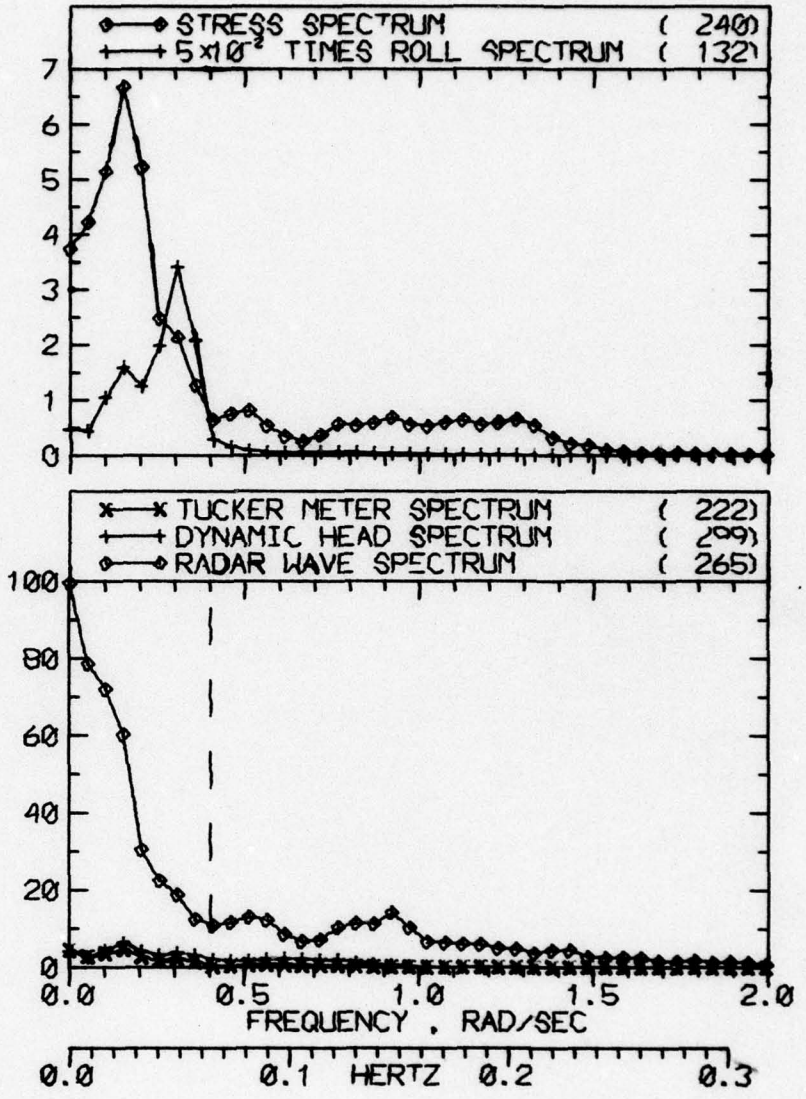
MAXIMUM PK-TR	7.9 KPSI
4.0 X RMS	5.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

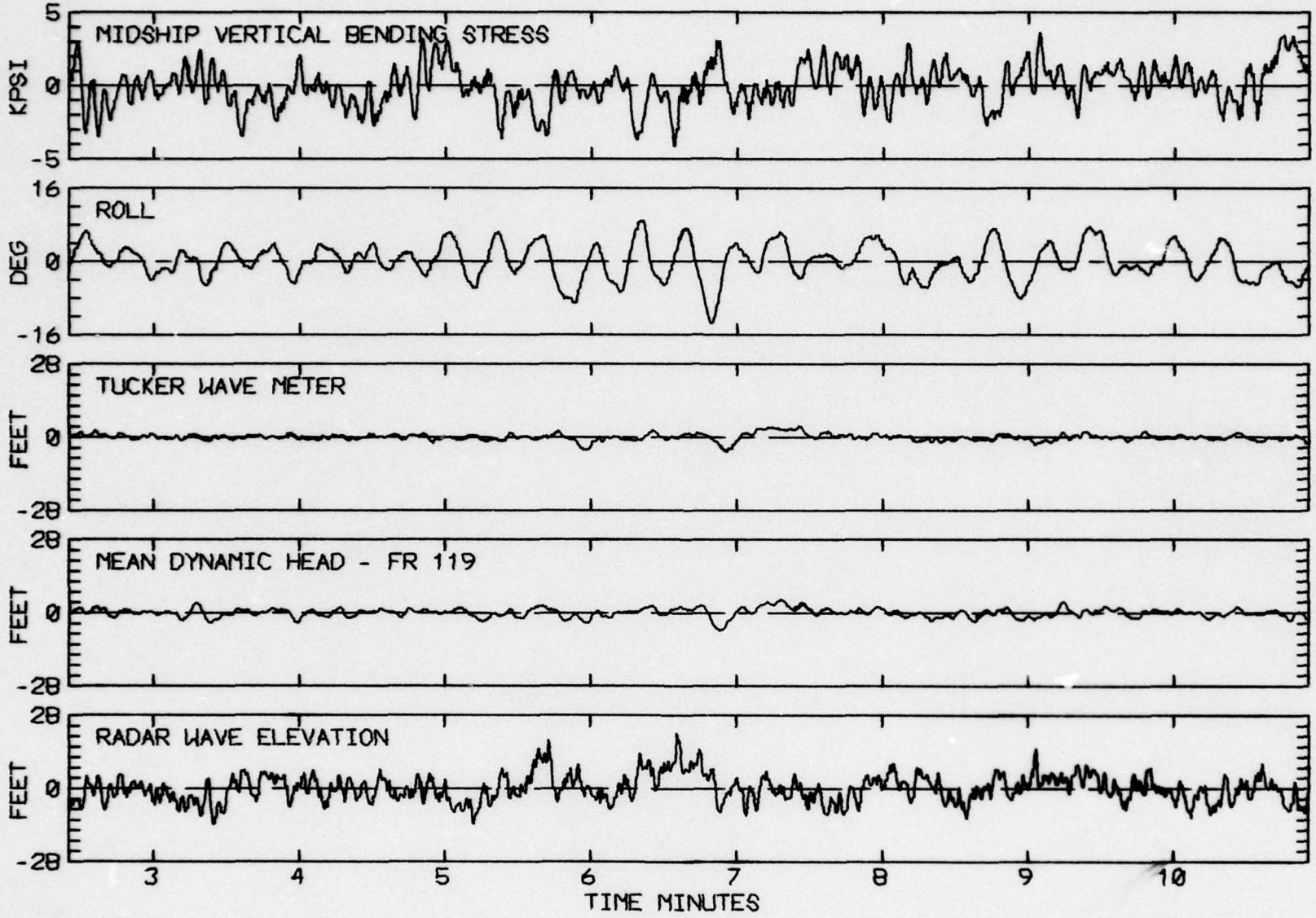
ROLL	14.6 DEG
PITCH	1.03 DEG
DK HSE VERT ACCEL	0.23 G
DK HSE LAT ACCEL	0.33 G
RADAR SLANT RANGE	32.5 FEET
VERTICAL RANGE	25.1 FEET
DISPL AT RADAR	11.3 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	378	227	167
MAXIMUM HEIGHT	5.5	9.9	30.4
10TH HIGHEST HTS	2.8	5.4	17.7
3RD HIGHEST HTS	1.8	3.4	13.7
4.0 RMS(SPECTRA)	4.8	6.3	21.4



RUN 1429 -- VOYAGE 35E -- TAPE 165 -- INDEX 8 -- INTERVAL 29



RUN 1429 -- VOYAGE 35E -- TAPE 165 -- INDEX 8 -- INTERVAL 29

LOG BOOK DATA

DATE AND TIME	02-13-74 2400
POSITION	42-35 N 55-02 W
COURSE AND SPEED	079 . 32.4 KNOTS
SEA STATE	4
WAVE HEIGHT	6 FEET
" REL DIR	169 PORT
SWELL HEIGHT	8 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

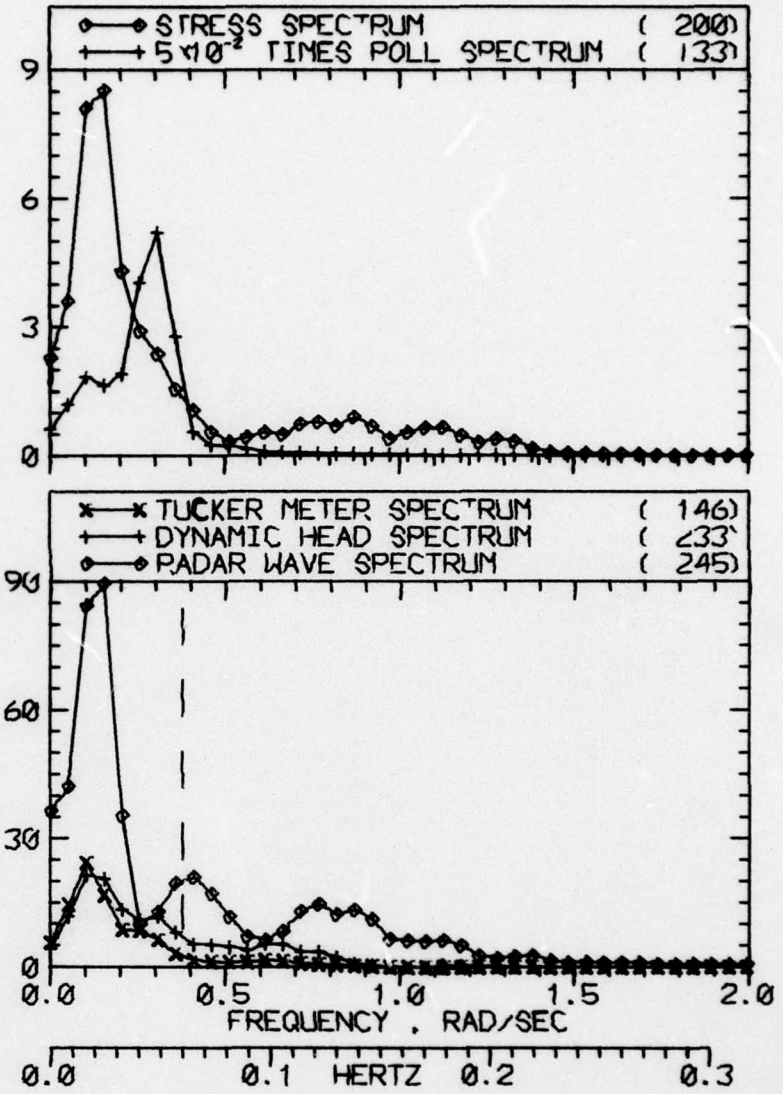
MAXIMUM PK-TR	9.5 KPSI
4.0 X RMS	6.0 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

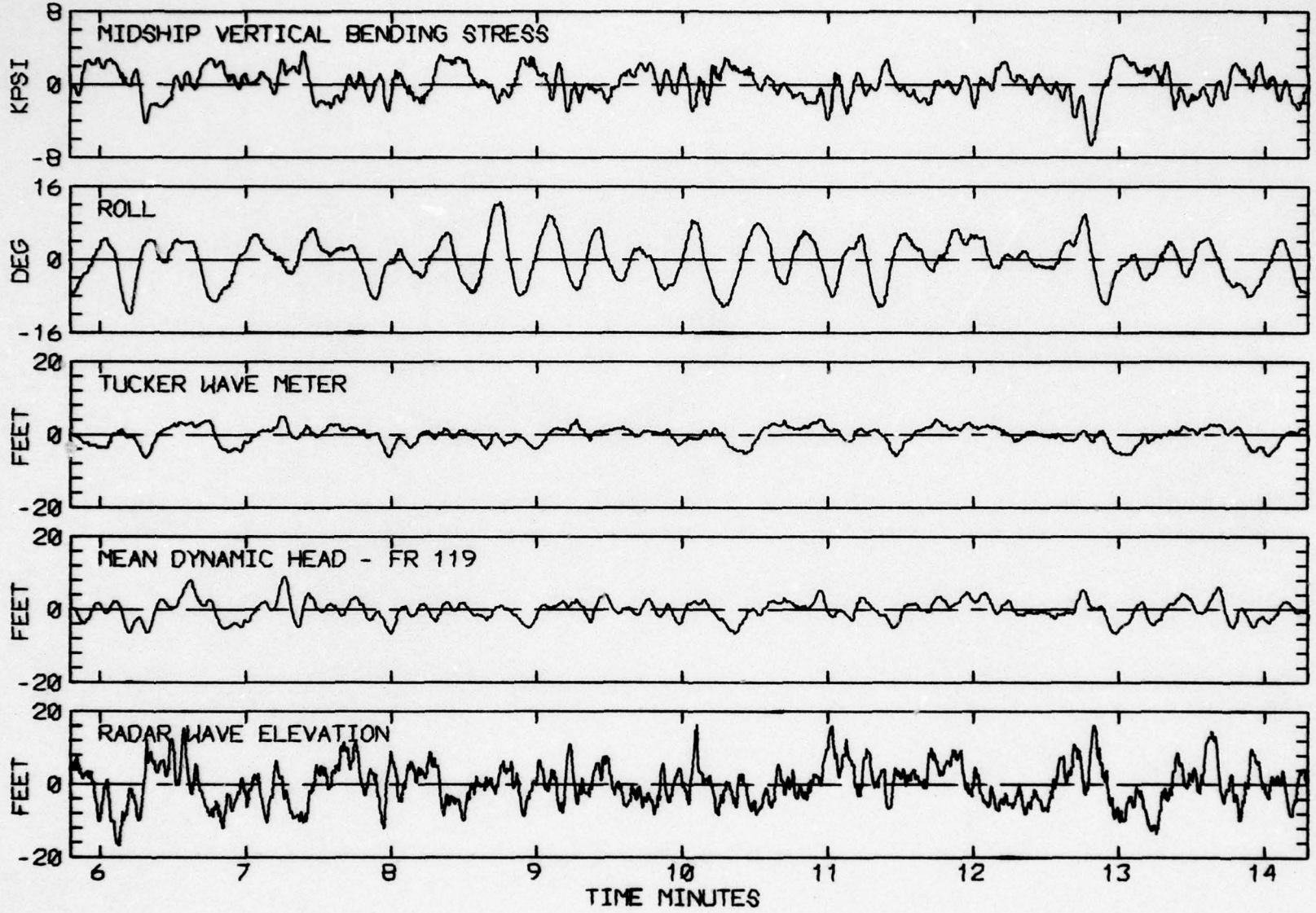
ROLL	18.3 DEG
PITCH	1.12 DEG
DK HSE VERT ACCEL	0.25 G
DK HSE LAT ACCEL	0.40 G
RADAR SLANT RANGE	36.3 FEET
VERTICAL RANGE	25.6 FEET
DISPL AT RADAR	15.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	151	110	165
MAXIMUM HEIGHT	10.8	13.7	30.1
10TH HIGHEST HTS	6.9	10.5	19.3
3RD HIGHEST HTS	4.2	7.3	14.1
4.0 RMS (SPECTRA)	8.9	10.8	20.5



RUN 1433 -- VOYAGE 35E -- TAPE 165 -- INDEX 9 -- INTERVAL 33



RUN 1433 -- VOYAGE 35E -- TAPE 165 -- INDEX 9 -- INTERVAL 33

LOG BOOK DATA

DATE AND TIME	02-14-74 0400
POSITION	42-35 N 55-02 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	5
WAVE HEIGHT	6 FEET
" REL DIR	169 PORT
SWELL HEIGHT	10 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

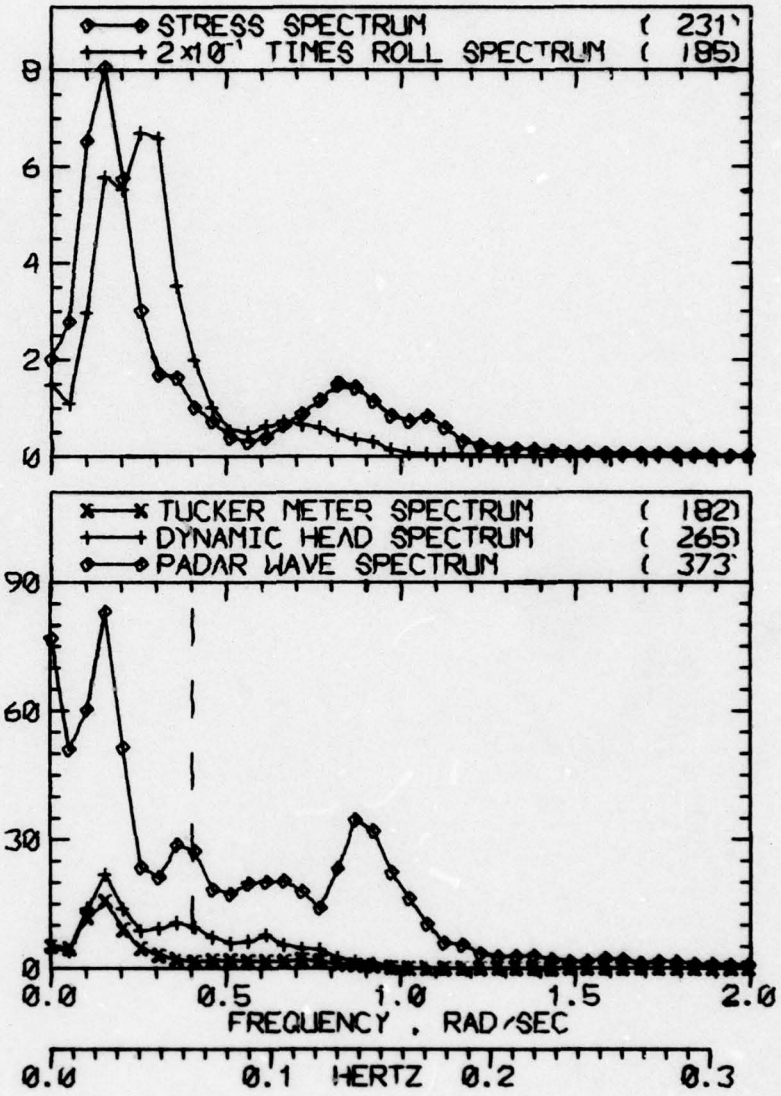
MAXIMUM PK-TR	7.2 KPSI
4.0 X RMS	6.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

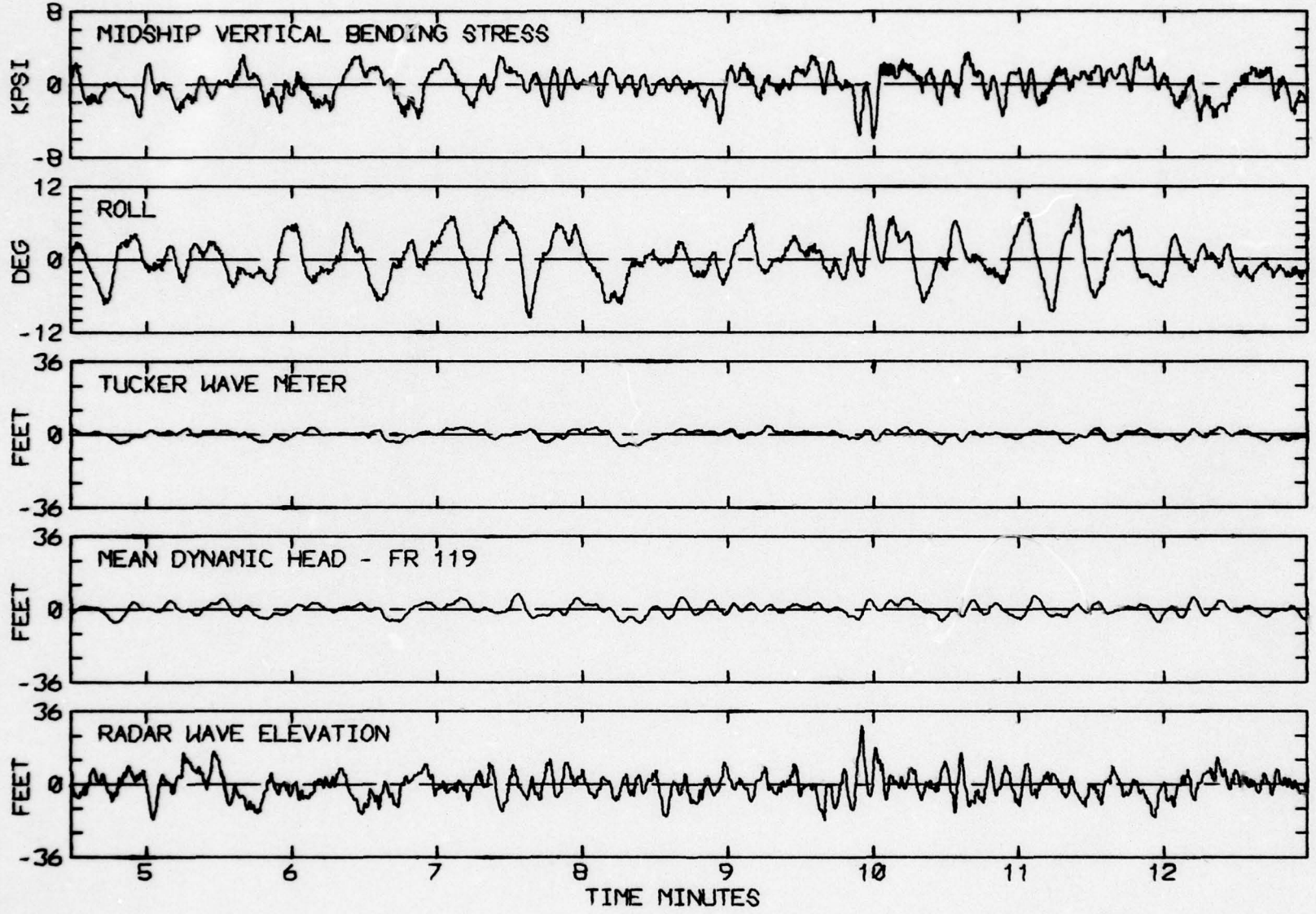
ROLL	13.0 DEG
PITCH	1.53 DEG
DK HSE VERT ACCEL	0.35 G
DK HSE LAT ACCEL	0.31 G
RADAR SLANT RANGE	33.8 FEET
VERTICAL RANGE	29.7 FEET
DISPL AT RADAR	18.8 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	185	139	163
MAXIMUM HEIGHT	10.8	12.1	34.9
10TH HIGHEST HTS	6.2	9.9	24.3
3RD HIGHEST HTS	4.1	7.3	18.7
4.0 RMS(SPECTRA)	7.7	10.8	24.2



RUN 1437 -- VOYAGE 35E -- TAPE 165 -- INDEX 10 -- INTERVAL 37



RUN 1437 -- VOYAGE 35E -- TAPE 165 -- INDEX 10 -- INTERVAL 37

LOG BOOK DATA

DATE AND TIME	02-14-74 0900
POSITION	42-35 N 55-02 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	7
WAVE HEIGHT	6 FEET
" REL DIR	146 PORT
SWELL HEIGHT	10 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

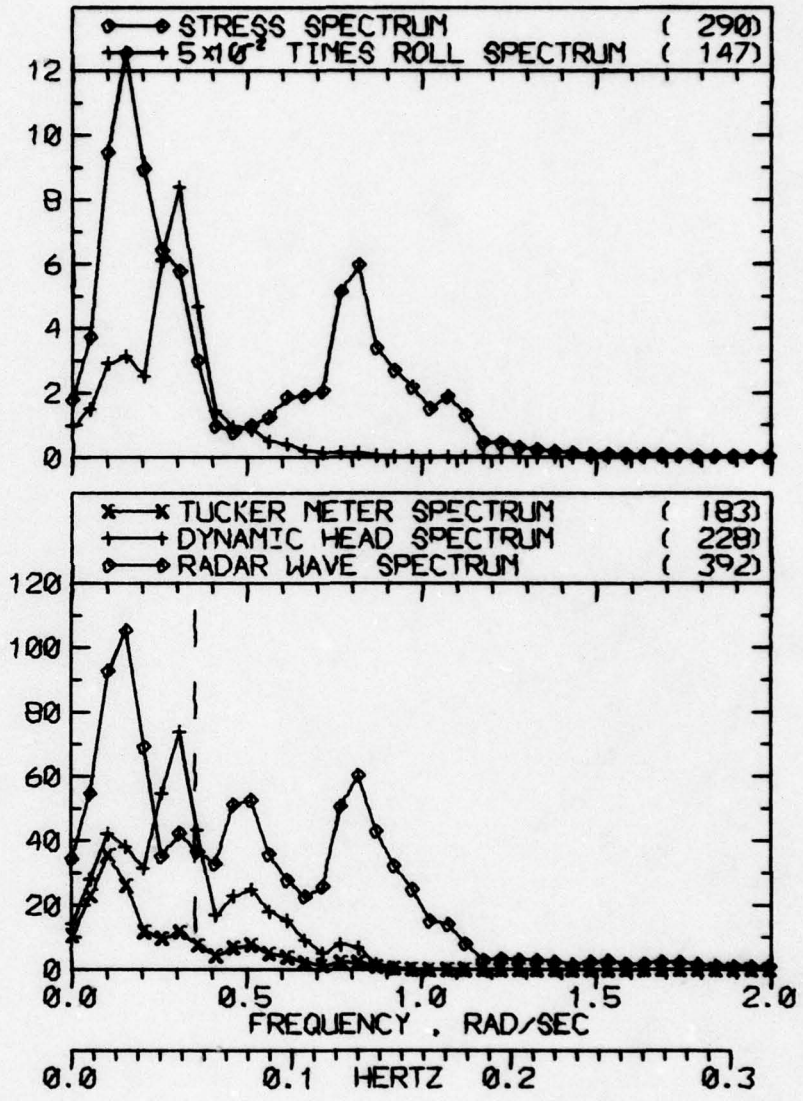
MAXIMUM PK-TR	10.2 KPSI
4.0 X RMS	8.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

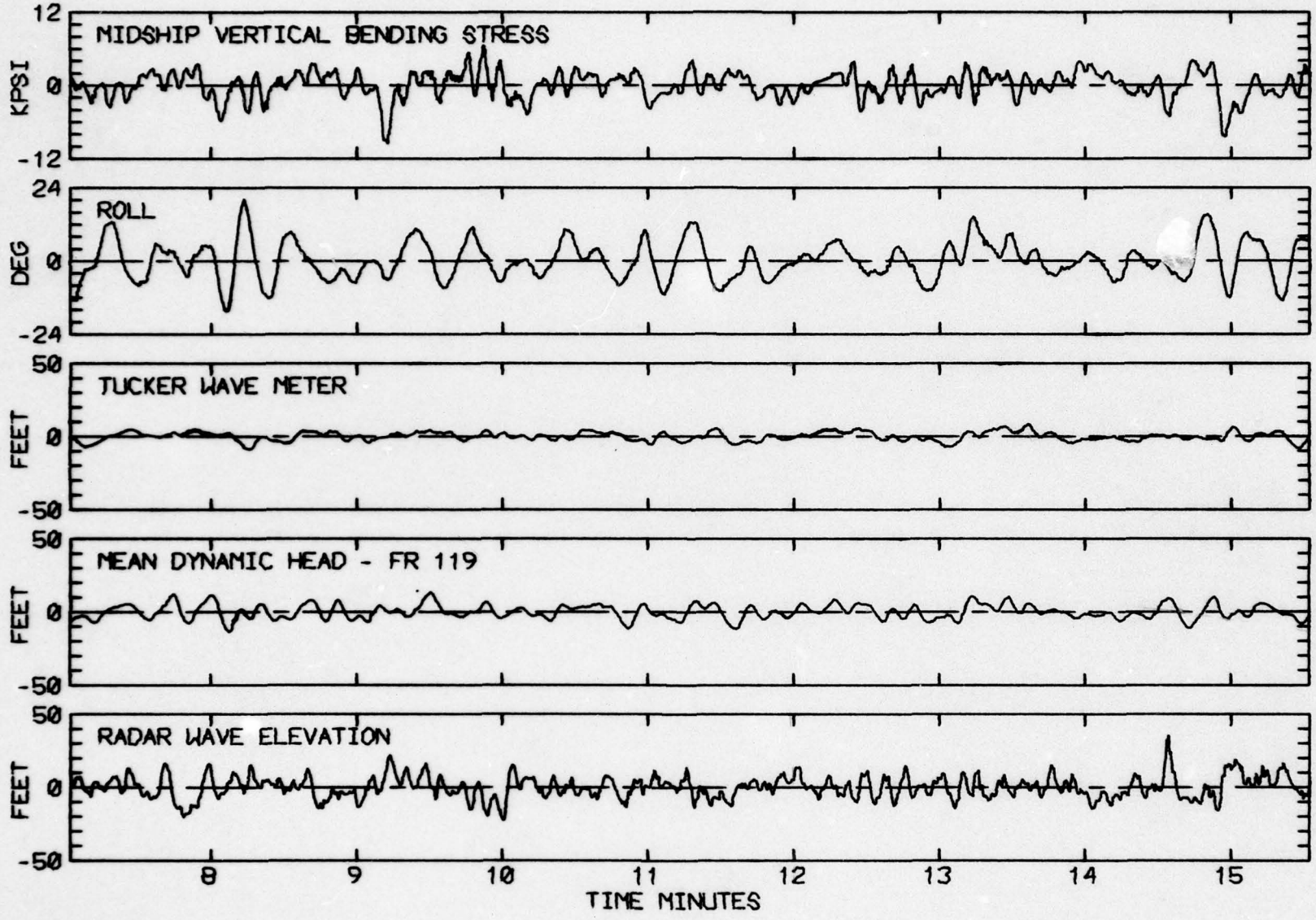
ROLL	23.8 DEG
PITCH	2.12 DEG
DK HSE VERT ACCEL	0.44 G
DK HSE LAT ACCEL	0.49 G
RADAR SLANT RANGE	44.9 FEET
VERTICAL RANGE	38.2 FEET
DISPL AT RADAR	29.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	142	77	149
MAXIMUM HEIGHT	14.1	24.7	46.3
10TH HIGHEST HTS	10.3	19.4	28.2
3RD HIGHEST HTS	6.9	15.5	22.2
4.0 RMS(SPECTRA)	11.8	19.2	28.8



RUN 1442 -- VOYAGE 35E -- TAPE 165 -- INDEX 11 -- INTERVAL 42



RUN 1442 -- VOYAGE 35E -- TAPE 165 -- INDEX 11 -- INTERVAL 42

LOG BOOK DATA

DATE AND TIME	02-14-74 1200
POSITION	45-05 N 38-25 W
COURSE AND SPEED	079 , 32.1 KNOTS
SEA STATE	8
WAVE HEIGHT	5 FEET
" REL DIR	124 PORT
SWELL HEIGHT	10 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

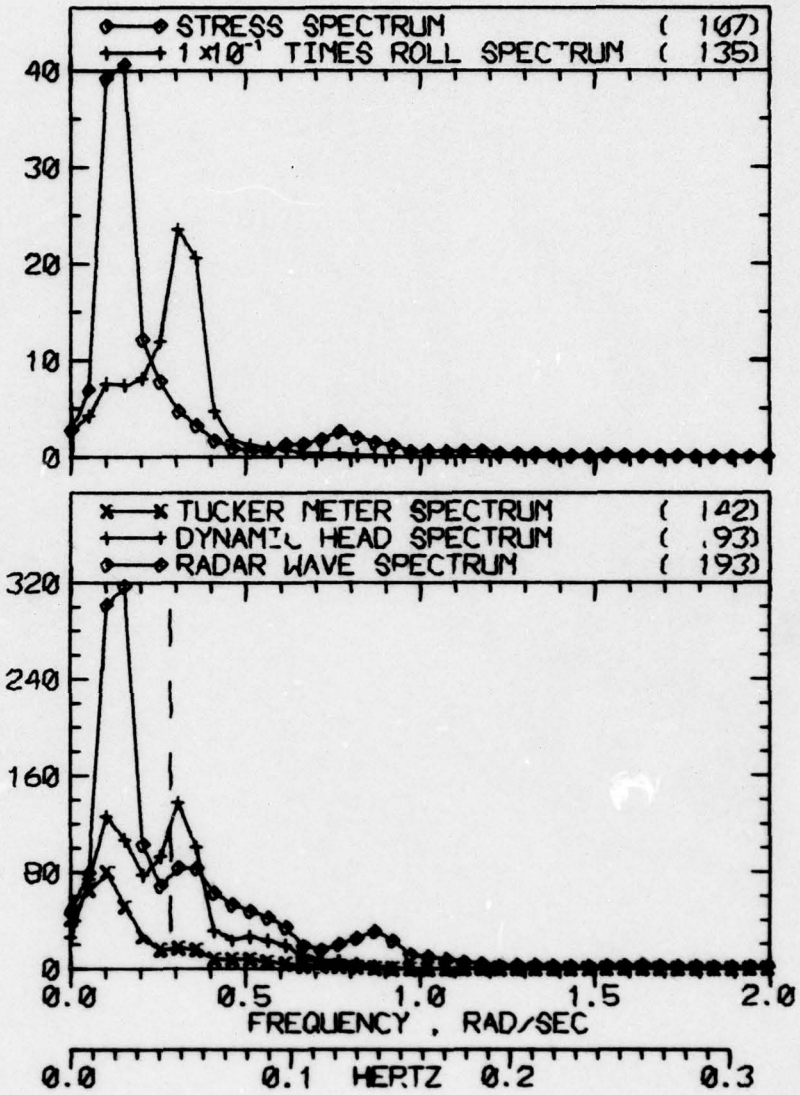
MAXIMUM PK-TR	17.7 KPSI
4.0 X RMS	10.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

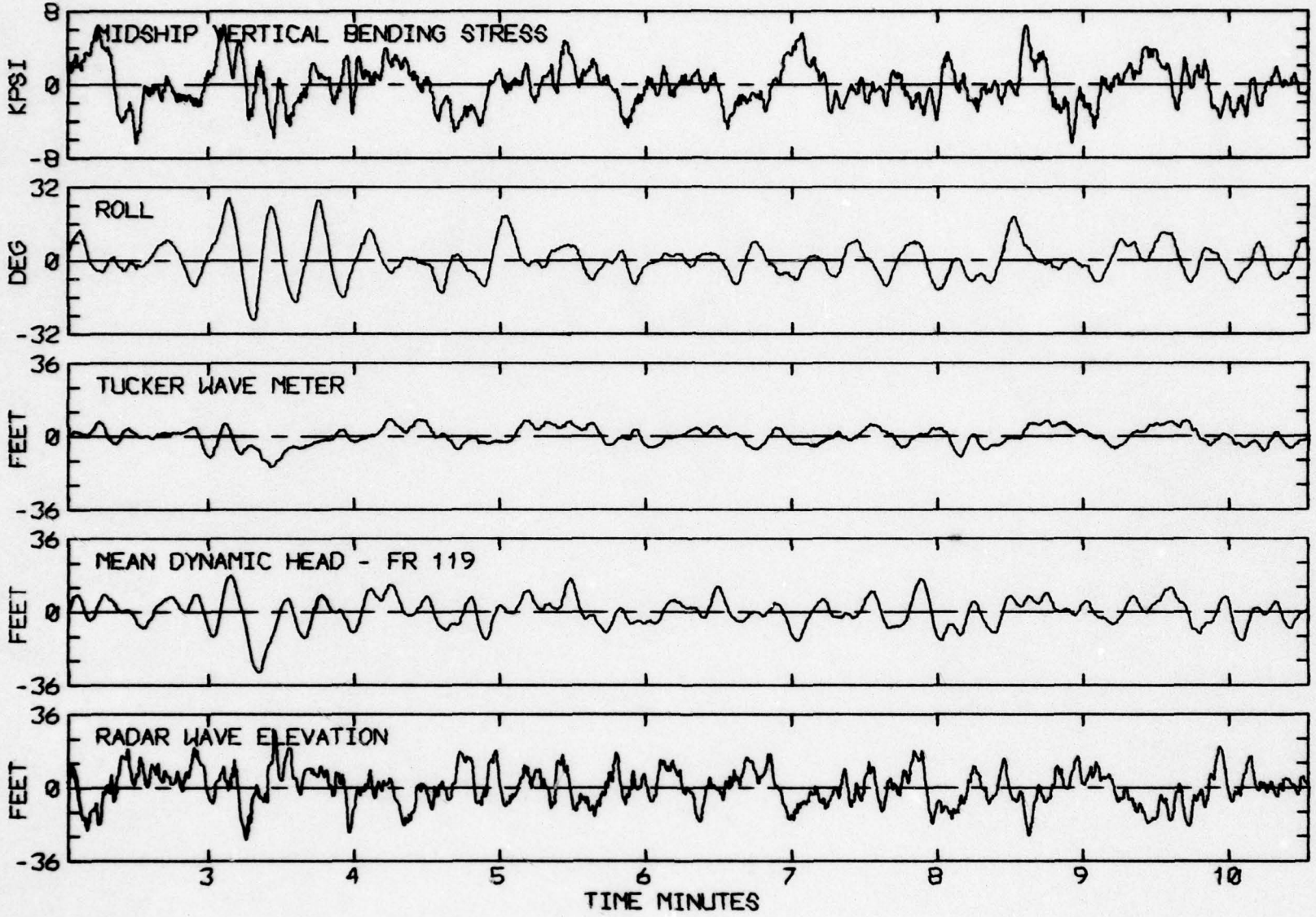
ROLL	28.0 DEG
PITCH	1.71 DEG
DK HSE VERT ACCEL	0.35 G
DK HSE LAT ACCEL	0.59 G
RADAR SLANT RANGE	47.9 FEET
VERTICAL RANGE	37.3 FEET
DISPL AT RADAR	28.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	107	74	107
MAXIMUM HEIGHT	21.1	47.3	30.5
10TH HIGHEST HTS	14.3	29.6	34.6
3RD HIGHEST HTS	9.5	21.2	26.5
4.0 RMS(SPECTRA)	16.6	26.9	35.4



RUN 1445 -- VOYAGE 35E -- TAPE 165 -- INDEX 12 -- INTERVAL 45



RUN 1445 -- VOYAGE 35E -- TAPE 165 -- INDEX 12 -- INTERVAL 45

LOG BOOK DATA

DATE AND TIME	02-14-74 1600
POSITION	45-05 N 38-25 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	8
WAVE HEIGHT	5 FEET
" REL DIR	146 PORT
SWELL HEIGHT	8 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

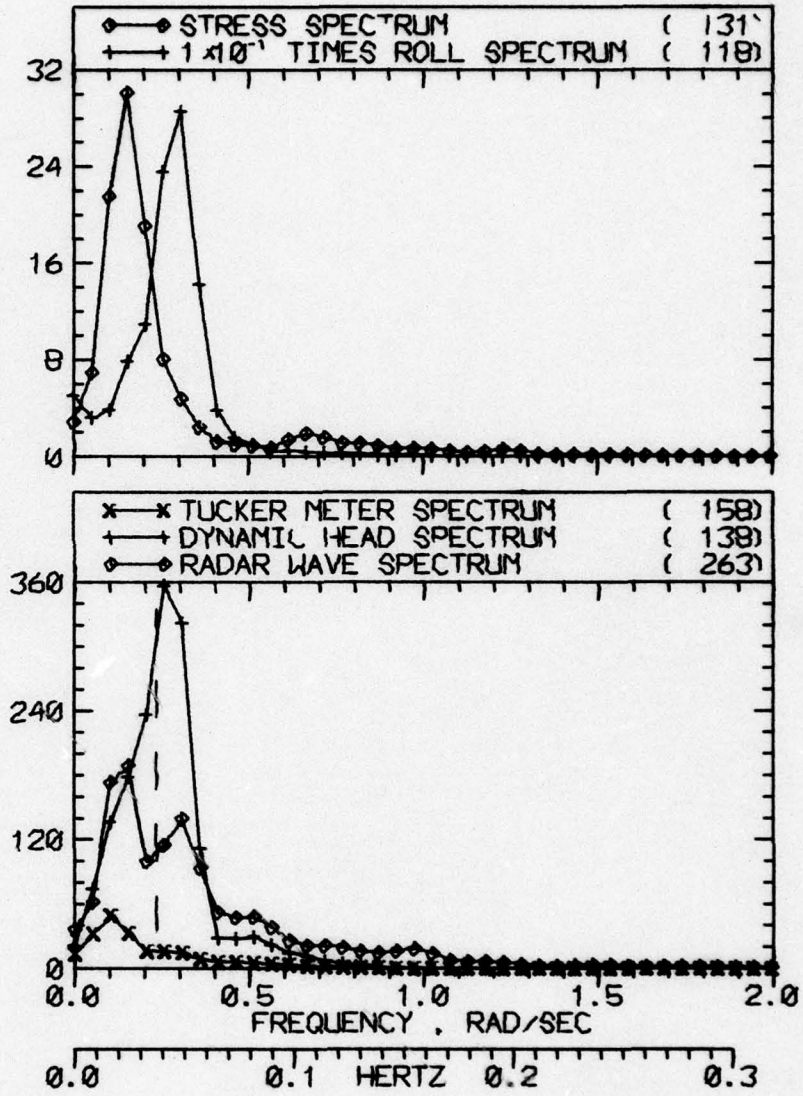
MAXIMUM PK-TR	13.6 KPSI
4.0 X RMS	9.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

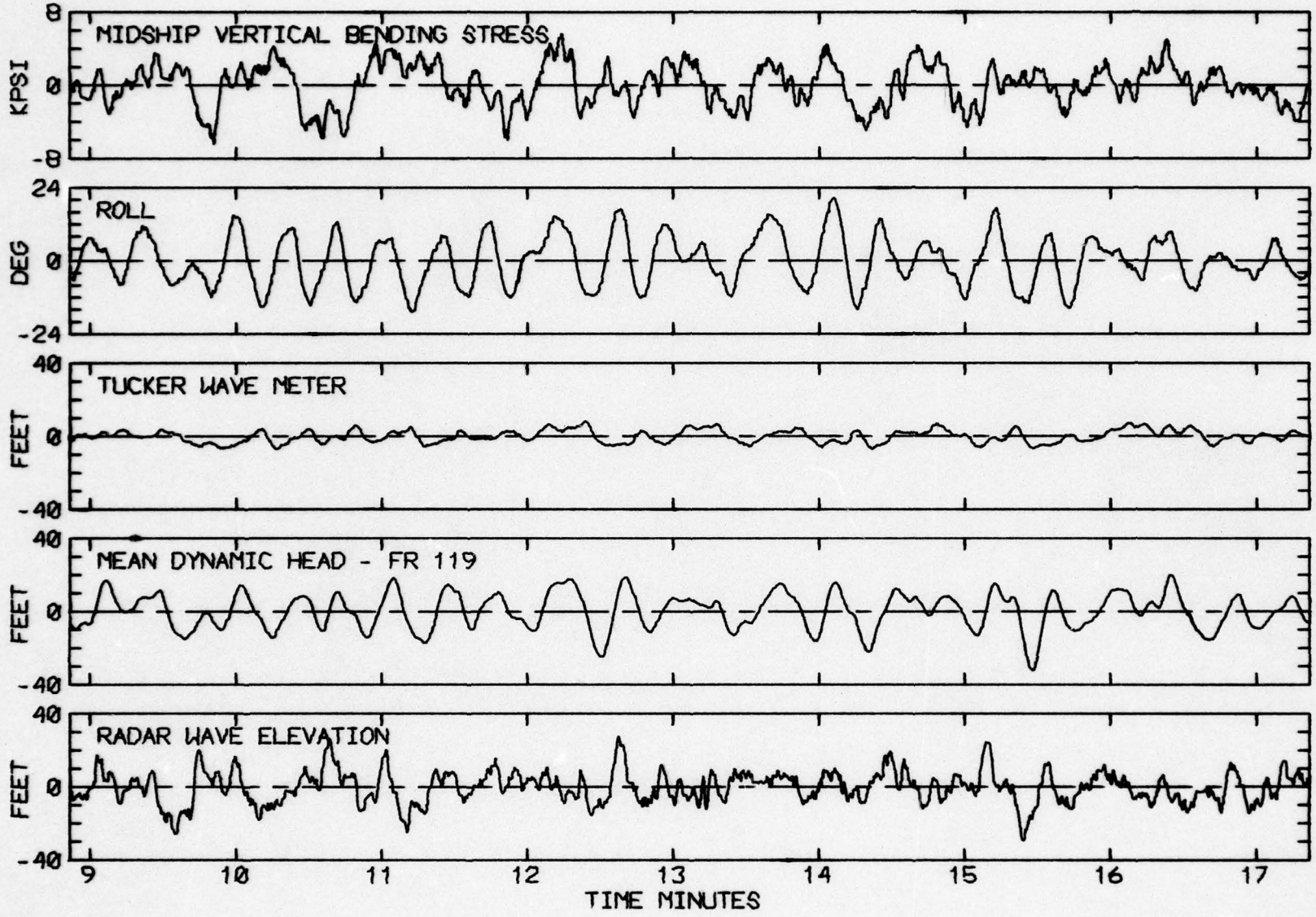
ROLL	29.1 DEG
PITCH	1.58 DEG
DK HSE VERT ACCEL	0.33 G
DK HSE LAT ACCEL	0.61 G
RADAR SLANT RANGE	41.9 FEET
VERTICAL RANGE	31.6 FEET
DISPL AT RADAR	32.8 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD	/RADAR
P-T SAMPLE SIZE	100 60	116
MAXIMUM HEIGHT	14.2 47.5	45.4
10TH HIGHEST HTS	11.9 38.7	33.5
3RD HIGHEST HTS	8.7 29.7	24.6
4.0 RMS(SPECTRA)	13.2 35.9	32.9



RUN 1449 -- VOYAGE 35E -- TAPE 165 -- INDEX 13 -- INTERVAL 49



RUN 1449 -- VOYAGE 35E -- TAPE 165 -- INDEX 13 -- INTERVAL 49

LOG BOOK DATA

DATE AND TIME	02-14-74 2000
POSITION	45-05 N 38-25 W
COURSE AND SPEED	079 . 32.1 KNOTS
SEA STATE	9
WAVE HEIGHT	6 FEET
" REL DIR	124 PORT
SWELL HEIGHT	10 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

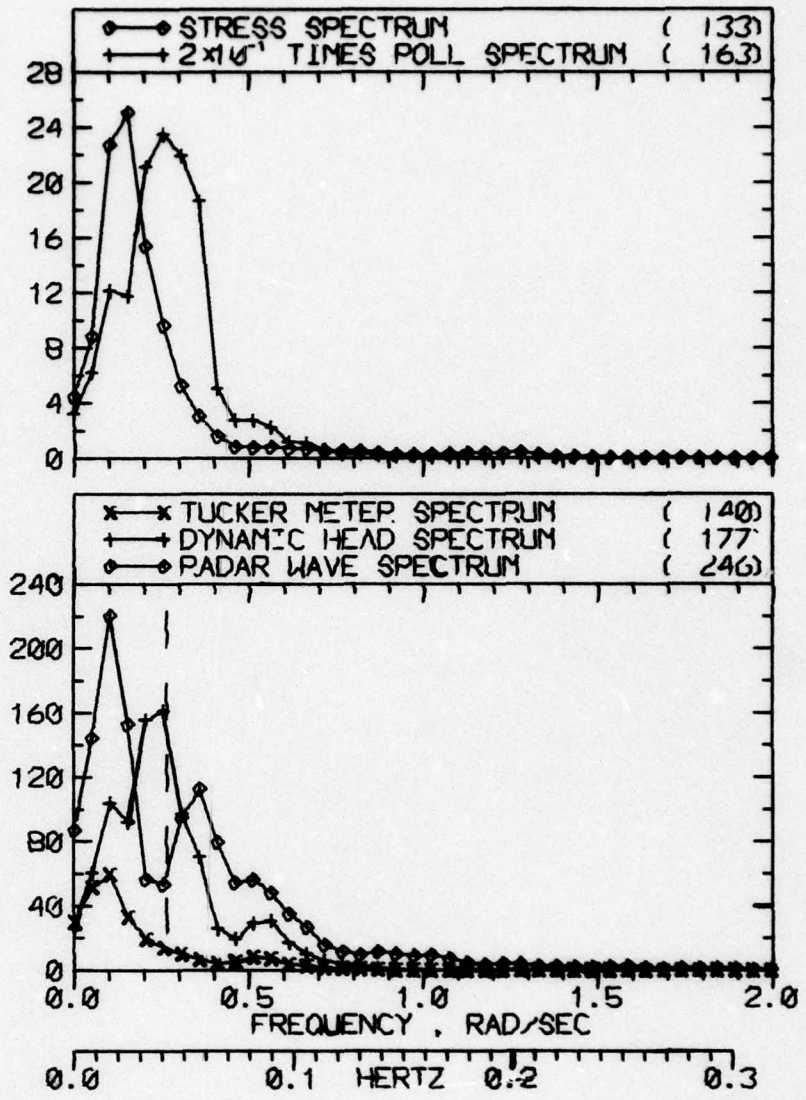
MAXIMUM PK-TP	11.5 KPSI
4.0 X RMS	9.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

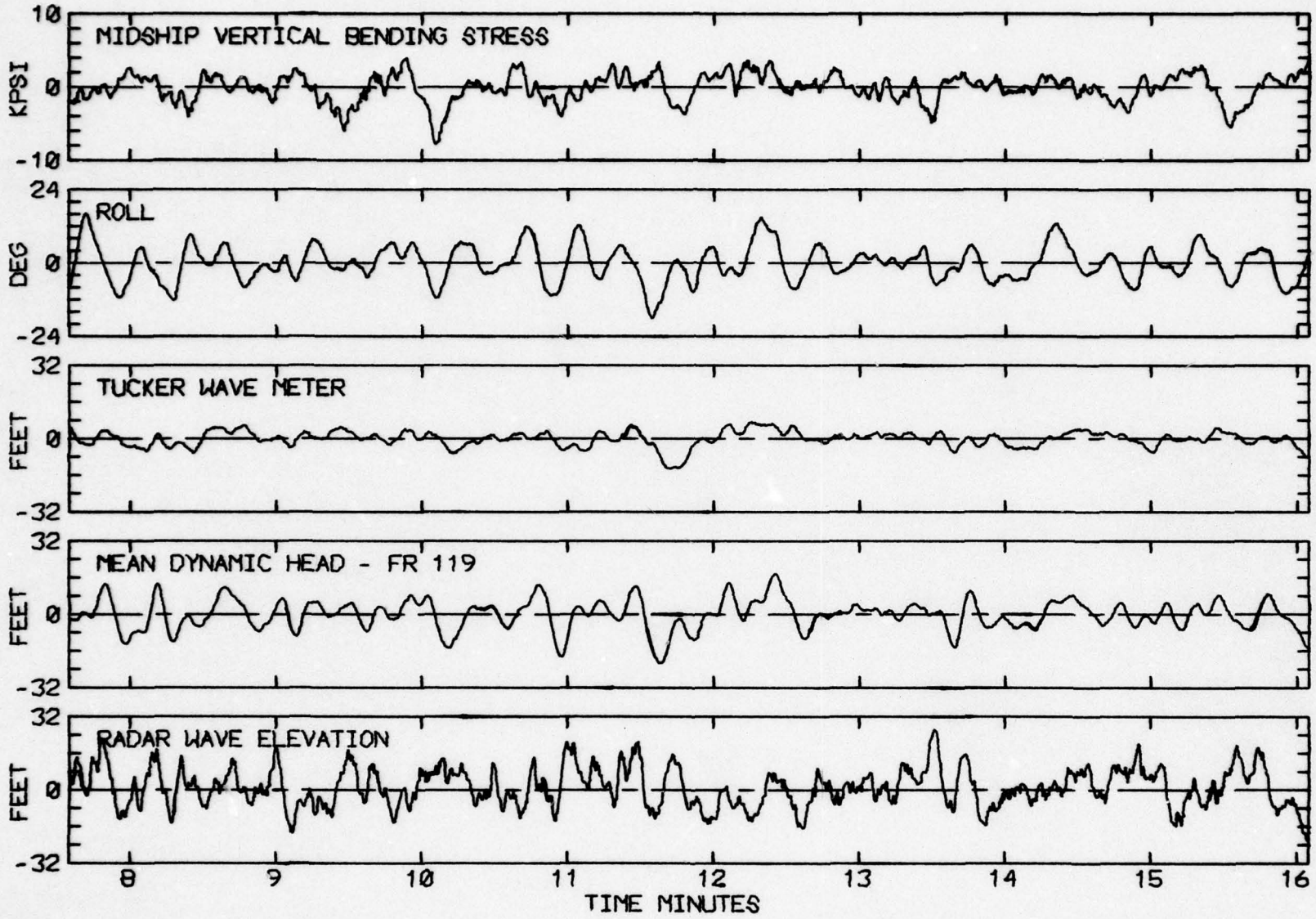
ROLL	23.4 DEG
PITCH	1.29 DEG
DK HSE VERT ACCEL	0.30 G
DK HSE LAT ACCEL	0.53 G
PADAR SLANT RANGE	42.2 FEET
VERTICAL RANGE	31.8 FEET
DISPL AT RADAR	27.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	127	67	116
MAXIMUM HEIGHT	19.1	42.2	41.3
10TH HIGHEST HTS	11.2	30.0	33.7
3RD HIGHEST HTS	7.1	23.2	24.1
4.0 RMS(SPECTRA)	14.2	27.1	32.9



RUN 1501 -- VOYAGE 35E -- TAPE 167 -- INDEX 14 -- INTERVAL 1



RUN 1501 -- VOYAGE 35E -- TAPE 167 -- INDEX 14 -- INTERVAL 1

LOG BOOK DATA

DATE AND TIME	02-14-74 2400
POSITION	45-05 N 38-25 W
COURSE AND SPEED	079 . 32.2 KNOTS
SEA STATE	9
WAVE HEIGHT	6 FEET
" REL DIR	124 PORT
SWELL HEIGHT	10 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

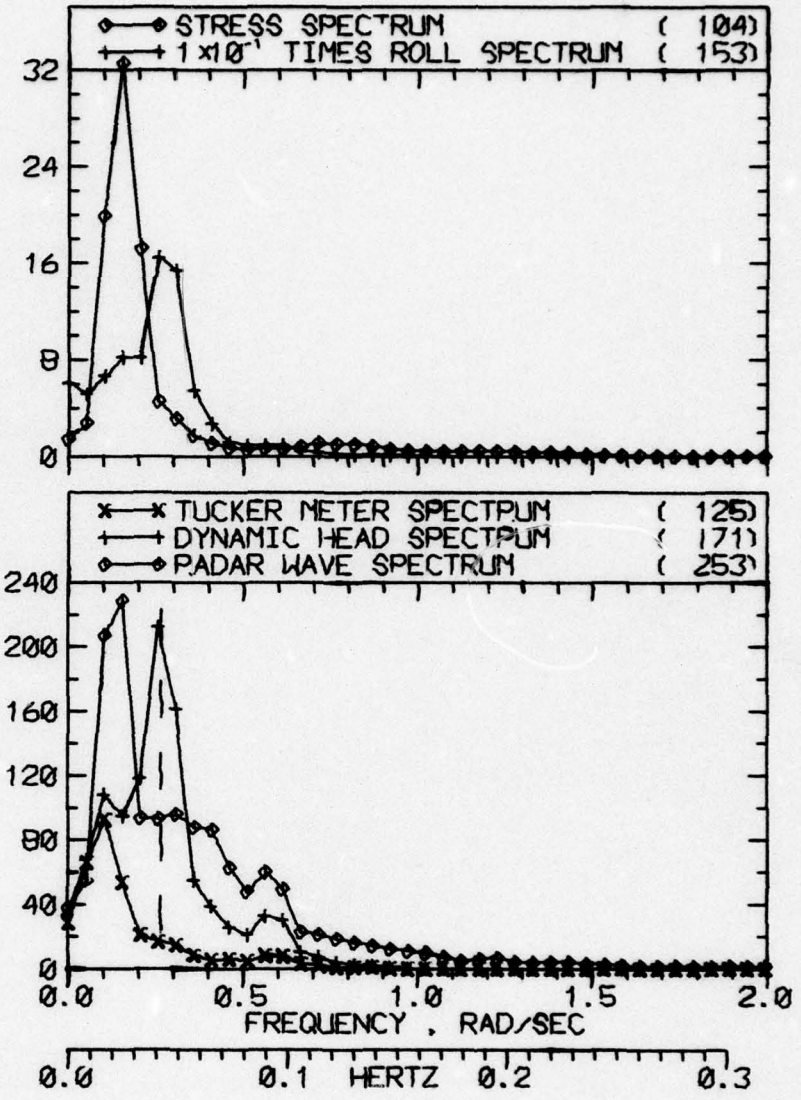
MAXIMUM PK-TR	15.2 KPSI
4.0 X RMS	8.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

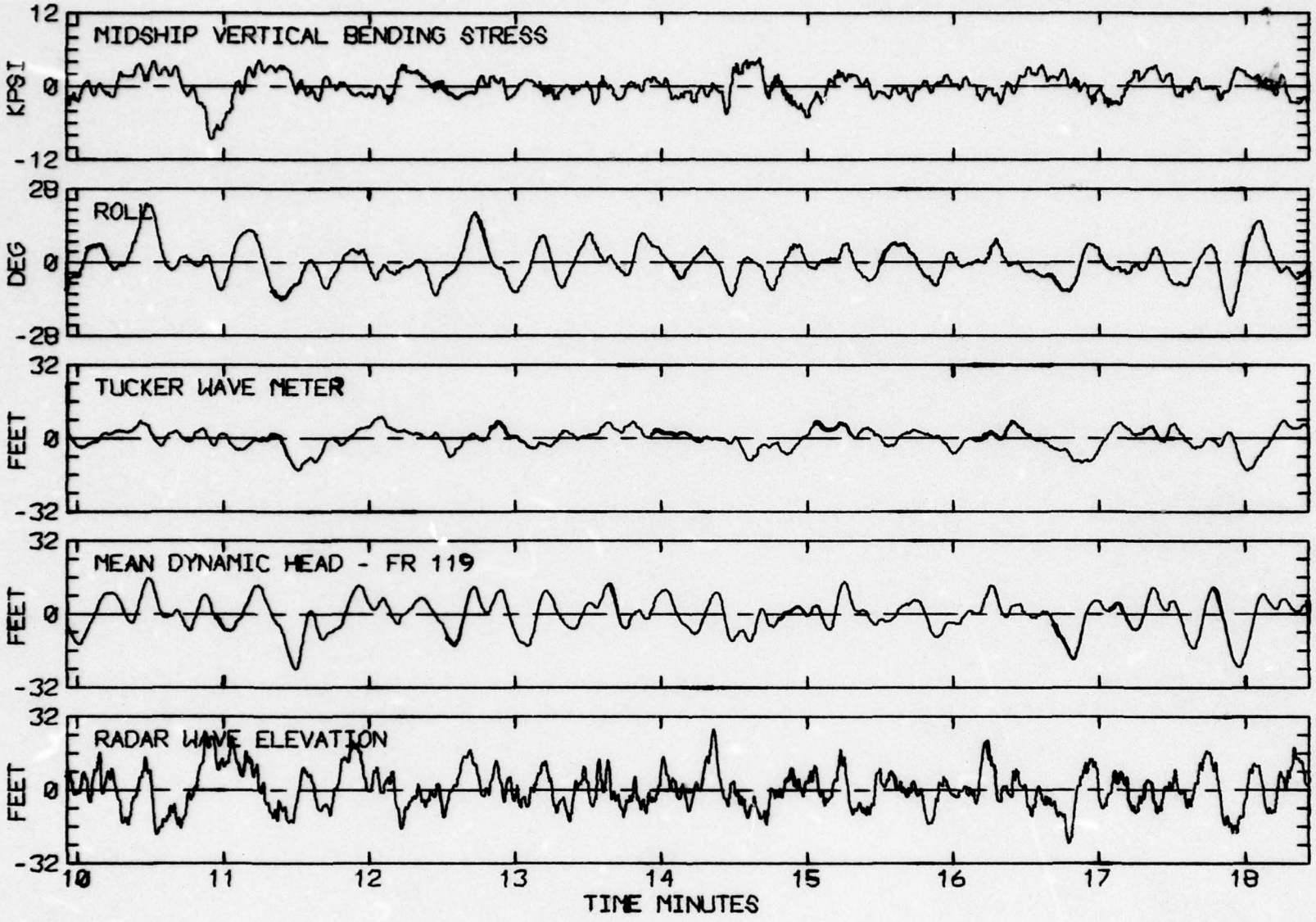
ROLL	25.1 DEG
PITCH	1.53 DEG
DK HSE VERT ACCEL	0.35 G
DK HSE LAT ACCEL	0.55 G
RADAR SLANT RANGE	43.6 FEET
VERTICAL RANGE	32.7 FEET
DISPL AT RADAR	30.9 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	86	59	113
MAXIMUM HEIGHT	17.0	36.6	35.8
10TH HIGHEST HTS	12.9	30.3	30.7
3RD HIGHEST HTS	9.7	23.7	25.1
4.0 RMS(SPECTRA)	16.5	28.7	33.9



RUN 1505 -- VOYAGE 35E -- TAPE 167 -- INDEX 15 -- INTERVAL 5



RUN 1505 -- VOYAGE 35E -- TAPE 167 -- INDEX 15 -- INTERVAL 5

LOG BOOK DATA

DATE AND TIME	02-15 74 0800
POSITION	45-05 N 39-25 W
COURSE AND SPEED	077 . 31.9 KNOTS
SEA STATE	9
WAVE HEIGHT	10 FEET
" REL DIR	111 PORT
SWELL HEIGHT	15 FEET
" REL DIR	122 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

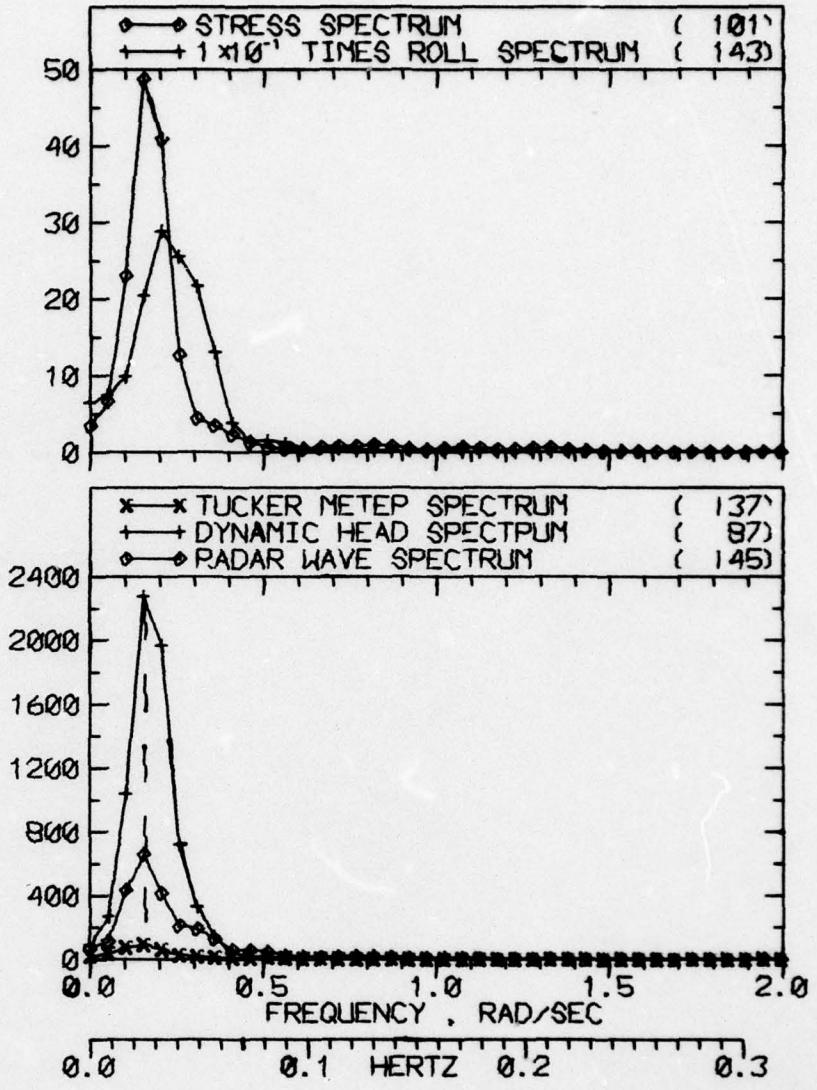
MAXIMUM PK-TR	13.1 KPSI
4.0 X RMS	11.3 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

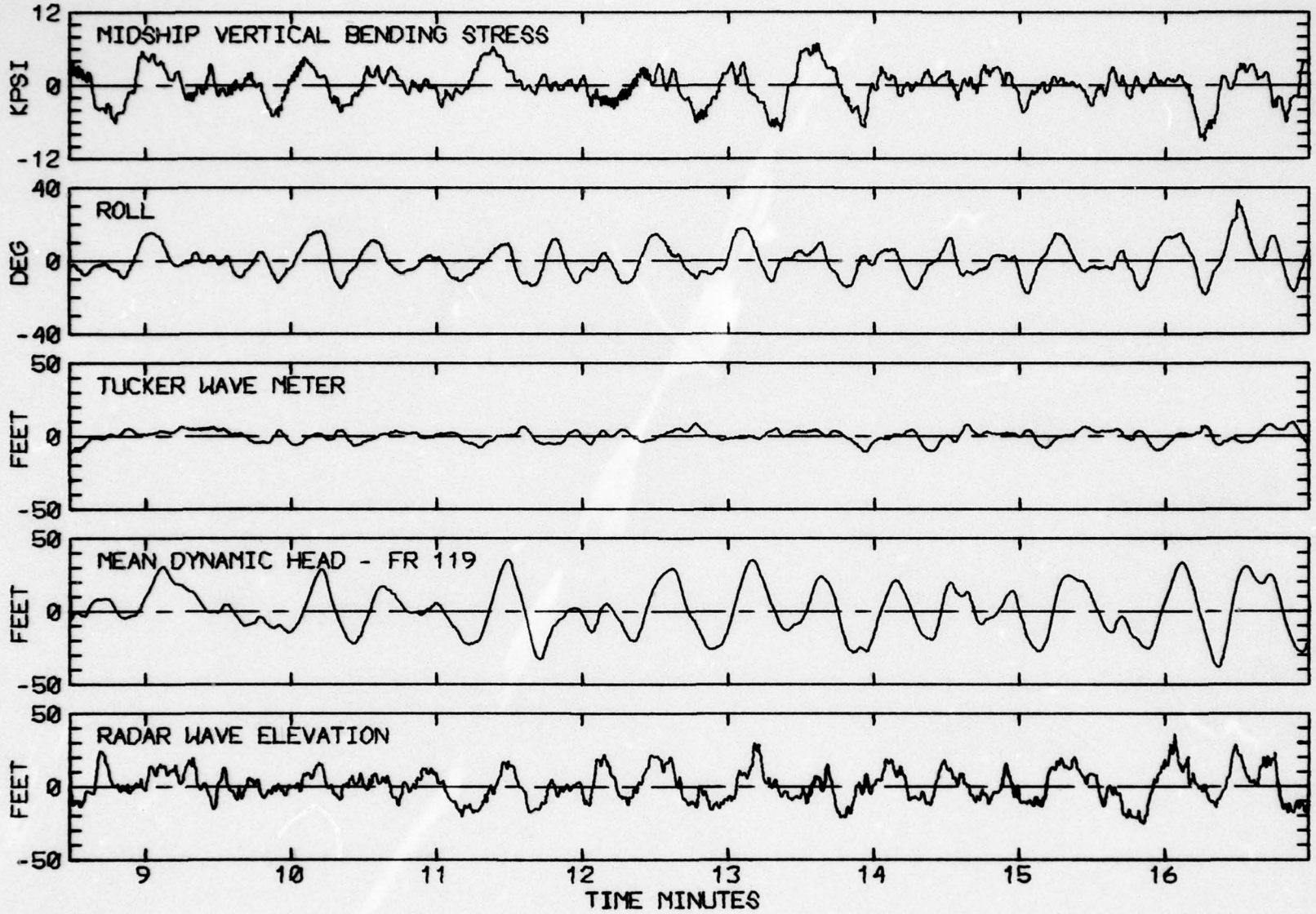
ROLL	33.9 DEG
PITCH	1.59 DEG
DK HSE VERT ACCEL	0.31 G
DK HSE LAT ACCEL	0.68 G
RADAR SLANT RANGE	42.4 FEET
VERTICAL RANGE	35.8 FEET
DISPL AT RADAR	56.4 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	76	35	77
MAXIMUM HEIGHT	22.3	83.1	47.4
10TH HIGHEST HTS	16.4	76.4	41.1
3RD HIGHEST HTS	12.6	64.3	33.4
4.0 RMS(SPECTRA)	17.6	75.1	46.0



RUN 1513 -- VOYAGE 35E -- TAPE 167 -- INDEX 17 -- INTERVAL 13



RUN 1513 -- VOYAGE 35E -- TAPE 167 -- INDEX 17 -- INTERVAL 13

LOG BOOK DATA

DATE AND TIME	02-15-74 1200
POSITION	47-09 N 21-59 W
COURSE AND SPEED	076 . 31.9 KNOTS
SEA STATE	10
WAVE HEIGHT	20 FEET
" REL DIR	121 PORT
SWELL HEIGHT	25 FEET
" REL DIR	121 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

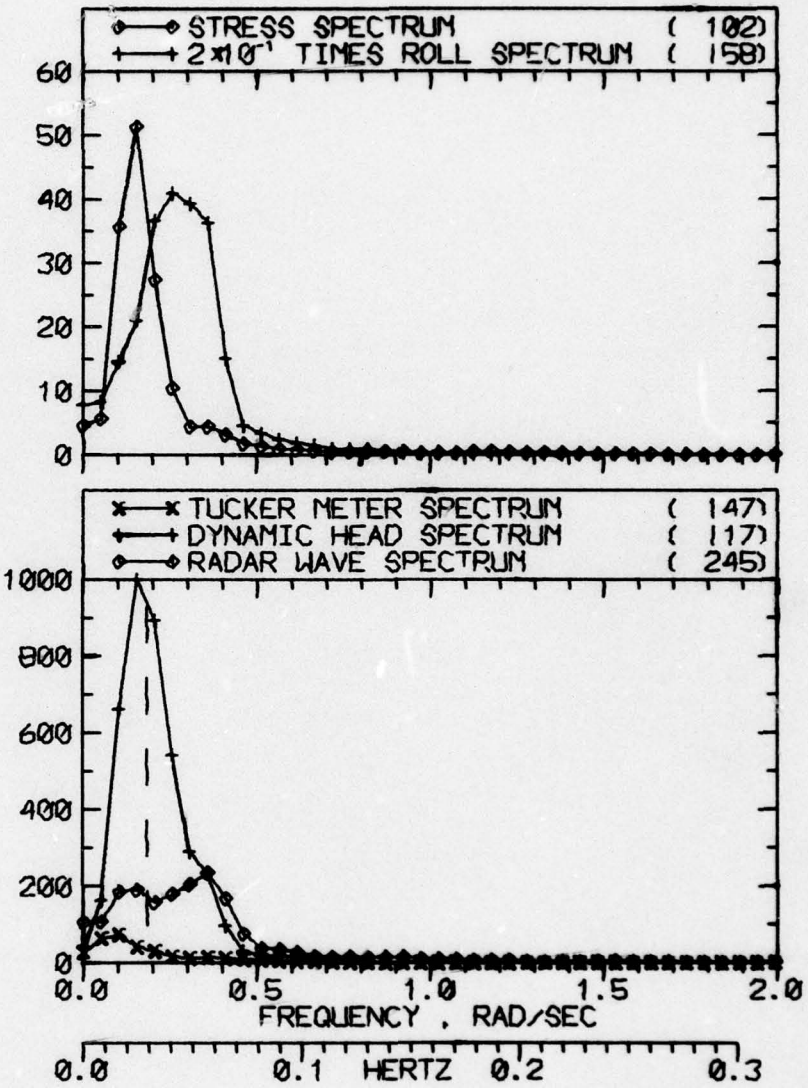
MAXIMUM PK-TR	18.2 KPSI
4.0 X RMS	11.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

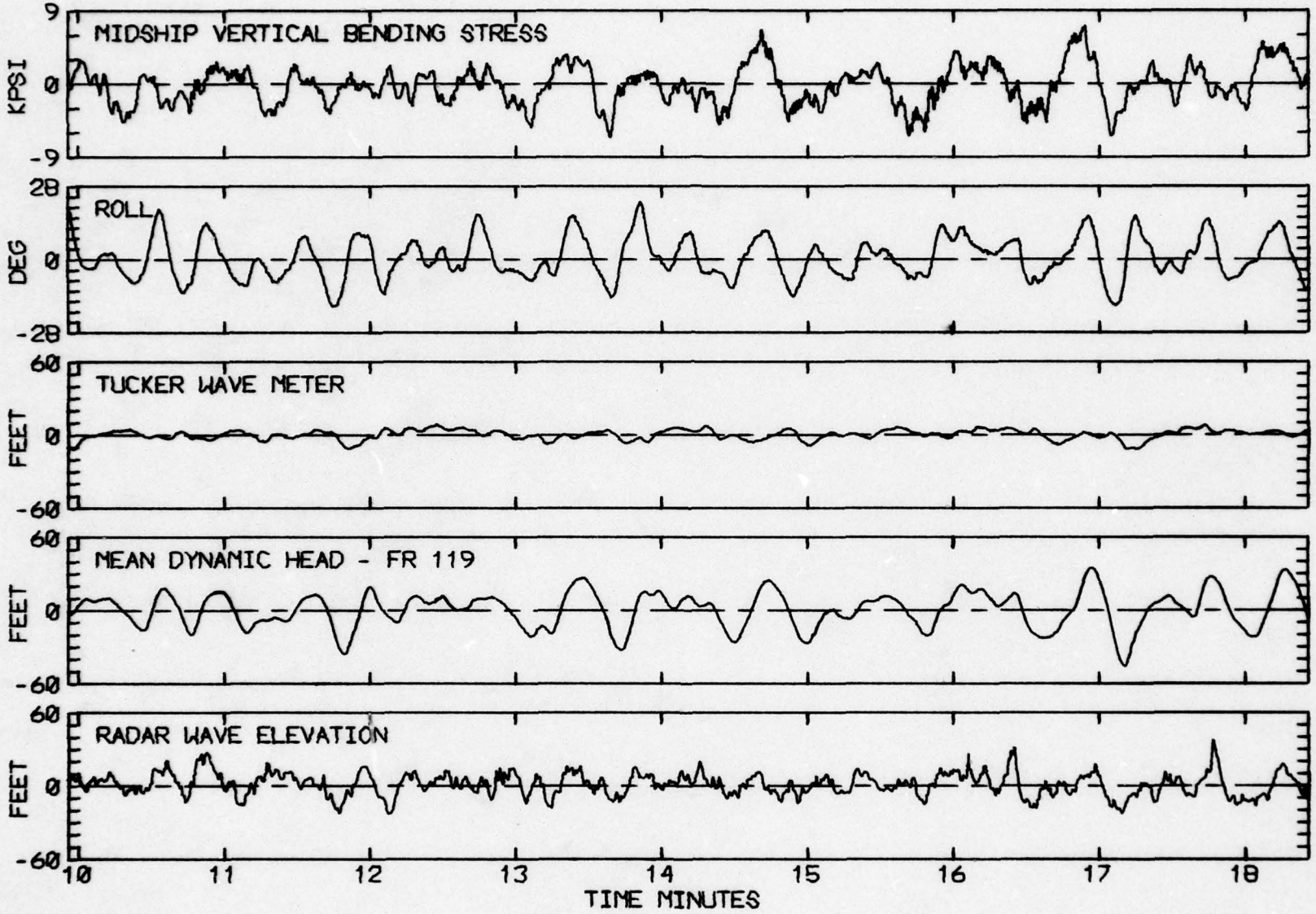
ROLL	30.9	DEG
PITCH	1.41	DEG
DK HSE VERT ACCEL	0.31	G
DK HSE LAT ACCEL	0.67	G
RADAR SLANT RANGE	42.7	FEET
VERTICAL RANGE	37.7	FEET
DISPL AT RADAR	47.7	FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	110	39	102
MAXIMUM HEIGHT	15.7	80.5	52.8
10TH HIGHEST HTS	13.1	64.4	42.4
3RD HIGHEST HTS	9.0	52.5	30.0
4.0 RMS(SPECTRA)	16.0	57.2	39.0



RUN 1517 -- VOYAGE 35E -- TAPE 167 -- INDEX 18 -- INTERVAL 17



RUN 1517 -- VOYAGE 35E -- TAPE 167 -- INDEX 18 -- INTERVAL 17

LOG BOOK DATA

DATE AND TIME	02-15-74 2400
POSITION	47-09 N 21-59 W
COURSE AND SPEED	080 . 17.2 KNOTS
SEA STATE	10
WAVE HEIGHT	20 FEET
" REL DIR	125 PORT
SWELL HEIGHT	20 FEET
" REL DIP	80 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

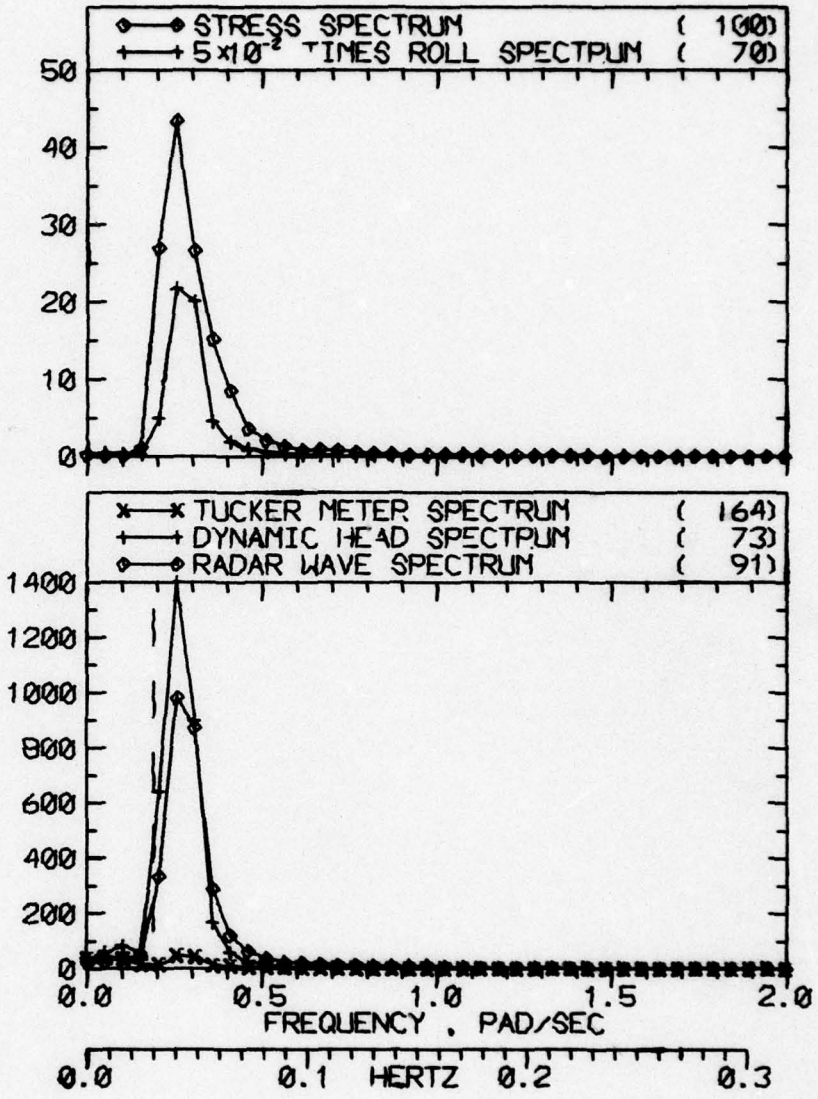
MAXIMUM PK-TP	14.8 KPSI
4.0 X RMS	10.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

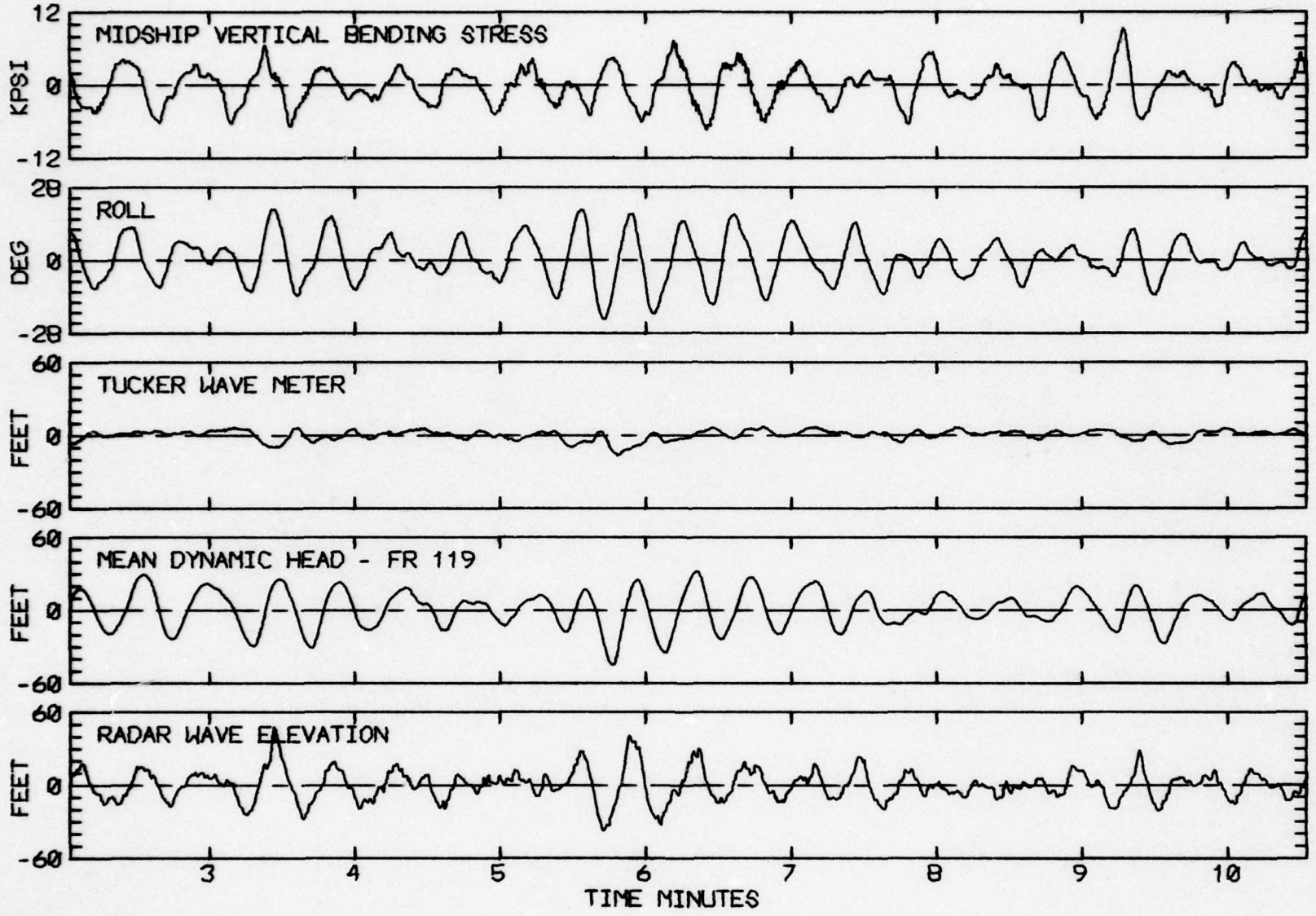
ROLL	30.6 DEG
PITCH	0.99 DEG
DK HSE VERT ACCEL	0.26 G
DK HSE LAT ACCEL	0.66 G
RADAR SLANT RANGE	44.2 FEET
VERTICAL RANGE	34.0 FEET
DISPL AT RADAR	50.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	117	39	74
MAXIMUM HEIGHT	19.1	62.0	74.1
10TH HIGHEST HTS	13.1	57.4	59.1
3RD HIGHEST HTS	8.5	50.3	46.1
4.0 RMS(SPECTRA)	14.7	53.1	49.4



RUN 1525 -- VOYAGE 35E -- TAPE 167 -- INDEX 20 -- INTERVAL 25



RUN 1525 -- VOYAGE 35E -- TAPE 167 -- INDEX 20 -- INTERVAL 25

LOG BOOK DATA

DATE AND TIME	02-16-74 0400
POSITION	47-09 N 21-59 W
COURSE AND SPEED	075 . 17.3 KNOTS
SEA STATE	9
WAVE HEIGHT	20 FEET
" REL DIR	120 PORT
SWELL HEIGHT	20 FEET
" REL DIR	75 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

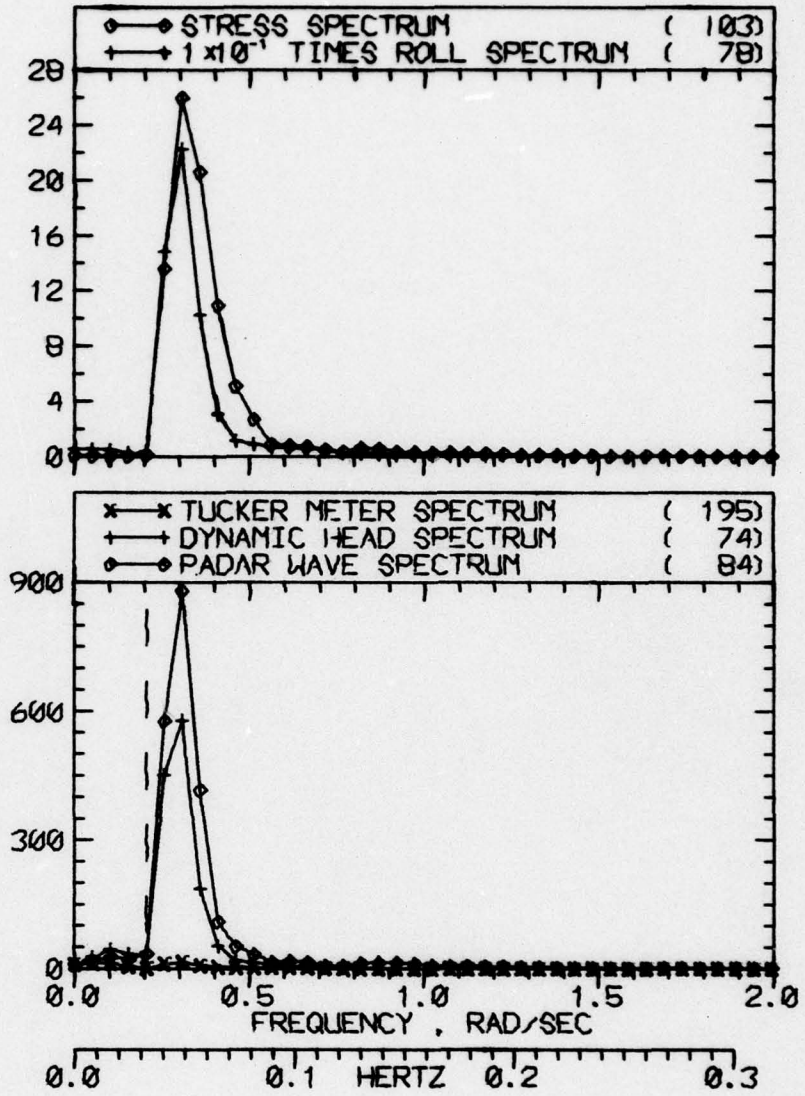
MAXIMUM PK-TR	12.1 KPSI
4.0 X RMS	8.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

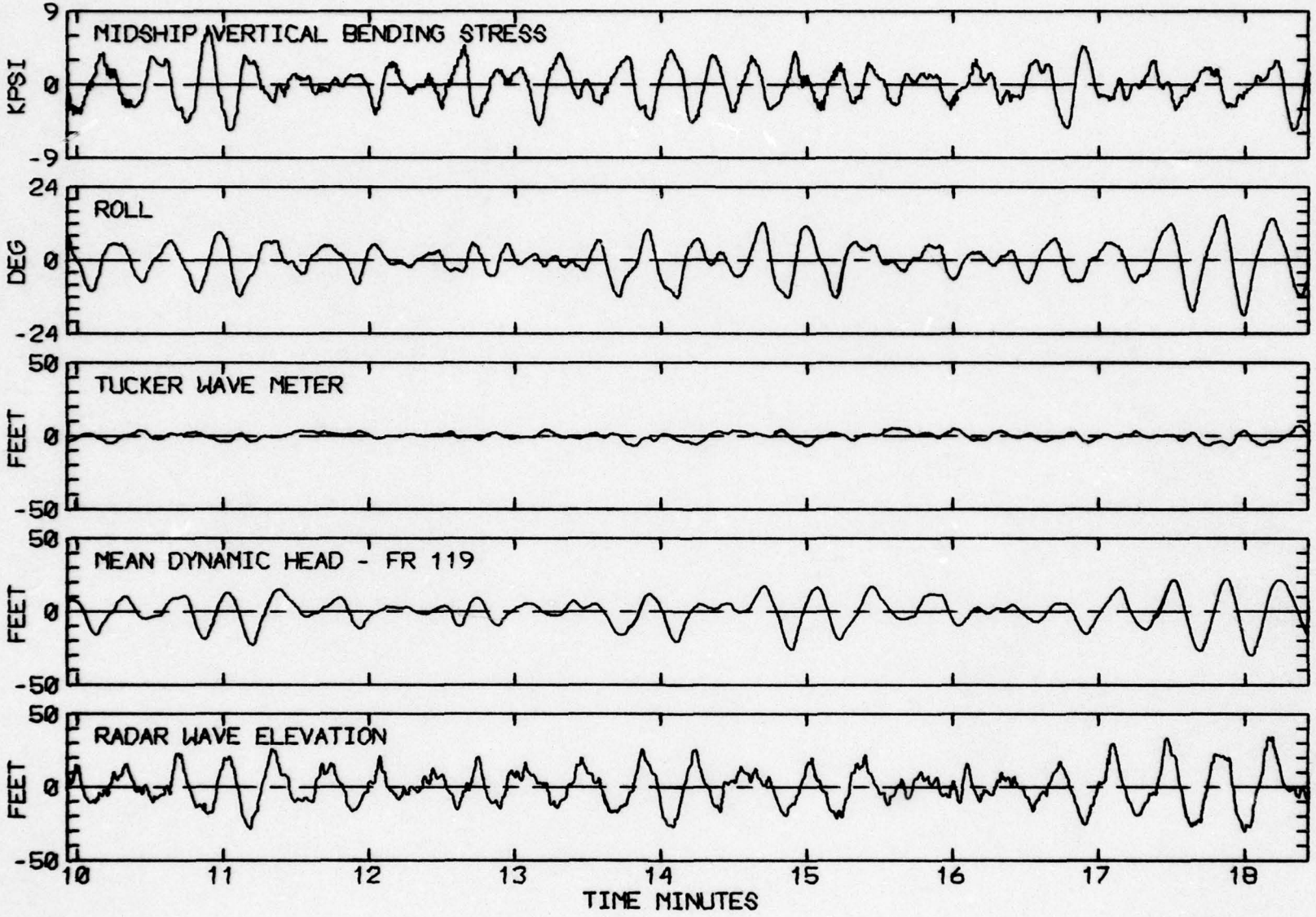
ROLL	21.7 DEG
PITCH	0.92 DEG
DK HSE VERT ACCEL	0.26 G
DK HSE LAT ACCEL	0.50 G
PADAR SLANT RANGE	42.4 FEET
VERTICAL RANGE	33.2 FEET
DISPL AT RADAR	37.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/PADAR		
P-T SAMPLE SIZE	216	58	80
MAXIMUM HEIGHT	11.1	52.3	60.0
10TH HIGHEST HTS	6.3	39.8	49.0
3RD HIGHEST HTS	3.9	29.3	39.9
4.0 RMS(SPECTRA)	8.8	34.6	43.8



RUN 1529 -- VOYAGE 35E -- TAPE 167 -- INDEX 21 -- INTERVAL 29



RUN 1529 -- VOYAGE 35E -- TAPE 167 -- INDEX 21 -- INTERVAL 29

LOG BOOK DATA

DATE AND TIME	02-16-74 0800
POSITION	47-09 N 21-59 W
COURSE AND SPEED	075 . 17.3 KNOTS
SEA STATE	9
WAVE HEIGHT	20 FEET
" REL DIR	97 PORT
SWELL HEIGHT	20 FEET
" REL DIR	75 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

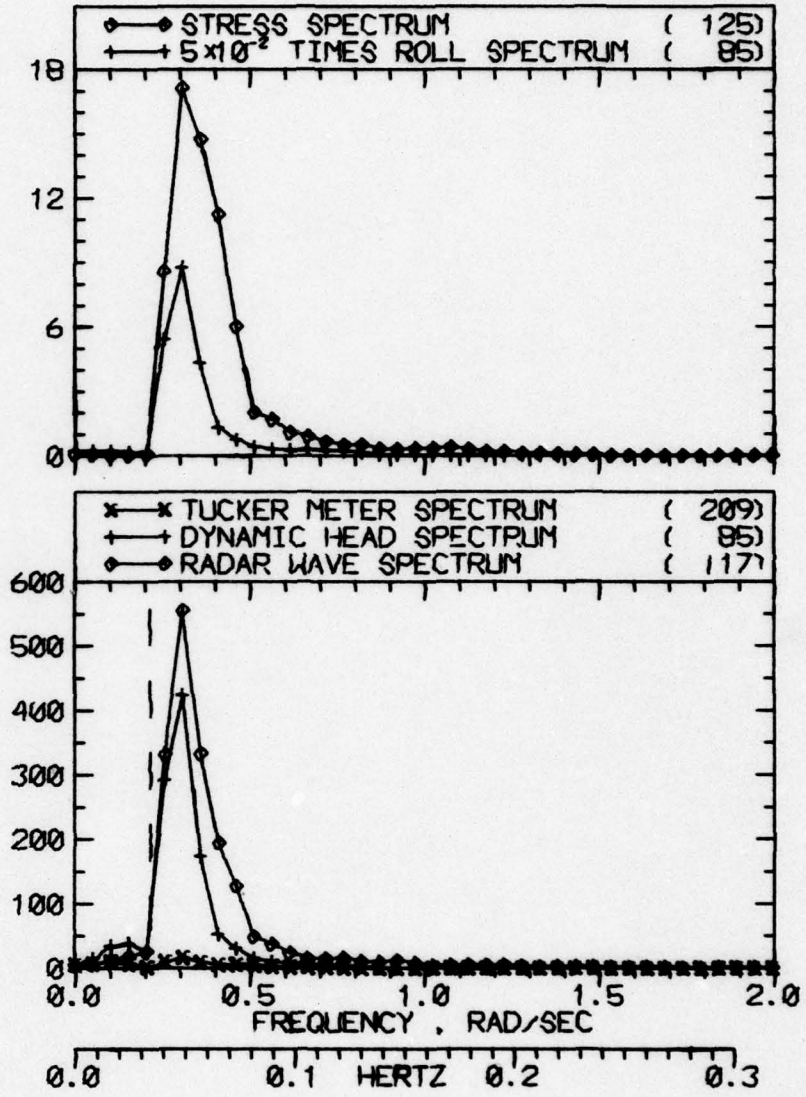
MAXIMUM PK-TR	10.5 KPSI
4.0 X RMS	7.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

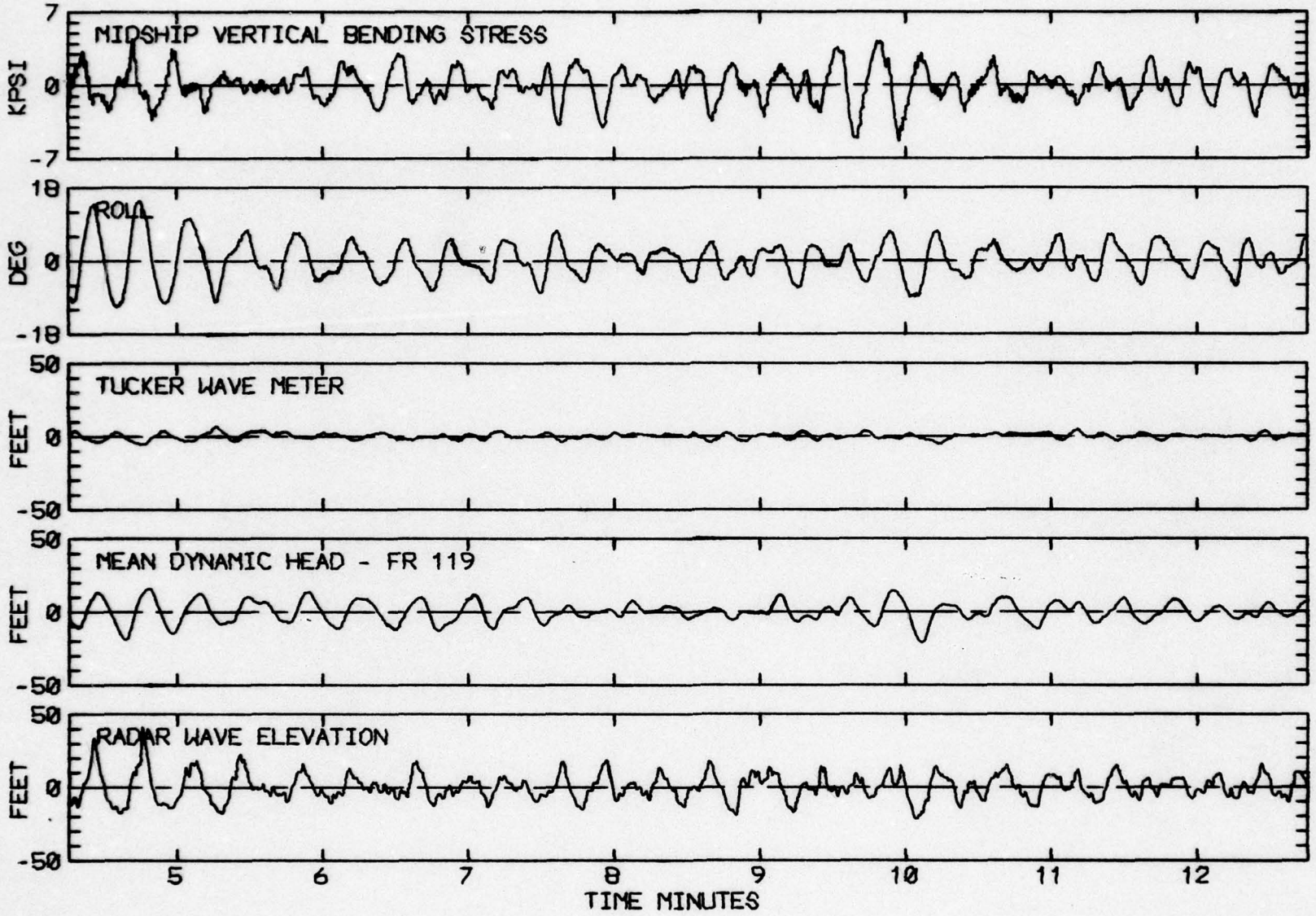
ROLL	19.5 DEG
PITCH	0.87 DEG
DK HSE VERT ACCEL	0.26 G
DK HSE LAT ACCEL	0.45 G
RADAR SLANT RANGE	39.1 FEET
VERTICAL RANGE	28.7 FEET
DISPL AT RADAR	35.6 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	180	59	82
MAXIMUM HEIGHT	12.8	48.9	54.8
10TH HIGHEST HTS	7.3	36.0	45.8
3RD HIGHEST HTS	4.8	28.3	36.1
4.0 RMS(SPECTRA)	8.6	30.5	39.0



RUN 1533 -- VOYAGE 35E -- TAPE 167 -- INDEX 22 -- INTERVAL 33



RUN 1533 -- VOYAGE 35E -- TAPE 167 -- INDEX 22 -- INTERVAL 33

LOG BOOK DATA

DATE AND TIME	02-16-74 1200
POSITION	48-36 N 11-29 W
COURSE AND SPEED	075 . 16.5 KNOTS
SEA STATE	9
WAVE HEIGHT	20 FEET
" REL DIR	97 PORT
SWELL HEIGHT	20 FEET
" REL DIR	75 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

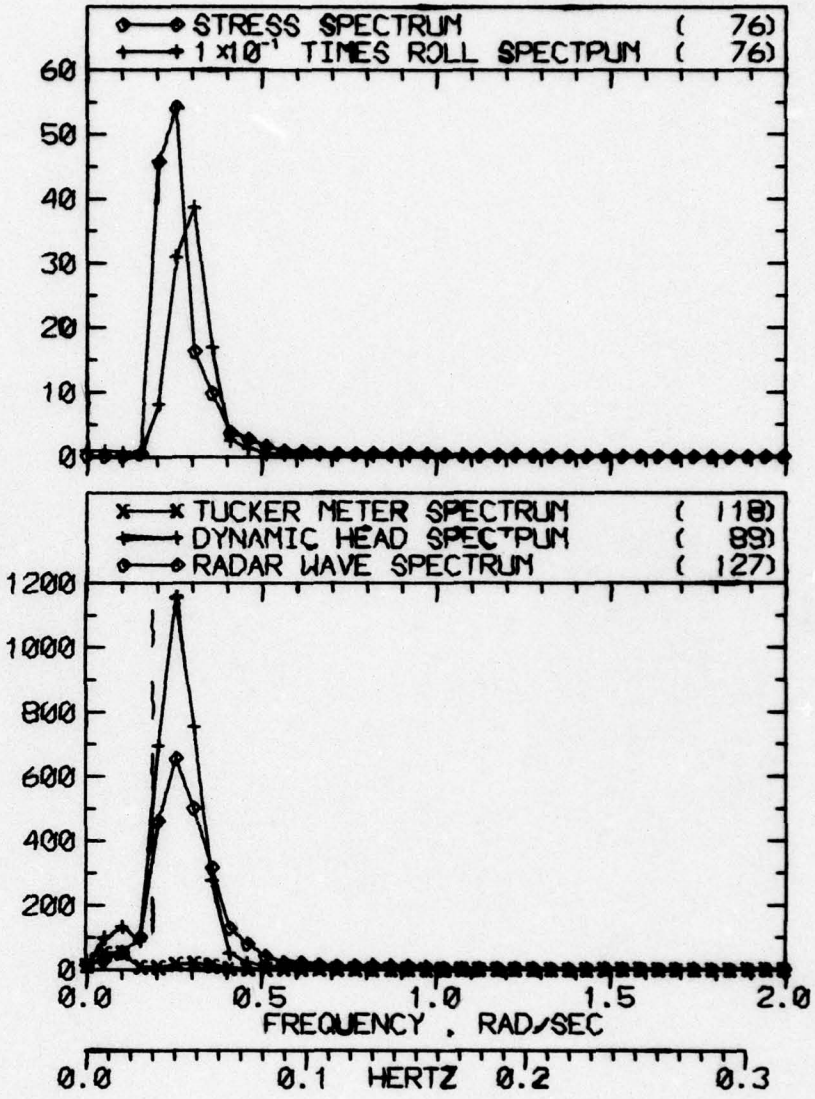
MAXIMUM PK-TR	15.3 KPSI
4.0 X RMS	10.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

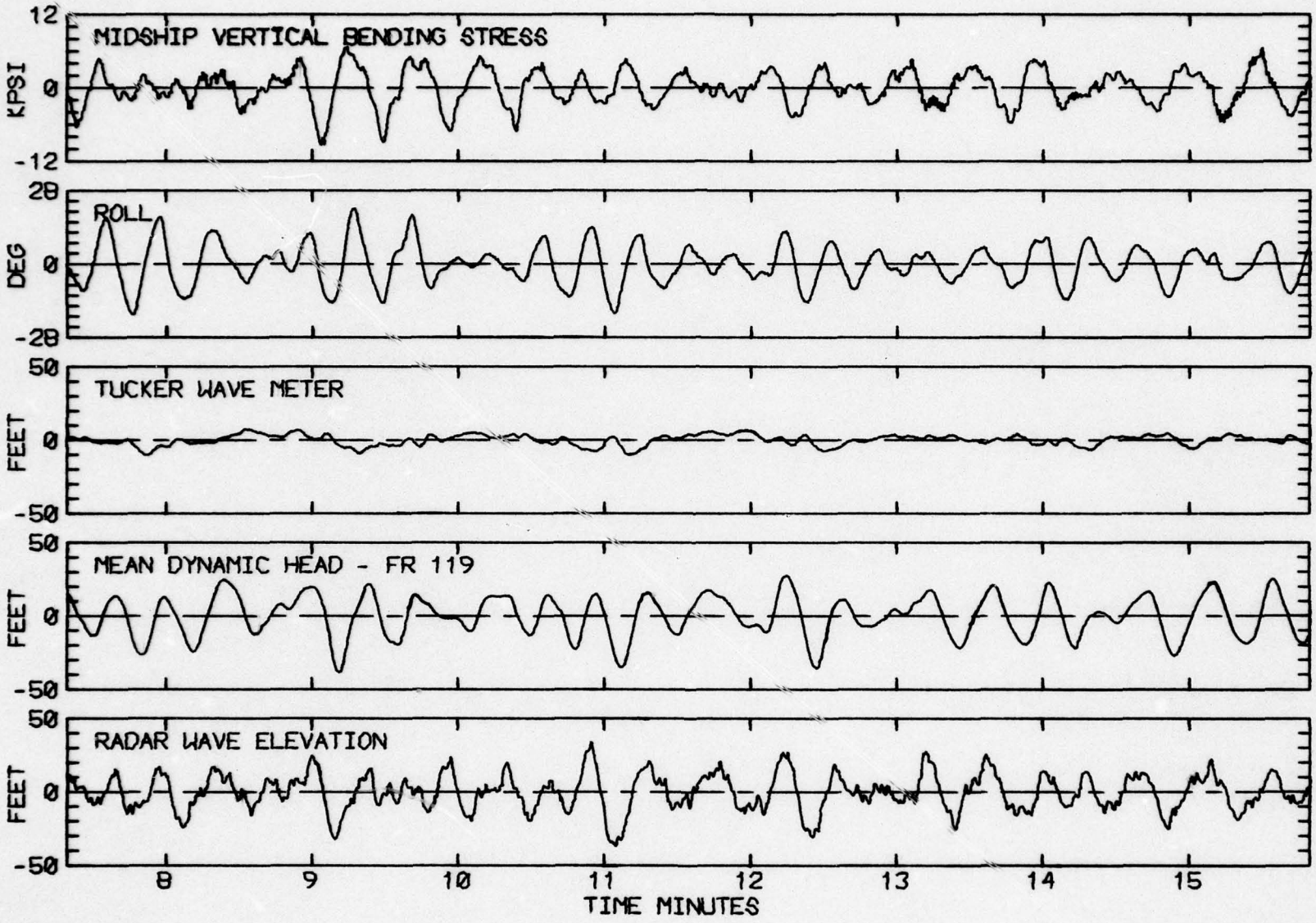
ROLL	29.2 DEG
PITCH	1.14 DEG
DK HSE VERT ACCEL	0.30 G
DK HSE LAT ACCEL	0.68 G
RADAR SLANT RANGE	39.9 FEET
VERTICAL RANGE	32.0 FEET
DISPL AT RADAR	49.0 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	111	41	71
MAXIMUM HEIGHT	16.6	62.7	70.9
10TH HIGHEST HTS	10.2	55.6	54.4
3RD HIGHEST HTS	6.8	47.2	41.3
4.0 RMS(SPECTRA)	12.6	52.2	45.7



RUN 1537 -- VOYAGE 35E -- TAPE 167 -- INDEX 23 -- INTERVAL 37



RUN 1537 -- VOYAGE 35E -- TAPE 167 -- INDEX 23 -- INTERVAL 37

LOG BOOK DATA

DATE AND TIME	02-16-74 1600
POSITION	48-36 N 11-29 W
COURSE AND SPEED	075 . 19.7 KNOTS
SEA STATE	10
WAVE HEIGHT	20 FEET
" REL DIR	97 PORT
SWELL HEIGHT	20 FEET
" REL DIR	75 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HEAVY ROLL

MIDSHIP VERTICAL BENDING STRESS

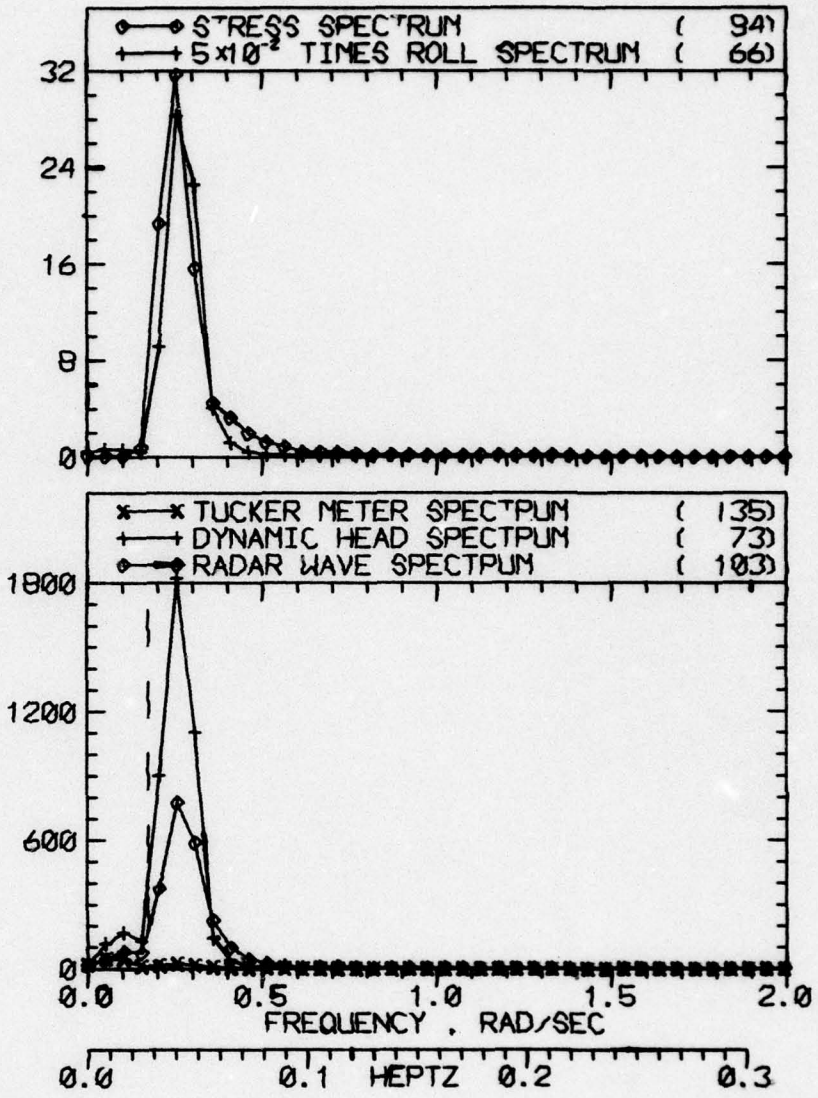
MAXIMUM PK-TR	11.4 KPSI
4.0 X RMS	8.3 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

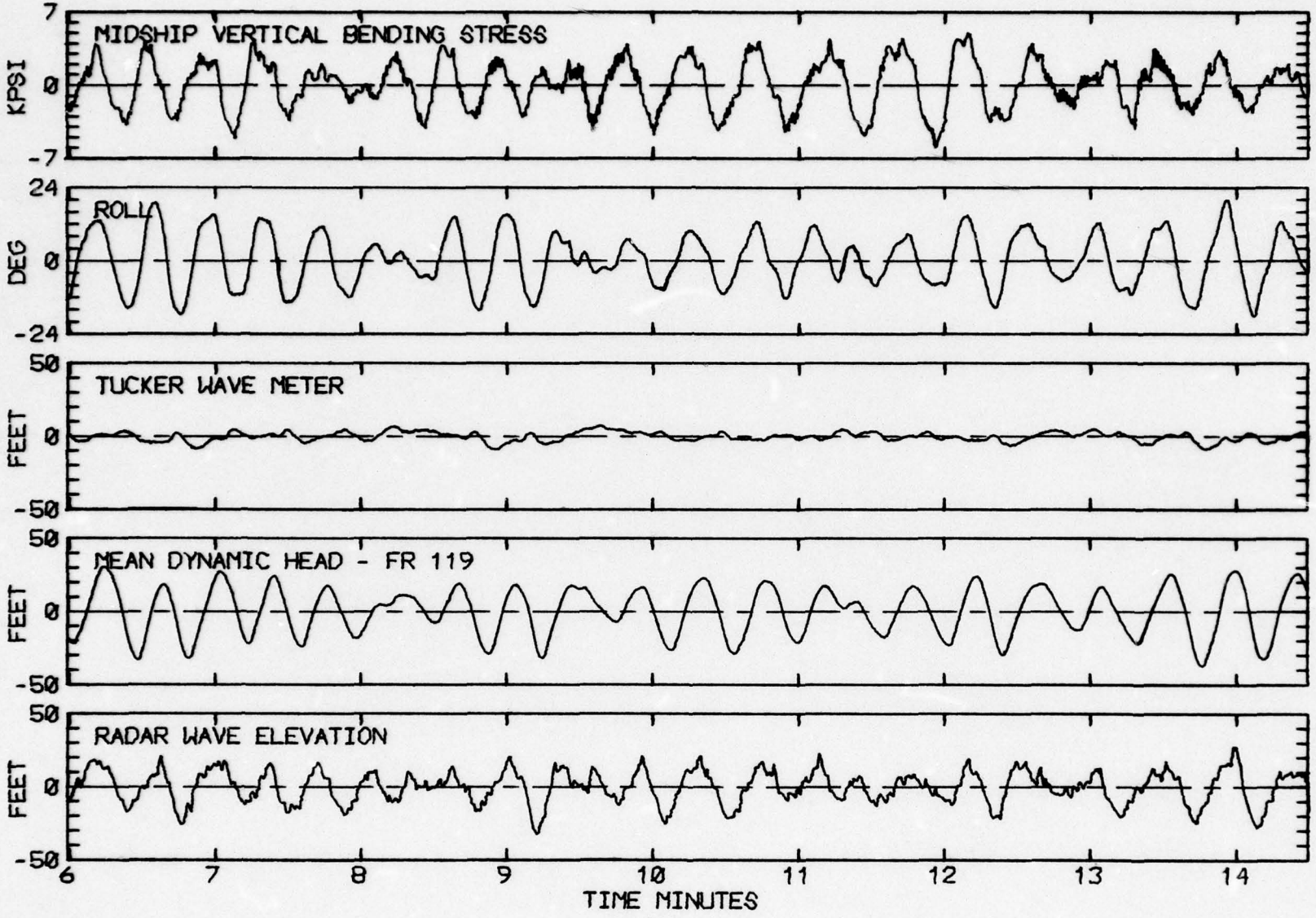
ROLL	33.5 DEG
PITCH	1.00 DEG
DK HSE VERT ACCEL	0.22 G
DK HSE LAT ACCEL	0.72 G
RADAR SLANT RANGE	39.2 FEET
VERTICAL RANGE	25.2 FEET
DISPL AT RADAR	51.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD	/RADAR
P-T SAMPLE SIZE	137 39	85
MAXIMUM HEIGHT	16.5 63.3	56.0
10TH HIGHEST HTS	10.1 61.6	48.8
3RD HIGHEST HTS	6.2 55.2	38.7
4.0 RMS(SPECTRA)	13.0 60.5	44.8



RUN 1541 -- VOYAGE 35E -- TAPE 167 -- INDEX 24 -- INTERVAL 41



RUN 1541 -- VOYAGE 35E -- TAPE 167 -- INDEX 24 -- INTERVAL 41

LOG BOOK DATA

DATE AND TIME	02-16-74 2000
POSITION	48-36 N 11-29 W
COURSE AND SPEED	075 . 26.2 KNOTS
SEA STATE	9
WAVE HEIGHT	4 FEET
" REL DIR	97 PORT
SWELL HEIGHT	6 FEET
" REL DIR	75 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

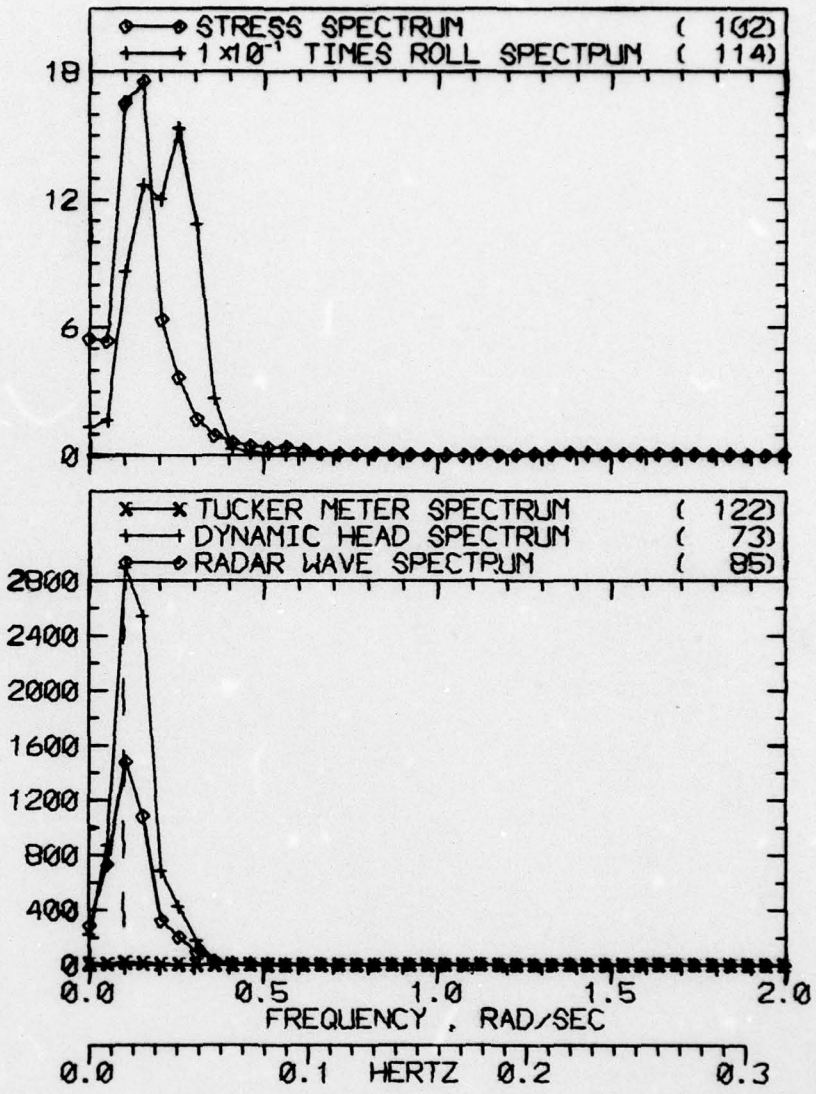
MAXIMUM PK-TR	7.8 KPSI
4.0 X RMS	6.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

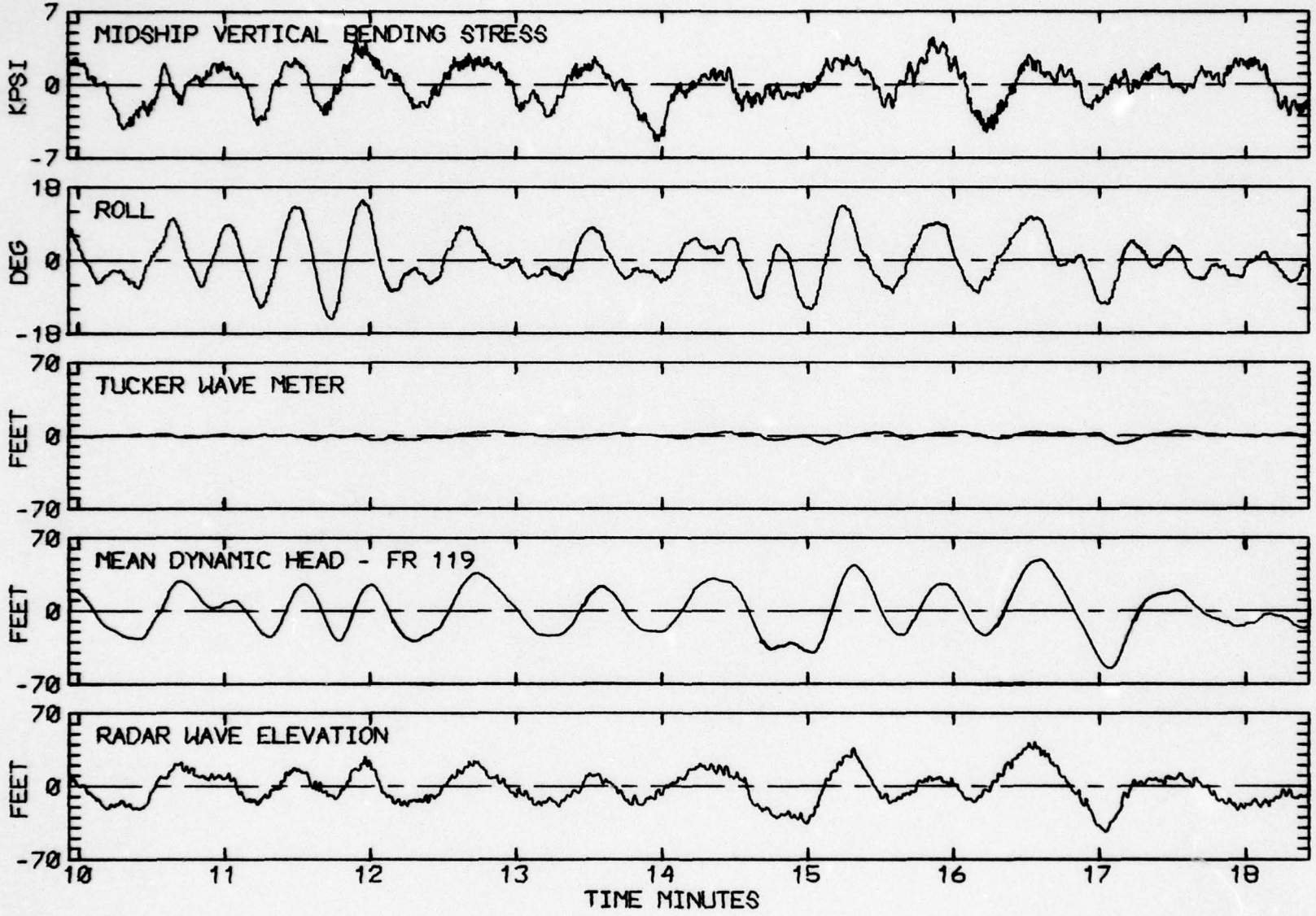
ROLL	23.1 DEG
PITCH	0.81 DEG
DK HSE VERT ACCEL	0.11 G
DK HSE LAT ACCEL	0.50 G
RADAR SLANT RANGE	28.4 FEET
VERTICAL RANGE	22.1 FEET
DISPL AT RADAR	62.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	242	24	54
MAXIMUM HEIGHT	12.1	103.5	84.9
10TH HIGHEST HTS	4.0	83.2	60.3
3RD HIGHEST HTS	2.2	70.2	40.2
4.0 RMS(SPECTRA)	7.1	79.5	58.4



RUN 1545 -- VOYAGE 35E -- TAPE 167 -- INDEX 25 -- INTERVAL 45



RUN 1545 -- VOYAGE 35E -- TAPE 167 -- INDEX 25 -- INTERVAL 45

TABLE IIa

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 1 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 WEST

D.L. RUN NO.	TMR TAPE NO.	TMR INDX NO.	TMR INTV NO.	DATE	TIME (GMT)	LATITUDE	LONGITUDE	COURSE	SPEED KT.	PROP RPM	DRAFT FT.	SEA/AIR TEMP
1617	169	5	17	02-20-74	2400	50-23 N	01-16 W	263	31.6	129.0	30.42	51/50
1621	169	6	21	02-21-74	0400	50-23 N	01-16 W	263	31.8	130.0	30.37	51/50
1625	169	7	25	02-21-74	0800	50-23 N	01-16 W	263	31.8	130.0	30.36	51/51
1629	169	8	29	02-21-74	1200	47-19 N	19-35 W	261	32.0	131.0	30.32	51/50
1633	169	9	33	02-21-74	1600	47-19 N	19-35 W	261	31.4	128.3	30.20	52/50
1641	169	11	41	02-21-74	2400	47-19 N	19-35 W	261	31.9	130.5	30.40	52/47
1645	169	12	45	02-22-74	0400	47-19 N	19-35 W	261	32.0	131.0	30.35	51/48
1649	169	13	49	02-22-74	0800	47-19 N	19-35 W	261	32.0	131.0	30.12	53/50
1653	169	14	53	02-22-74	1200	45-12 N	38-08 W	259	31.8	130.0	29.83	53/53
1705	171	16	5	02-22-74	1700	45-12 N	38-08 W	259	31.3	128.0	29.65	57/48
1710	171	17	10	02-22-74	2000	45-12 N	38-08 W	259	31.3	128.0	29.80	57/37
1713	171	18	13	02-22-74	2400	45-12 N	38-08 W	235	25.3	106.0	29.99	40/34
1717	171	19	17	02-23-74	0400	45-12 N	38-08 W	260	20.2	86.0	30.12	36/34
1721	171	20	21	02-23-74	0800	45-12 N	38-08 W	261	31.8	130.0	30.20	31/33
1725	171	21	25	02-23-74	1200	42-32 N	52-49 W	261	32.1	131.4	29.97	45/45
1729	171	22	29	02-23-74	1600	42-32 N	52-49 W	259	32.0	131.0	29.55	52/46
1743	171	25	43	02-24-74	0400	42-32 N	52-49 W	259	10.0	60.0	29.67	34/44
1747	171	26	47	02-24-74	0800	42-32 N	52-49 W		6.0	42.0	29.81	38/45
1749	171	27	49	02-24-74	1200	40-35 N	60-49 W	225		30.0	30.02	55/45
1756	171	28	56	02-24-74	1600	40-35 N	60-49 W	250	10.0	62.0	30.09	50/46
1801	173	29	1	02-24-74	1900	40-35 N	60-49 W	270	10.0	64.0	30.20	50/41
1809	173	31	9	02-24-74	2300	40-35 N	60-49 W	268	32.0	131.0	30.20	60/40
1813	173	32	13	02-25-74	0100	40-35 N	60-49 W	268	32.1	131.5	30.10	52/39
1817	173	33	17	02-25-74	0300	40-35 N	60-49 W	269	32.3	131.8	29.96	40/38

TABLE IIb

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 2 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 WEST

D.L. RUN NO.	SEA STATE	<REL WIND> DIR/SPEED /(KT)	REL WAVE DIR	WAVE HT. FT.	REL SWELL DIR	<-SWELL-> HT FT.	<-SWELL-> LENGTH FT.	VISUAL WEATHER /TMR LOG-BOOK COMMENTS
1617	1	7S/ 2	7S	1	7S	3	250	PT CLDY /
1621	3	7S/10	7S	1	7S	3	250	PT CLDY /
1625	3	38P/10	38P	1	38P	3	250	OCAST /
1629	5	36P/20	36P	2	36P	4	200	PT CLDY /
1633	5	47P/20	36P	3	36P	5	150	OCAST /
1641	2	99S/ 5	99S	3	9S	5	150	OCAST /
1645	2	171P/ 5	171P	3	9S	5	150	PT CLDY /
1649	5	103P/20	103P	3	36P	5	150	PT CLDY /
1653	7	79P/30	79P	6	79P	8	150	OCAST /
1705	9	33S/45	33S	5	79P	8	150	OCAST /
1710	8	22S/40	22S	5	22S	8	150	OCAST /RETURN TO AUTO RECORDING
1713	8	35S/40	35S	6	35S	8	150	OCAST /
1717	5	44S/20	55S	4	55S	6	200	PT CLDY /
1721	2	36P/ 5	36P	2	36P	4	200	PT CLDY /
1725	5	81P/20	81P	2	81P	4	200	PT CLDY /
1729	7	56P/30	56P	5	11S	7	150	OCAST /
1743	9	12S/45	12S	25	0	25	400	OCAST /HOVE TO 30 RPM
1747	10	0 /50	0	30	25S	30	400	PT CLDY /HOVE TO 30 RPM
1749	10	56S/50	56S	30	45S	30	400	PT CLDY /
1756	10	20S/50	20S	15	20S	15	200	PT CLDY /
1801	9	11S/45	11S	15	0	15	200	PT CLDY /
1809	2	34S/ 5	2S	6	2S	6	300	OCAST /
1813	5	178P/20	178P	4	178P	4	300	OCAST /
1817	7	179P/30	179P	3	179P	3	300	OCAST /

TABLE IIc

COMPARISON OF TMR RESULTS FOR MIDSHIP VERTICAL BENDING STRESS
WITH CORRESPONDING RAW DIGITIZATION RESULTS AT DAVIDSON LABORATORY

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 WEST

	<---------TMR RESULTS---------->					<----D.L. DIGITIZATION--->			<--COLUMN RATIOS-->		
D.L. RUN NO.	NO. WAVE INDUCED CYCLES (1)	NO. 1ST MODE BURSTS (2)	MAX P-TO-T STRESS KPSI (3)	RMS P-TO-T STRESS KPSI (4)	MAX 1ST MODE STRESS KPSI (5)	RANGE OF RECORDED EXTREMES KPSI (6)	2.83X (SAMPLE RMS) KPSI (7)	REL MEAN STRESS KPSI (8)	(7) / (4)	(6) / (3+5)	(6) / (3)
1617	171	8	7.61	3.50	1.10	7.05	3.16	-1.32	0.91	0.81	0.93
1621	179	1	6.39	2.86	0.70	6.54	2.76	-1.29	0.96	0.92	1.02
1625	173	0	4.44	2.22	0.00	5.29	2.20	-1.26	0.99	1.19	1.19
1629	177	23	7.14	2.97	1.19	8.08	3.14	-1.41	1.05	0.97	1.13
1633	183	37	8.16	3.56	2.00	9.71	3.55	-1.25	1.00	0.96	1.19
1641	189	25	11.25	4.01	2.10	11.83	3.71	-1.38	0.93	0.89	1.05
1645	199	8	7.27	3.24	1.59	8.35	3.22	-1.36	0.99	0.94	1.15
1649	194	13	4.46	2.16	1.16	5.09	2.14	-1.49	0.99	0.91	1.14
1653	190	37	5.59	2.50	3.39	8.17	2.83	-1.52	1.13	0.91	1.46
1705	166	59	12.51	5.21	4.53	15.74	5.47	-1.20	1.05	0.92	1.26
1710	165	71	7.72	4.00	4.21	10.55	4.17	-1.10	1.04	0.88	1.37
1713	160	69	15.99	6.61	4.11	16.68	6.71	-0.25	1.01	0.83	1.04
1717	147	45	13.06	5.61	3.18	14.56	5.72	0.01	1.02	0.90	1.12
1721	189	52	16.48	5.10	9.33	24.03	5.07	-1.23	0.99	0.93	1.46
1725	210	2	5.00	2.40	0.93	6.33	2.64	-1.49	1.10	1.07	1.27
1729	199	34	3.23	1.32	1.71	4.17	1.64	-1.64	1.24	0.84	1.29
1743	113	71	23.26	11.01	3.29	23.56	10.38	0.52	0.94	0.89	1.01
1747	107	42	27.76	10.07	2.95	26.12	9.38	0.68	0.93	0.85	0.94
1749	107	37	18.64	9.00	2.32	17.67	8.35	0.59	0.93	0.84	0.95
1756	147	73	20.10	8.19	5.13	21.62	7.95	0.37	0.97	0.86	1.08
1801	133	22	18.78	7.98	3.90	18.73	7.07	0.53	0.89	0.83	1.00
1809	200	25	7.94	3.82	7.15	9.77	4.23	-0.93	1.11	0.65	1.23
1813	221	0	4.21	2.02	0.00	6.13	2.57	-1.22	1.27	1.46	1.46
1817	184	0	3.30	1.33	0.00	4.07	1.49	-1.20	1.12	1.23	1.23

TABLE IId

SUMMARY OF RAW DIGITIZATION RESULTS FOR RADAR RANGE
ROLL, PITCH, DECK HOUSE ACCELERATIONS, AND TUCKER METER

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 35 WEST

	<--- RADAR --->			<--- ROLL ---->			<--- PITCH --->			<--VERT ACCEL->			<--LAT ACCEL-->			<-- TUCKER -->		
D.L. RUN NO.	4.0 (RMS) FT	RECORDED EXTREMES FT		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) FT	RECORDED EXTREMES FT	
1617	27.	22.	-20.	3.1	2.	-3.	1.5	0.8	-2.0	0.33	0.3	-0.3	0.09	0.1	-0.1	3.	3.	-3.
1621	23.	21.	-19.	3.0	2.	-3.	1.3	0.5	-1.8	0.28	0.2	-0.2	0.09	0.1	-0.1	3.	3.	-2.
1625	18.	17.	-15.	2.7	2.	-2.	1.0	0.2	-1.5	0.22	0.2	-0.2	0.08	0.1	-0.1	2.	2.	-2.
1629	25.	21.	-20.	2.4	2.	-2.	1.4	0.8	-1.8	0.29	0.2	-0.3	0.07	0.1	-0.1	3.	2.	-3.
1633	26.	23.	-24.	2.2	3.	-1.	1.4	0.6	-1.8	0.30	0.2	-0.2	0.07	0.1	-0.1	3.	2.	-2.
1641	26.	24.	-40.	2.5	1.	-3.	1.4	1.0	-2.2	0.30	0.4	-0.3	0.07	0.1	-0.1	2.	2.	-2.
1645	24.	18.	-18.	3.2	1.	-4.	1.3	0.5	-1.9	0.27	0.2	-0.2	0.09	0.1	-0.1	3.	2.	-2.
1649	17.	15.	-13.	3.0	3.	-2.	0.9	0.3	-1.4	0.20	0.2	-0.2	0.09	0.1	-0.1	2.	2.	-2.
1653	19.	16.	-18.	5.7	7.	-3.	1.0	0.3	-1.3	0.21	0.2	-0.2	0.15	0.2	-0.1	3.	2.	-2.
1705	41.	30.	-44.	11.0	9.	-9.	2.2	1.7	-2.3	0.49	0.4	-0.4	0.26	0.2	-0.2	6.	5.	-5.
1710	34.	31.	-42.	5.8	4.	-6.	1.8	1.1	-2.0	0.37	0.3	-0.3	0.15	0.2	-0.1	4.	4.	-3.
1713	50.	34.	-51.	5.0	2.	-7.	2.4	1.5	-2.1	0.52	0.4	-0.4	0.13	0.1	-0.1	5.	4.	-4.
1717	51.	35.	-49.	4.6	1.	-14.	2.0	1.1	-2.0	0.45	0.3	-0.3	0.13	0.1	-0.1	5.	4.	-4.
1721	34.	34.	-46.	3.3	2.	-5.	1.9	2.0	-2.4	0.39	0.6	-0.5	0.10	0.1	-0.1	3.	3.	-3.
1725	16.	15.	-14.	2.6	2.	-3.	1.0	0.3	-1.3	0.19	0.2	-0.2	0.08	0.1	-0.1	2.	2.	-2.
1729	11.	9.	-11.	3.1	5.	-0.	0.8	0.3	-0.9	0.11	0.1	-0.1	0.09	0.1	-0.1	2.	2.	-2.
1743	52.	39.	-42.	9.3	11.	-12.	2.1	1.9	-2.1	0.45	0.3	-0.4	0.24	0.2	-0.3	7.	7.	-7.
1747	51.	39.	-43.	10.3	8.	-13.	1.6	1.4	-1.8	0.36	0.3	-0.3	0.26	0.3	-0.3	8.	8.	-8.
1749	49.	35.	-41.	11.1	5.	-12.	1.6	1.2	-1.6	0.36	0.3	-0.3	0.27	0.2	-0.2	9.	8.	-8.
1756	55.	44.	-49.	7.0	4.	-8.	2.3	1.7	-2.0	0.49	0.4	-0.4	0.18	0.2	-0.2	6.	5.	-6.
1801	53.	36.	-51.	5.5	2.	-6.	1.9	1.3	-1.8	0.43	0.4	-0.3	0.14	0.1	-0.2	5.	4.	-4.
1809	28.	23.	-25.	5.2	3.	-7.	1.7	0.8	-2.0	0.38	0.3	-0.3	0.14	0.1	-0.1	3.	3.	-3.
1813	16.	15.	-13.	3.8	1.	-6.	0.9	0.2	-1.4	0.17	0.1	-0.1	0.10	0.1	-0.1	2.	1.	-2.
1817	12.	11.	-12.	3.6	2.	-4.	0.8	0.2	-1.3	0.16	0.1	-0.1	0.10	0.1	-0.1	2.	1.	-1.

LOG BOOK DATA

DATE AND TIME	02-20-74 2400
POSITION	50-23 N 01-16 W
COURSE AND SPEED	263 , 31.6 KNOTS
SEA STATE	1
WAVE HEIGHT	1 FEET
" REL DIR	7 STBD
SWELL HEIGHT	3 FEET
" REL DIR	7 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

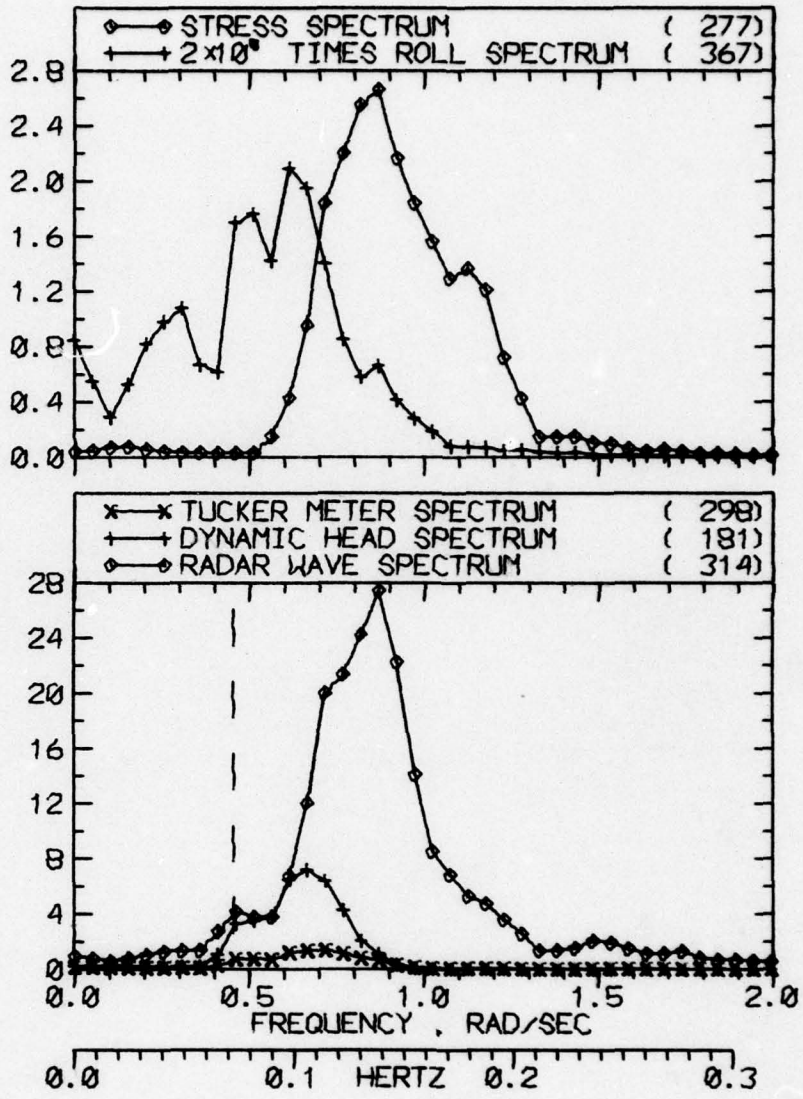
MAXIMUM PK-TR	7.6 KPSI
4.0 X RMS	4.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

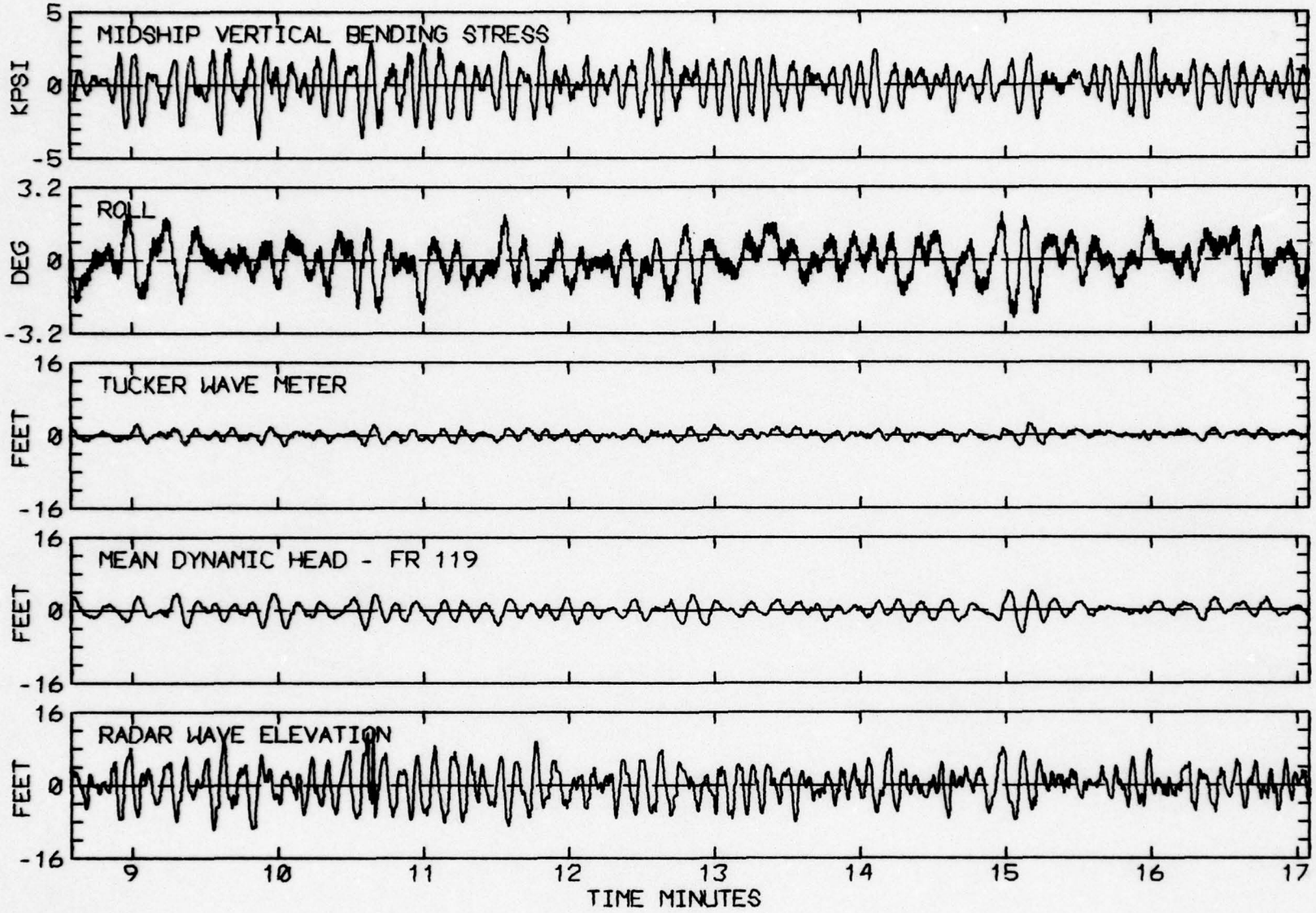
ROLL	3.0 DEG
PITCH	1.51 DEG
DK HSE VERT ACCEL	0.33 G
DK HSE LAT ACCEL	0.09 G
RADAR SLANT RANGE	27.1 FEET
VERTICAL RANGE	25.5 FEET
DISPL AT RADAR	16.7 FEET

WAVE HEIGHT STATISTICS (FEET)

		TUCKER/DYN. HEAD/RADAR	
P-T SAMPLE SIZE	589	255	204
MAXIMUM HEIGHT	3.1	9.6	19.6
10TH HIGHEST HTS	1.7	6.2	15.4
3RD HIGHEST HTS	1.2	3.9	12.6
4.0 RMS(SPECTRA)	3.1	5.9	13.7



RUN 1617 -- VOYAGE 35W -- TAPE 169 -- INDEX 5 -- INTERVAL 17



RUN 1617 -- VOYAGE 35W -- TAPE 169 -- INDEX 5 -- INTERVAL 17

LOG BOOK DATA

DATE AND TIME	02-21-74 0400
POSITION	50-23 N 01-16 W
COURSE AND SPEED	263 . 31.8 KNOTS
SEA STATE	3
WAVE HEIGHT	1 FEET
" REL DIR	7 STBD
SWELL HEIGHT	3 FEET
" REL DIR	7 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

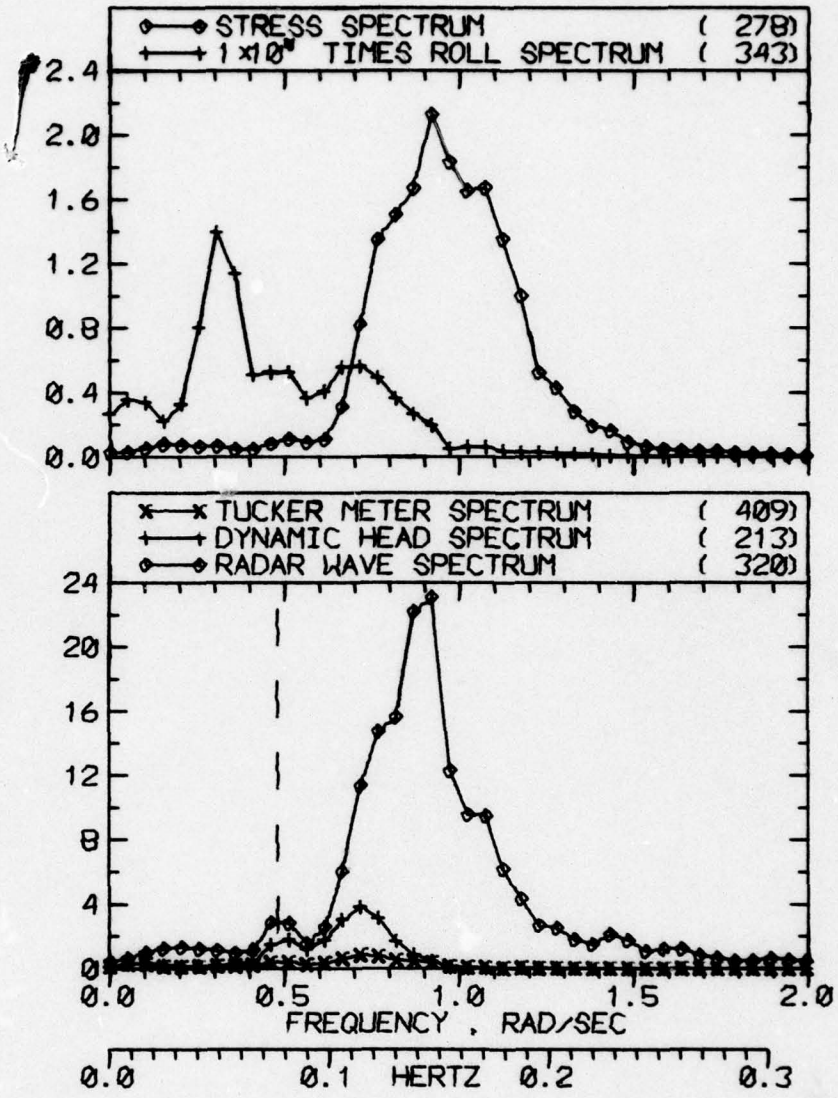
MAXIMUM PK-TR	6.4 KPSI
4.0 X RMS	3.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

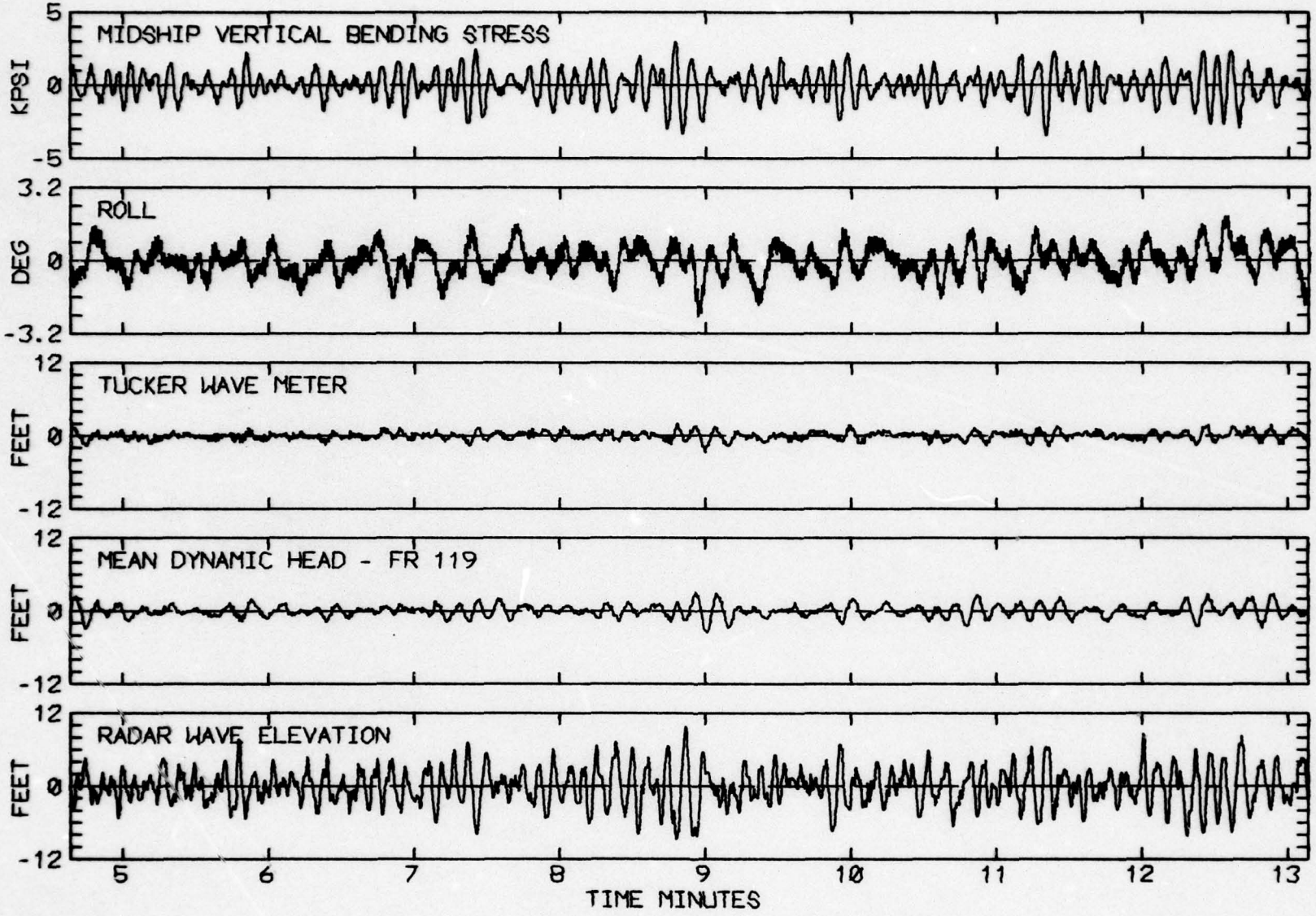
ROLL	3.0 DEG
PITCH	1.28 DEG
DK HSE VERT ACCEL	0.28 G
DK HSE LAT ACCEL	0.09 G
RADAR SLANT RANGE	23.2 FEET
VERTICAL RANGE	22.1 FEET
DISPL AT RADAR	13.3 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	702	339	221
MAXIMUM HEIGHT	3.3	6.7	18.0
10TH HIGHEST HTS	1.6	3.9	14.4
3RD HIGHEST HTS	1.1	2.5	11.2
4.0 RMS(SPECTRA)	2.6	4.3	12.3



RUN 1621 -- VOYAGE 35W -- TAPE 169 -- INDEX 6 -- INTERVAL 21



RUN 1621 -- VOYAGE 35W -- TAPE 169 -- INDEX 6 -- INTERVAL 21

LOG BOOK DATA

DATE AND TIME	02-21-74 0800
POSITION	50-23 N 01-16 W
COURSE AND SPEED	263 . 31.8 KNOTS
SEA STATE	3
WAVE HEIGHT	1 FEET
" REL DIR	38 PORT
SWELL HEIGHT	3 FEET
" REL DIR	38 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

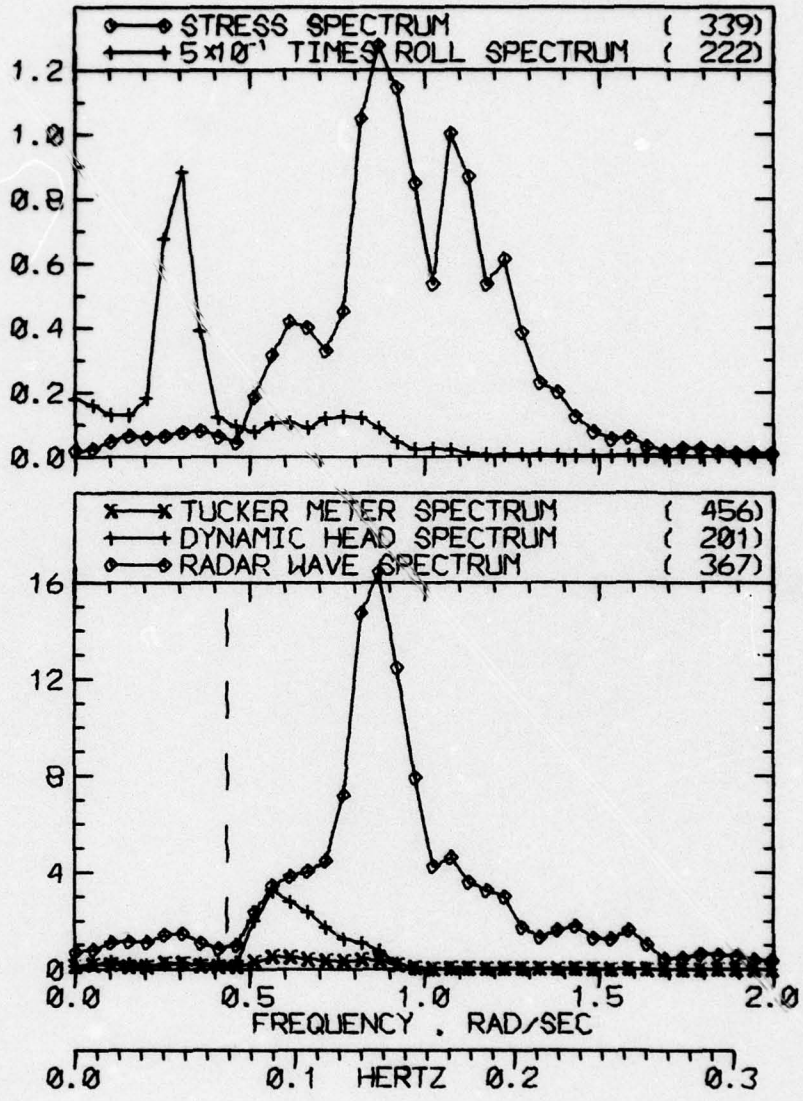
MAXIMUM PK-TR	4.4 KPSI
4.0 X RMS	3.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

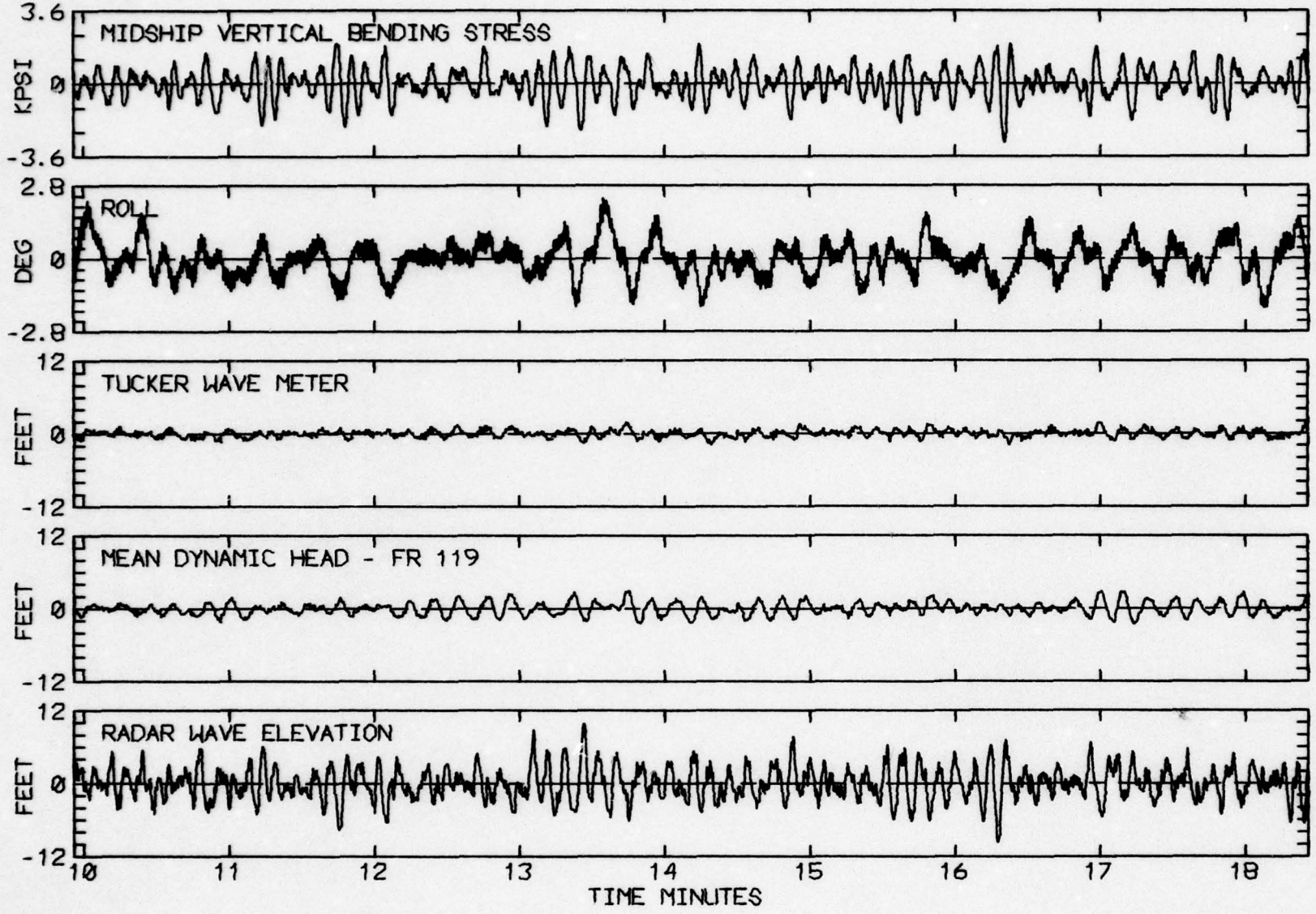
ROLL	2.7 DEG
PITCH	1.01 DEG
DK HSE VERT ACCEL	0.22 G
DK HSE LAT ACCEL	0.08 G
RADAR SLANT RANGE	18.5 FEET
VERTICAL RANGE	17.8 FEET
DISPL AT RADAR	10.9 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	685	319	259
MAXIMUM HEIGHT	2.6	5.5	16.5
10TH HIGHEST HTS	1.8	3.4	11.4
3RD HIGHEST HTS	1.3	2.4	9.0
4.0 RMS(SPECTRA)	2.3	3.9	10.3



RUN 1625 -- VOYAGE 35W -- TAPE 169 -- INDEX 7 -- INTERVAL 25



RUN 1625 -- VOYAGE 35W -- TAPE 169 -- INDEX 7 -- INTERVAL 25

LOG BOOK DATA

DATE AND TIME	02-21-74 1200
POSITION	47-19 N 19-35 W
COURSE AND SPEED	261 . 32.0 KNOTS
SEA STATE	5
WAVE HEIGHT	2 FEET
" REL DIR	36 PORT
SWELL HEIGHT	4 FEET
" REL DIR	36 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

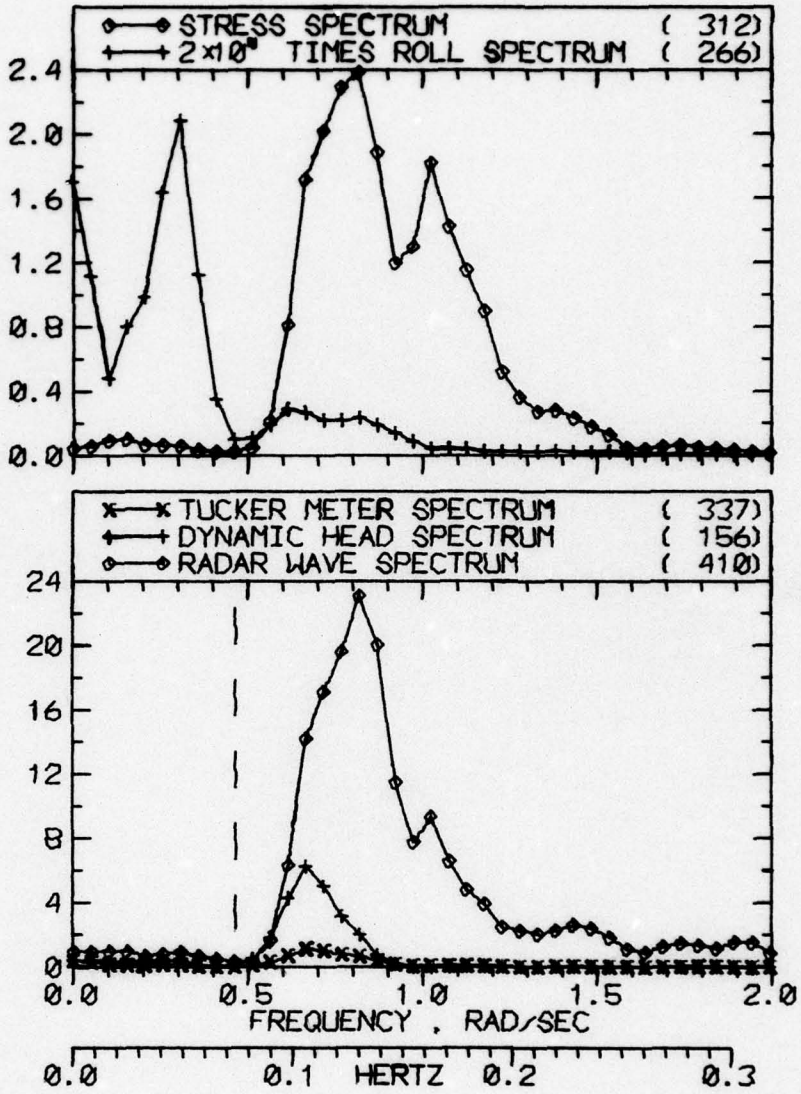
MAXIMUM PK-TR	7.1 KPSI
4.0 X RMS	4.3 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

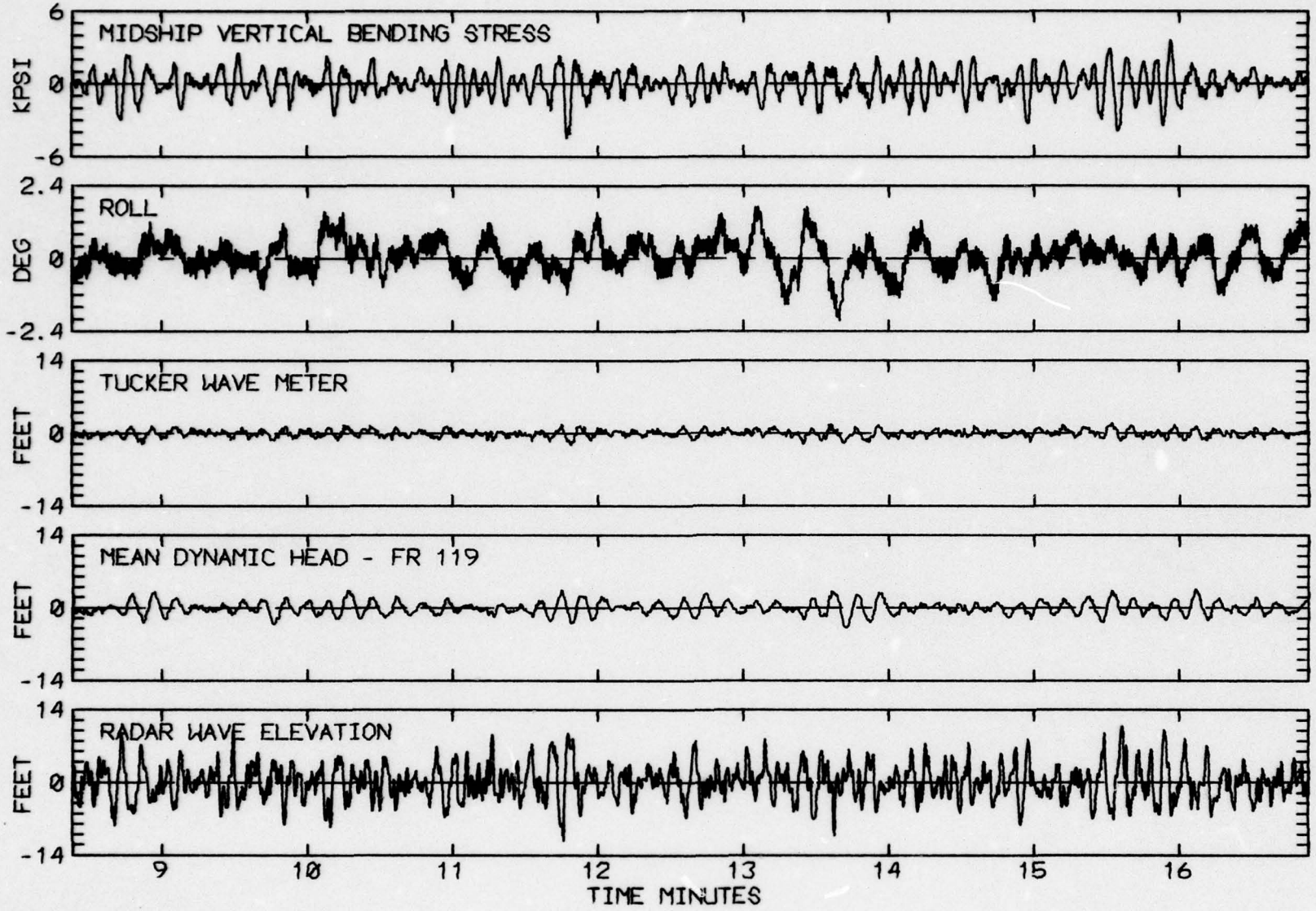
ROLL	2.4 DEG
PITCH	1.38 DEG
DK HSE VERT ACCEL	0.29 G
DK HSE LAT ACCEL	0.07 G
RADAR SLANT RANGE	25.2 FEET
VERTICAL RANGE	23.7 FEET
DISPL AT RADAR	15.0 FEET

WAVE HEIGHT STATISTICS (FEET)

		TUCKER/DYN.	HEAD/RADAR
P-T SAMPLE SIZE	646	282	297
MAXIMUM HEIGHT	3.4	6.9	19.3
10TH HIGHEST HTS	2.0	4.5	14.4
3RD HIGHEST HTS	1.4	2.9	11.3
4.0 RMS(SPECTRA)	2.7	4.8	13.3



RUN 1629 -- VOYAGE 35W -- TAPE 169 -- INDEX 8 -- INTERVAL 29



RUN 1629 -- VOYAGE 35W -- TAPE 169 -- INDEX 8 -- INTERVAL 29

LOG BOOK DATA

DATE AND TIME	02-21-74 1600
POSITION	47-19 N 19-35 W
COURSE AND SPEED	261 . 31.4 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	36 PORT
SWELL HEIGHT	5 FEET
" REL DIR	36 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

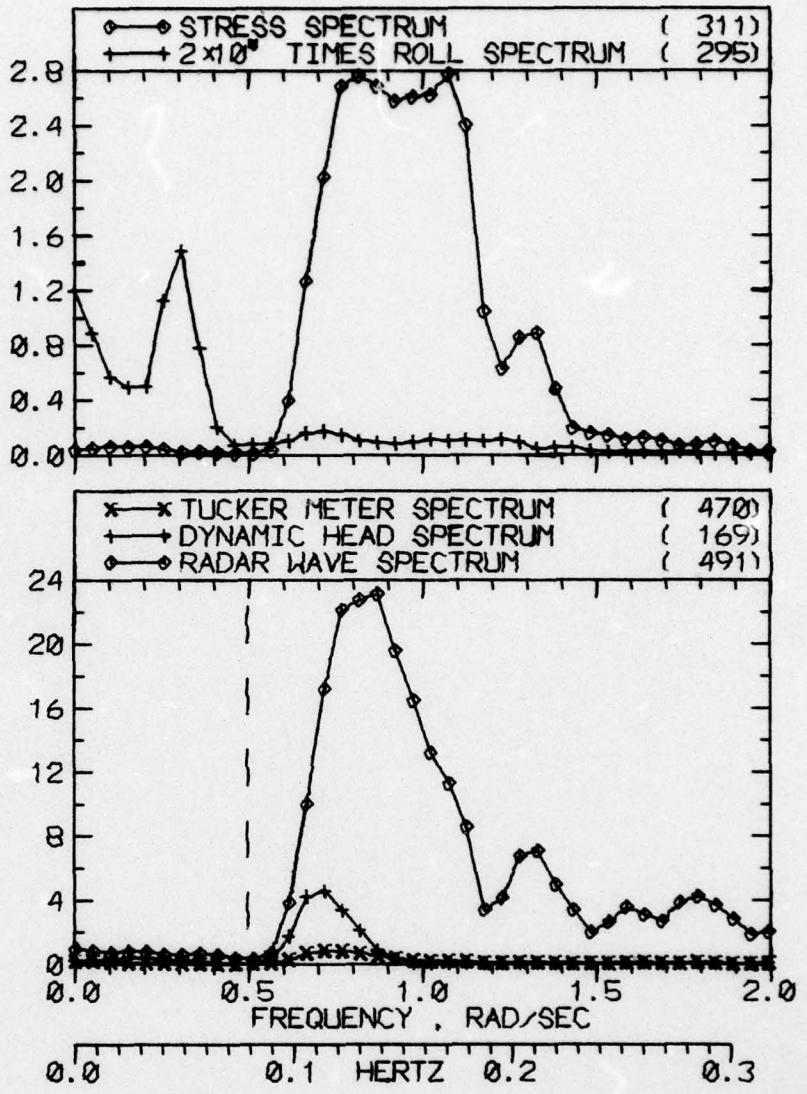
MAXIMUM PK-TR	8.2 KPSI
4.0 X RMS	5.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

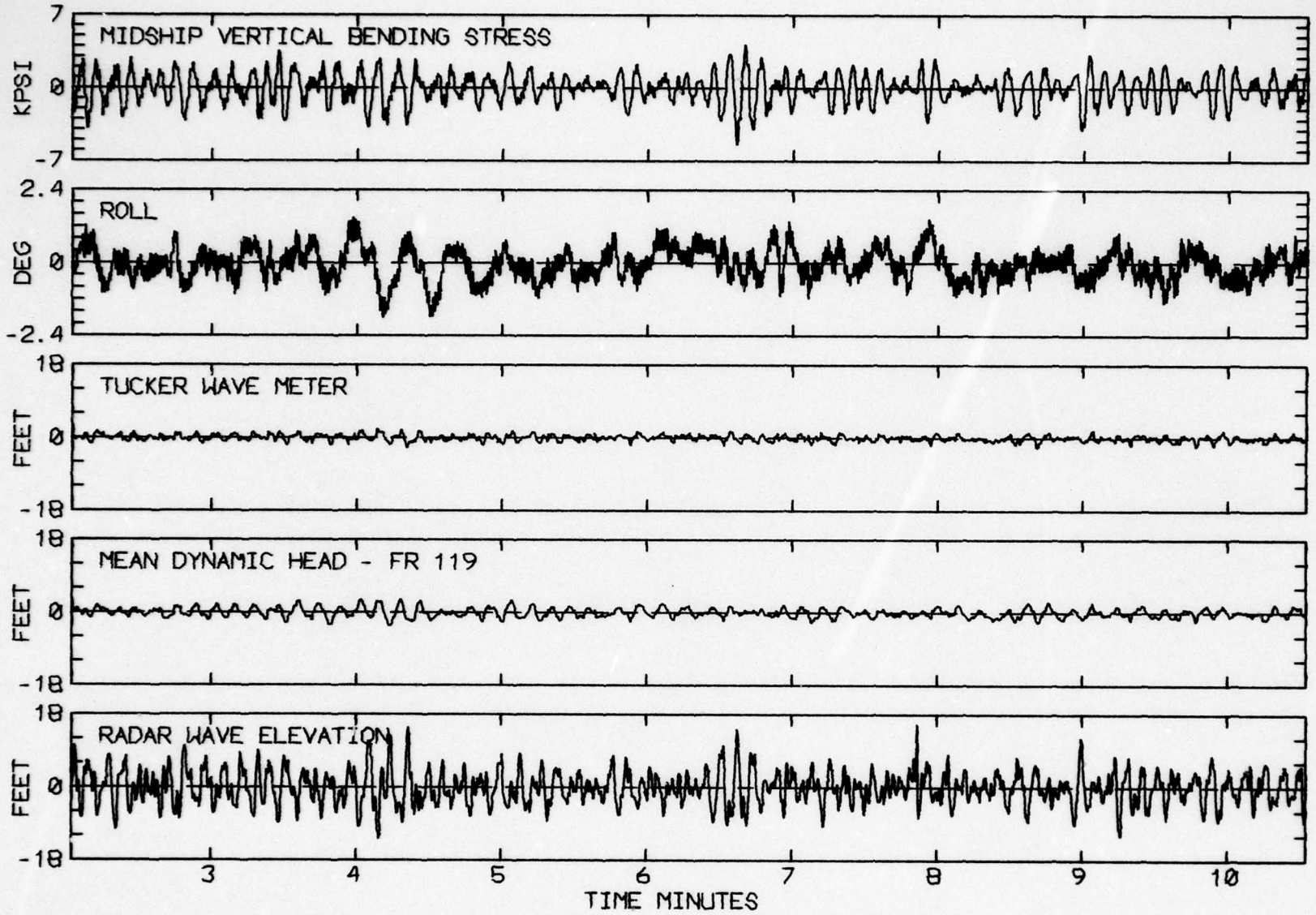
ROLL	2.1 DEG
PITCH	1.38 DEG
DK HSE VERT ACCEL	0.30 G
DK HSE LAT ACCEL	0.07 G
RADAR SLANT RANGE	26.2 FEET
VERTICAL RANGE	25.6 FEET
DISPL AT RADAR	14.9 FEET

WAVE HEIGHT STATISTICS (FEET)

		TUCKER/DYN. HEAD	/RADAR
P-T SAMPLE SIZE	588	301	285
MAXIMUM HEIGHT	4.2	6.3	24.5
10TH HIGHEST HTS	2.5	4.4	18.4
3RD HIGHEST HTS	1.8	3.0	13.9
4.0 RMS(SPECTRA)	2.7	4.3	15.3



RUN 1633 -- VOYAGE 35W -- TAPE 169 -- INDEX 9 -- INTERVAL 33



RUN 1633 -- VOYAGE 35W -- TAPE 169 -- INDEX 9 -- INTERVAL 33

LOG BOOK DATA

DATE AND TIME	02-21-74 2400
POSITION	47-19 N 19-35 W
COURSE AND SPEED	261 . 31.9 KNOTS
SEA STATE	2
WAVE HEIGHT	3 FEET
" REL DIR	99 STBD
SWELL HEIGHT	5 FEET
" REL DIR	9 STBD

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

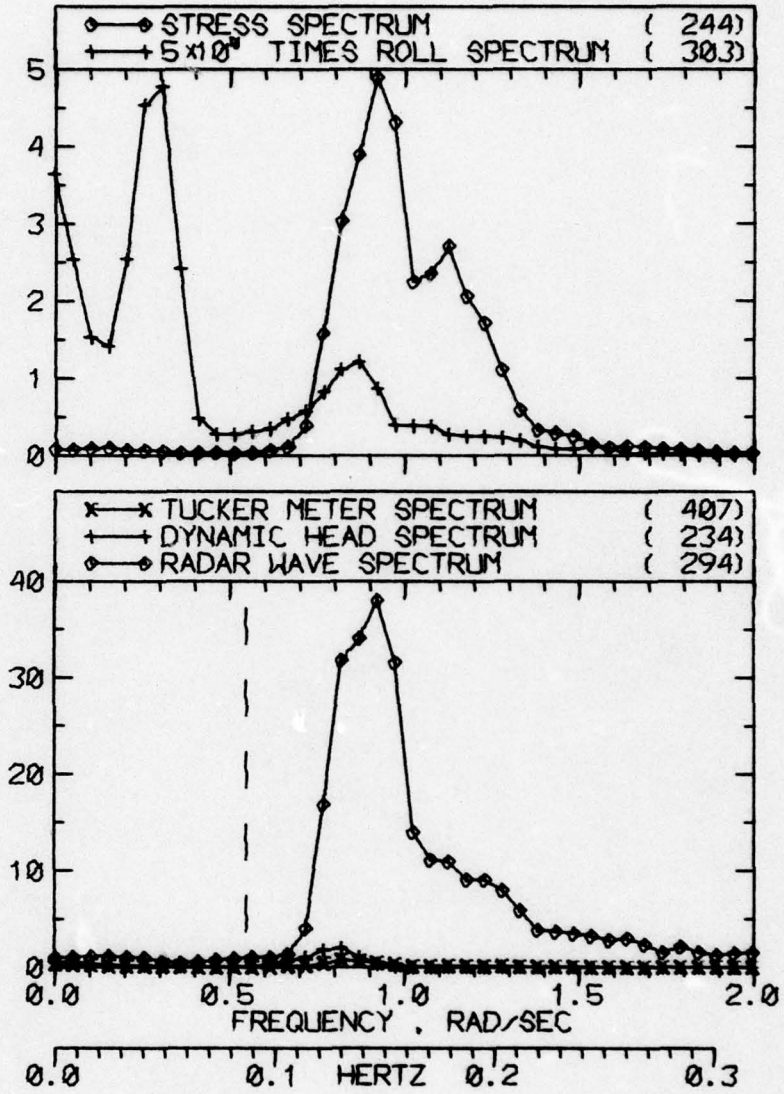
MAXIMUM PK-TR	11.3 KPSI
4.0 X RMS	5.3 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

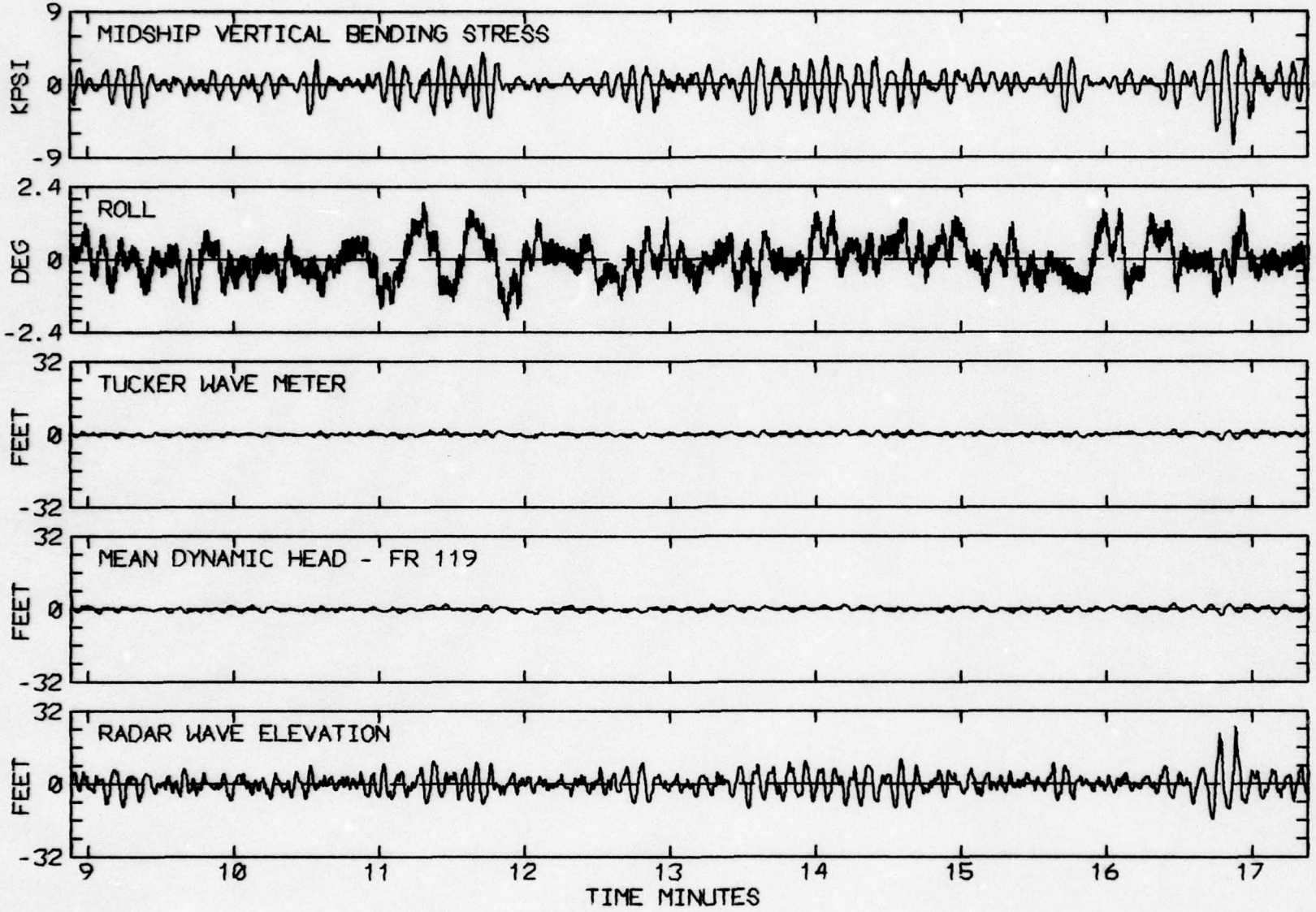
ROLL	2.5 DEG
PITCH	1.45 DEG
DK HSE VERT ACCEL	0.30 G
DK HSE LAT ACCEL	0.07 G
RADAR SLANT RANGE	26.2 FEET
VERTICAL RANGE	25.7 FEET
DISPL AT RADAR	13.0 FEET

WAVE HEIGHT STATISTICS (FEET)

		TUCKER/DYN.	HEAD/RADAR
P-T SAMPLE SIZE	775	459	257
MAXIMUM HEIGHT	2.9	3.5	33.8
10TH HIGHEST HTS	1.6	2.2	18.3
3RD HIGHEST HTS	1.1	1.5	14.2
4.0 RMS(SPECTRA)	2.4	3.0	15.4



RUN 1641 -- VOYAGE 35W -- TAPE 169 -- INDEX 11 -- INTERVAL 41



RUN 1641 -- VOYAGE 35W -- TAPE 169 -- INDEX 11 -- INTERVAL 41

LOG BOOK DATA

DATE AND TIME	02-22-74 0400
POSITION	47-19 N 19-35 W
COURSE AND SPEED	261 . 32.0 KNOTS
SEA STATE	2
WAVE HEIGHT	3 FEET
" REL DIR	171 PORT
SWELL HEIGHT	5 FEET
" REL DIR	9 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

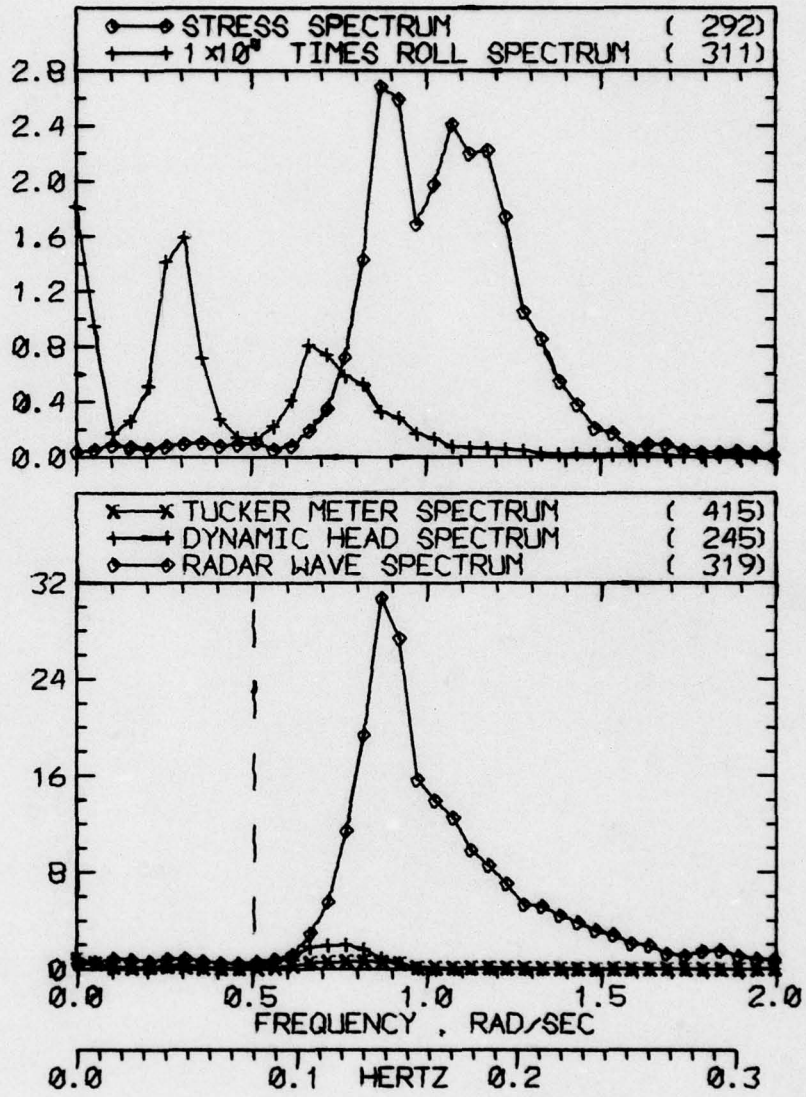
MAXIMUM PK-TR	7.3 KPSI
4.0 X RMS	4.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

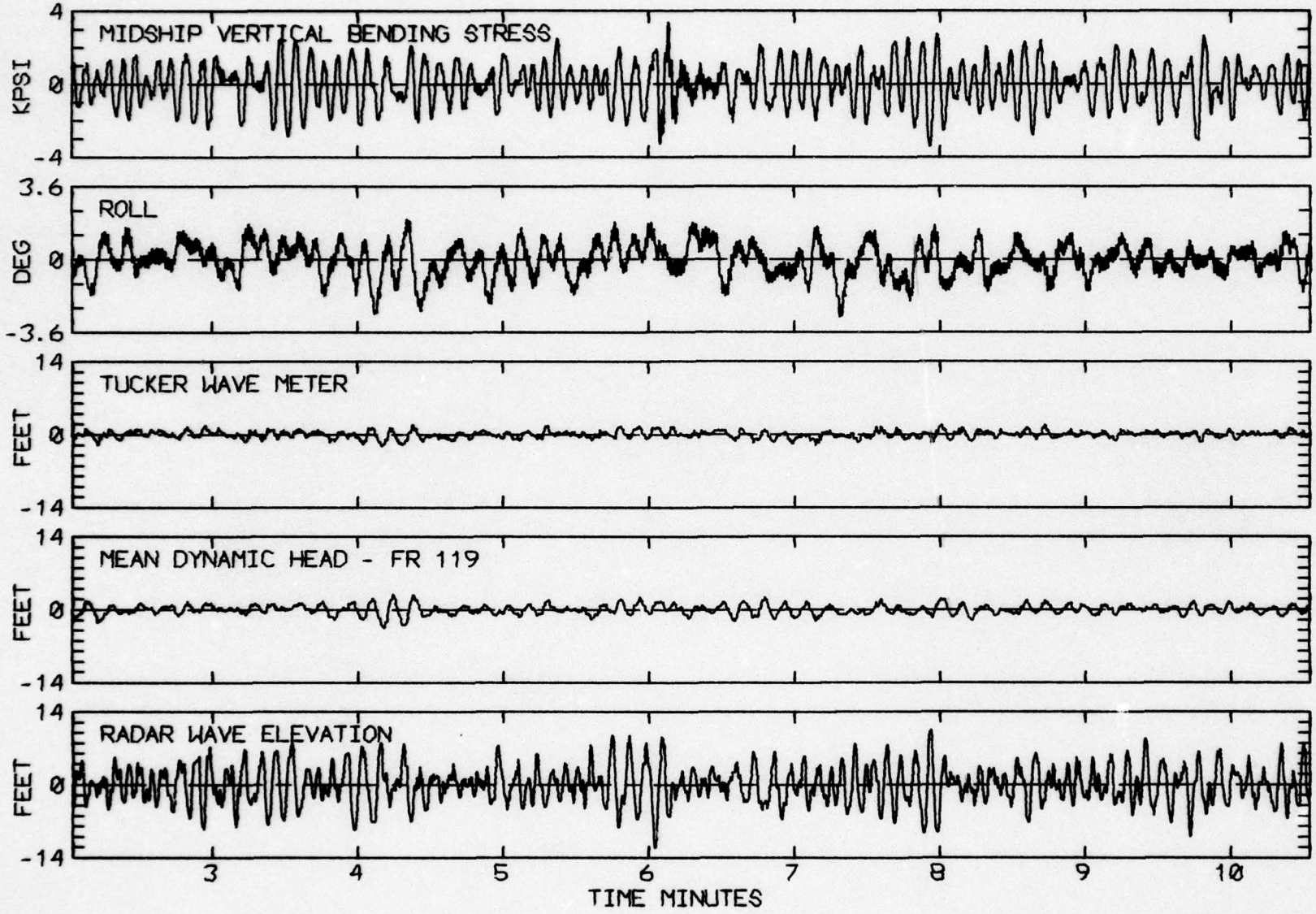
ROLL	3.2 DEG
PITCH	1.31 DEG
DK HSE VERT ACCEL	0.27 G
DK HSE LAT ACCEL	0.09 G
RADAR SLANT RANGE	23.5 FEET
VERTICAL RANGE	22.7 FEET
DISPL AT RADAR	11.9 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	683	383	237
MAXIMUM HEIGHT	3.3	6.2	20.1
10TH HIGHEST HTS	2.0	3.3	15.9
3RD HIGHEST HTS	1.4	2.1	12.8
4.0 RMS(SPECTRA)	2.6	3.5	13.6



RUN 1645 -- VOYAGE 35W -- TAPE 169 -- INDEX 12 -- INTERVAL 45



RUN 1645 -- VOYAGE 35W -- TAPE 169 -- INDEX 12 -- INTERVAL 45

LOG BOOK DATA

DATE AND TIME	02-22-74 0800
POSITION	47-19 N 19-35 W
COURSE AND SPEED	261 . 32.0 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	103 PORT
SWELL HEIGHT	5 FEET
" REL DIR	36 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

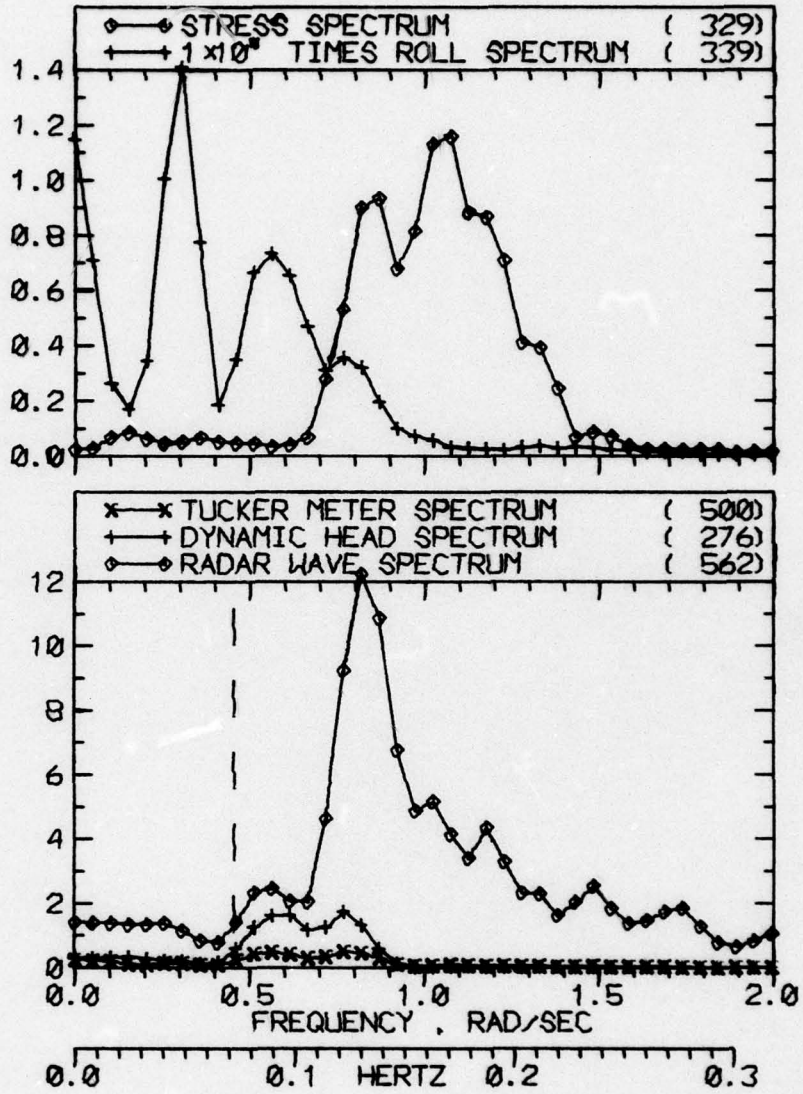
MAXIMUM PK-TR	4.5 KPSI
4.0 X RMS	3.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

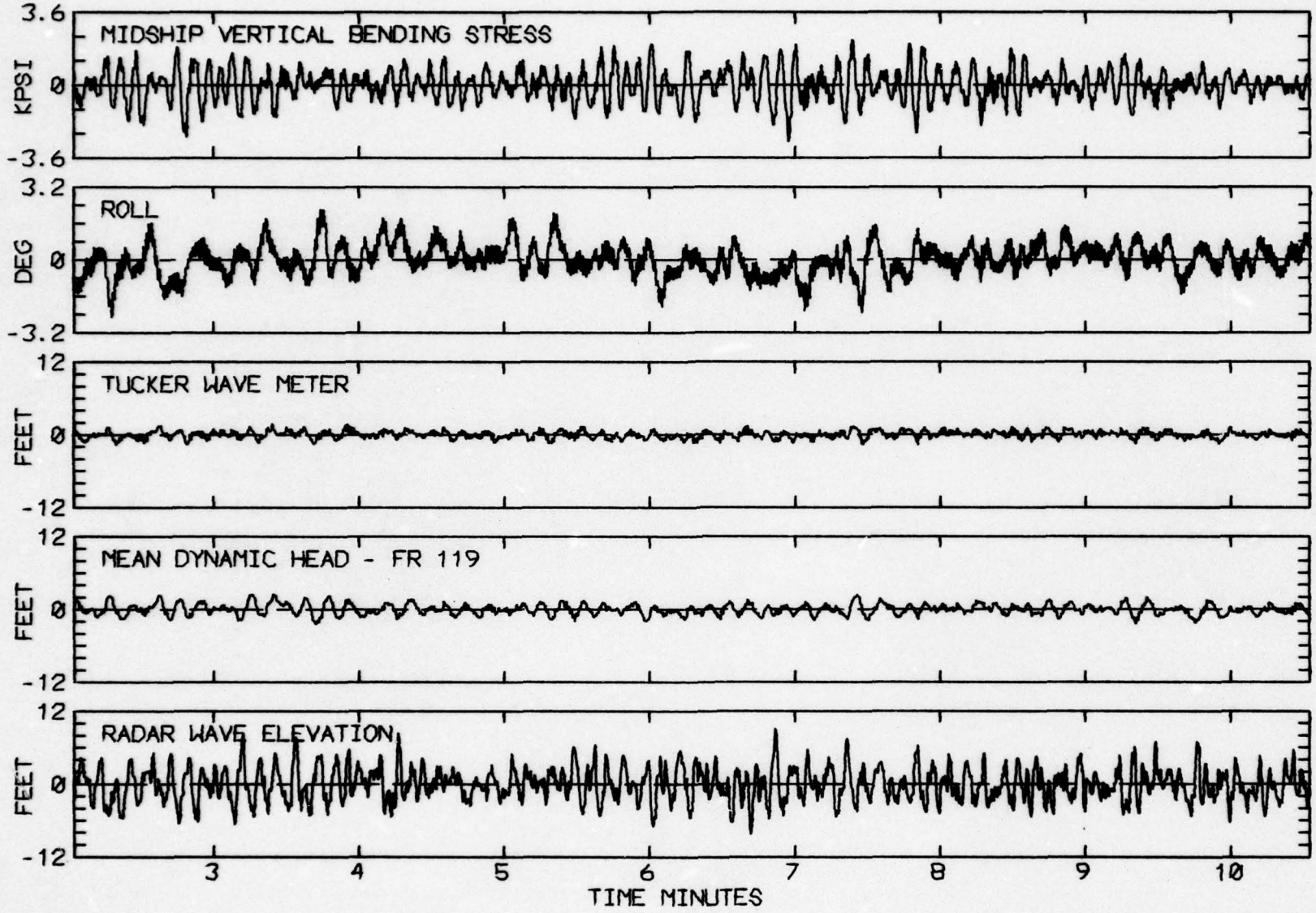
ROLL	3.0 DEG
PITCH	0.95 DEG
DK HSE VERT ACCEL	0.20 G
DK HSE LAT ACCEL	0.09 G
RADAR SLANT RANGE	17.3 FEET
VERTICAL RANGE	16.3 FEET
DISPL AT RADAR	9.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	748	391	277
MAXIMUM HEIGHT	3.2	4.5	15.1
10TH HIGHEST HTS	1.8	3.0	11.6
3RD HIGHEST HTS	1.3	2.0	9.2
4.0 RMS(SPECTRA)	2.4	3.5	10.4



RUN 1649 -- VOYAGE 35W -- TAPE 169 -- INDEX 13 -- INTERVAL 49



RUN 1649 -- VOYAGE 35W -- TAPE 169 -- INDEX 13 -- INTERVAL 49

LOG BOOK DATA

DATE AND TIME	02-22-74 1200
POSITION	45-12 N 38-08 W
COURSE AND SPEED	259 . 31.8 KNOTS
SEA STATE	7
WAVE HEIGHT	6 FEET
" REL DIR	79 PORT
SWELL HEIGHT	8 FEET
" REL DIR	79 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

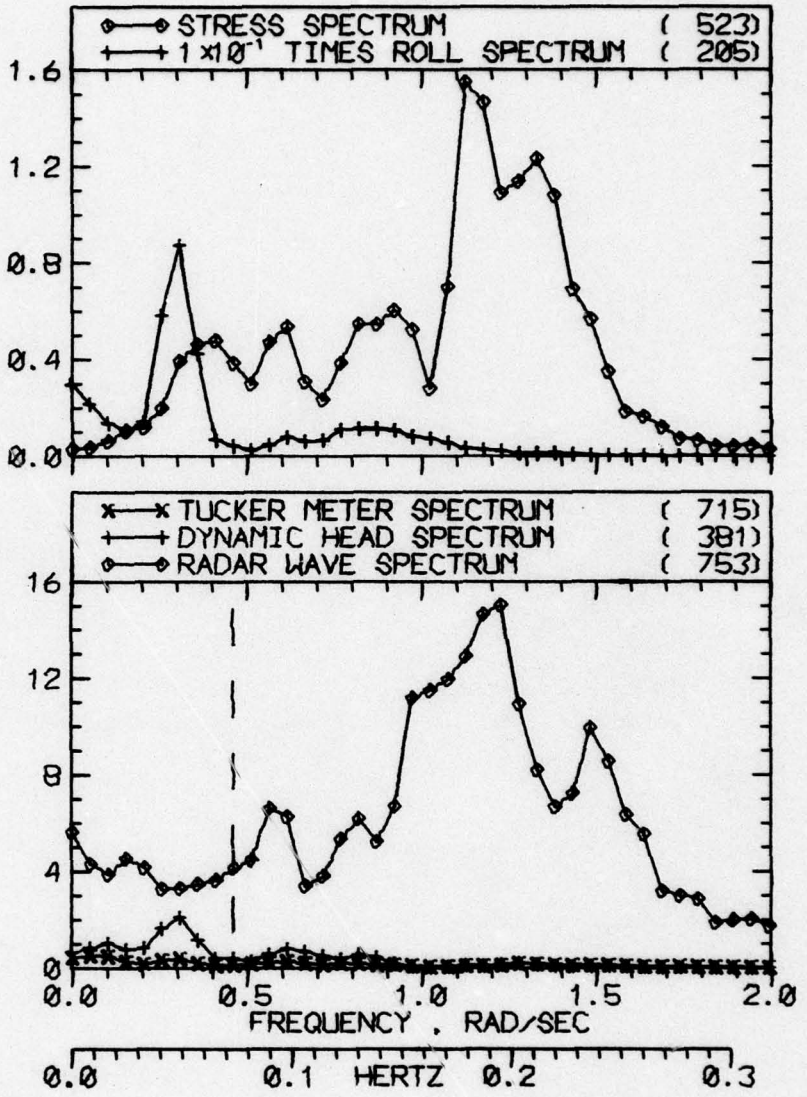
MAXIMUM PK-TR	5.6 KPSI
4.0 X RMS	4.0 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

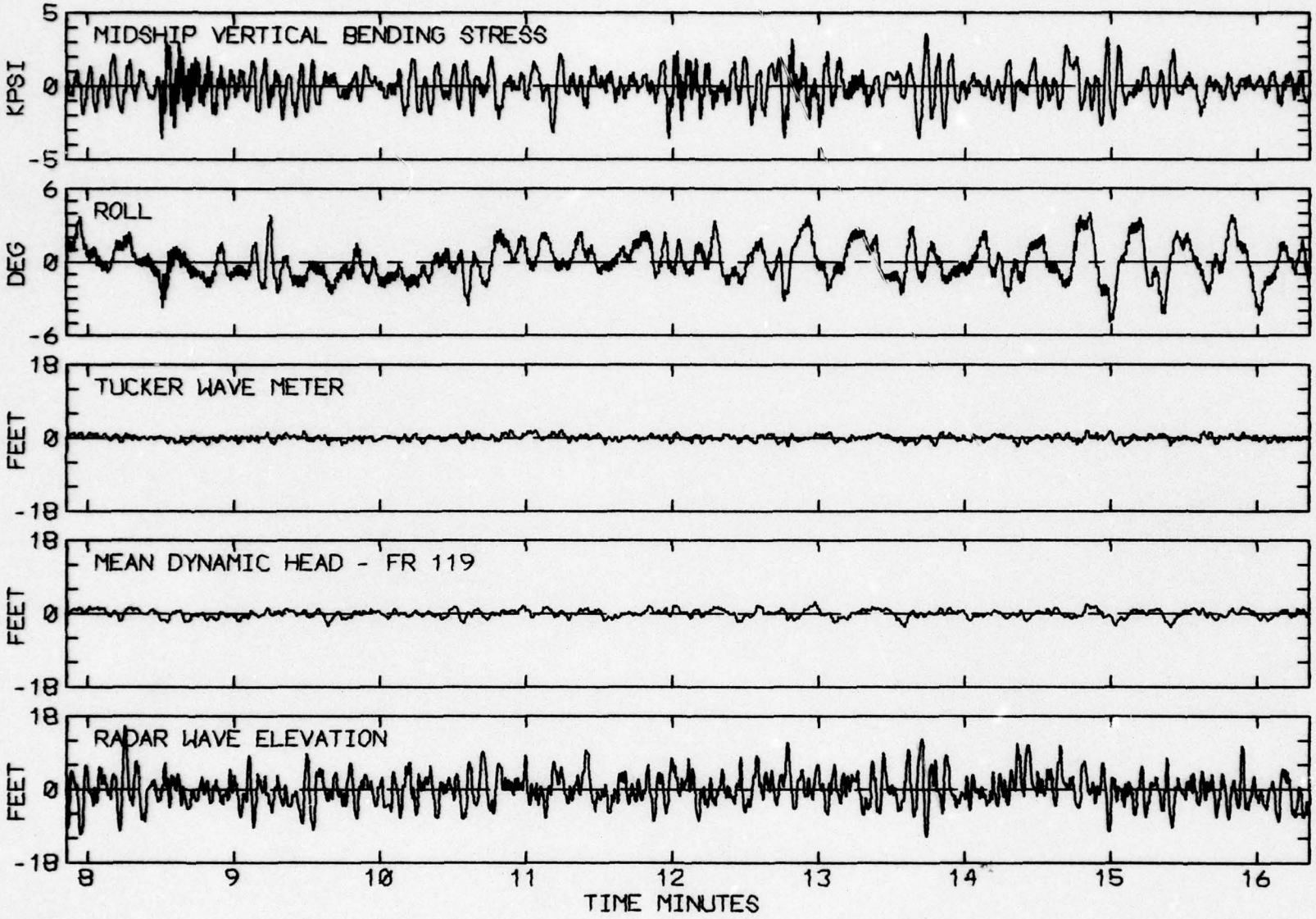
ROLL	5.7 DEG
PITCH	0.99 DEG
DK HSE VERT ACCEL	0.21 G
DK HSE LAT ACCEL	0.15 G
RADAR SLANT RANGE	19.1 FEET
VERTICAL RANGE	18.2 FEET
DISPL AT RADAR	8.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	725	416	285
MAXIMUM HEIGHT	2.8	4.3	24.2
10TH HIGHEST HTS	2.0	2.8	16.5
3RD HIGHEST HTS	1.5	2.0	13.0
4.0 RMS(SPECTRA)	2.6	3.7	15.0



RUN 1653 -- VOYAGE 35W -- TAPE 169 -- INDEX 14 -- INTERVAL 53



RUN 1653 -- VOYAGE 35W -- TAPE 169 -- INDEX 14 -- INTERVAL 53

LOG BOOK DATA

DATE AND TIME	02-22-74 1700
POSITION	45-12 N 38-08 W
COURSE AND SPEED	259 . 31.3 KNOTS
SEA STATE	9
WAVE HEIGHT	5 FEET
" REL DIR	33 STBD
SWELL HEIGHT	8 FEET
" REL DIR	79 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

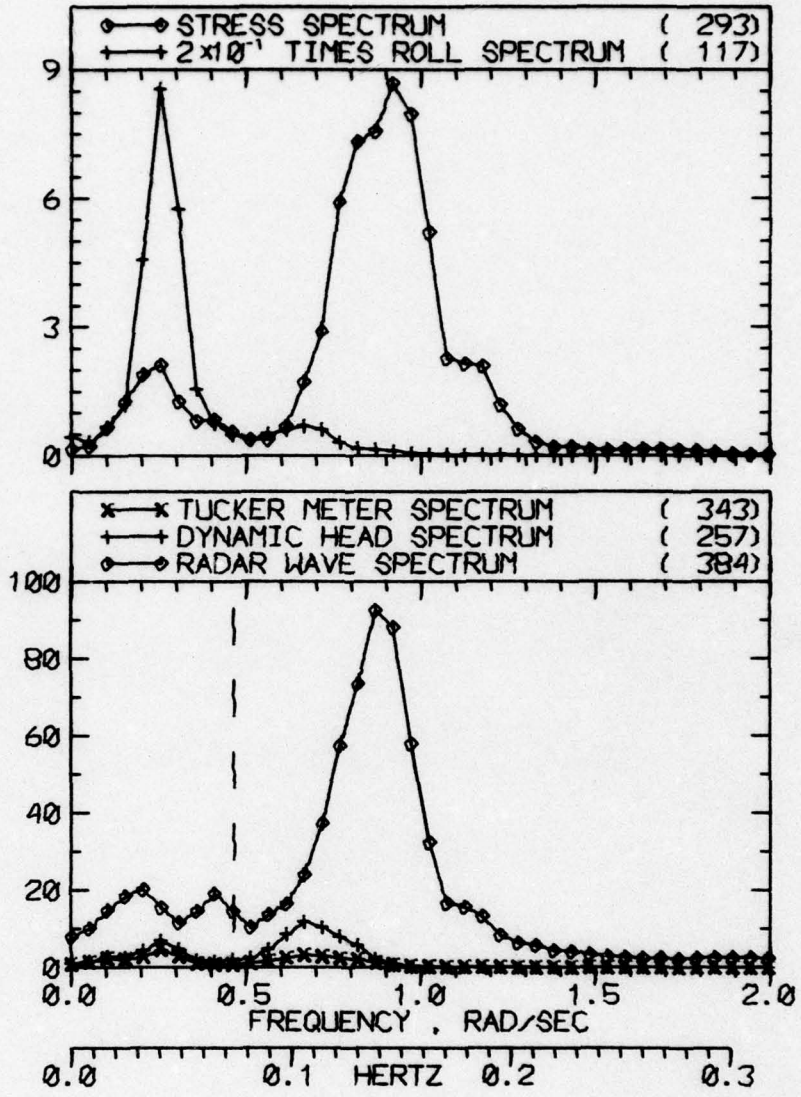
MAXIMUM PK-TR	12.5 KPSI
4.0 X RMS	7.7 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

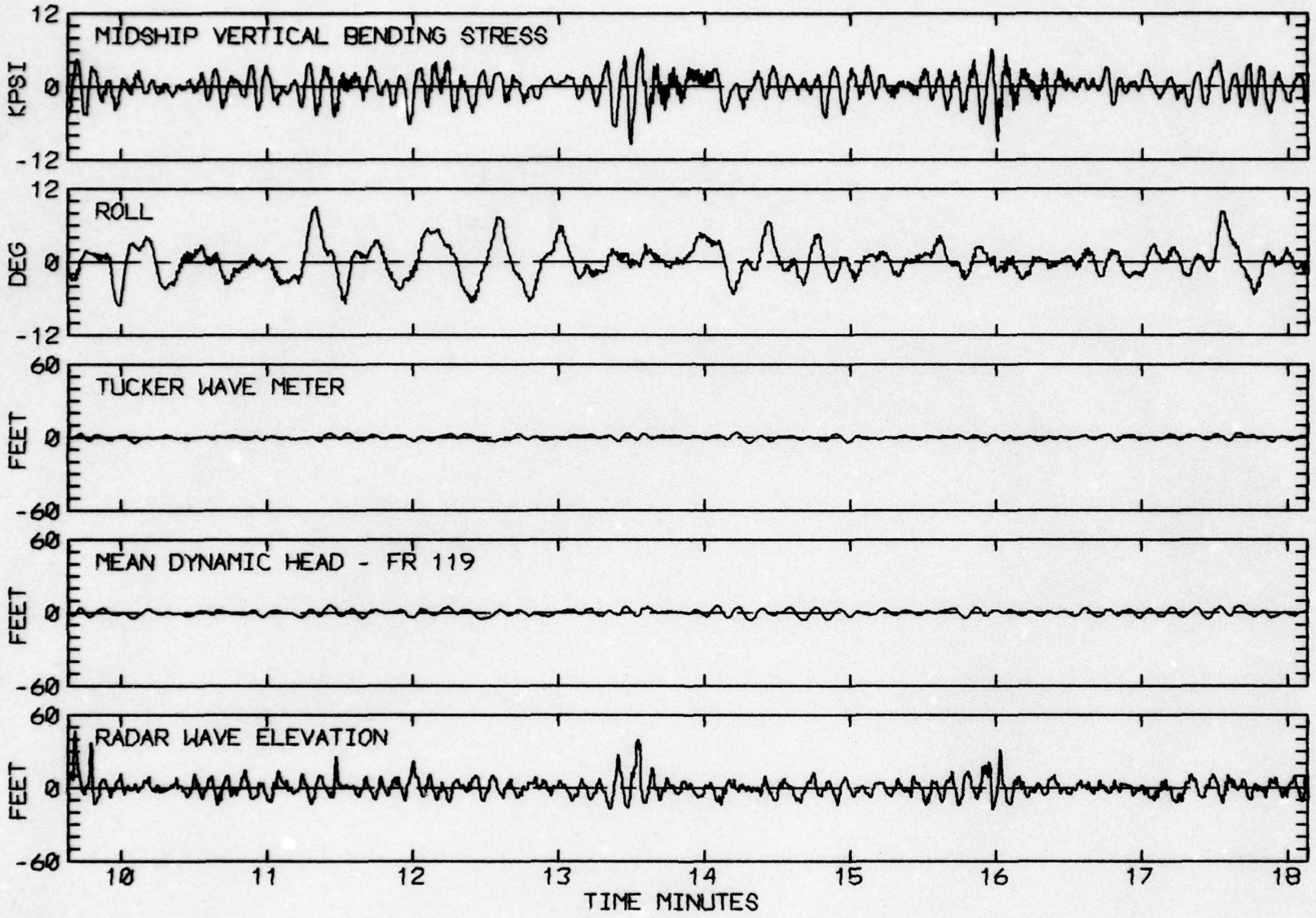
ROLL	10.7 DEG
PITCH	2.25 DEG
DK HSE VERT ACCEL	0.49 G
DK HSE LAT ACCEL	0.26 G
RADAR SLANT RANGE	41.1 FEET
VERTICAL RANGE	39.1 FEET
DISPL AT RADAR	25.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	335	176	221
MAXIMUM HEIGHT	8.7	11.1	52.5
10TH HIGHEST HTS	4.7	8.4	32.6
3RD HIGHEST HTS	3.1	6.6	22.8
4.0 RMS(SPECTRA)	5.7	8.3	25.9



RUN 1705 -- VOYAGE 35W -- TAPE 171 -- INDEX 16 -- INTERVAL 5



RUN 1705 -- VOYAGE 35W -- TAPE 171 -- INDEX 16 -- INTERVAL 5

LOG BOOK DATA

DATE AND TIME	02-22-74 2000
POSITION	45-12 N 38-08 W
COURSE AND SPEED	259 . 31.3 KNOTS
SEA STATE	8
WAVE HEIGHT	5 FEET
" REL DIR	22 STBD
SWELL HEIGHT	8 FEET
" REL DIR	22 STBD

---- VISUAL WEATHER / COMMENTS ----

OCAST /RETURN TO AUTO RECORDING

MIDSHIP VERTICAL BENDING STRESS

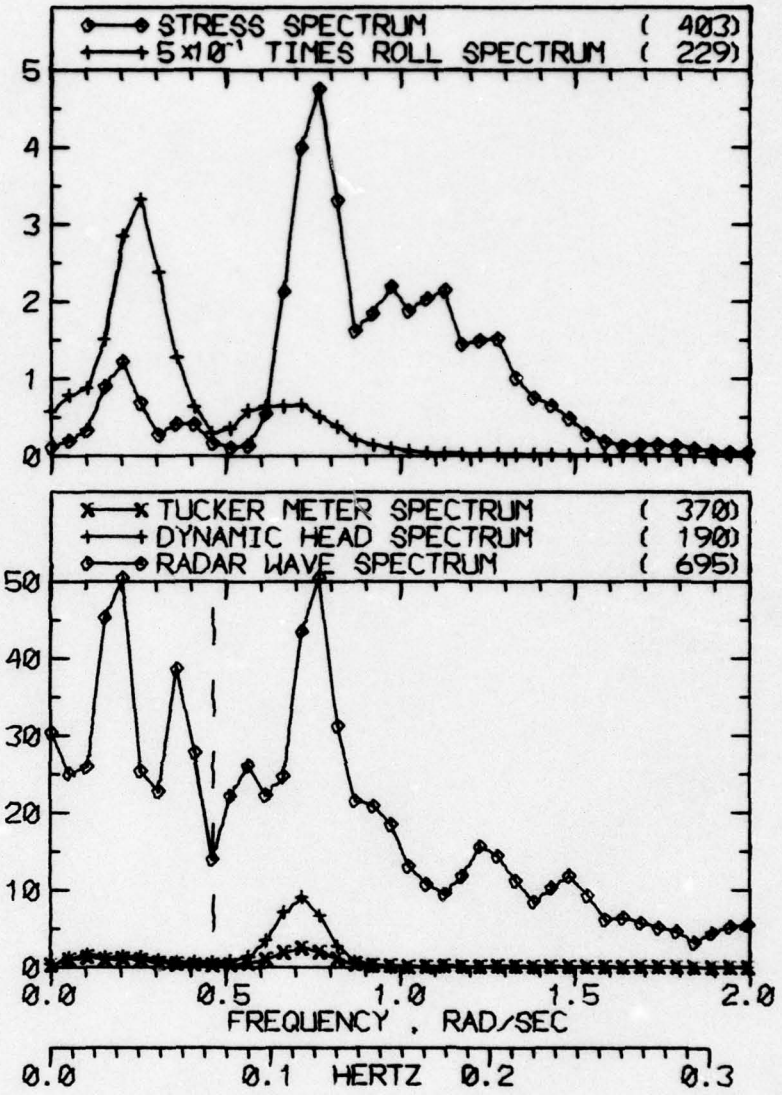
MAXIMUM PK-TR	7.7 KPSI
4.0 X RMS	5.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

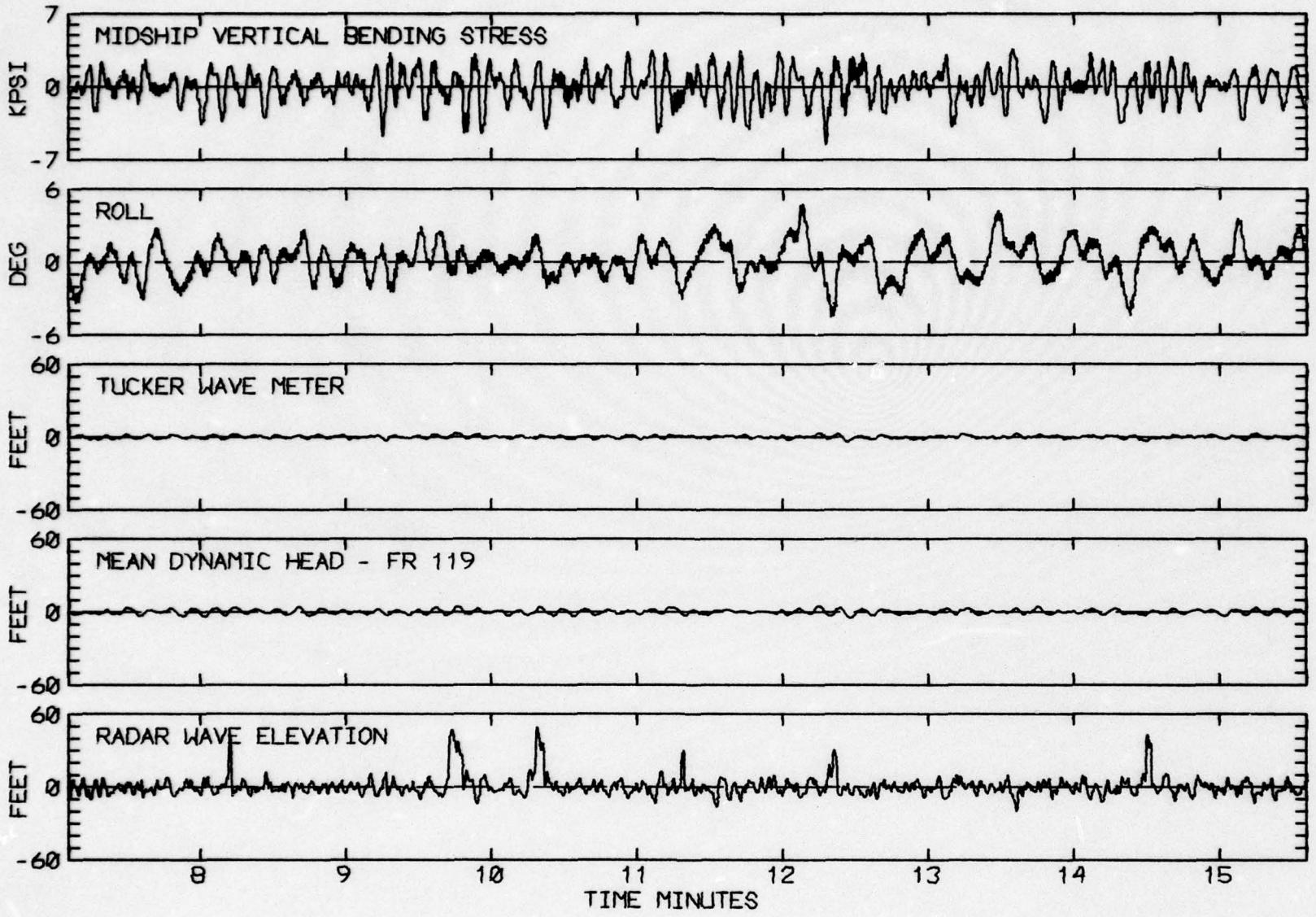
ROLL	5.7 DEG
PITCH	1.76 DEG
DK HSE VERT ACCEL	0.37 G
DK HSE LAT ACCEL	0.15 G
RADAR SLANT RANGE	34.3 FEET
VERTICAL RANGE	33.0 FEET
DISPL AT RADAR	19.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	360	219	260
MAXIMUM HEIGHT	5.8	8.7	51.8
10TH HIGHEST HTS	3.7	6.4	30.4
3RD HIGHEST HTS	2.6	4.7	19.8
4.0 RMS(SPECTRA)	4.2	6.1	26.4



RUN 1710 -- VOYAGE 35W -- TAPE 171 -- INDEX 17 -- INTERVAL 10



RUN 1710 -- VOYAGE 35W -- TAPE 171 -- INDEX 17 -- INTERVAL 10

LOG BOOK DATA

DATE AND TIME	02-22-74 2400
POSITION	45-12 N 38-08 W
COURSE AND SPEED	235 . 25.3 KNOTS
SEA STATE	8
WAVE HEIGHT	6 FEET
" REL DIR	35 STBD
SWELL HEIGHT	8 FEET
" REL DIR	35 STBD

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

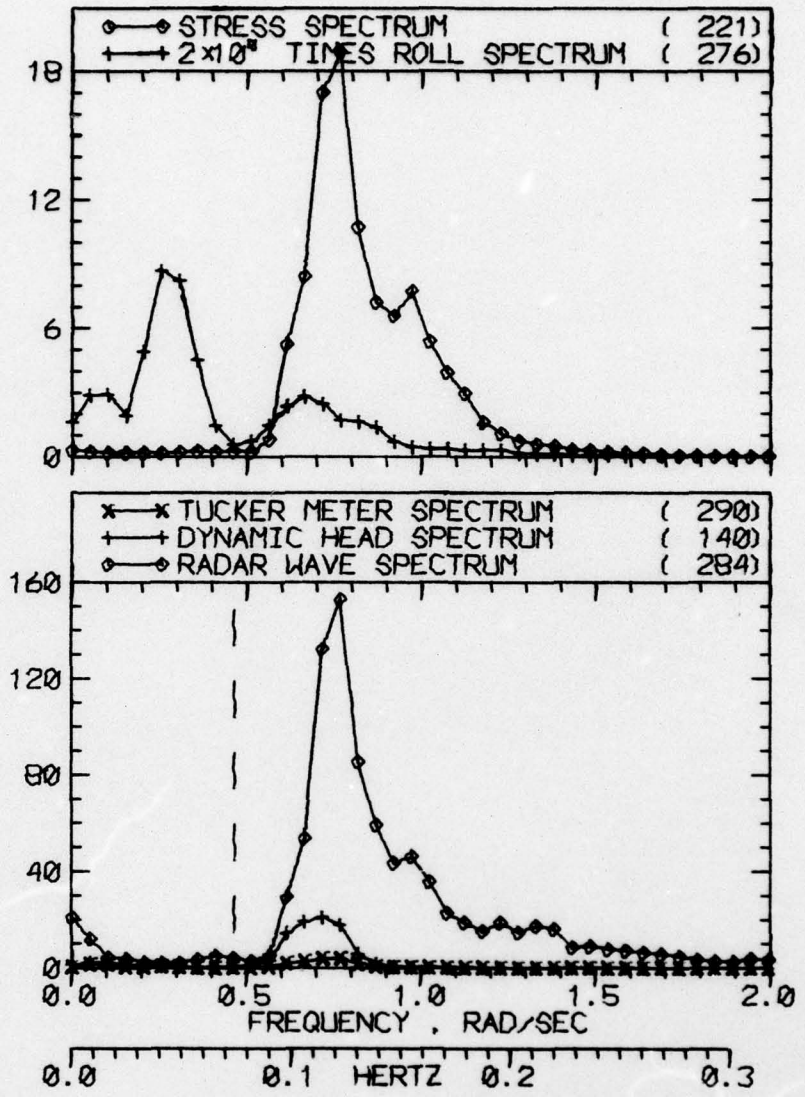
MAXIMUM PK-TR	16.0 KPSI
4.0 X RMS	9.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

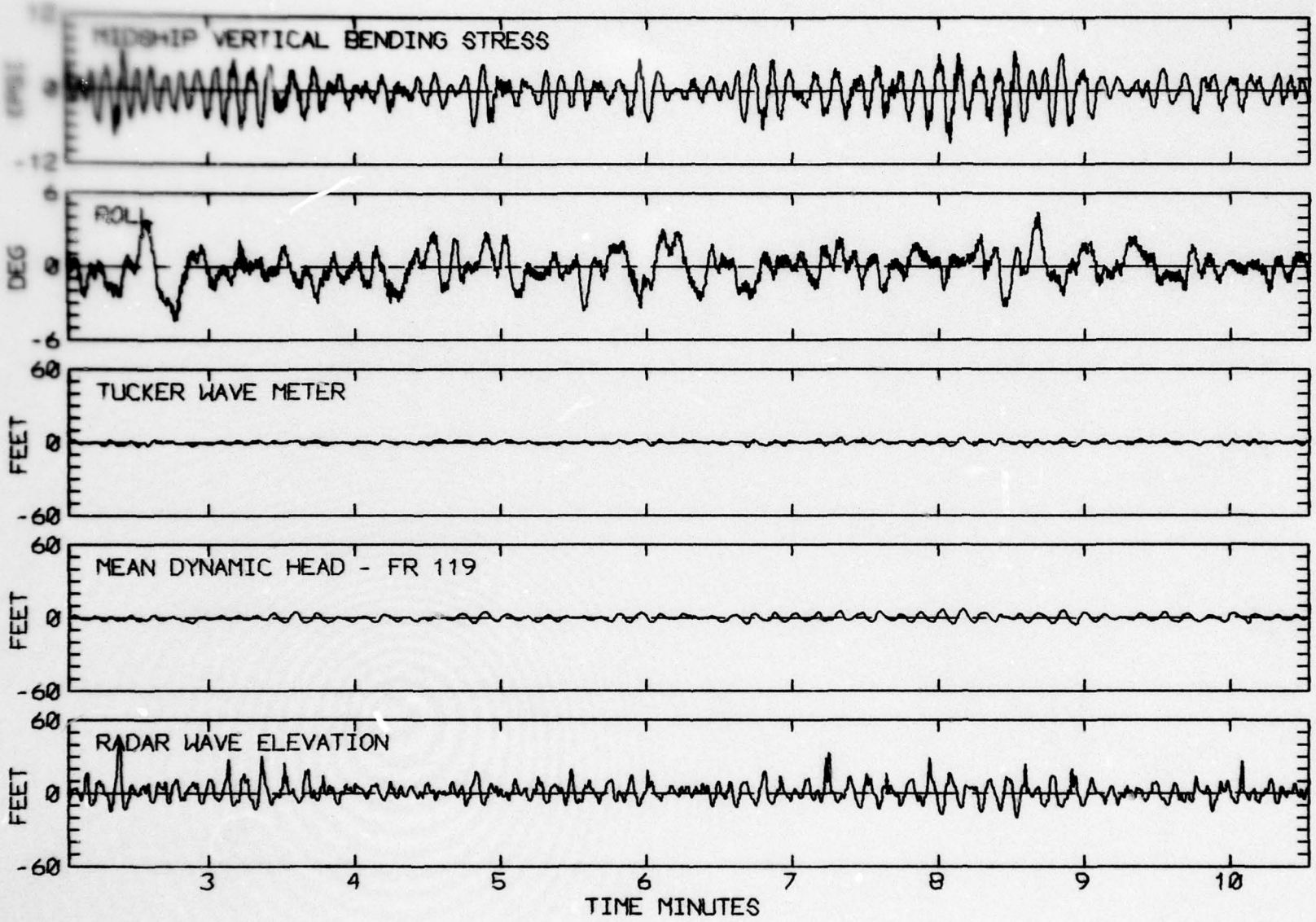
ROLL	4.9 DEG
PITCH	2.36 DEG
DK HSE VERT ACCEL	0.52 G
DK HSE LAT ACCEL	0.13 G
RADAR SLANT RANGE	49.8 FEET
VERTICAL RANGE	47.7 FEET
DISPL AT RADAR	28.8 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	400	182	195
MAXIMUM HEIGHT	6.2	12.3	56.3
10TH HIGHEST HTS	4.2	9.7	35.0
3RD HIGHEST HTS	2.9	7.3	26.1
4.0 RMS(SPECTRA)	4.9	9.0	27.9



RUN 1713 -- VOYAGE 35W -- TAPE 171 -- INDEX 18 -- INTERVAL 13



RUN 1713 -- VOYAGE 35W -- TAPE 171 -- INDEX 18 -- INTERVAL 13

LOG BOOK DATA

DATE AND TIME	02-23-74 0400
POSITION	45-12 N 38-08 W
COURSE AND SPEED	260 . 20.2 KNOTS
SEA STATE	5
WAVE HEIGHT	4 FEET
" REL DIR	55 STBD
SWELL HEIGHT	6 FEET
" REL DIR	55 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

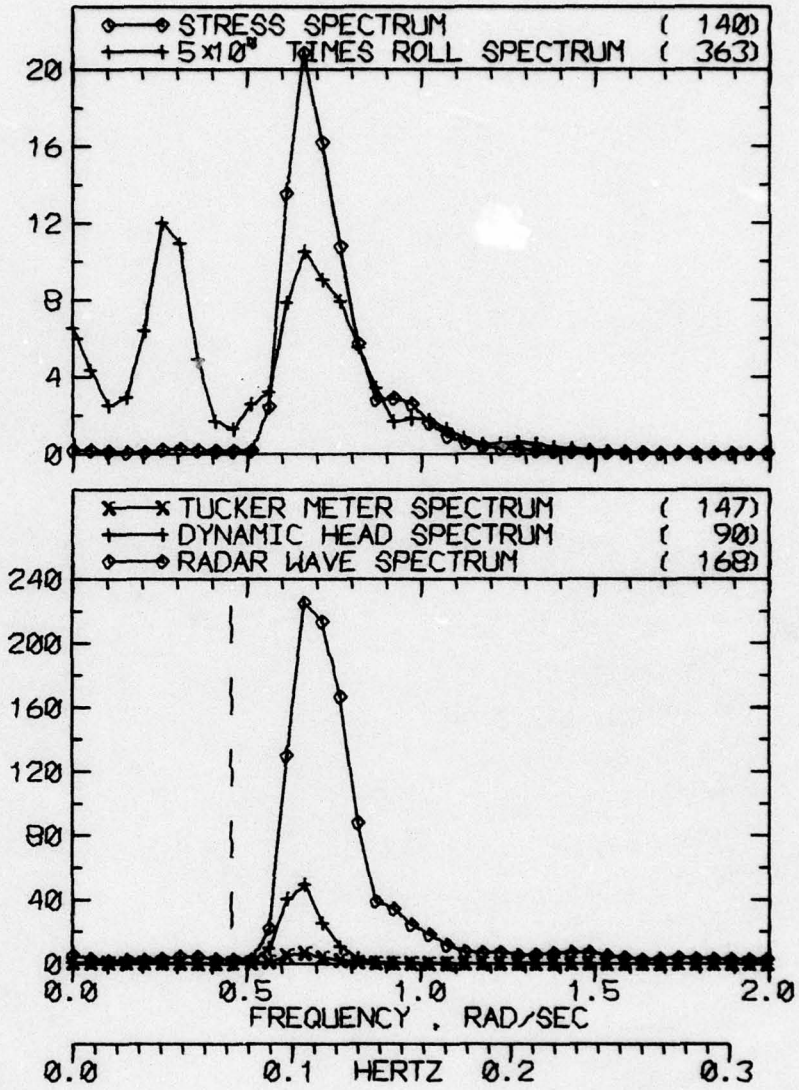
MAXIMUM PK-TR	13.1 KPSI
4.0 X RMS	8.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

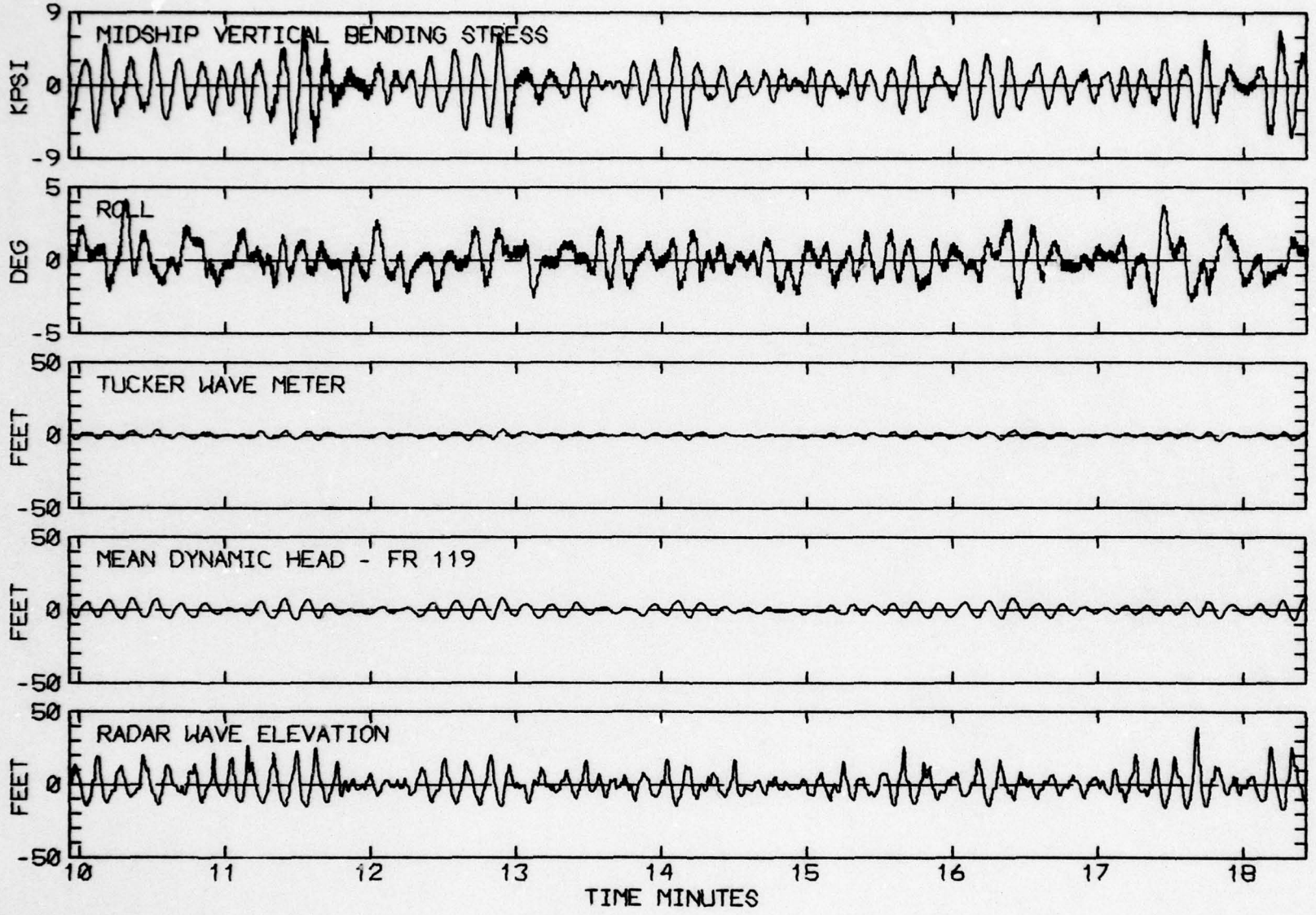
ROLL	4.4 DEG
PITCH	1.99 DEG
DK HSE VERT ACCEL	0.45 G
DK HSE LAT ACCEL	0.13 G
RADAR SLANT RANGE	50.6 FEET
VERTICAL RANGE	51.6 FEET
DISPL AT RADAR	30.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	341	152	149
MAXIMUM HEIGHT	6.1	14.5	54.5
10TH HIGHEST HTS	4.2	12.2	38.7
3RD HIGHEST HTS	2.8	9.7	31.3
4.0 RMS(SPECTRA)	4.6	11.1	30.5



RUN 1717 -- VOYAGE 35W -- TAPE 171 -- INDEX 19 -- INTERVAL 17



RUN 1717 -- VOYAGE 35W -- TAPE 171 -- INDEX 19 -- INTERVAL 17

LOG BOOK DATA

DATE AND TIME	02-23-74 0800
POSITION	45-12 N 38-08 W
COURSE AND SPEED	261 . 31.8 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	36 PORT
SWELL HEIGHT	4 FEET
" REL DIR	36 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

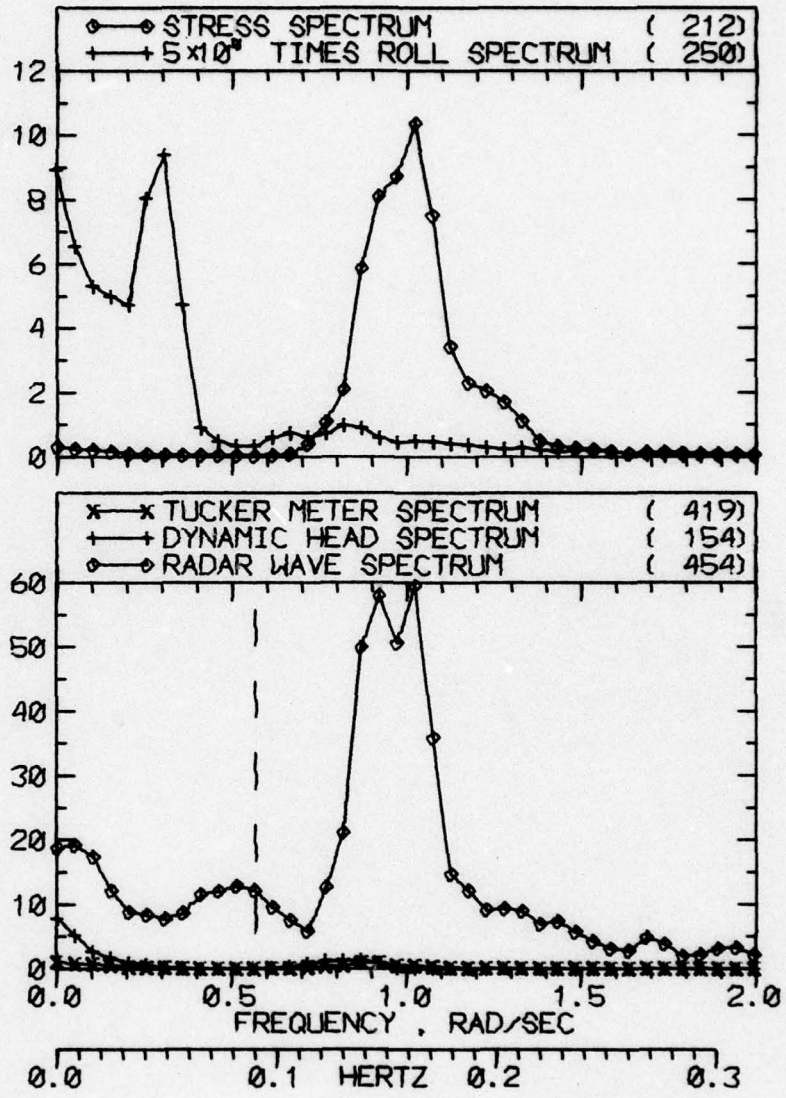
MAXIMUM PK-TR	16.5 KPSI
4.0 X RMS	7.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

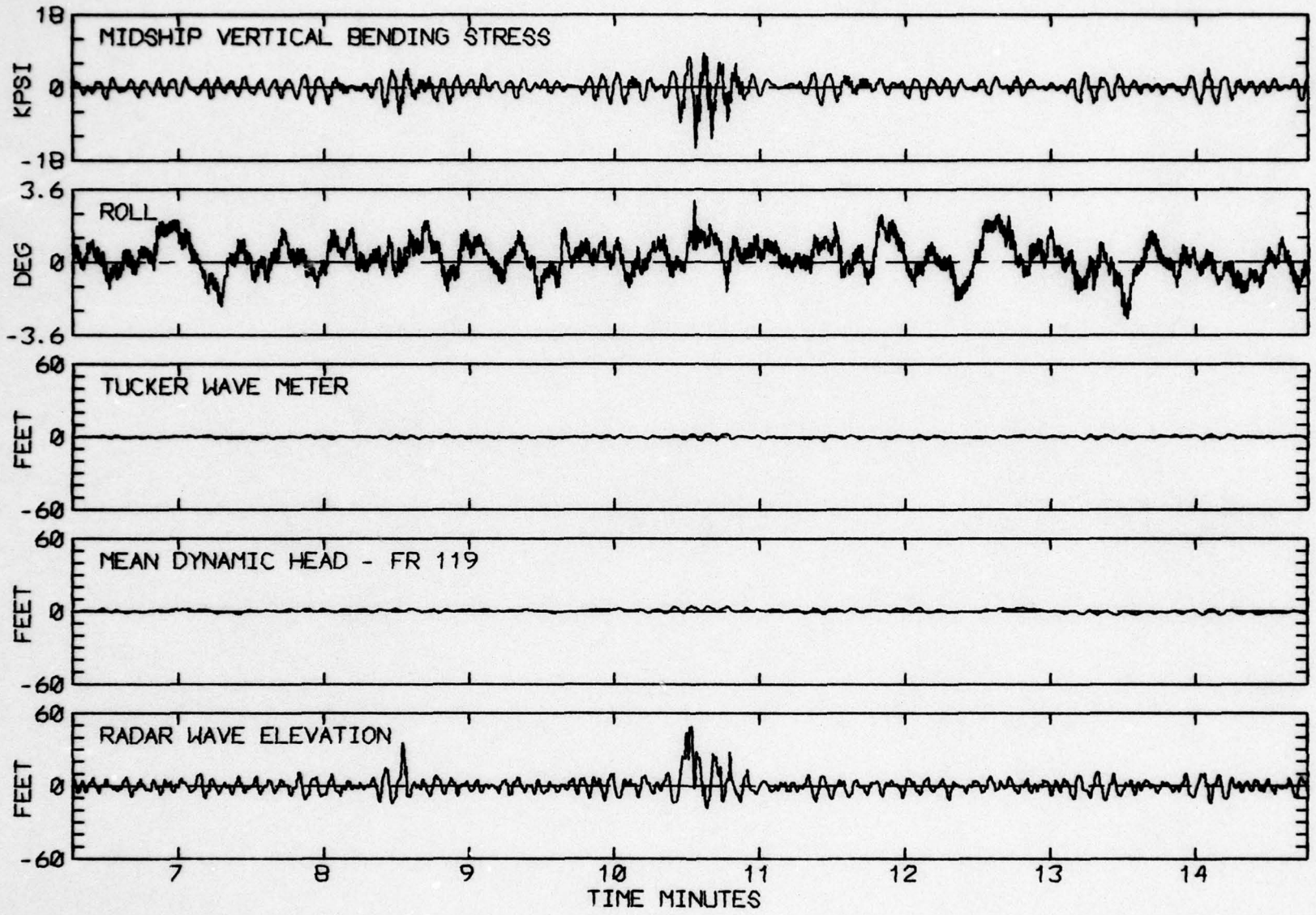
ROLL	3.3 DEG
PITCH	1.92 DEG
DK HSE VERT ACCEL	0.39 G
DK HSE LAT ACCEL	0.10 G
RADAR SLANT RANGE	34.2 FEET
VERTICAL RANGE	33.0 FEET
DISPL AT RADAR	15.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	627	330	250
MAXIMUM HEIGHT	2.9	4.6	51.3
10TH HIGHEST HTS	2.1	3.3	28.0
3RD HIGHEST HTS	1.5	2.2	19.1
4.0 RMS(SPECTRA)	3.0	4.4	22.5



RUN 1721 -- VOYAGE 35W -- TAPE 171 -- INDEX 20 -- INTERVAL 21



RUN 1721 -- VOYAGE 35W -- TAPE 171 -- INDEX 20 -- INTERVAL 21

LOG BOOK DATA

DATE AND TIME	02-23-74 1200
POSITION	42-32 N 52-49 W
COURSE AND SPEED	261 . 32.1 KNOTS
SEA STATE	5
WAVE HEIGHT	2 FEET
" REL DIR	81 PORT
SWELL HEIGHT	4 FEET
" REL DIR	81 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

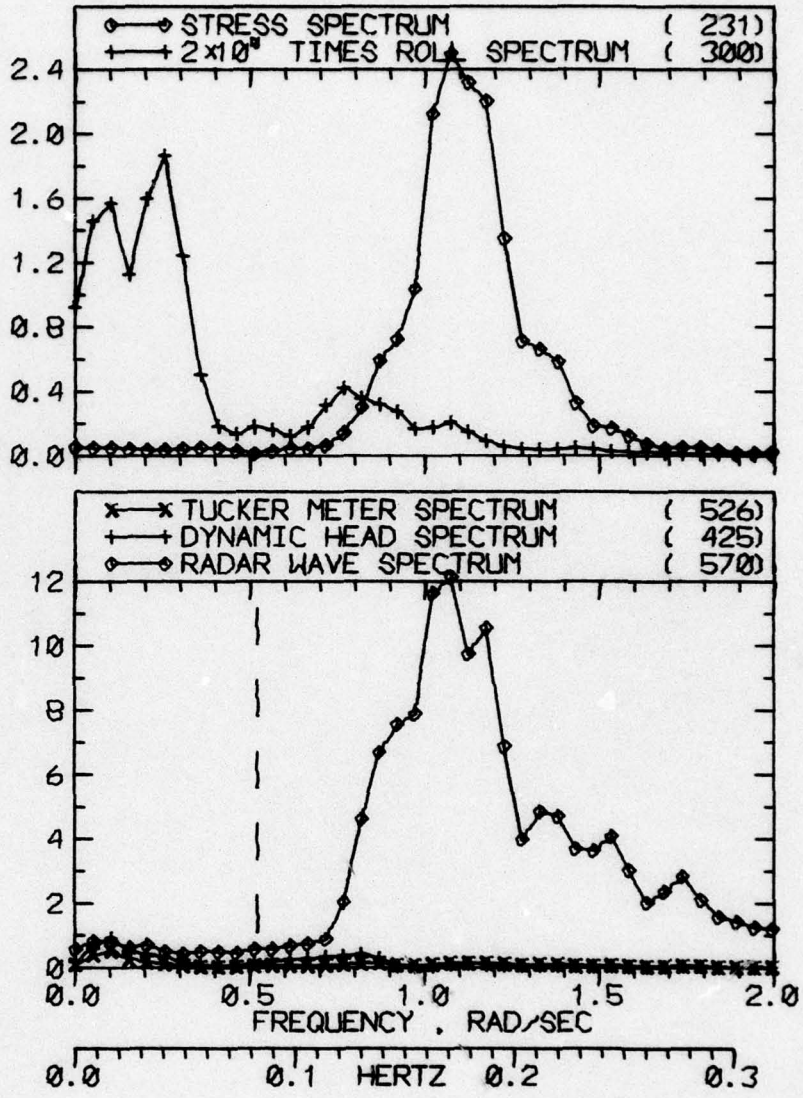
MAXIMUM PK-TR	5.0 KPSI
4.0 X RMS	3.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

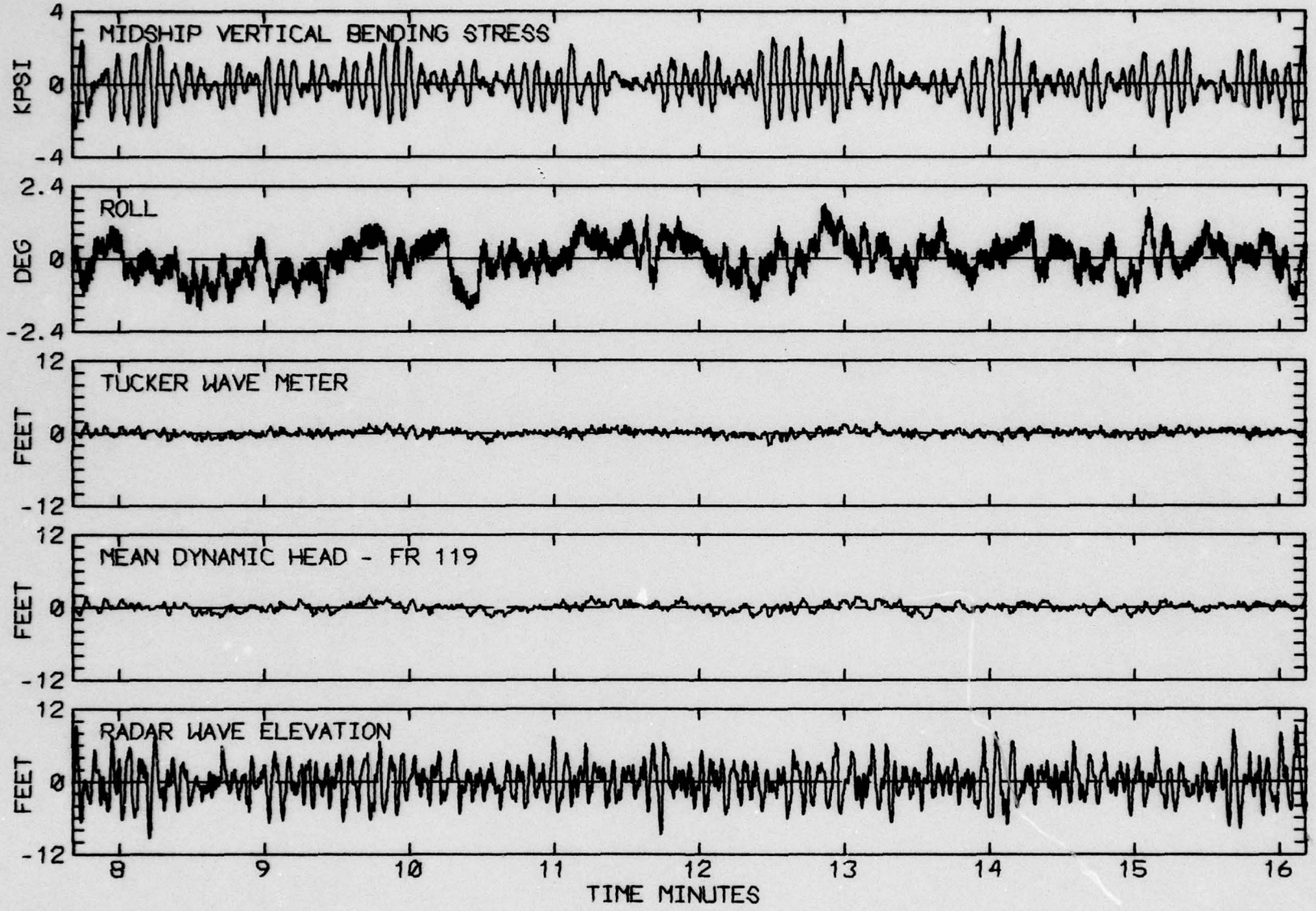
ROLL	2.6 DEG
PITCH	0.99 DEG
DK HSE VERT ACCEL	0.19 G
DK HSE LAT ACCEL	0.08 G
RADAR SLANT RANGE	16.3 FEET
VERTICAL RANGE	15.6 FEET
DISPL AT RADAR	7.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	952	630	297
MAXIMUM HEIGHT	2.9	2.8	16.2
10TH HIGHEST HTS	1.5	1.8	13.2
3RD HIGHEST HTS	1.1	1.3	10.5
4.0 RMS(SPECTRA)	2.1	2.5	11.4



RUN 1725 -- VOYAGE 35W -- TAPE 171 -- INDEX 21 -- INTERVAL 25



RUN 1725 -- VOYAGE 35W -- TAPE 171 -- INDEX 21 -- INTERVAL 25

LOG BOOK DATA

DATE AND TIME	02-23-74 1600
POSITION	42-32 N 52-49 W
COURSE AND SPEED	259 . 32.0 KNOTS
SEA STATE	7
WAVE HEIGHT	5 FEET
" REL DIR	56 PORT
SWELL HEIGHT	7 FEET
" REL DIR	11 STBD

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

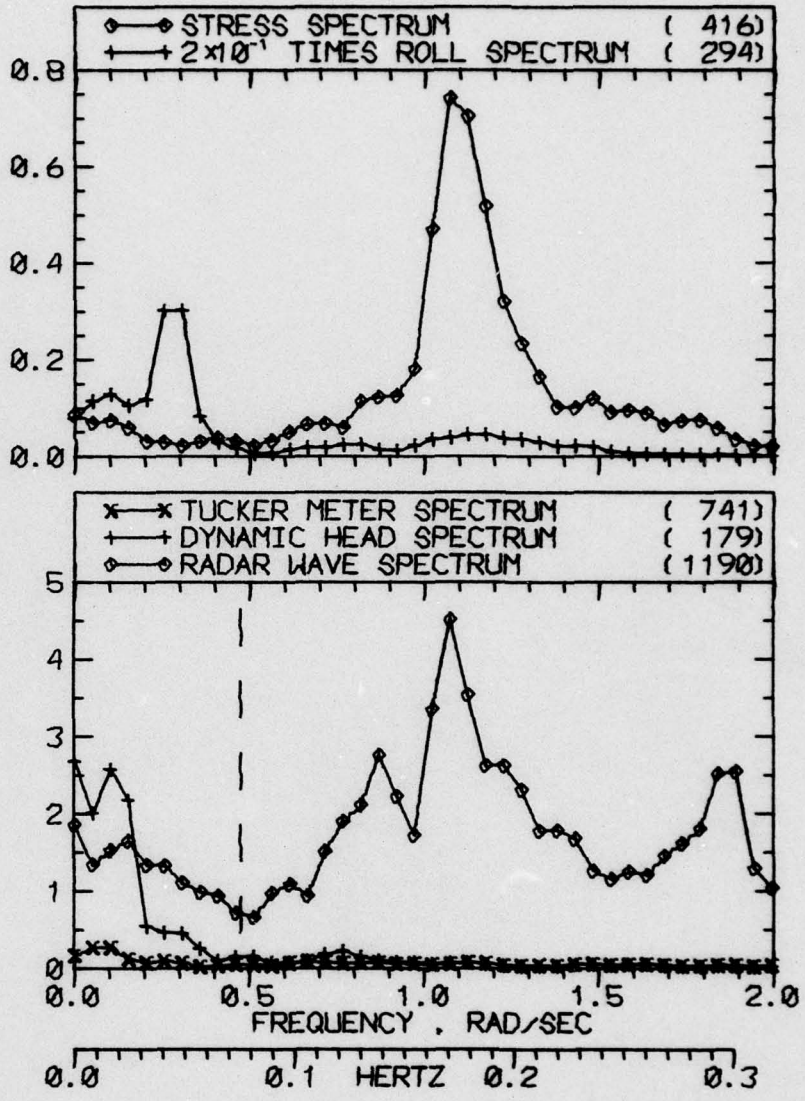
MAXIMUM PK-TR	3.2 KPSI
4.0 X RMS	2.3 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

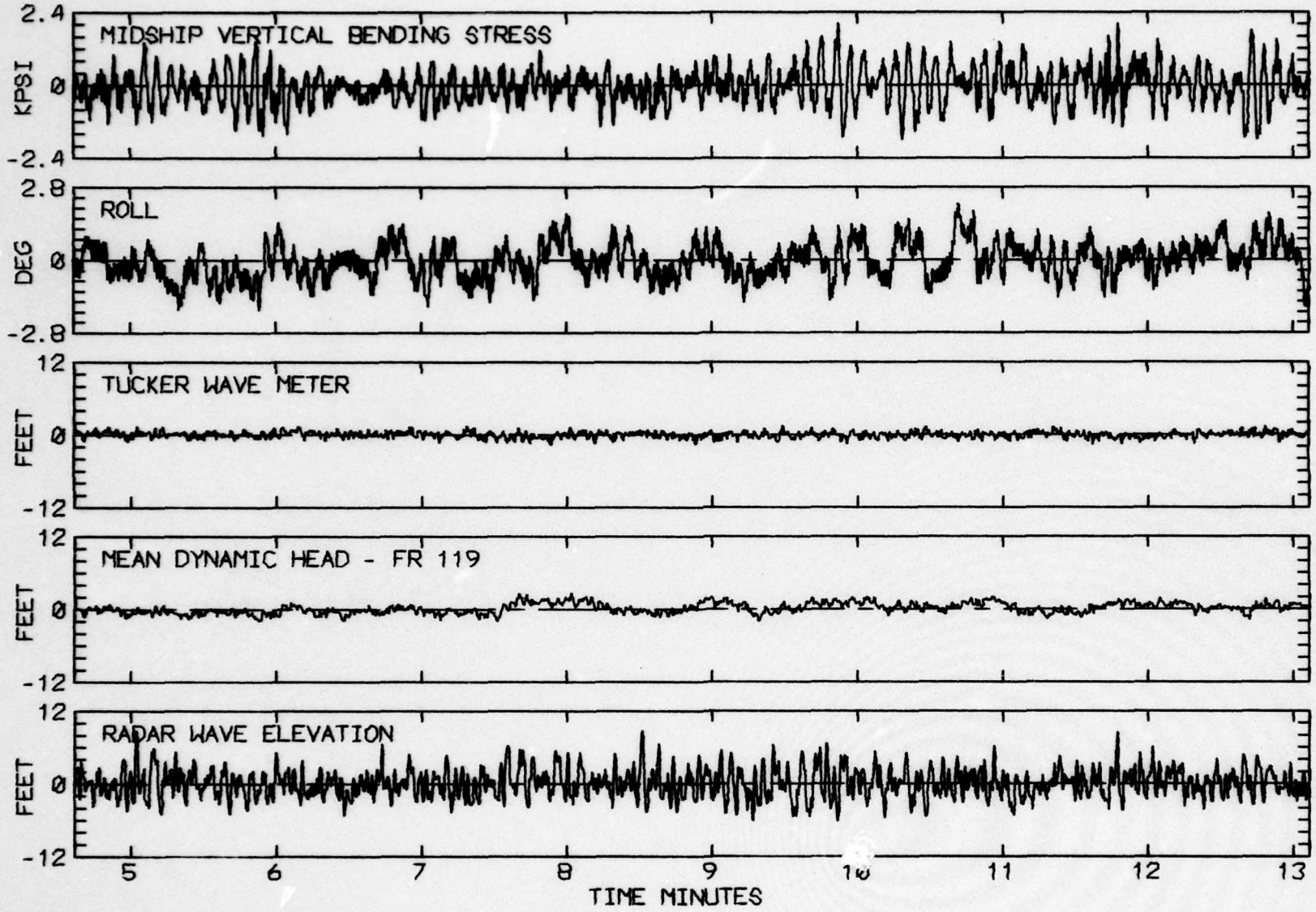
ROLL	2.9 DEG
PITCH	0.78 DEG
DK HSE VERT ACCEL	0.11 G
DK HSE LAT ACCEL	0.09 G
RADAR SLANT RANGE	11.4 FEET
VERTICAL RANGE	10.4 FEET
DISPL AT RADAR	3.9 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	923	418	387
MAXIMUM HEIGHT	2.3	3.4	13.8
10TH HIGHEST HTS	1.6	2.0	9.9
3RD HIGHEST HTS	1.2	1.4	7.6
4.0 RMS(SPECTRA)	1.9	3.3	9.1



RUN 1729 -- VOYAGE 35W -- TAPE 171 -- INDEX 22 -- INTERVAL 29



RUN 1729 -- VOYAGE 35W -- TAPE 171 -- INDEX 22 -- INTERVAL 29

LOG BOOK DATA

DATE AND TIME	02-24-74 0400
POSITION	42-32 N 52-49 W
COURSE AND SPEED	259 . 10.0 KNOTS
SEA STATE	9
WAVE HEIGHT	25 FEET
" REL DIR	12 STBD
SWELL HEIGHT	25 FEET
" REL DIR	0

---- VISUAL WEATHER / COMMENTS ----

OCAST /HOVE TO 30 RPM

MIDSHIP VERTICAL BENDING STRESS

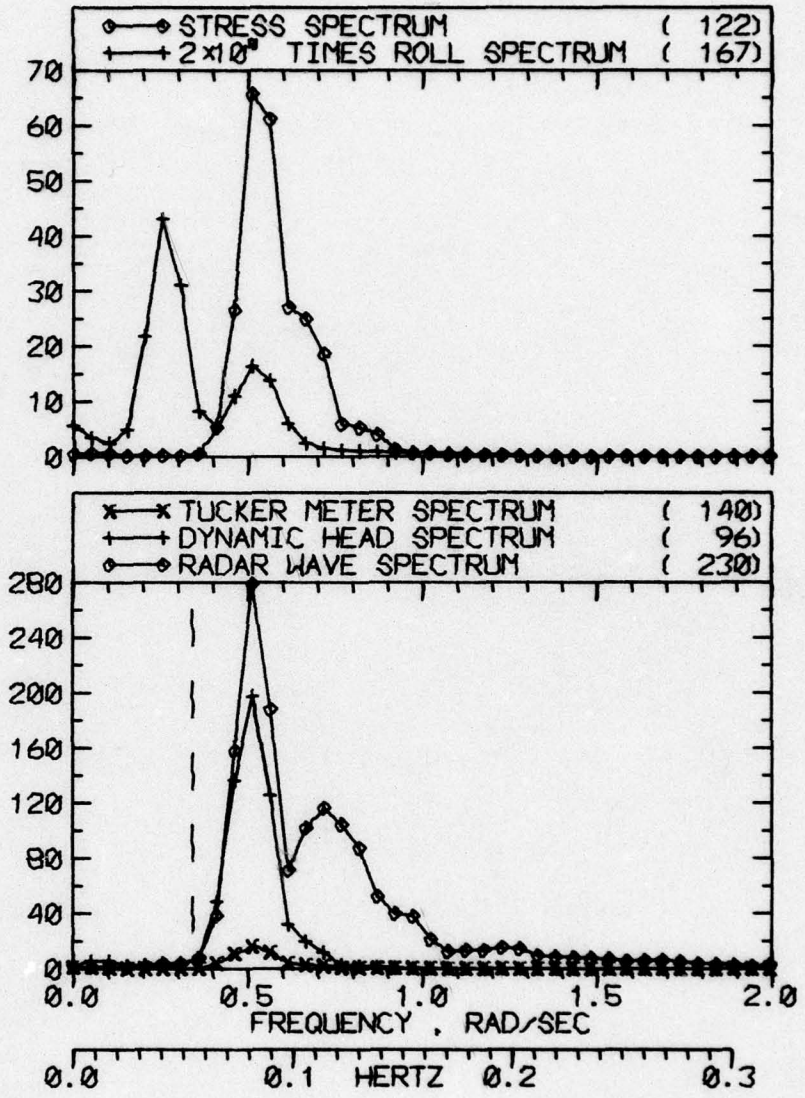
MAXIMUM PK-TR	23.3 KPSI
4.0 X RMS	14.4 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

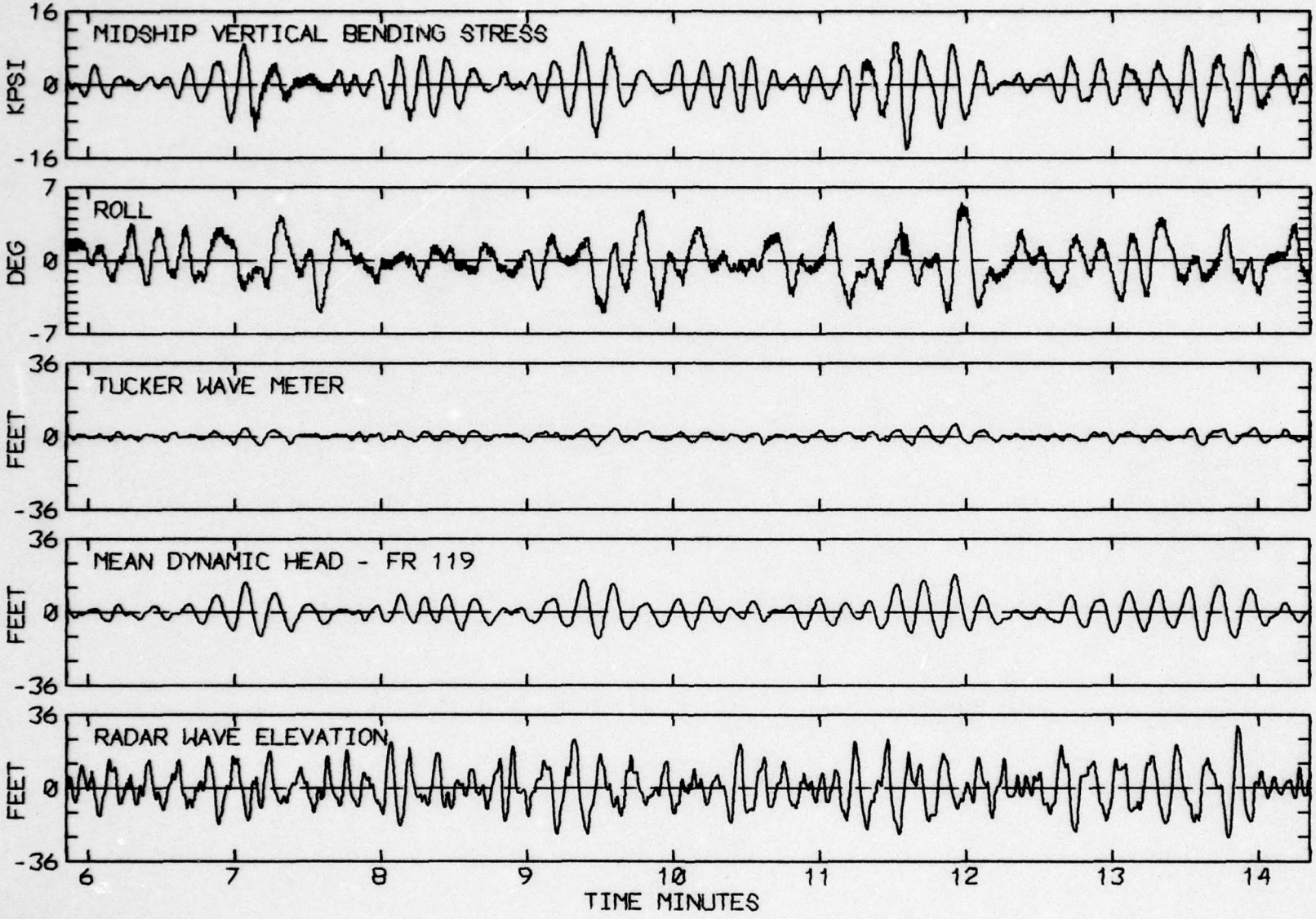
ROLL	8.7 DEG
PITCH	2.10 DEG
DK HSE VERT ACCEL	0.45 G
DK HSE LAT ACCEL	0.24 G
RADAR SLANT RANGE	51.7 FEET
VERTICAL RANGE	47.6 FEET
DISPL AT RADAR	41.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	261	93	136
MAXIMUM HEIGHT	10.1	31.7	47.0
10TH HIGHEST HTS	7.1	26.7	41.5
3RD HIGHEST HTS	4.4	20.5	32.9
4.0 RMS(SPECTRA)	7.3	22.4	35.0



RUN 1743 -- VOYAGE 35W -- TAPE 171 -- INDEX 25 -- INTERVAL 43



RUN 1743 -- VOYAGE 35W -- TAPE 171 -- INDEX 25 -- INTERVAL 43

LOG BOOK DATA

DATE AND TIME	02-24-74 0800
POSITION	42-32 N 52-49 W
COURSE AND SPEED	. 6.0 KNOTS
SEA STATE	10
WAVE HEIGHT	30 FEET
" REL DIR	0
SWELL HEIGHT	30 FEET
" REL DIR	25 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /HOVE TO 30 RPM

MIDSHIP VERTICAL BENDING STRESS

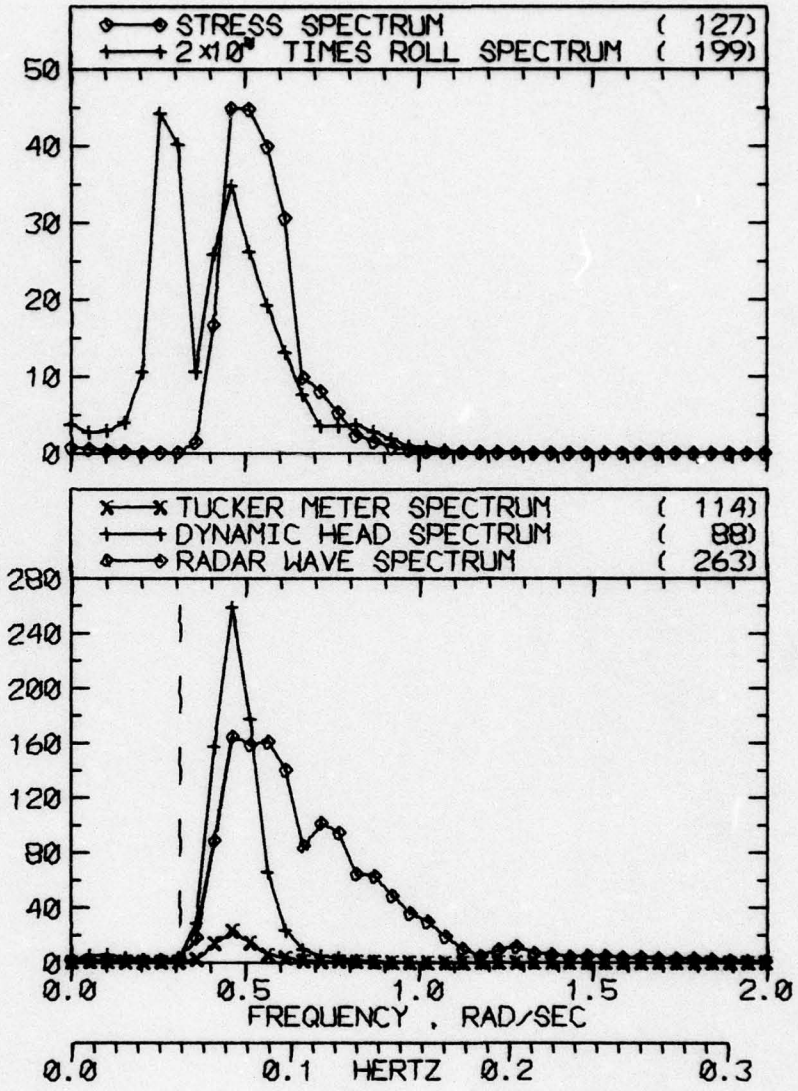
MAXIMUM PK-TR	27.8 KPSI
4.0 X RMS	13.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

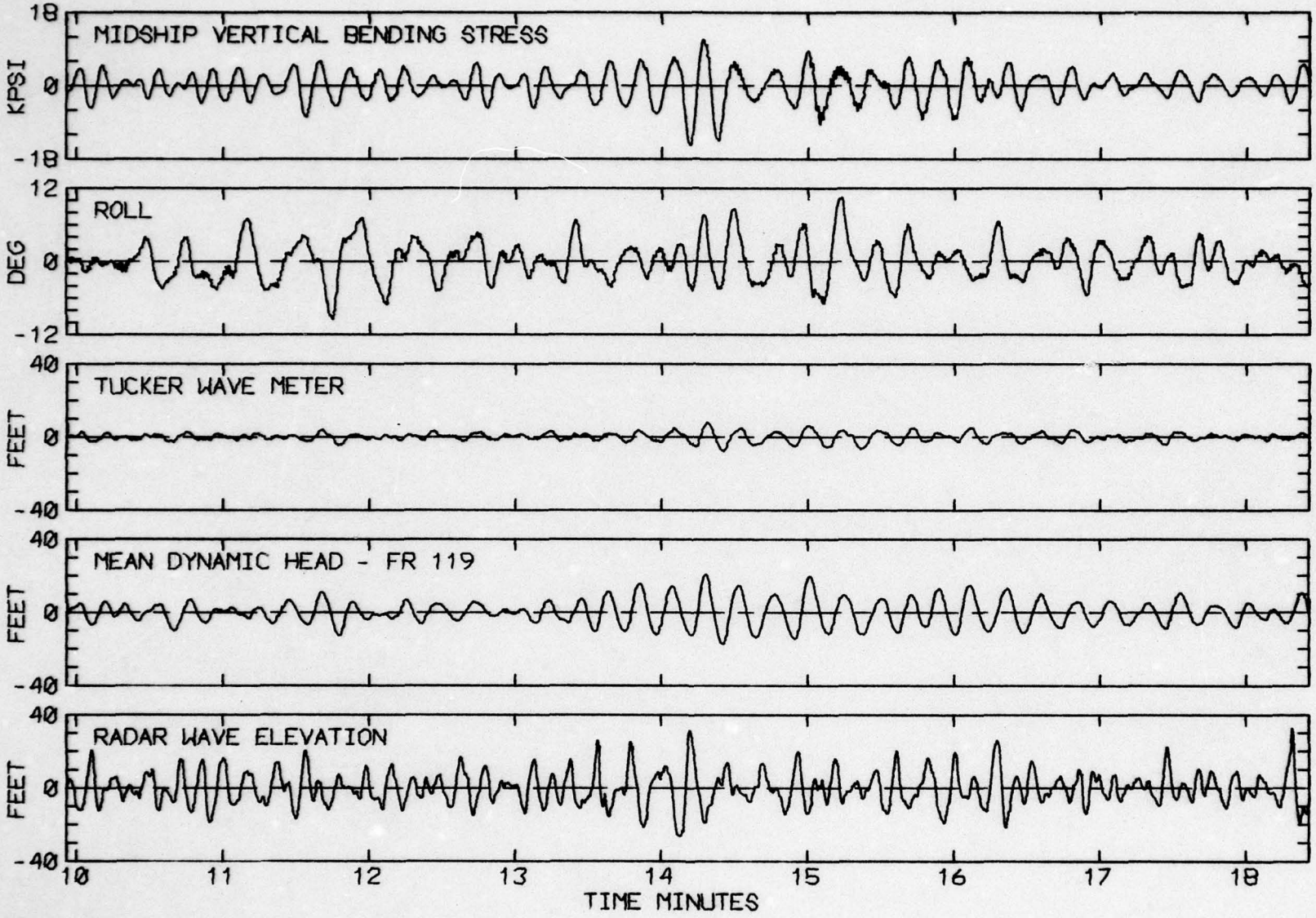
ROLL	10.4 DEG
PITCH	1.64 DEG
DK HSE VERT ACCEL	0.36 G
DK HSE LAT ACCEL	0.26 G
RADAR SLANT RANGE	50.8 FEET
VERTICAL RANGE	50.0 FEET
DISPL AT RADAR	38.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	211	77	133
MAXIMUM HEIGHT	15.9	38.6	50.8
10TH HIGHEST HTS	8.5	29.2	40.4
3RD HIGHEST HTS	5.1	24.4	31.7
4.0 RMS(SPECTRA)	7.9	24.9	33.7



RUN 1747 -- VOYAGE 35W -- TAPE 171 -- INDEX 26 -- INTERVAL 47



RUN 1747 -- VOYAGE 35W -- TAPE 171 -- INDEX 26 -- INTERVAL 47

LOG BOOK DATA

DATE AND TIME	02-24-74	1200
POSITION	40-35 N	60-49 W
COURSE AND SPEED	225 .	KNOTS
SEA STATE	10	
WAVE HEIGHT	30 FEET	
" REL DIR	56 STBD	
SWELL HEIGHT	30 FEET	
" REL DIR	45 STBD	

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

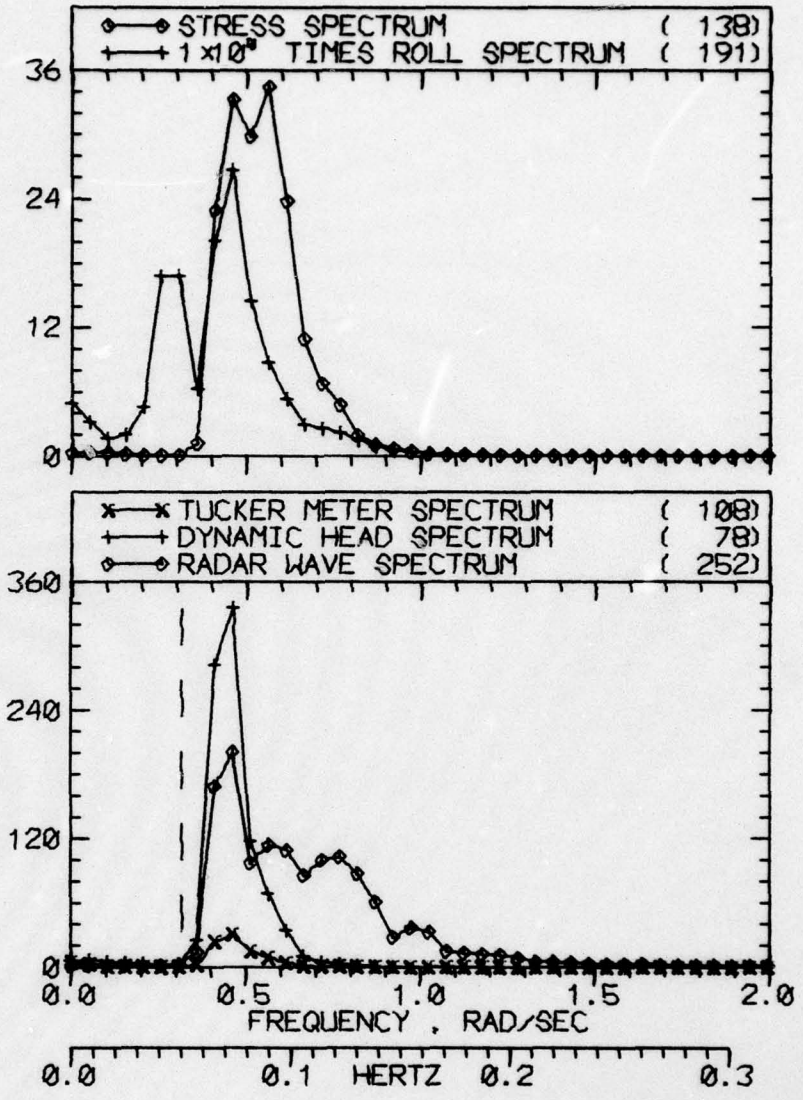
MAXIMUM PK-TR	18.6 KPSI
4.0 X RMS	12.0 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

ROLL	10.8	DEG
PITCH	1.56	DEG
DK HSE VERT ACCEL	0.36	G
DK HSE LAT ACCEL	0.27	G
RADAR SLANT RANGE	48.9	FEET
VERTICAL RANGE	49.7	FEET
DISPL AT RADAR	39.9	FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	196	78	129
MAXIMUM HEIGHT	12.4	38.1	43.8
10TH HIGHEST HTS	9.0	31.0	38.6
3RD HIGHEST HTS	5.5	24.3	31.9
4.0 RMS(SPECTRA)	9.1	27.4	33.4

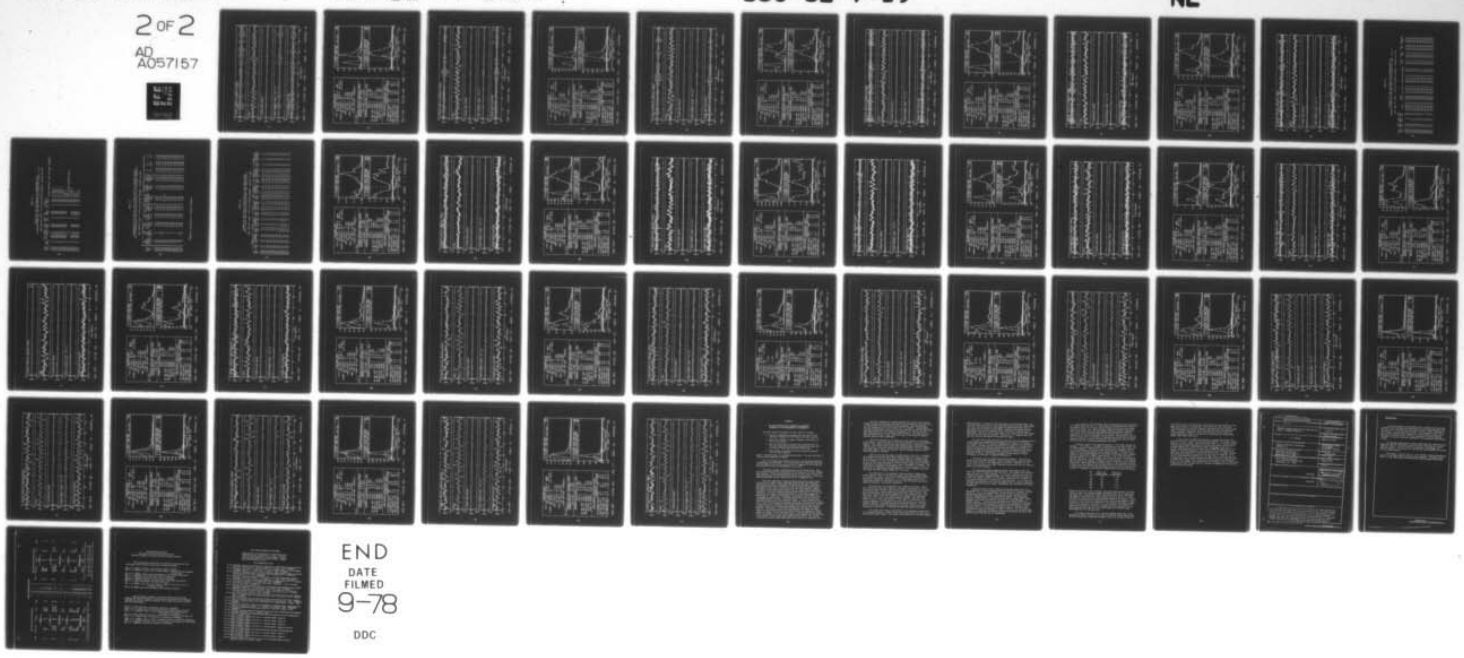


RUN 1749 -- VOYAGE 35W -- TAPE 171 -- INDEX 27 -- INTERVAL 49

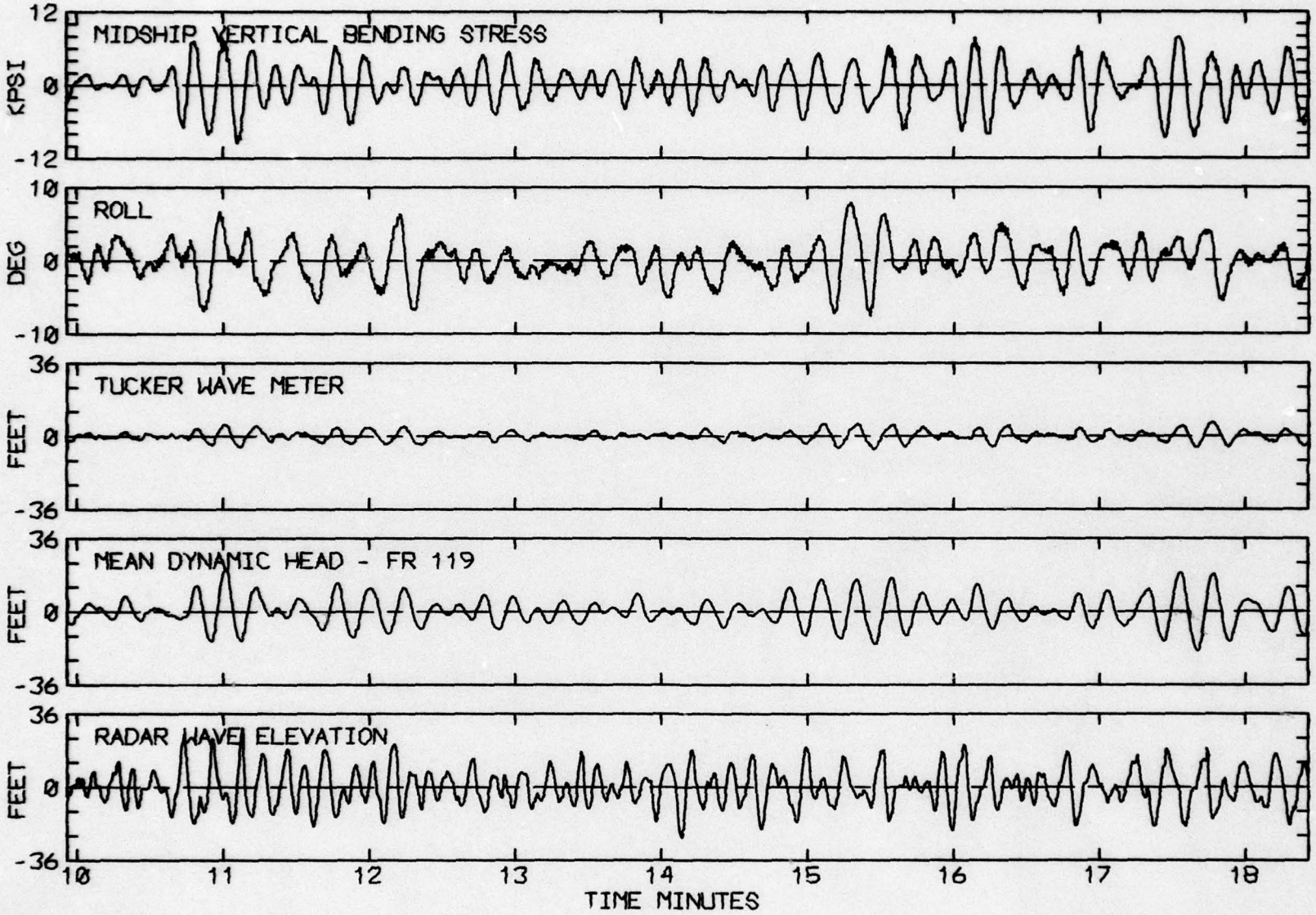
06

AD-A057 157 STEVENS INST OF TECH HOBOKEN N J DAVIDSON LAB F/G 8/3
RADAR AND TUCKER WAVEMETER DATA FROM SEA-LAND MCLEAN VOYAGES 35--ETC(U)
AUG 78 J F DALZELL N00024-74-C-5451
UNCLASSIFIED SIT-DL-77-1935 SSC-SL-7-19 NL

2 OF 2
AD A057157



END
DATE FILMED
9-78
DDC



RUN 1749 -- VOYAGE 35W -- TAPE 171 -- INDEX 27 -- INTERVAL 49

LOG BOOK DATA

DATE AND TIME	02-24-74 1600
POSITION	40-35 N 60-49 W
COURSE AND SPEED	250 . 10.0 KNOTS
SEA STATE	10
WAVE HEIGHT	15 FEET
" REL DIR	20 STBD
SWELL HEIGHT	15 FEET
" REL DIR	20 STBD

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

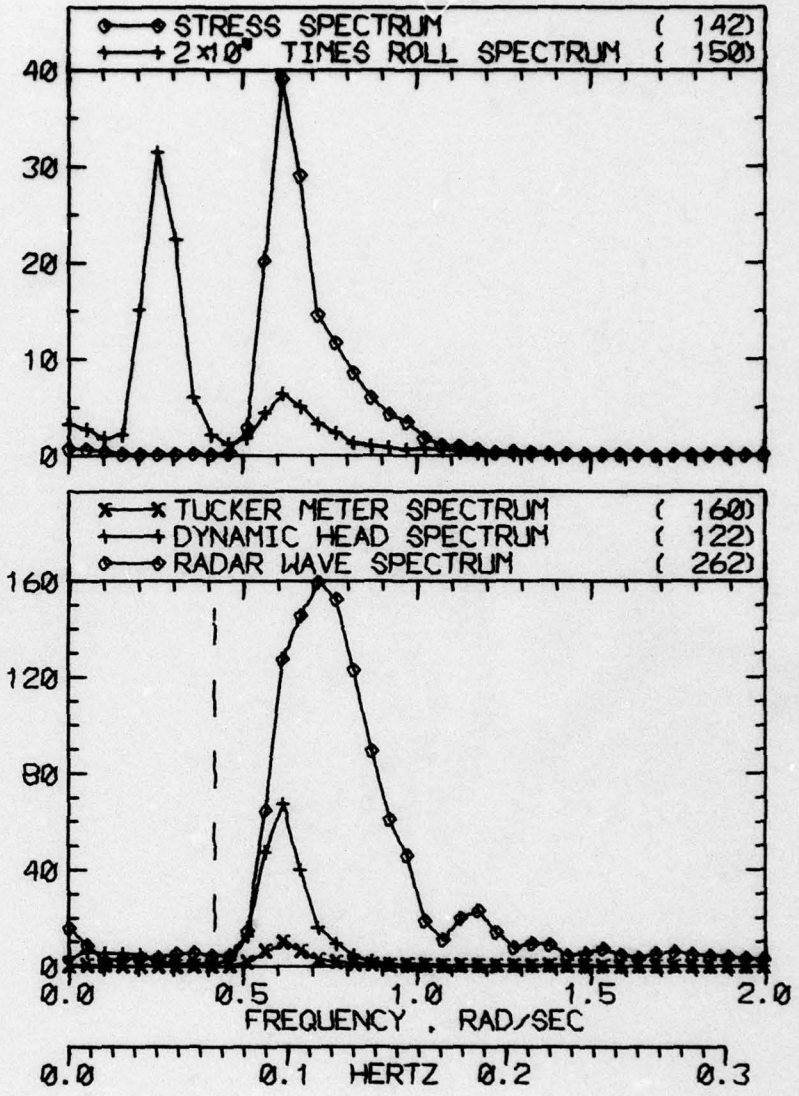
MAXIMUM PK-TR	20.1 KPSI
4.0 X RMS	11.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

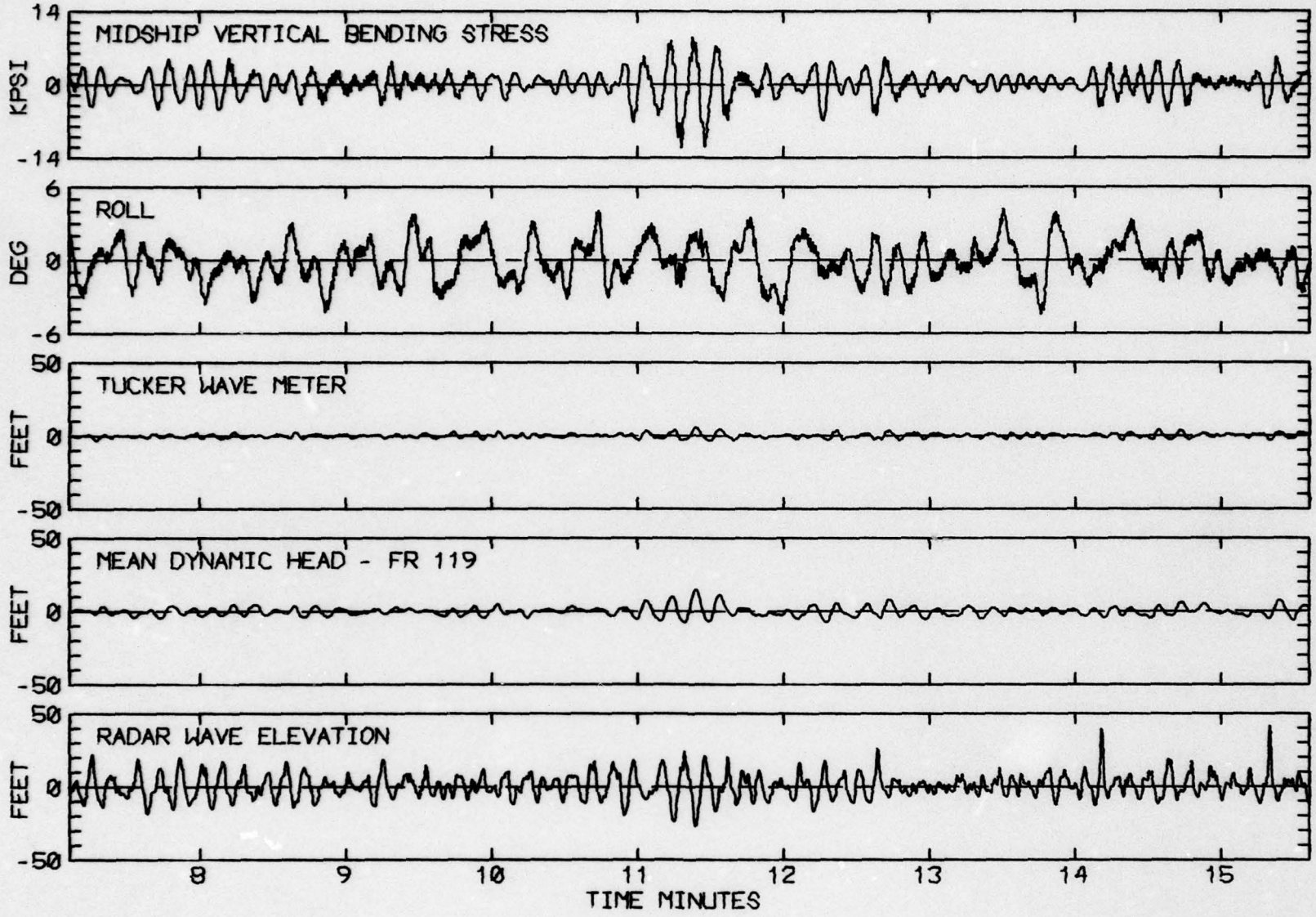
ROLL	7.0 DEG
PITCH	2.25 DEG
DK HSE VERT ACCEL	0.49 G
DK HSE LAT ACCEL	0.18 G
RADAR SLANT RANGE	55.5 FEET
VERTICAL RANGE	52.1 FEET
DISPL AT RADAR	33.3 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	364	158	171
MAXIMUM HEIGHT	6.7	21.8	55.1
10TH HIGHEST HTS	4.7	15.2	40.2
3RD HIGHEST HTS	2.9	10.5	31.7
4.0 RMS(SPECTRA)	5.8	13.9	32.2



RUN 1756 -- VOYAGE 35W -- TAPE 171 -- INDEX 28 -- INTERVAL 56



RUN 1756 -- VOYAGE 35W -- TAPE 171 -- INDEX 28 -- INTERVAL 56

LOG BOOK DATA

DATE AND TIME	02-24-74 1900
POSITION	40-35 N 60-49 W
COURSE AND SPEED	270 , 10.0 KNOTS
SEA STATE	9
WAVE HEIGHT	15 FEET
" REL DIR	11 STBD
SWELL HEIGHT	15 FEET
" REL DIR	0

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

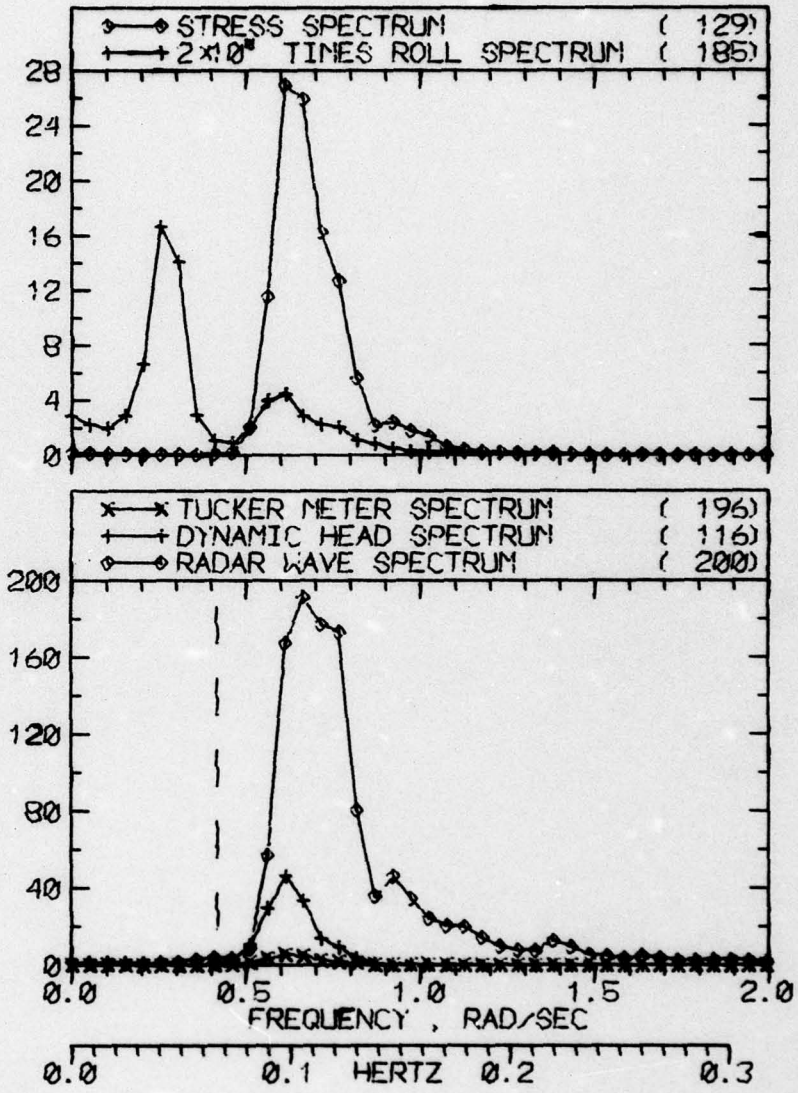
MAXIMUM PK-TR	18.8 KPSI
4.0 X RMS	9.7 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

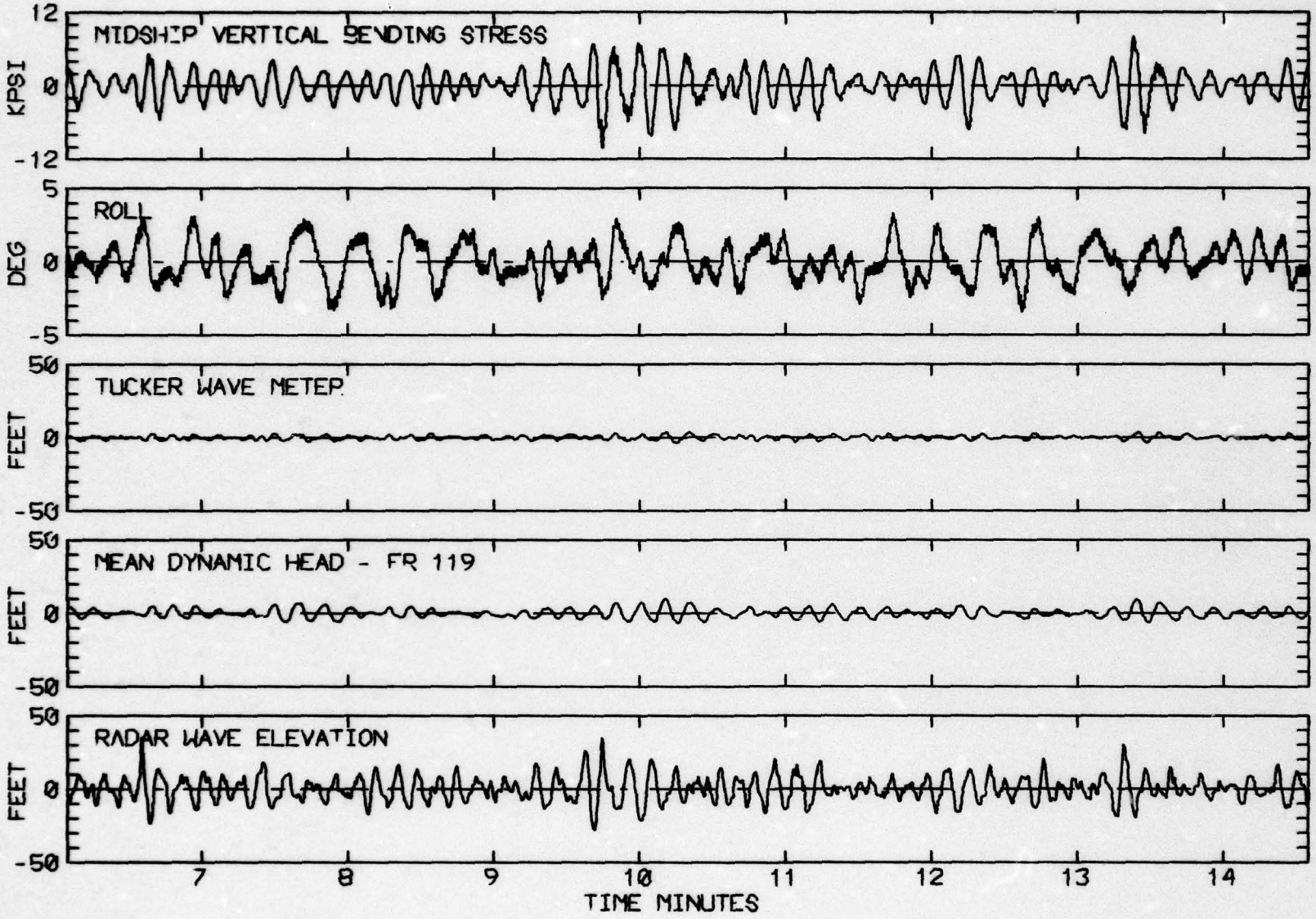
ROLL	5.5 DEG
PITCH	1.93 DEG
DK HSE VERT ACCEL	0.43 G
DK HSE LAT ACCEL	0.14 G
RADAR SLANT RANGE	53.1 FEET
VERTICAL RANGE	50.7 FEET
DISPL AT RADAR	28.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	348	165	152
MAXIMUM HEIGHT	7.3	16.4	58.7
10TH HIGHEST HTS	4.4	13.3	38.0
3RD HIGHEST HTS	3.0	10.0	30.2
4.0 RMS(SPECTRA)	4.8	11.5	31.3



RUN 1801 -- VOYAGE 35W -- TAPE 173 -- INDEX 29 -- INTERVAL 1



RUN 1801 -- VOYAGE 35W -- TAPE 173 -- INDEX 29 -- INTERVAL 1

LOG BOOK DATA

DATE AND TIME	02-24-74 2300
POSITION	40-35 N 60-49 W
COURSE AND SPEED	268 , 32.0 KNOTS
SEA STATE	2
WAVE HEIGHT	6 FEET
" REL DIR	2 STBD
SWELL HEIGHT	6 FEET
" REL DIR	2 STBD

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

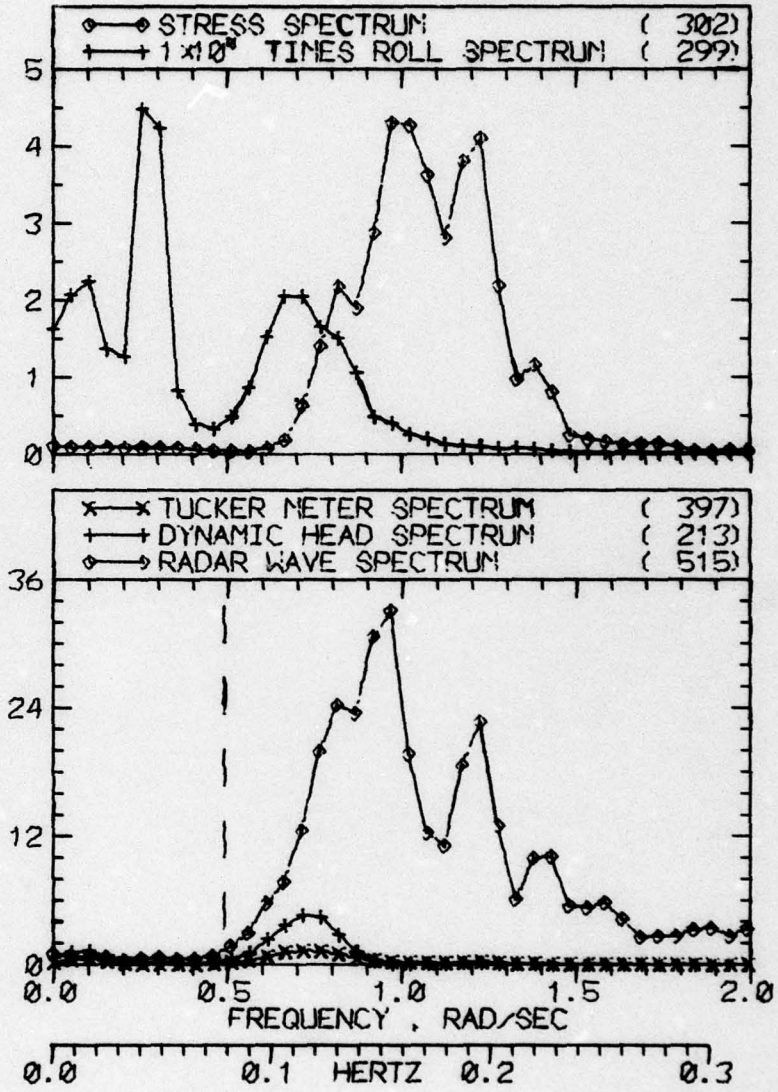
MAXIMUM PK-TR	7.9 KPSI
4.0 X RMS	5.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

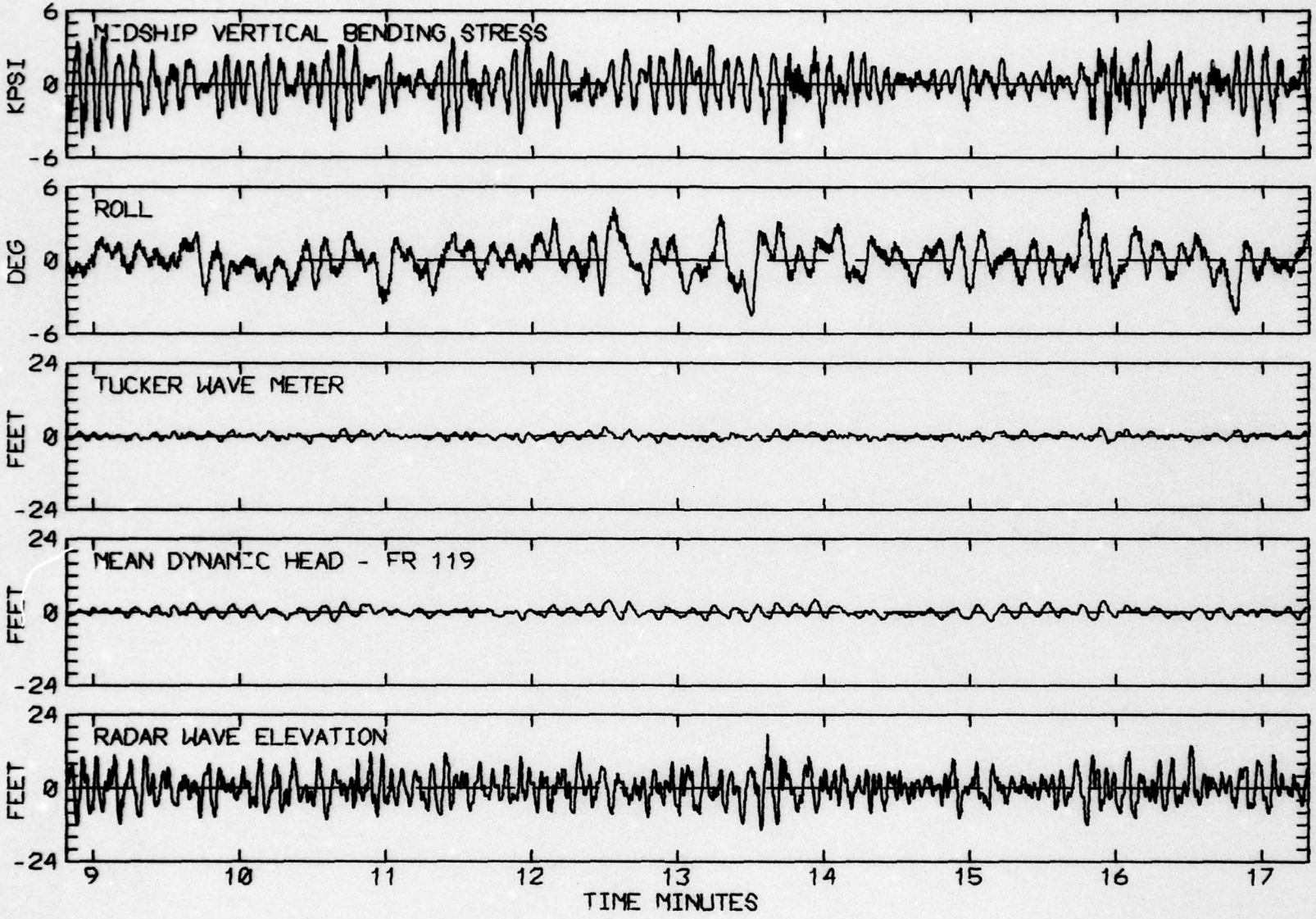
ROLL	5.2 DEG
PITCH	1.68 DEG
DK HSE VERT ACCEL	0.38 G
DK HSE LAT ACCEL	0.14 G
RADAR SLANT RANGE	28.2 FEET
VERTICAL RANGE	26.5 FEET
DISPL AT RADAR	16.6 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	529	298	294
MAXIMUM HEIGHT	4.3	6.6	29.7
10TH HIGHEST HTS	2.7	4.7	20.7
3RD HIGHEST HTS	1.8	3.2	16.6
4.0 RMS(SPECTRA)	3.3	4.8	18.0



RUN 1809 -- VOYAGE 35W -- TAPE 173 -- INDEX 31 -- INTERVAL 9



RUN 1809 -- VOYAGE 35W -- TAPE 173 -- INDEX 31 -- INTERVAL 9

LOG BOOK DATA

DATE AND TIME	02-25-74 0100
POSITION	40-35 N 60-49 W
COURSE AND SPEED	268 , 32.1 KNOTS
SEA STATE	5
WAVE HEIGHT	4 FEET
" REL DIR	178 PORT
SWELL HEIGHT	4 FEET
" REL DIR	178 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

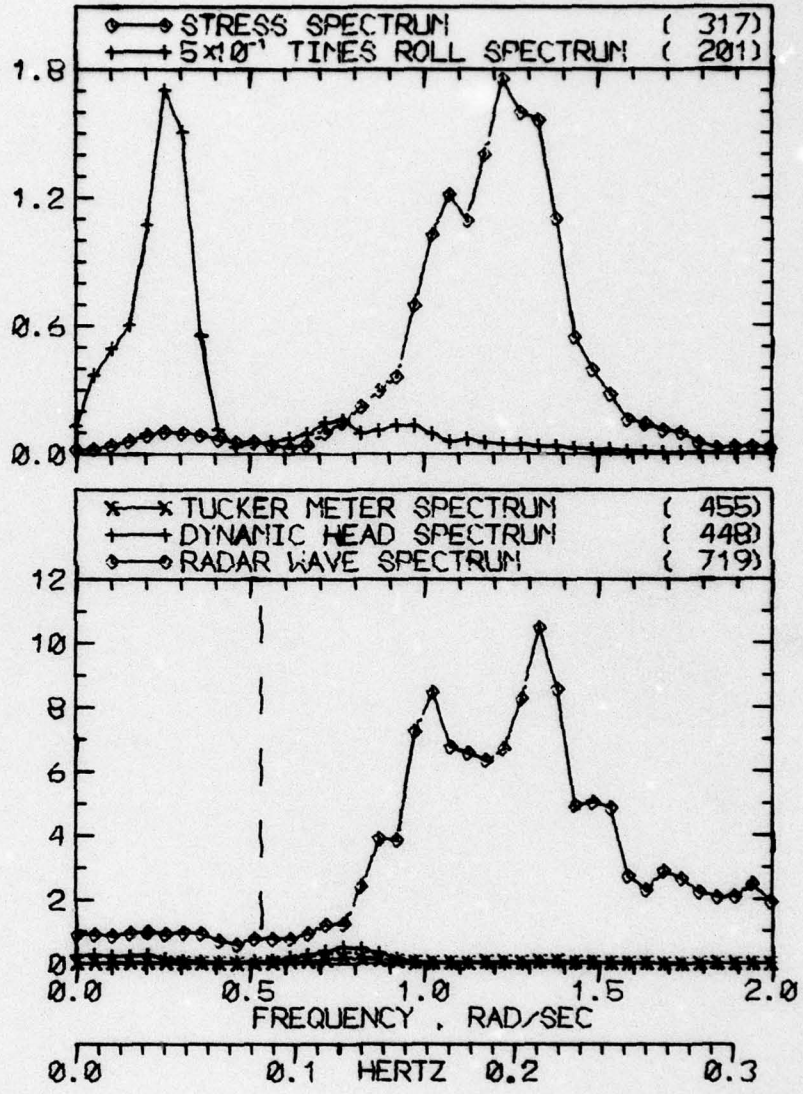
MAXIMUM PK-TR	4.2 KPSI
4.0 X RMS	3.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

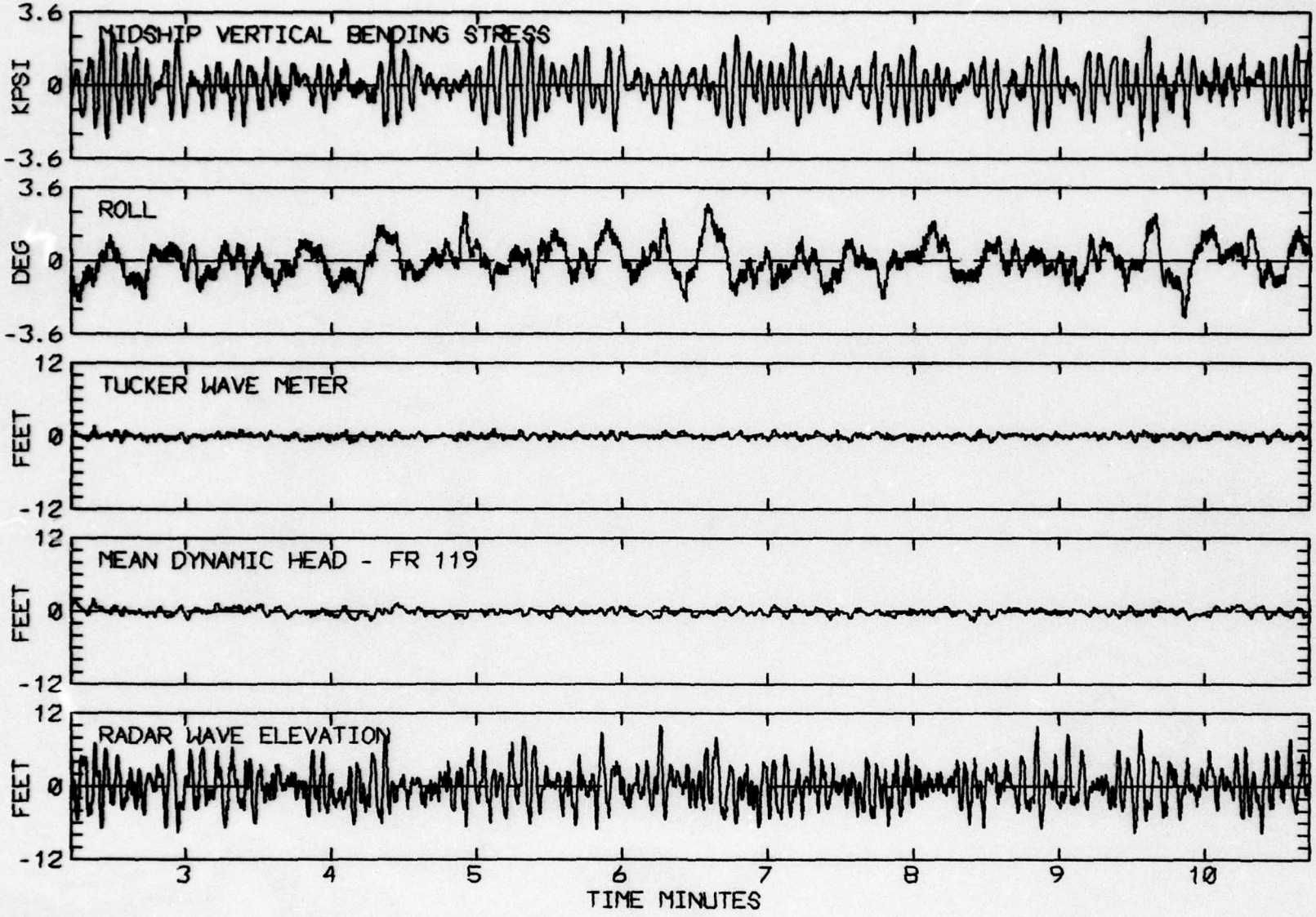
ROLL	3.8 DEG
PITCH	0.87 DEG
DK HSE VERT ACCEL	0.17 G
DK HSE LAT ACCEL	0.10 G
RADAR SLANT RANGE	16.0 FEET
VERTICAL RANGE	14.6 FEET
DISPL AT RADAR	6.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	1119	671	377
MAXIMUM HEIGHT	2.4	2.5	17.5
10TH HIGHEST HTS	1.4	1.7	13.0
3RD HIGHEST HTS	1.0	1.2	10.4
4.0 RMS(SPECTRA)	1.7	2.2	11.6



RUN 1813 -- VOYAGE 35W -- TAPE 173 -- INDEX 32 -- INTERVAL 13



RUN 1813 -- VOYAGE 35W -- TAPE 173 -- INDEX 32 -- INTERVAL 13

LOG BOOK DATA

DATE AND TIME	02-25-74 0300
POSITION	40-35 N 60-49 W
COURSE AND SPEED	269 , 32.3 KNOTS
SEA STATE	7
WAVE HEIGHT	3 FEET
" REL DIR	179 PORT
SWELL HEIGHT	3 FEET
" REL DIR	179 PORT

---- VISUAL WEATHER / COMMENTS ----

OCAST /

MIDSHIP VERTICAL BENDING STRESS

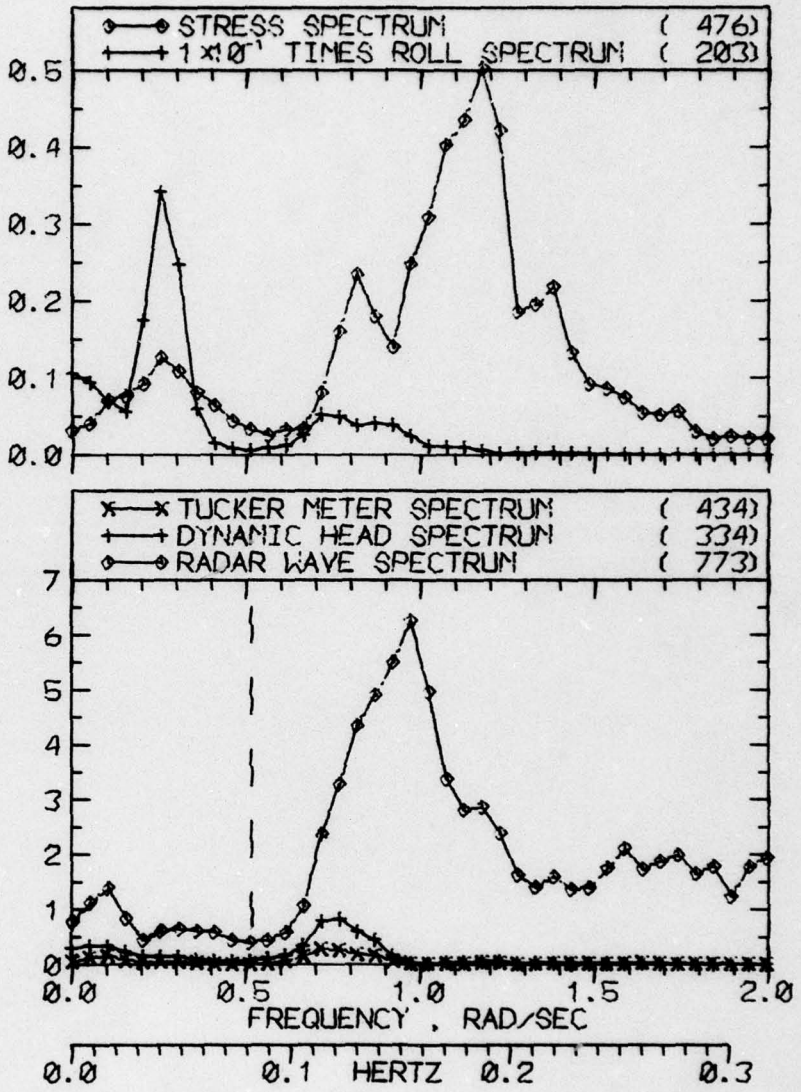
MAXIMUM PK-TR	3.3 KPSI
4.0 X RMS	2.1 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

ROLL	3.6 DEG
PITCH	0.81 DEG
DK HSE VERT ACCEL	0.16 G
DK HSE LAT ACCEL	0.10 G
RADAR SLANT RANGE	12.3 FEET
VERTICAL RANGE	11.4 FEET
DISPL AT RADAR	6.4 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	1140	685	352
MAXIMUM HEIGHT	1.9	3.1	14.0
10TH HIGHEST HTS	1.3	1.8	10.0
3RD HIGHEST HTS	0.9	1.2	7.8
4.0 RMS(SPECTRA)	1.7	2.3	8.9



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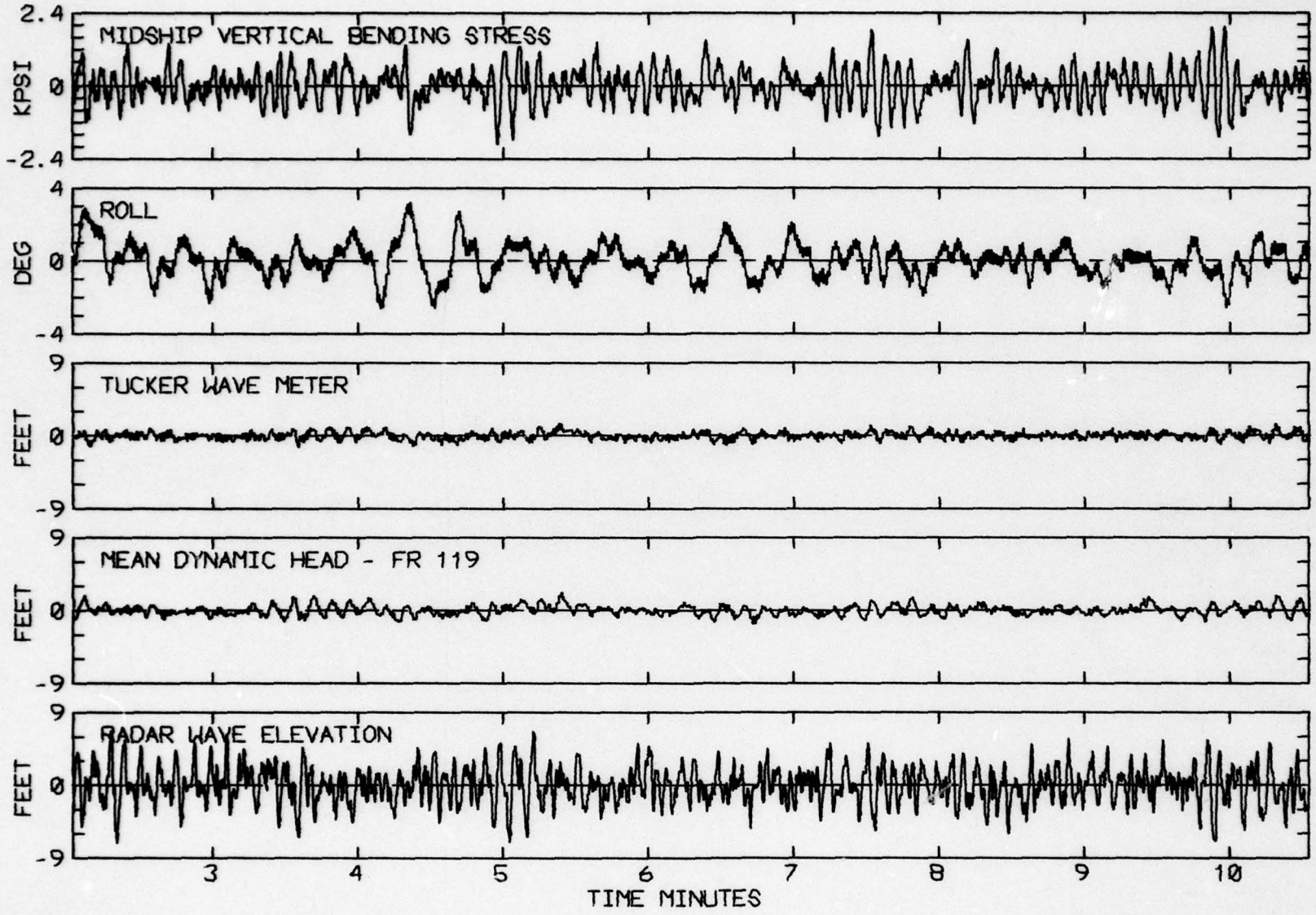
RUN 1817 -- VOYAGE 35W -- TAPE 173 -- INDEX 33 -- INTERVAL 17



RUN 1817 -- VOYAGE 35W -- TAPE 173 -- INDEX 33 -- INTERVAL 17

TABLE IIIa

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 1 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 36 EAST

D.L. RUN NO.	TMR TAPE NO.	TMR INDX NO.	TMR INTV NO.	DATE	TIME (GMT)	LATITUDE	LONGITUDE	COURSE	SPEED KT.	PROP RPM	DRAFT FT.	SEA/AIR TEMP
1925	175	7	25	02-28-74	2000	41-36 N	58-10 W	079	32.3	131.0	30.31	47/37
1929	175	8	29	02-28-74	2400	41-36 N	58-10 W	078	32.1	130.0	30.30	43/35
1933	175	9	33	03-01-74	0400	41-36 N	58-10 W	078	32.4	131.3	30.30	42/34
1937	175	10	37	03-01-74	0800	41-36 N	58-10 W	078	31.9	129.5	30.26	37/35
1941	175	11	41	03-01-74	1200	41-36 N	58-10 W	078	32.1	130.0	30.24	60/36
1945	175	12	45	03-01-74	1600	44-05 N	42-20 W	078	32.2	130.6	30.27	57/46
1949	175	13	49	03-01-74	2000	44-05 N	42-20 W	078	32.3	130.8	30.25	58/47
1953	175	14	53	03-01-74	2400	44-05 N	42-20 W	077	32.3	131.0	30.29	57/48
1957	175	15	57	03-02-74	0400	44-05 N	42-20 W	077	32.4	131.3	30.34	53/48
1961	175	16	61	03-02-74	0800	44-05 N	42-20 W	077	32.2	130.5	30.33	54/47
2001	177	17	1	03-02-74	1200	44-05 N	42-20 W	077	32.1	130.0	30.34	52/48
2005	177	18	5	03-02-74	1600	46-36 N	25-47 W	078	32.4	131.3	30.40	52/50
2010	177	19	10	03-02-74	2000	46-36 N	25-47 W	077	32.4	131.2	30.36	52/50
2013	177	20	13	03-02-74	2400	46-36 N	25-47 W	078	32.2	131.0	30.39	51/48
2017	177	21	17	03-03-74	0400	46-36 N	25-47 W	078	32.5	131.6	30.38	51/48
2021	177	22	21	03-03-74	0800	46-36 N	25-47 W	077	32.4	131.4	30.33	51/47

TABLE IIIb

SUMMARY OF TMR LOG-BOOK DATA CORRESPONDING TO
INTERVALS SELECTED FOR WAVE METER DATA REDUCTION (PAGE 2 OF 2)

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 36 EAST

D.L. RUN NO.	SEA STATE	<REL WIND> DIR/SPEED /(KT)	REL WAVE DIR	WAVE HT. FT.	REL SWELL DIR	<-SWELL-> HT FT.	<-SWELL-> LENGTH FT.	VISUAL WEATHER /TMR LOG-BOOK COMMENTS
1925	4	56P/12	56P	2	56P	3	150	PT CLDY /
1929	3	56P/12	56P	2	55P	3	150	PT CLDY /
1933	4	33P/12	33P	3	33P	3	150	PT CLDY /
1937	5	55P/15	55P	3	55P	3	150	PT CLDY /
1941	5	33P/15	33P	3	33P	3	150	PT CLDY /
1945	5	33P/20	33P	3	33P	3	250	PT CLDY /
1949	4	55P/15	55P	3	33P	3	250	PT CLDY /
1953	2	54P/10	32P	2	32P	4	300	CLDY /
1957	2	54P/ 5	32P	2	32P	4	300	OCAST /
1961	2	/ 5		2		6	500	CLDY /LONG CONFUSED SWELL
2001	2	/ 5		2		6	500	PT CLDY /
2005	2	78P/ 5	78P	2	123P	6	500	PT CLDY /
2010	4	99P/10	99P	2	124P	6	300	CLDY /
2013	3	78P/10	78P	4	124P	6	300	CLDY /
2017	4	78P/10	78P	4	124P	6	125	CLDY /
2021	4	54P/15	54P	5	124P	6	125	PT CLDY /

TABLE IIIc

COMPARISON OF TMR RESULTS FOR MIDSHIP VERTICAL BENDING STRESS
WITH CORRESPONDING RAW DIGITIZATION RESULTS AT DAVIDSON LABORATORY

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 36 EAST

	<---TMR RESULTS--->					<---D.L. DIGITIZATION--->			<--COLUMN RATIOS-->		
D.L. RUN NO.	NO. WAVE INDUCED CYCLES (1)	NO. 1ST MODE BURSTS (2)	MAX P-TO-T STRESS KPSI (3)	RMS P-TO-T STRESS KPSI (4)	MAX 1ST MODE STRESS KPSI (5)	RANGE OF RECORDED EXTREMES KPSI (6)	2.83X (SAMPLE RMS) KPSI (7)	REL MEAN STRESS KPSI (8)	(7) / (4)	(6) / (3+5)	(6) / (3)
1925	197	0	2.24	0.88	0.00	2.85	1.12	0.39	1.26	1.27	1.27
1929	187	0	2.29	0.94	0.00	3.05	1.17	0.19	1.25	1.33	1.33
1933	207	2	2.48	1.04	0.72	3.42	1.23	0.31	1.18	1.07	1.38
1937	197	50	3.46	1.74	2.15	5.64	2.10	0.23	1.21	1.01	1.63
1941	181	13	4.52	2.03	0.79	6.21	2.44	0.28	1.20	1.17	1.37
1945	149	6	3.49	1.50	3.40	22.95 **	2.21	0.50	1.47	3.33	6.58
1949	136	1	2.56	1.38	0.56	4.24	1.79	0.51	1.30	1.36	1.66
1953	121	0	3.29	1.45	0.00	4.44	1.80	0.44	1.24	1.35	1.35
1957	124	0	3.61	1.73	0.00	5.27	2.15	0.48	1.24	1.46	1.46
1961	113	7	4.08	2.00	0.83	5.84	2.43	0.60	1.21	1.19	1.43
2001	95	2	3.78	1.89	0.53	5.76	2.33	-0.14	1.24	1.33	1.52
2005	102	7	6.19	2.37	0.92	5.93	2.64	-0.24	1.11	0.83	0.96
2010	91	1	4.39	2.22	0.65	6.21	2.84	-0.78	1.28	1.23	1.42
2013	82	11	4.72	2.20	1.00	7.49	2.74	-0.58	1.25	1.31	1.59
2017	90	10	4.80	2.08	0.77	5.82	2.60	-0.71	1.25	1.05	1.21
2021	76	19	5.69	2.22	1.19	6.05	2.52	-0.61	1.13	0.88	1.06

** Magnetic tape saturation, probably extraneous.

TABLE IIId

SUMMARY OF RAW DIGITIZATION RESULTS FOR RADAR RANGE
ROLL, PITCH, DECK HOUSE ACCELERATIONS, AND TUCKER METER

SEA LAND MC LEAN : 1973-1974 WINTER SEASON : VOYAGE 36 EAST

	<--- RADAR --->			<--- ROLL ---->			<--- PITCH --->			<--VERT ACCEL->			<--LAT ACCEL-->			<-- TUCKER -->		
D.L. RUN NO.	4.0 (RMS) FT	RECORDED EXTREMES FT		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) DEG	RECORDED EXTREMES DEG		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) (G)	RECORDED EXTREMES (G)		4.0 (RMS) FT	RECORDED EXTREMES FT	
1925	10.	10.	-8.	2.1	3.	-1.	0.5	-0.2	-1.1	0.08	0.1	-0.1	0.06	0.1	-0.1	1.	1.	-1.
1929	10.	8.	-10.	2.3	3.	-1.	0.5	-0.3	-1.1	0.09	0.1	-0.1	0.07	0.1	-0.1	1.	1.	-1.
1933	11.	9.	-10.	2.3	3.	-1.	0.5	-0.1	-1.0	0.09	0.1	-0.1	0.07	0.1	-0.1	1.	1.	-1.
1937	16.	13.	-12.	3.4	5.	-1.	0.8	0.3	-1.3	0.18	0.2	-0.2	0.10	0.1	-0.1	2.	2.	-2.
1941	18.	20.	-18.	4.8	6.	-2.	1.0	0.6	-1.6	0.22	0.2	-0.2	0.13	0.1	-0.1	2.	2.	-2.
1945	14.	14.	-13.	5.0	5.	-4.	0.7	0.1	-1.1	0.15	0.1	-0.1	0.13	0.1	-0.1	2.	2.	-2.
1949	14.	12.	-12.	5.5	5.	-4.	0.8	0.7	-0.7	0.15	0.1	-0.1	0.14	0.1	-0.1	2.	2.	-2.
1953	16.	12.	-12.	9.0	8.	-6.	0.7	0.7	-0.6	0.13	0.1	-0.1	0.21	0.1	-0.2	2.	3.	-2.
1957	18.	14.	-14.	7.6	9.	-5.	0.9	0.9	-0.7	0.19	0.2	-0.2	0.19	0.2	-0.2	3.	3.	-2.
1961	20.	19.	-15.	9.4	9.	-7.	1.0	1.1	-0.8	0.20	0.2	-0.2	0.23	0.2	-0.2	3.	3.	-3.
2001	19.	18.	-13.	10.6	9.	-7.	0.7	0.7	-0.7	0.16	0.2	-0.1	0.25	0.2	-0.2	3.	3.	-2.
2005	22.	19.	-17.	12.3	10.	-10.	0.9	1.0	-0.9	0.20	0.2	-0.2	0.29	0.3	-0.2	4.	4.	-3.
2010	27.	25.	-21.	19.0	16.	-13.	0.8	0.7	-0.8	0.17	0.2	-0.1	0.43	0.3	-0.3	5.	7.	-4.
2013	24.	23.	-19.	17.5	15.	-12.	0.8	0.8	-0.6	0.14	0.1	-0.1	0.38	0.3	-0.3	5.	7.	-5.
2017	25.	20.	-19.	16.1	14.	-9.	0.8	0.9	-0.5	0.14	0.1	-0.1	0.37	0.3	-0.3	5.	5.	-3.
2021	24.	23.	-16.	14.7	14.	-9.	0.7	0.8	-0.4	0.12	0.1	-0.1	0.36	0.3	-0.3	5.	6.	-3.

LOG BOOK DATA

DATE AND TIME	02-28-74 2000
POSITION	41-36 N 58-10 W
COURSE AND SPEED	079 . 32.3 KNOTS
SEA STATE	4
WAVE HEIGHT	2 FEET
" REL DIR	56 PORT
SWELL HEIGHT	3 FEET
" REL DIR	56 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

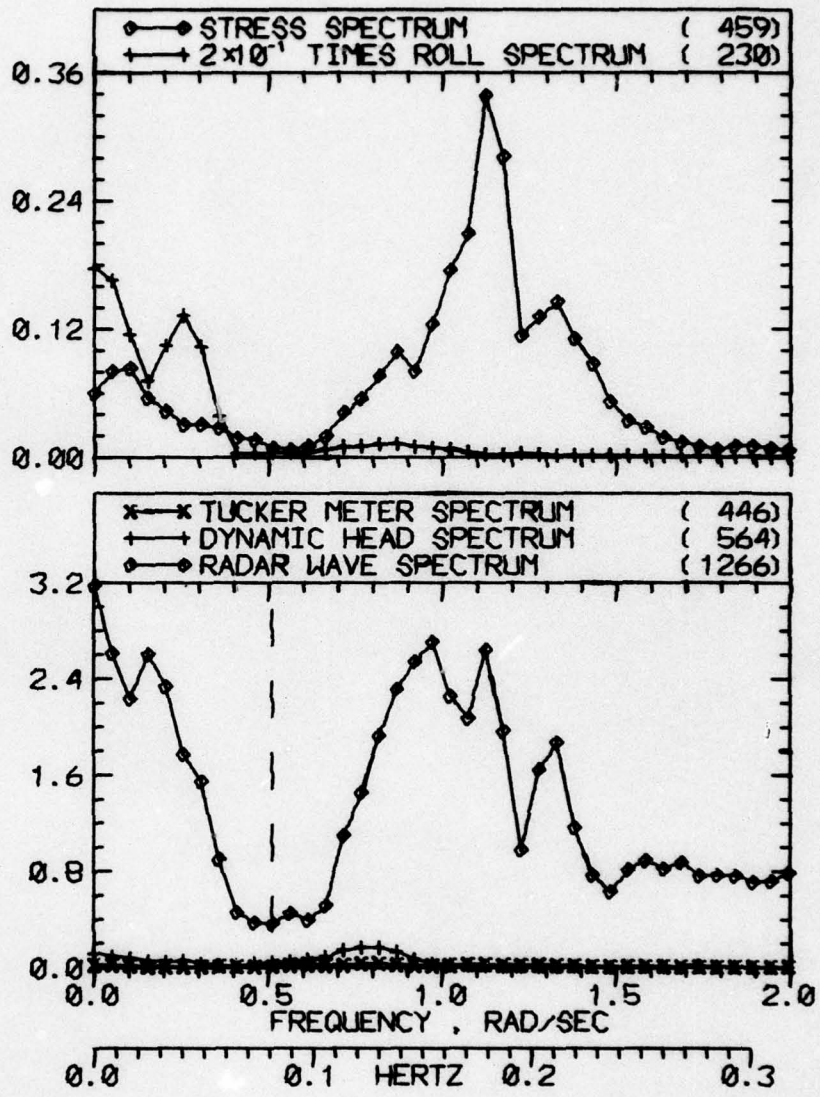
MAXIMUM PK-TR	2.2 KPSI
4.0 X RMS	1.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

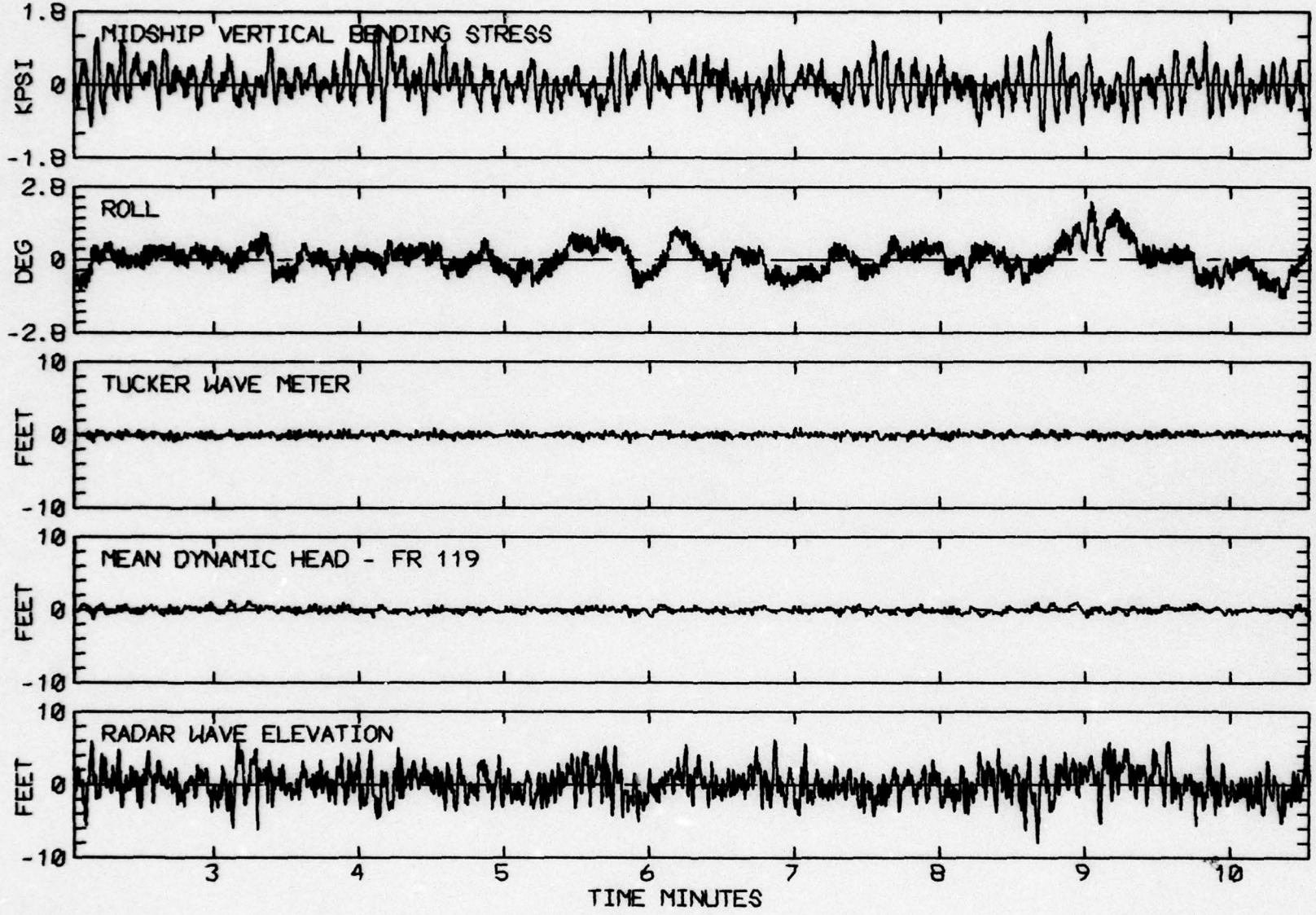
ROLL	2.1 DEG
PITCH	0.49 DEG
DK HSE VERT ACCEL	0.08 G
DK HSE LAT ACCEL	0.06 G
RADAR SLANT RANGE	10.3 FEET
VERTICAL RANGE	9.6 FEET
DISPL AT RADAR	3.0 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	1396	955	493
MAXIMUM HEIGHT	1.5	1.6	11.9
10TH HIGHEST HTS	1.0	1.1	8.4
3RD HIGHEST HTS	0.8	0.8	6.5
4.0 RMS(SPECTRA)	1.2	1.4	8.3



RUN 1925 -- VOYAGE 36E -- TAPE 175 -- INDEX 7 -- INTERVAL 25



RUN 1925 -- VOYAGE 36E -- TAPE 175 -- INDEX 7 -- INTERVAL 25

LOG BOOK DATA

DATE AND TIME	02-28-74 2400
POSITION	41-36 N 58-10 W
COURSE AND SPEED	078 . 32.1 KNOTS
SEA STATE	3
WAVE HEIGHT	2 FEET
" REL DIR	56 PORT
SWELL HEIGHT	3 FEET
" REL DIR	55 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

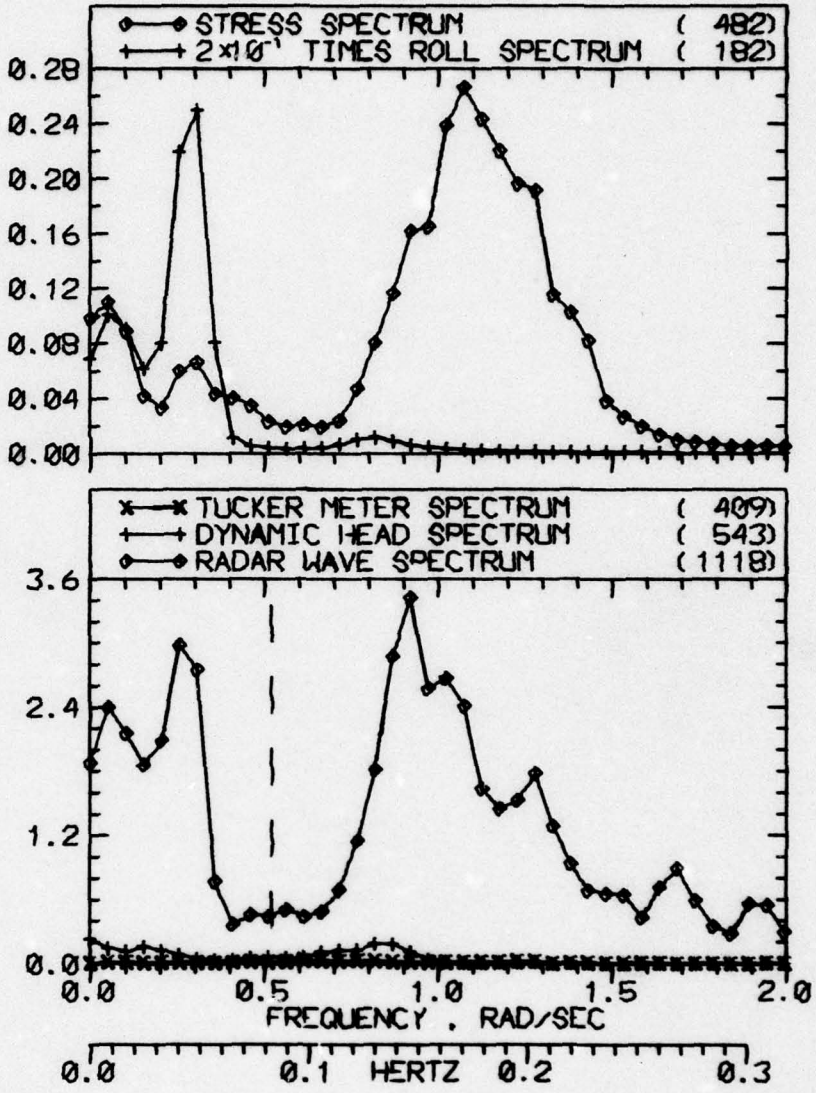
MAXIMUM PK-TR	2.3 KPSI
4.0 X RMS	1.7 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

ROLL	2.2 DEG
PITCH	0.52 DEG
DK HSE VERT ACCEL	0.09 G
DK HSE LAT ACCEL	0.07 G
RADAR SLANT RANGE	10.3 FEET
VERTICAL RANGE	9.7 FEET
DISPL AT RADAR	3.4 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	1387	839	458
MAXIMUM HEIGHT	1.7	2.0	9.0
10TH HIGHEST HTS	1.0	1.3	7.4
3RD HIGHEST HTS	0.8	1.0	6.1
4.0 RMS(SPECTRA)	1.2	1.6	8.0



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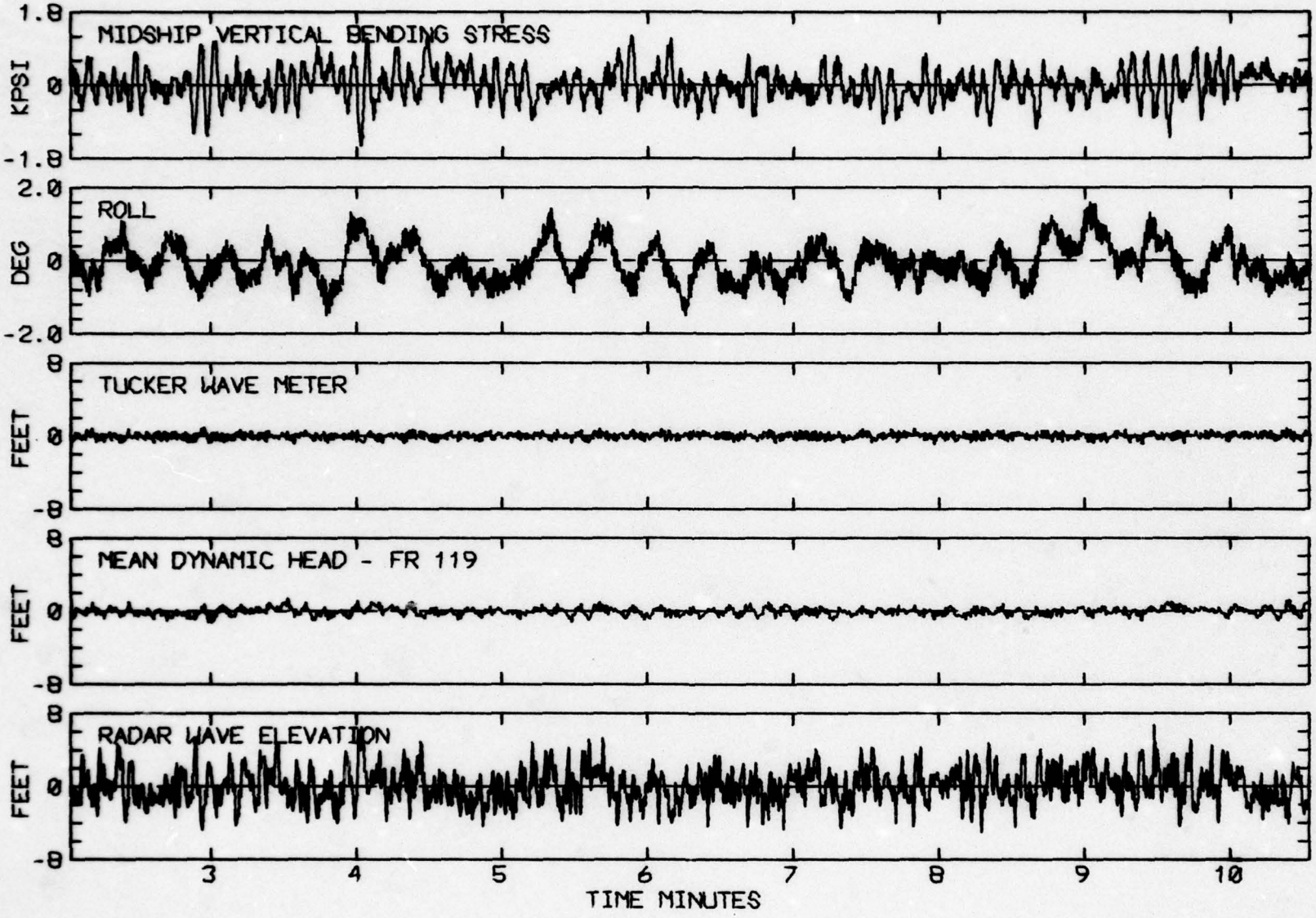
RUN 1929 -- VOYAGE 36E -- TAPE 175 -- INDEX 8 -- INTERVAL 29



RUN 1929 -- VOYAGE 36E -- TAPE 175 -- INDEX 8 -- INTERVAL 29

LOG BOOK DATA

DATE AND TIME	03-01-74 0400
POSITION	41-36 N 58-10 W
COURSE AND SPEED	078 . 32.4 KNOTS
SEA STATE	4
WAVE HEIGHT	3 FEET
" REL DIR	33 PORT
SWELL HEIGHT	3 FEET
" REL DIR	33 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

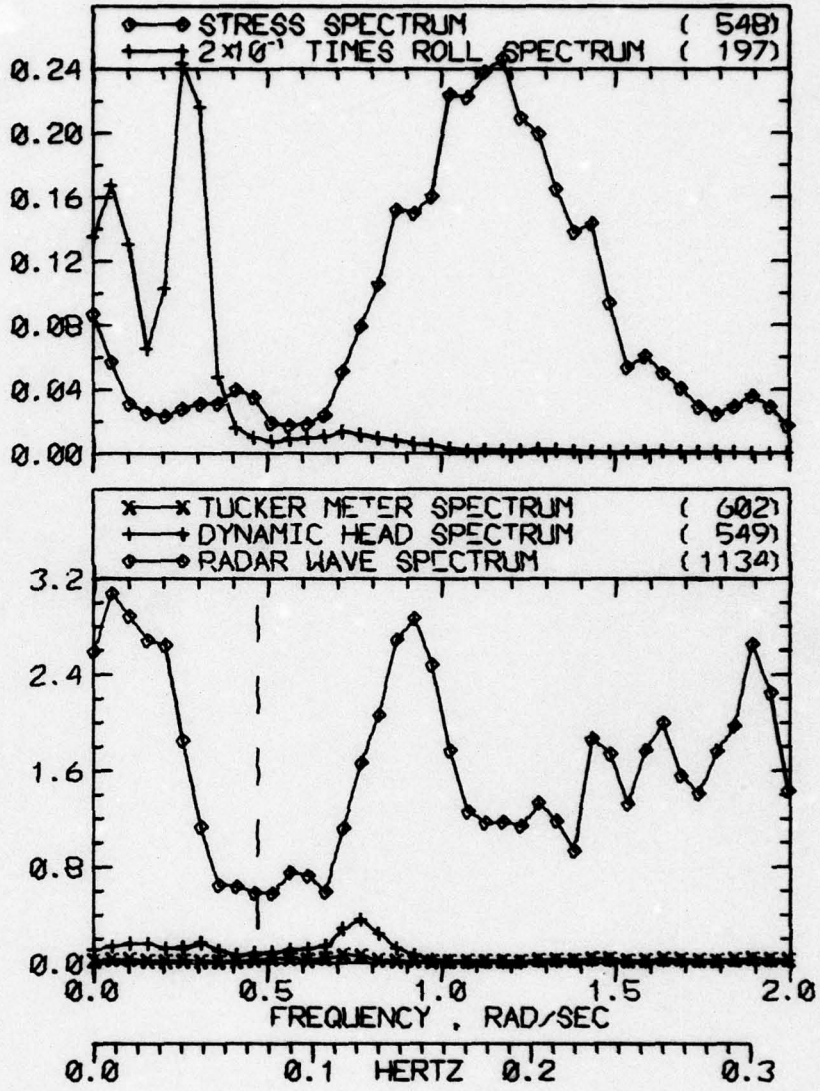
MAXIMUM PK-TR	2.5 KPSI
4.0 X RMS	1.7 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

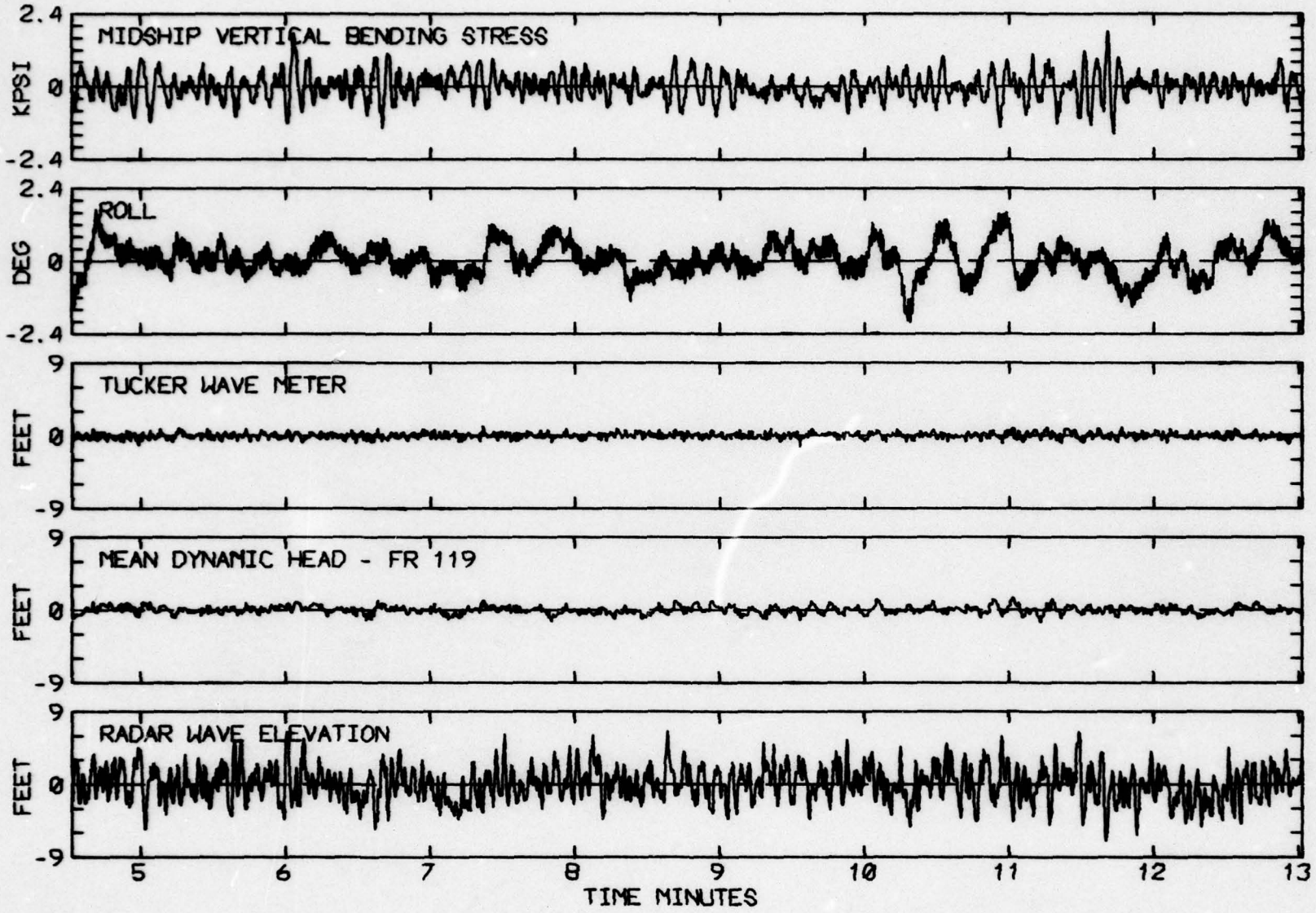
ROLL	2.4 DEG
PITCH	0.52 DEG
DK HSE VERT ACCEL	0.09 G
DK HSE LAT ACCEL	0.07 G
RADAR SLANT RANGE	10.7 FEET
VERTICAL RANGE	10.1 FEET
DISPL AT RADAR	3.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	1217	755	414
MAXIMUM HEIGHT	1.3	1.6	11.6
10TH HIGHEST HTS	1.1	1.2	8.9
3RD HIGHEST HTS	0.9	0.9	6.8
4.0 RMS(SPECTRA)	1.4	1.8	8.5



RUN 1933 -- VOYAGE 36E -- TAPE 175 -- INDEX 9 -- INTERVAL 33



RUN 1933 -- VOYAGE 36E -- TAPE 175 -- INDEX 9 -- INTERVAL 33

LOG BOOK DATA

DATE AND TIME	03-01-74 0800
POSITION	41-36 N 58-10 W
COURSE AND SPEED	078 . 31.9 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	55 PORT
SWELL HEIGHT	3 FEET
" REL DIR	55 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

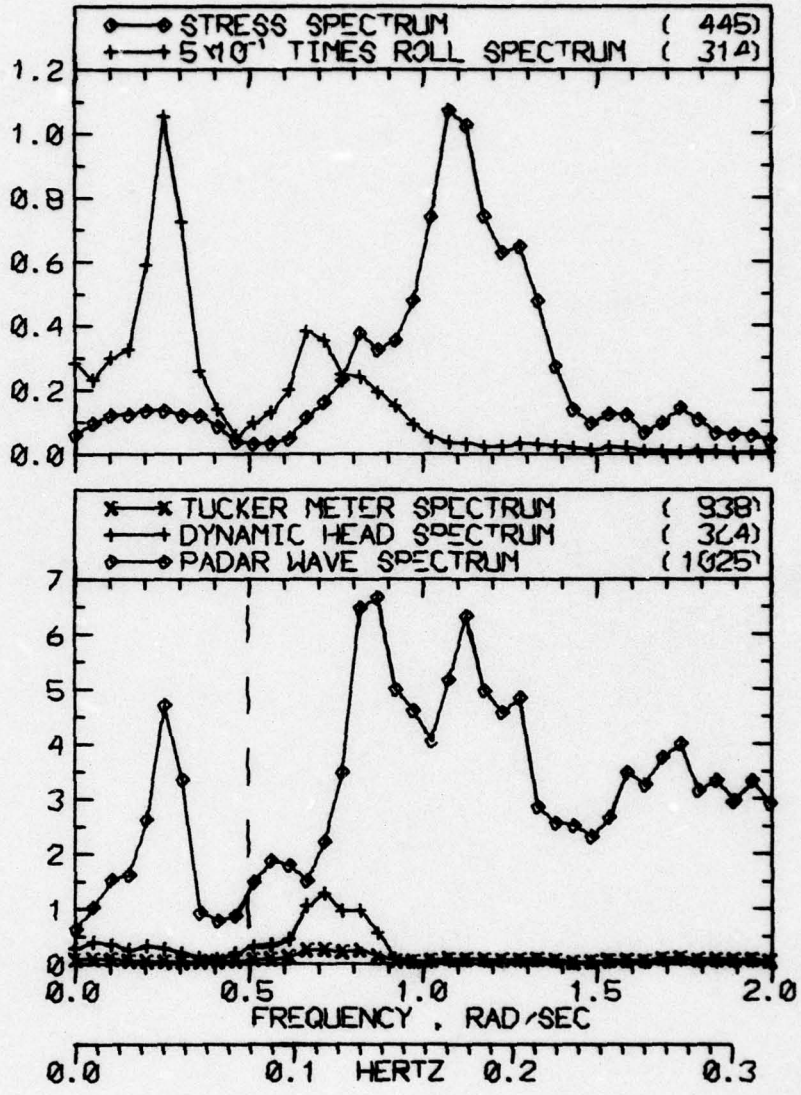
MAXIMUM PK-TR	3.5 KPSI
4.0 X RMS	3.0 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

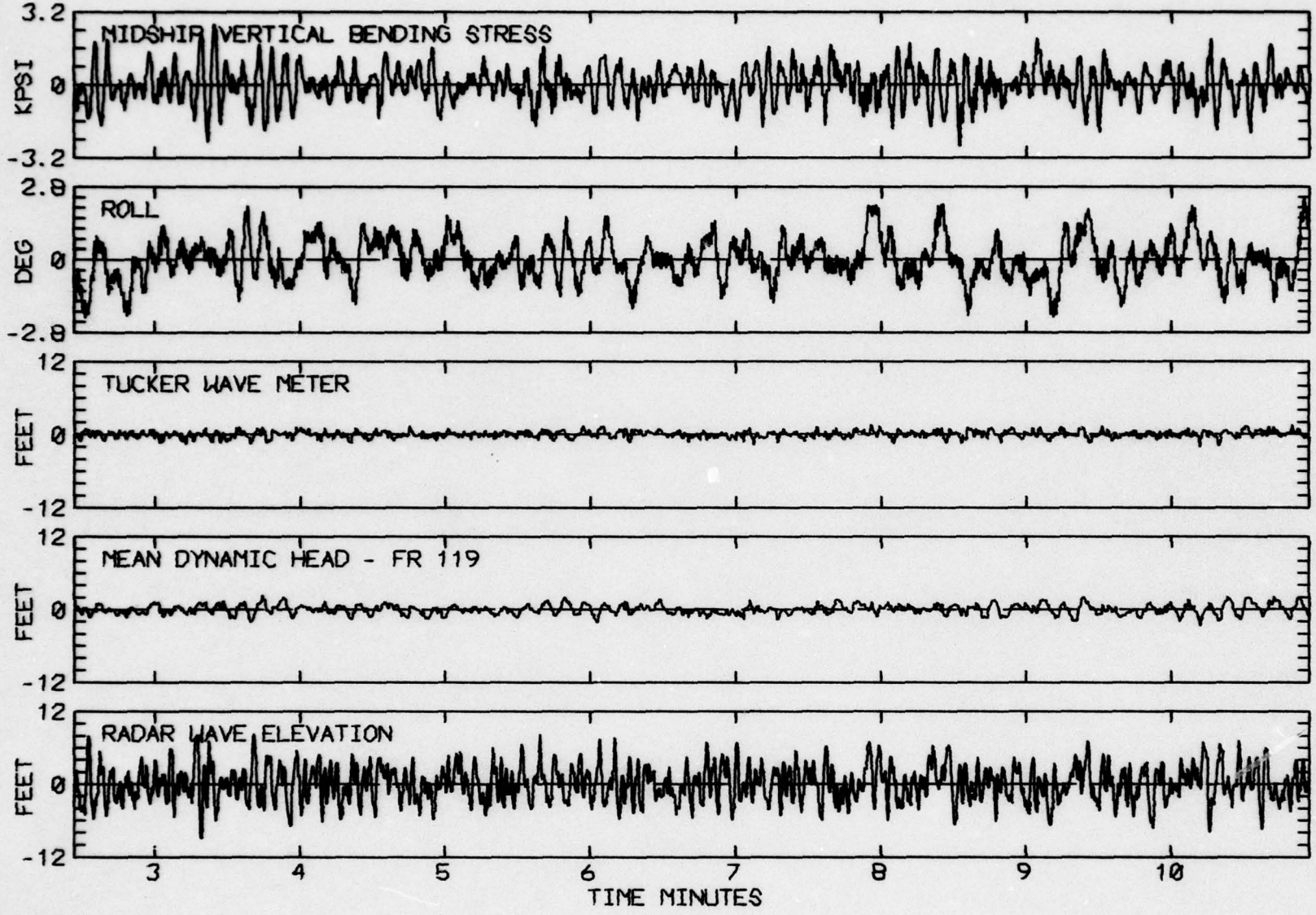
ROLL	3.3 DEG
PITCH	0.82 DEG
DK HSE VERT ACCEL	0.18 G
DK HSE LAT ACCEL	0.10 G
PADAR SLANT RANGE	15.7 FEET
VERTICAL RANGE	14.9 FEET
DTSPL AT RADAR	8.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	780	416	351
MAXIMUM HEIGHT	2.5	4.2	18.2
10TH HIGHEST HTS	1.7	2.7	12.8
3RD HIGHEST HTS	1.3	1.9	10.2
4.0 RMS(SPECTRA)	2.1	2.9	11.7



RUN 1937 -- VOYAGE 36E -- TAPE 175 -- INDEX 10 -- INTERVAL 37



RUN 1937 -- VOYAGE 36E -- TAPE 175 -- INDEX 10 -- INTERVAL 37

LOG BOOK DATA

DATE AND TIME	03-01-74 1200
POSITION	41-36 N 58-10 W
COURSE AND SPEED	078 , 32.1 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	33 PORT
SWELL HEIGHT	3 FEET
" REL DIR	33 PORT

---- VISUAL WEATHER / COMMENTS - - -

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

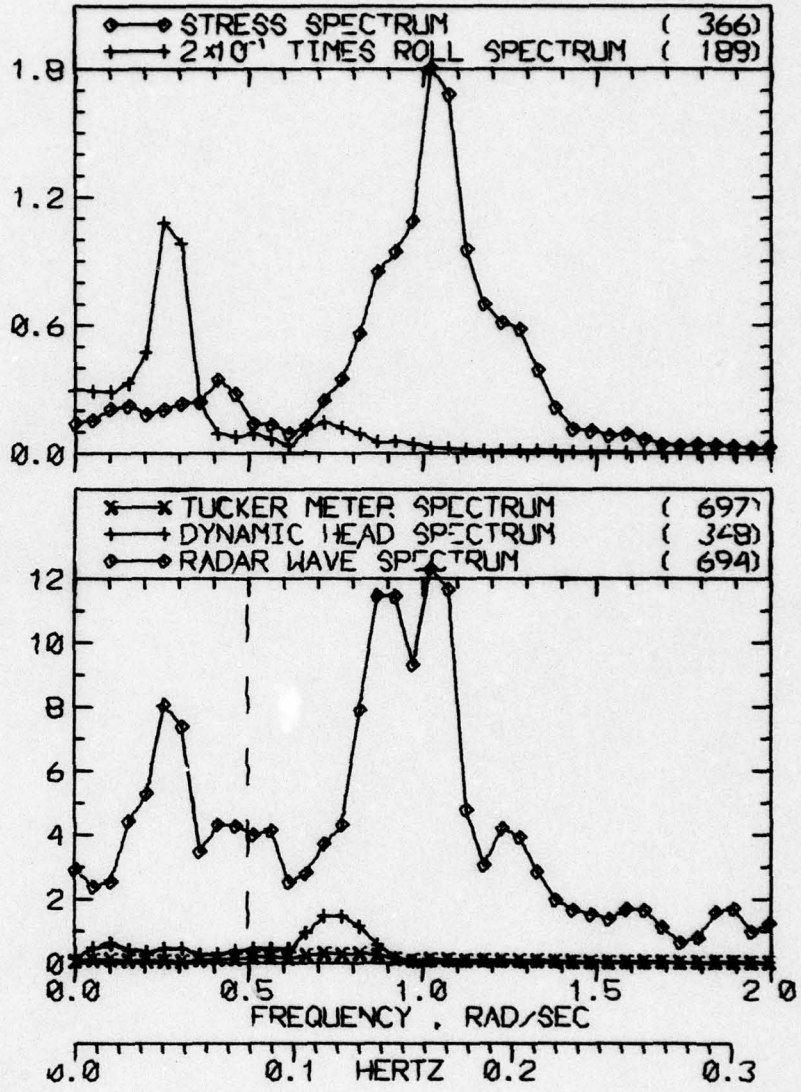
MAXIMUM PK-TR	4.5 KPSI
4.0 X RMS	3.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

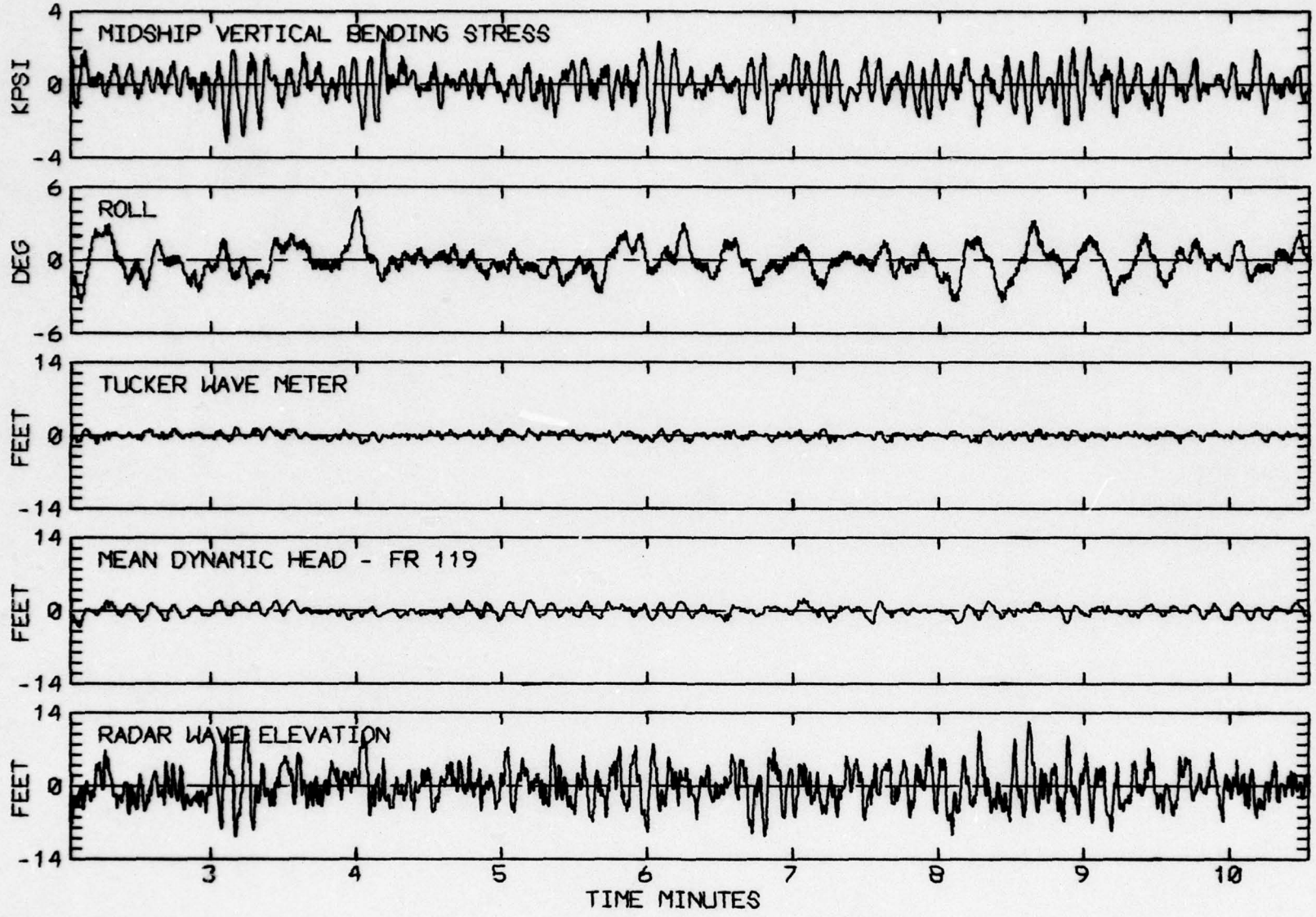
ROLL	4.6 DEG
PITCH	1.00 DEG
DK HSE VERT ACCEL	0.22 G
DK HSE LAT ACCEL	0.13 G
RADAR SLANT RANGE	18.4 FEET
VERTICAL RANGE	17.5 FEET
DISPL AT RADAR	9.9 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	774	422	315
MAXIMUM HEIGHT	3.2	3.8	19.9
10TH HIGHEST HTS	1.8	3.0	14.4
3RD HIGHEST HTS	1.3	2.1	10.7
4.0 RMS(SPECTRAL)	2.1	3.2	12.7



RUN 1941 -- VOYAGE 36E -- TAPE 175 -- INDEX 11 -- INTERVAL 41



RUN 1941 -- VOYAGE 36E -- TAPE 175 -- INDEX 11 -- INTERVAL 41

LOG BOOK DATA

DATE AND TIME	03-01-74 1600
POSITION	44-05 N 42-20 W
COURSE AND SPEED	078 . 32.2 KNOTS
SEA STATE	5
WAVE HEIGHT	3 FEET
" REL DIR	33 PORT
SWELL HEIGHT	3 FEET
" REL DIR	33 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

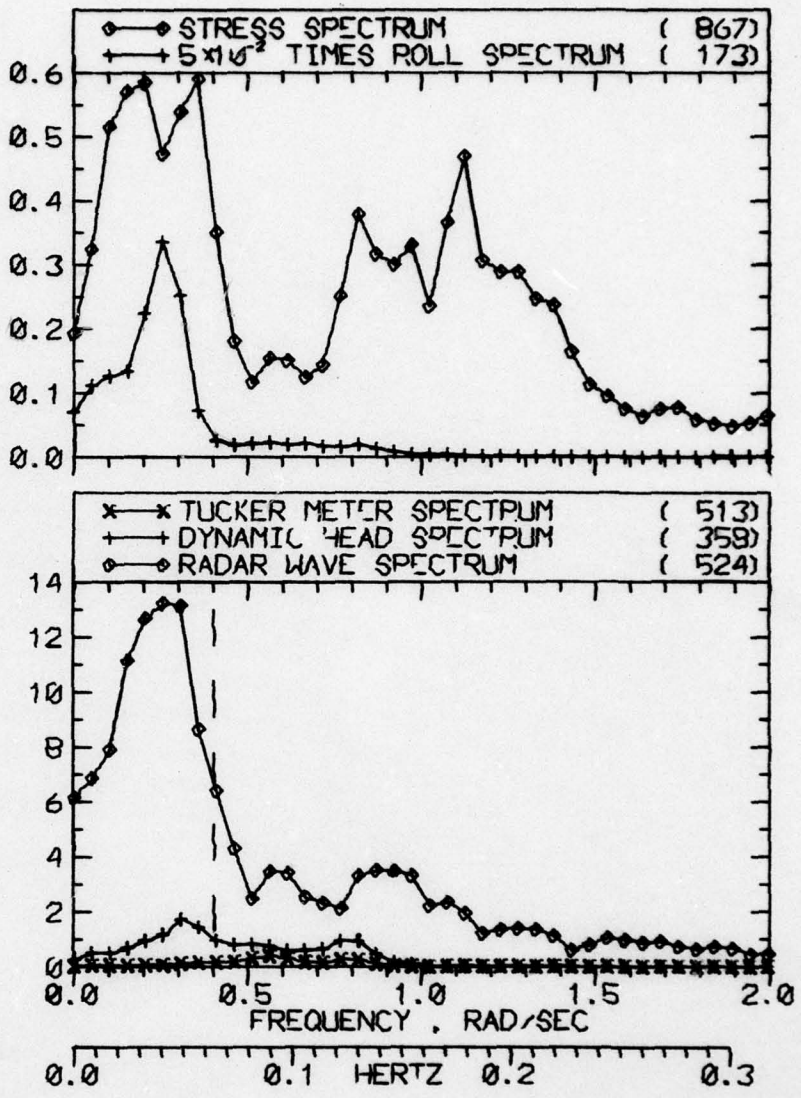
MAXIMUM PK-TR	3.5 KPSI
4.0 X RMS	3.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

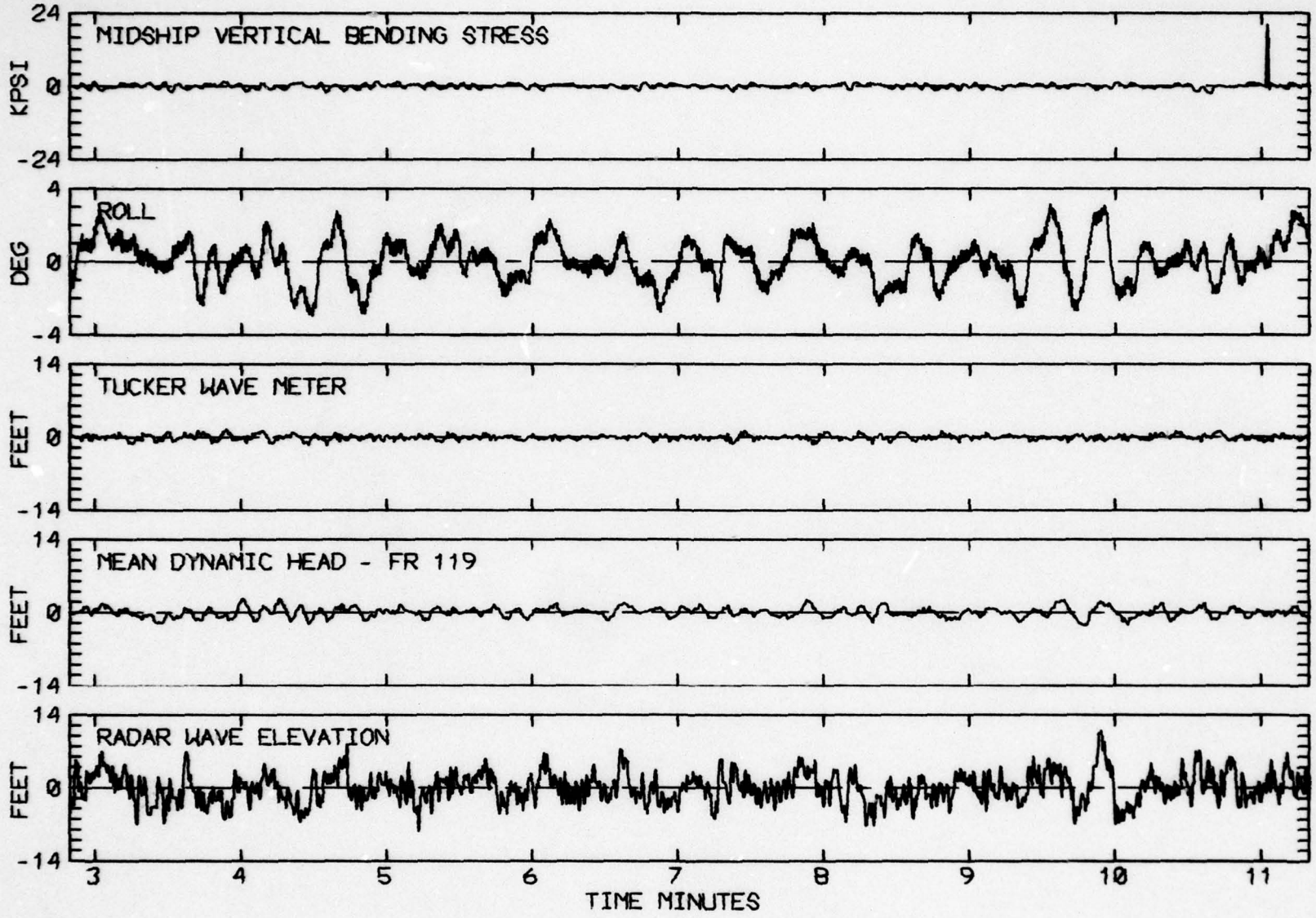
ROLL	5.1 DEG
PITCH	0.73 DEG
DK HSE VERT ACCEL	0.15 G
DK HSE LAT ACCEL	0.13 G
RADAR SLANT RANGE	14.3 FEET
VERTICAL RANGE	13.0 FEET
DISPL AT RADAR	7.8 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	817	356	315
MAXIMUM HEIGHT	2.6	4.3	18.3
10TH HIGHEST HTS	1.5	2.8	10.3
3RD HIGHEST HTS	1.1	1.9	7.8
4.0 RMS(SPECTRA)	2.0	3.6	11.6



RUN 1945 -- VOYAGE 36E -- TAPE 175 -- INDEX 12 -- INTERVAL 45



RUN 1945 -- VOYAGE 36E -- TAPE 175 -- INDEX 12 -- INTERVAL 45

LOG BOOK DATA

DATE AND TIME	03-01-74 2000
POSITION	44-05 N 42-20 W
COURSE AND SPEED	078 . 32.3 KNOTS
SEA STATE	4
WAVE HEIGHT	3 FEET
" REL DIR	55 PORT
SWELL HEIGHT	3 FEET
" REL DIR	33 PORT

---- VISUAL WEATHER / COMMENTS - ..

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

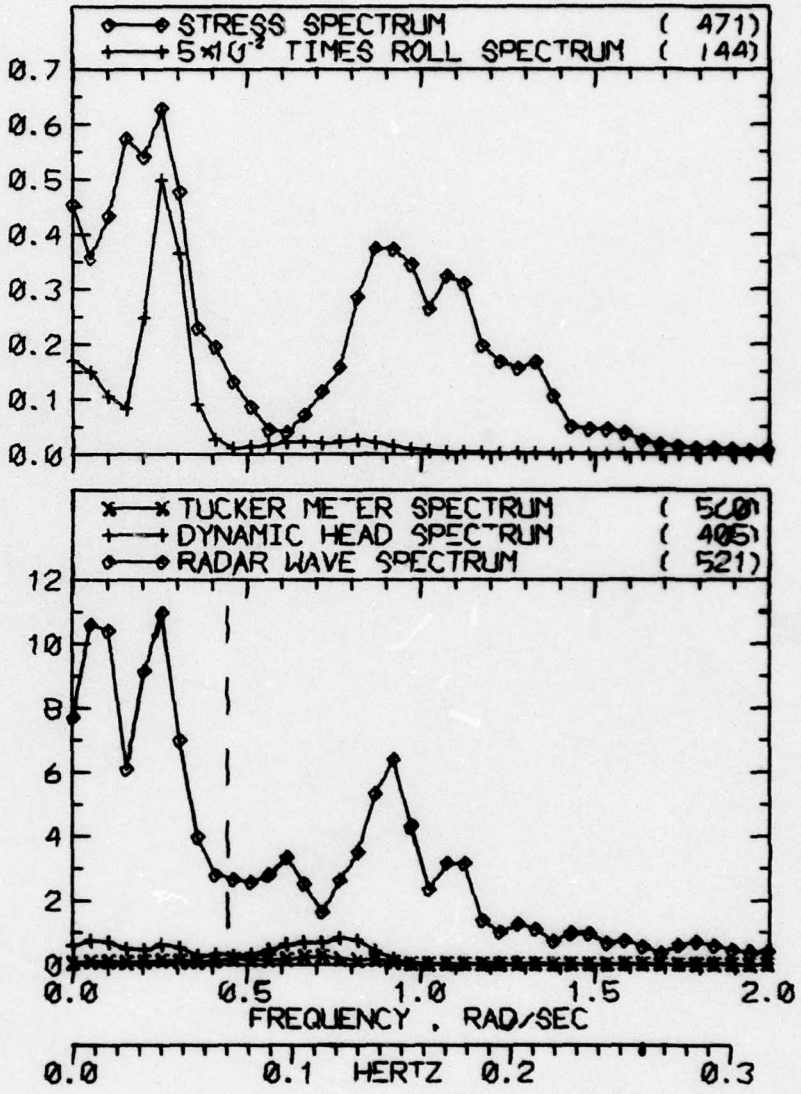
MAXIMUM PK-TP	2.6 KPSI
4.0 X RMS	2.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

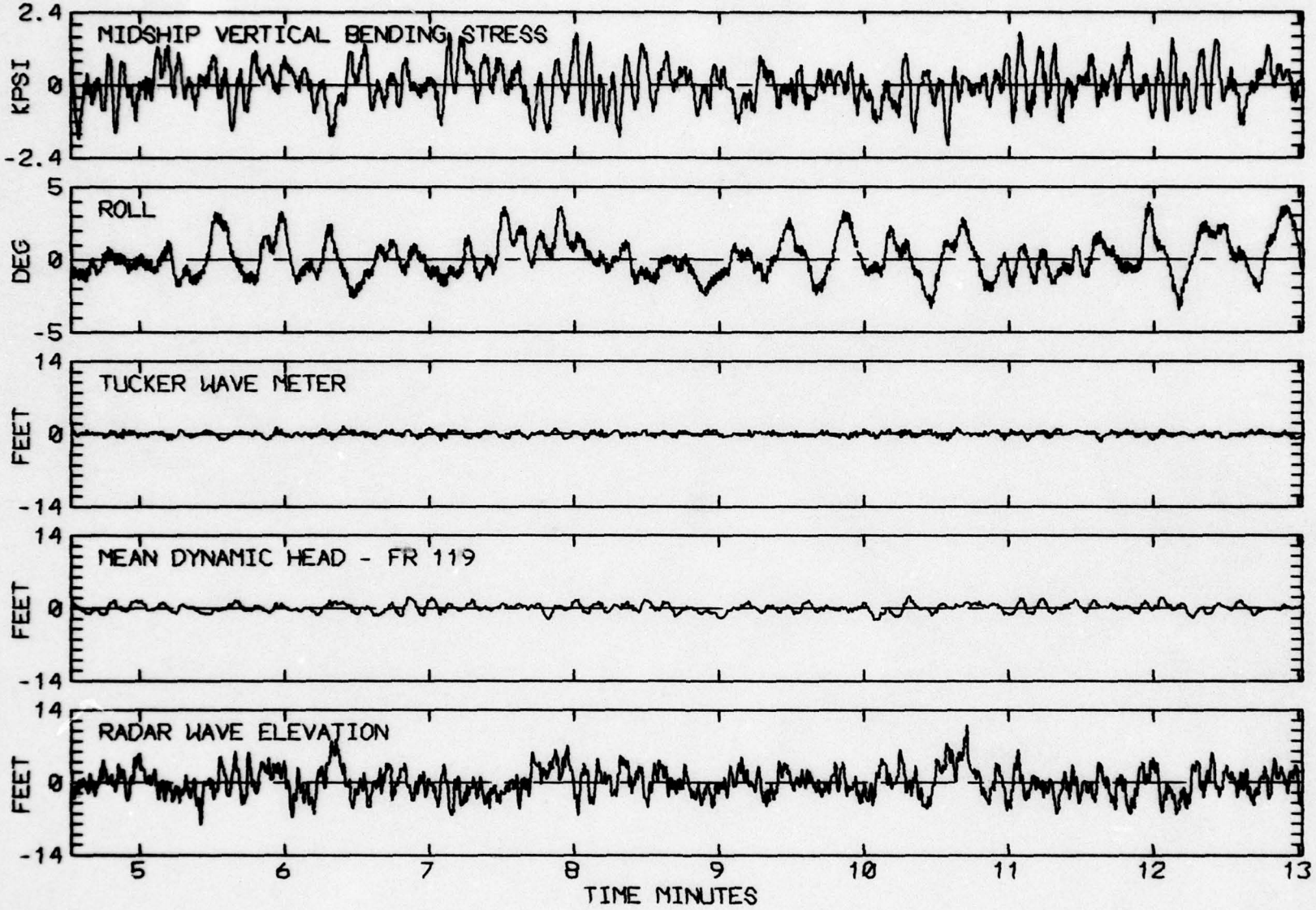
ROLL	5.6 DEG
PITCH	0.76 DEG
DK HSE VERT ACCEL	0.15 G
DK HSE LAT ACCEL	0.14 G
RADAR SLANT RANGE	14.2 FEET
VERTICAL RANGE	13.1 FEET
DISPL AT RADAR	7.2 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	945	427	325
MAXIMUM HEIGHT	1.7	3.8	15.2
10TH HIGHEST HTS	1.4	2.4	9.6
3RD HIGHEST HTS	1.0	1.6	7.1
4.0 RMS(SPECTRA)	1.8	3.0	10.7



RUN 1949 -- VOYAGE 36E -- TAPE 175 -- INDEX 13 -- INTERVAL 49



RUN 1949 -- VOYAGE 36E -- TAPE 175 -- INDEX 13 -- INTERVAL 49

LOG BOOK DATA

DATE AND TIME	03-01-74 2400
POSITION	44-05 N 42-20 W
COURSE AND SPEED	077 . 32.3 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	32 PORT
SWELL HEIGHT	4 FEET
" REL DIR	32 PORT

---- VISUAL WEATHER / COMMENTS ---

CLDY /

MIDSHIP VERTICAL BENDING STRESS

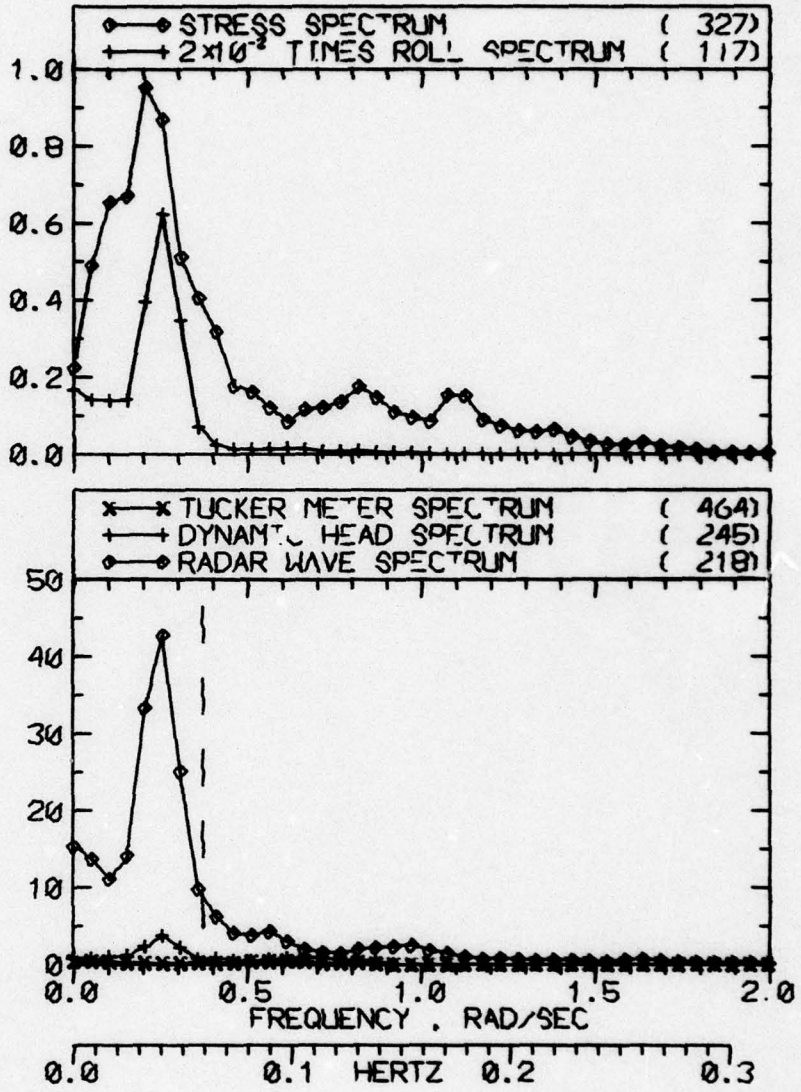
MAXIMUM P-TR	3.3 KPSI
4.0 X RMS	2.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

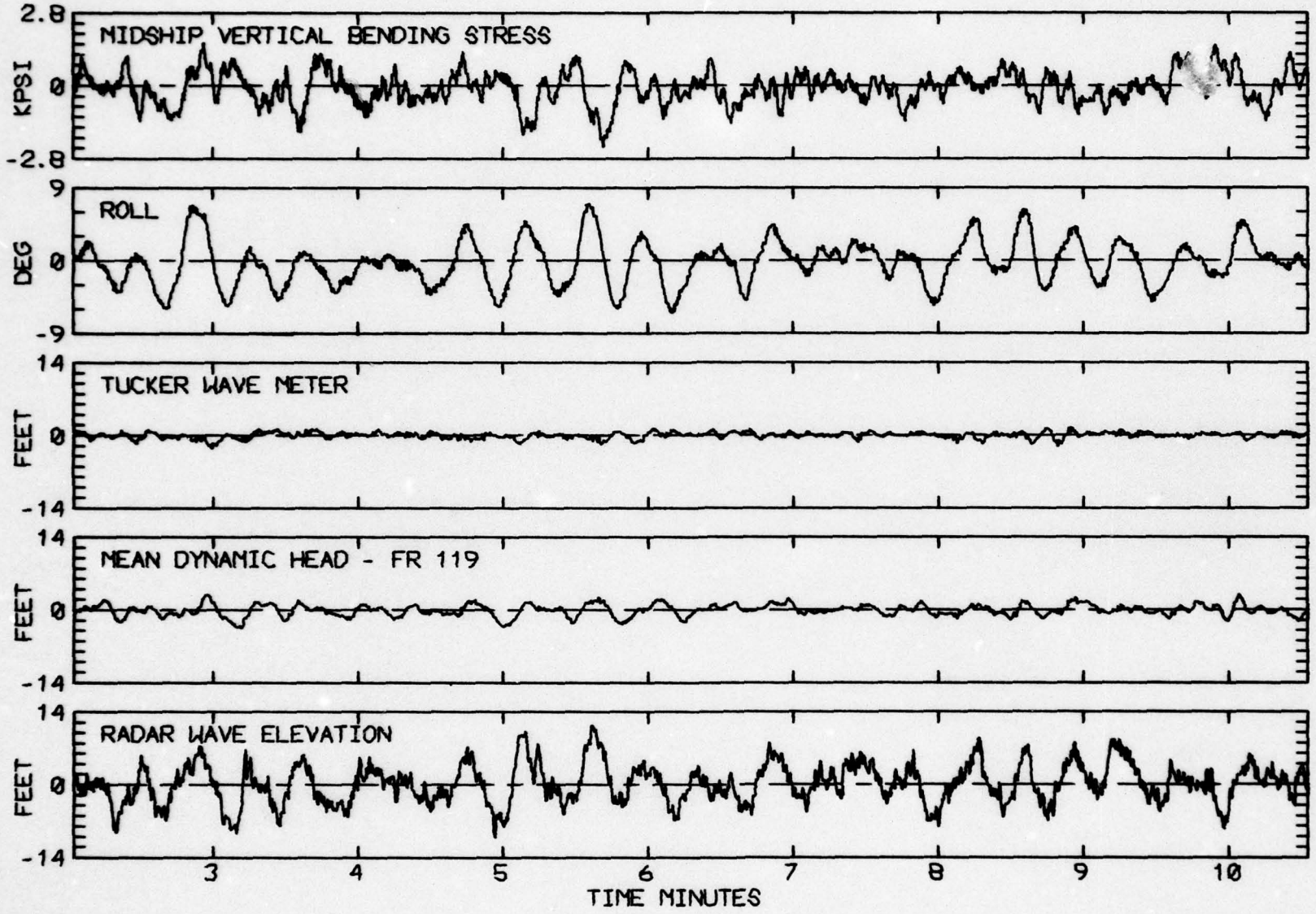
ROLL	9.2 DEG
PITCH	0.72 DEG
DK HSE VERT ACCEL	0.13 G
DK HSE LAT ACCEL	0.21 G
RADAR SLANT RANGE	16.5 FEET
VERTICAL RANGE	13.7 FEET
DISPL AT RADAR	7.0 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	700	303	232
MAXIMUM HEIGHT	2.6	5.1	15.7
10TH HIGHEST HTS	1.6	3.0	11.5
3RD HIGHEST HTS	1.1	2.0	8.2
4.0 RMS(SPECTRA)	2.3	4.0	13.4



RUN 1953 -- VOYAGE 36E -- TAPE 175 -- INDEX 14 -- INTERVAL 53



RUN 1953 -- VOYAGE 36E -- TAPE 175 -- INDEX 14 -- INTERVAL 53

LOG BOOK DATA

DATE AND TIME	03-02-74 0400
POSITION	44-05 N 42-20 W
COURSE AND SPEED	077 . 32.4 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	32 PORT
SWELL HEIGHT	4 FEET
" REL DIR	32 PORT

---- VISUAL WEATHER COMMENTS -- .
OCAST /

MIDSHIP VERTICAL BENDING STRESS

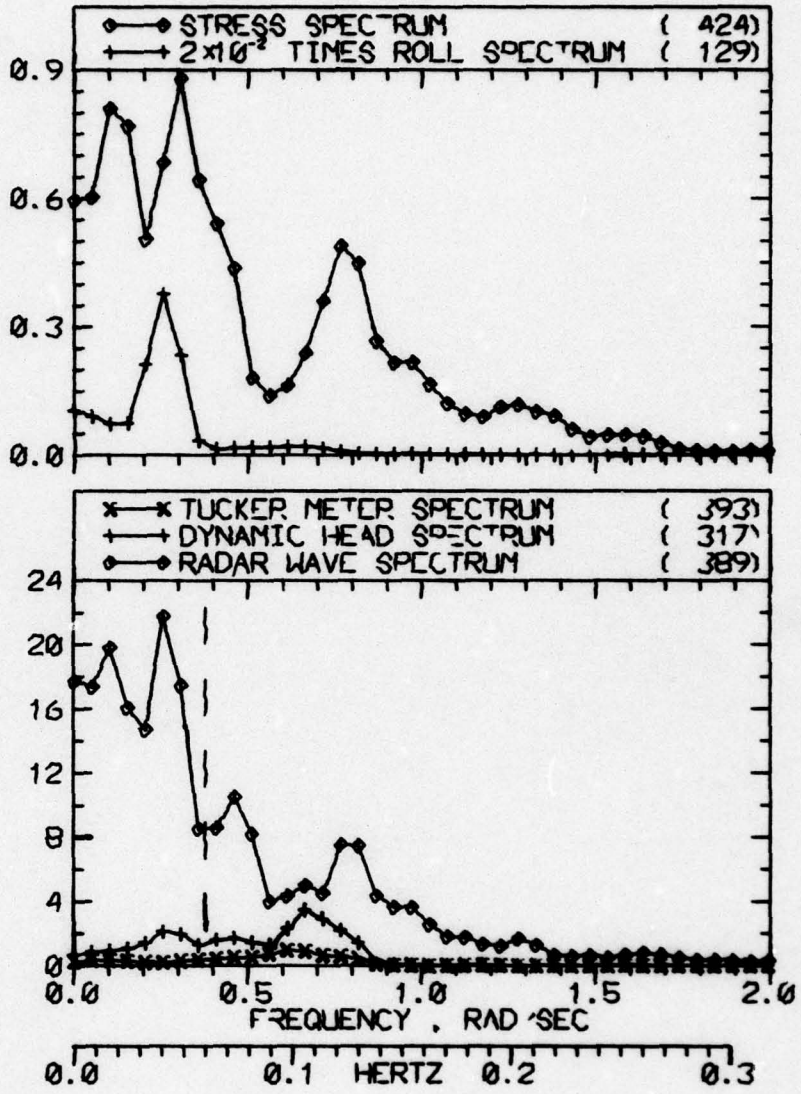
MAXIMUM PK-TR	3.6 KPSI
4.0 X RMS	2.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

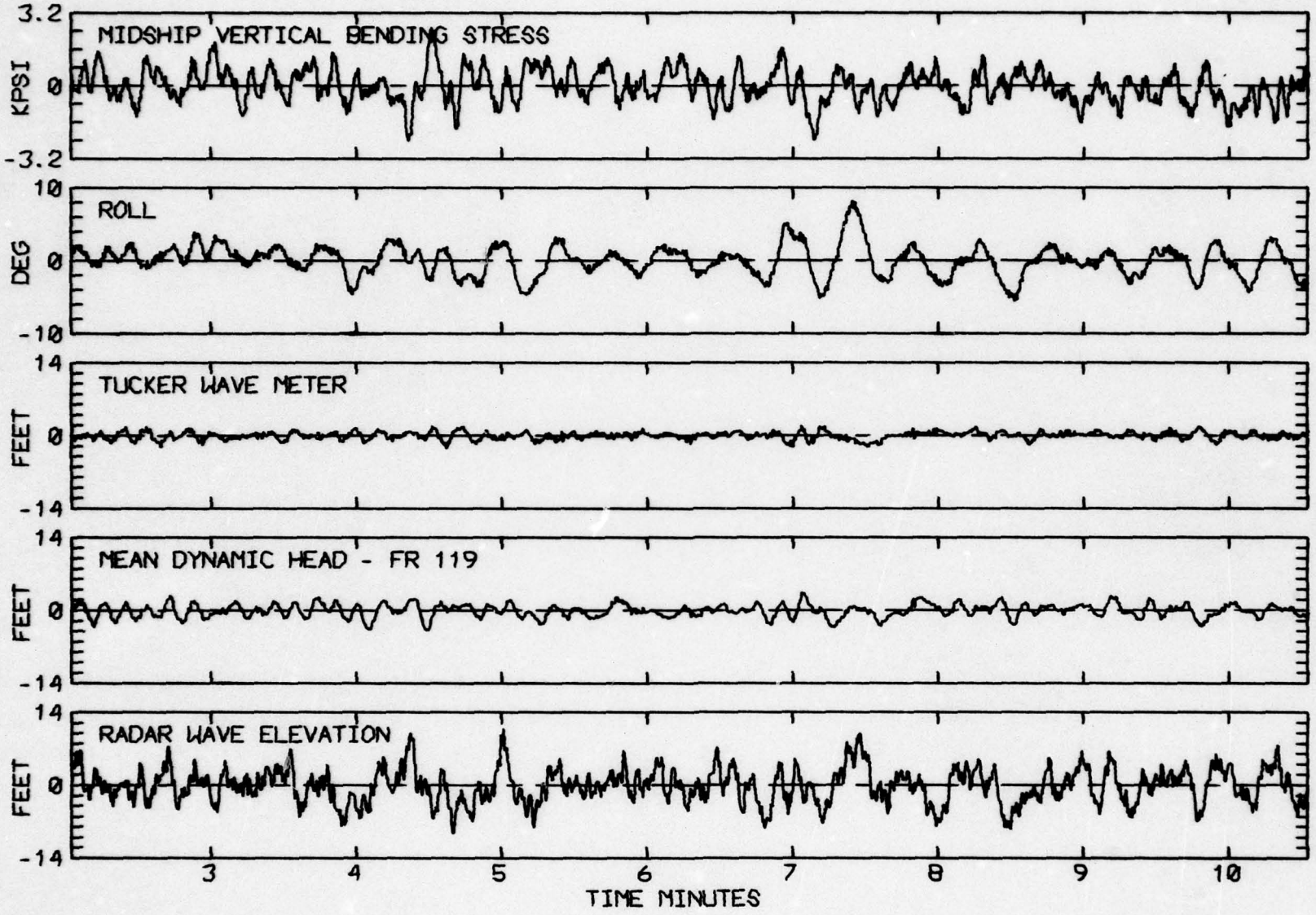
ROLL	7.3 DEG
PITCH	0.87 DEG
DK HSE VERT ACCEL	0.19 G
DK HSE LAT ACCEL	0.19 G
RADAR SLANT RANGE	18.2 FEET
VERTICAL RANGE	15.7 FEET
DISPL AT RADAR	10.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	591	252	240
MAXIMUM HEIGHT	3.8	6.2	19.0
10TH HIGHEST HTS	2.0	4.4	11.8
3RD HIGHEST HTS	1.4	3 1	8.7
4.0 RMS(SPECTRA)	2.8	5.0	13.7



RUN 1957 -- VOYAGE 36E -- TAPE 175 -- INDEX 15 -- INTERVAL 57



RUN 1957 -- VOYAGE 36E -- TAPE 175 -- INDEX 15 -- INTERVAL 57

LOG BOOK DATA

DATE AND TIME	03-02-74 0800
POSITION	44-05 N 42-20 W
COURSE AND SPEED	077 . 32.2 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	
SWELL HEIGHT	6 FEET
" REL DIR	

---- VISUAL WEATHER COMMENTS ----

CLDY /LONG CONFUSED SWELL

MIDSHIP VERTICAL BENDING STRESS

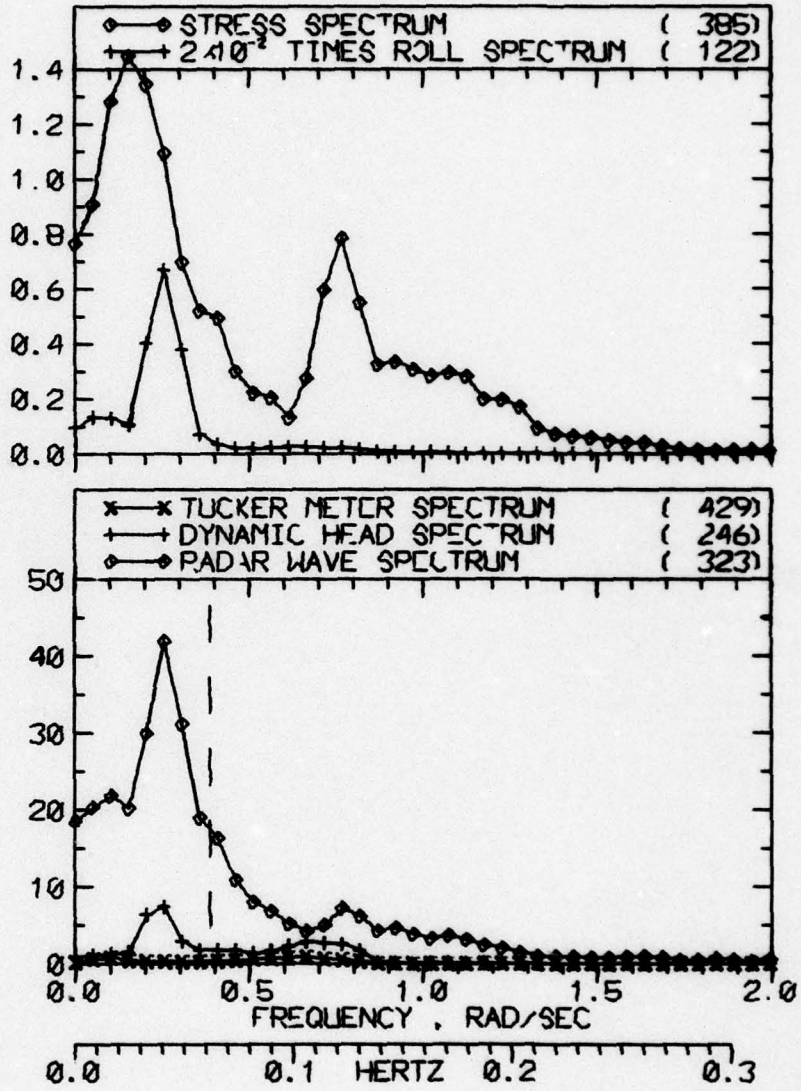
MAXIMUM PK-TR	4.1 KPSI
4.0 X RMS	3.5 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

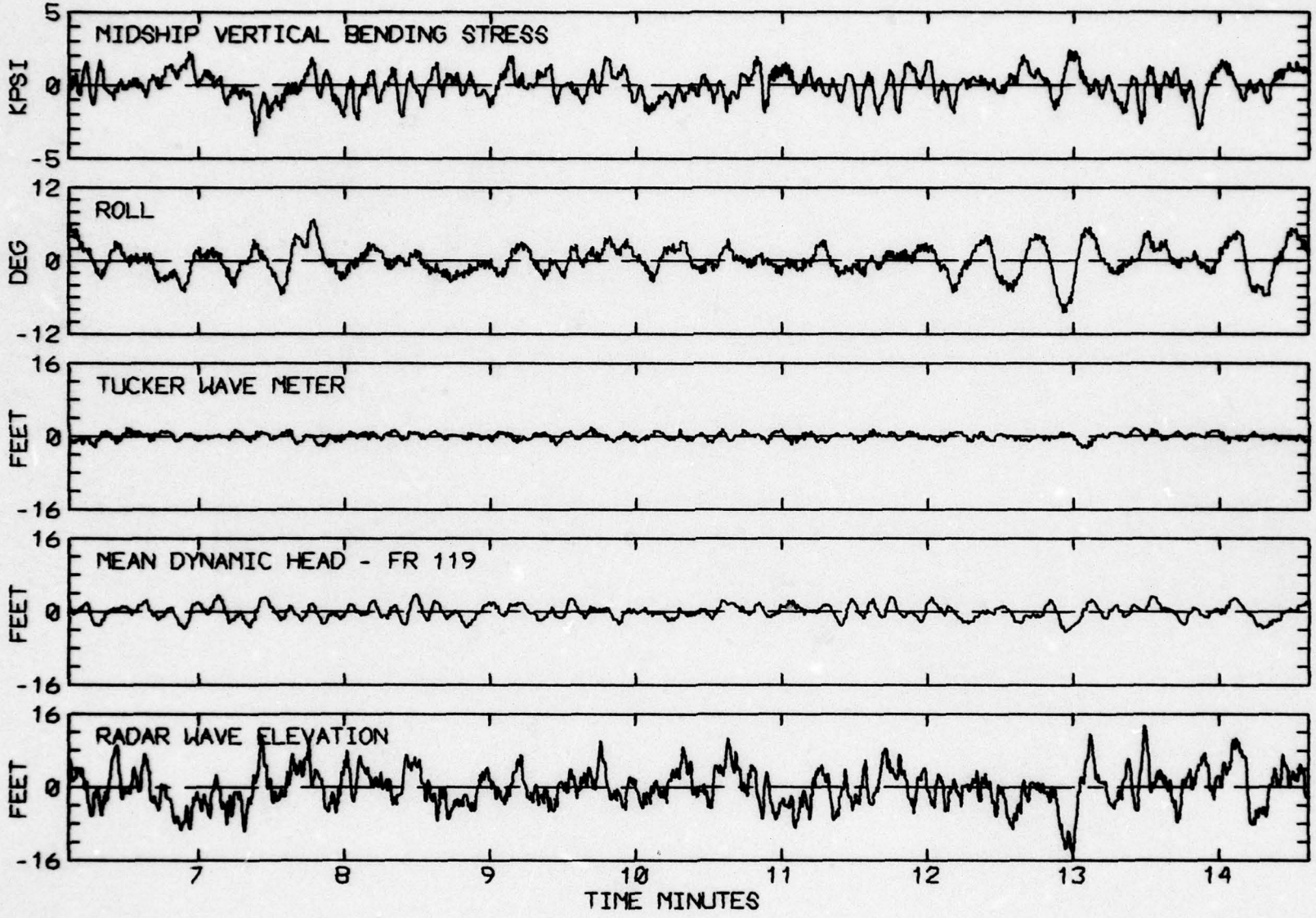
POLL	9.6 DEG
PITCH	1.04 DEG
DK HSE VERT ACCEL	0.20 G
DK HSE LAT ACCEL	0.23 G
RADAR SLANT RANGE	19.9 FEET
VERTICAL RANGE	17.5 FEET
DISPL AT RADAR	11.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	529	229	191
MAXIMUM HEIGHT	3.8	7.8	20.1
10TH HIGHEST HTS	2.4	5.2	14.9
3RD HIGHEST HTS	1.6	3.7	11.0
4.0 RMS(SPECTRA)	3.0	6.0	16.1



RUN 1961 -- VOYAGE 36E -- TAPE 175 -- INDEX 16 -- INTERVAL 61



RUN 1961 -- VOYAGE 36E -- TAPE 175 -- INDEX 16 -- INTERVAL 61

LOG BOOK DATA

DATE AND TIME	03-02-74 1200
POSITION	44-05 N 42-20 W
COURSE AND SPEED	077 . 32.1 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	
SWELL HEIGHT	6 FEET
" REL DIR	

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

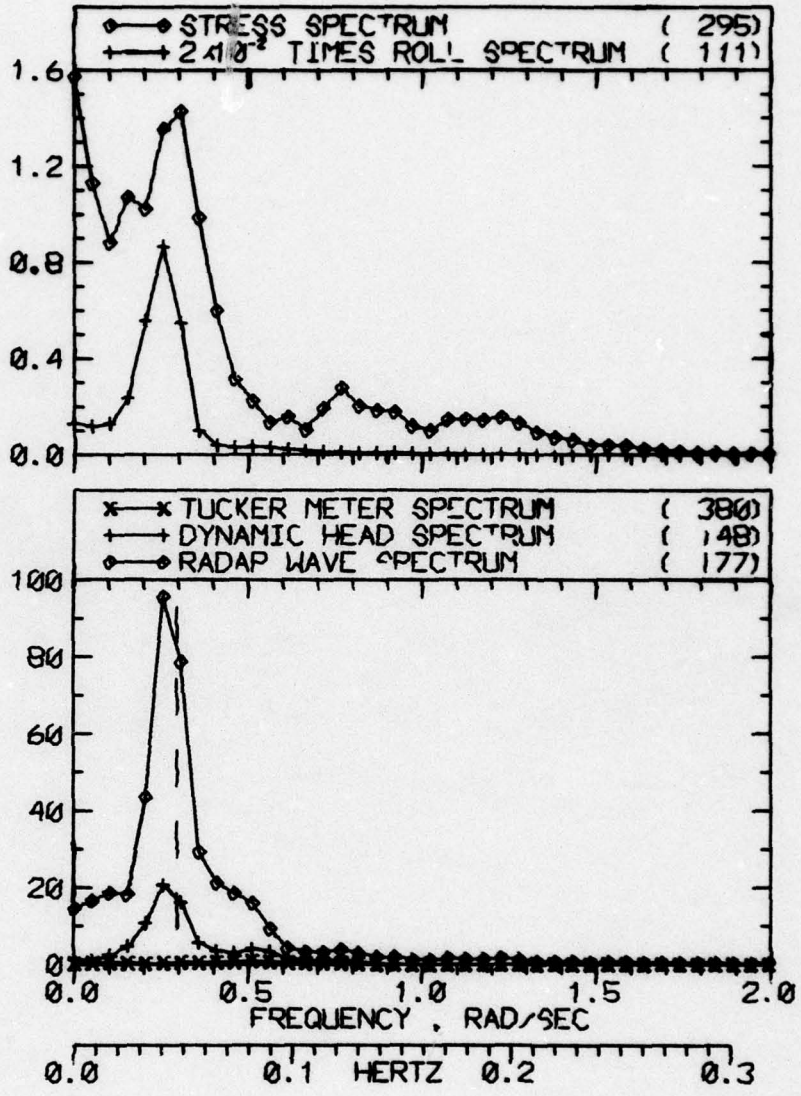
MAXIMUM PK-TR	3.8 KPSI
4.0 X RMS	3.2 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

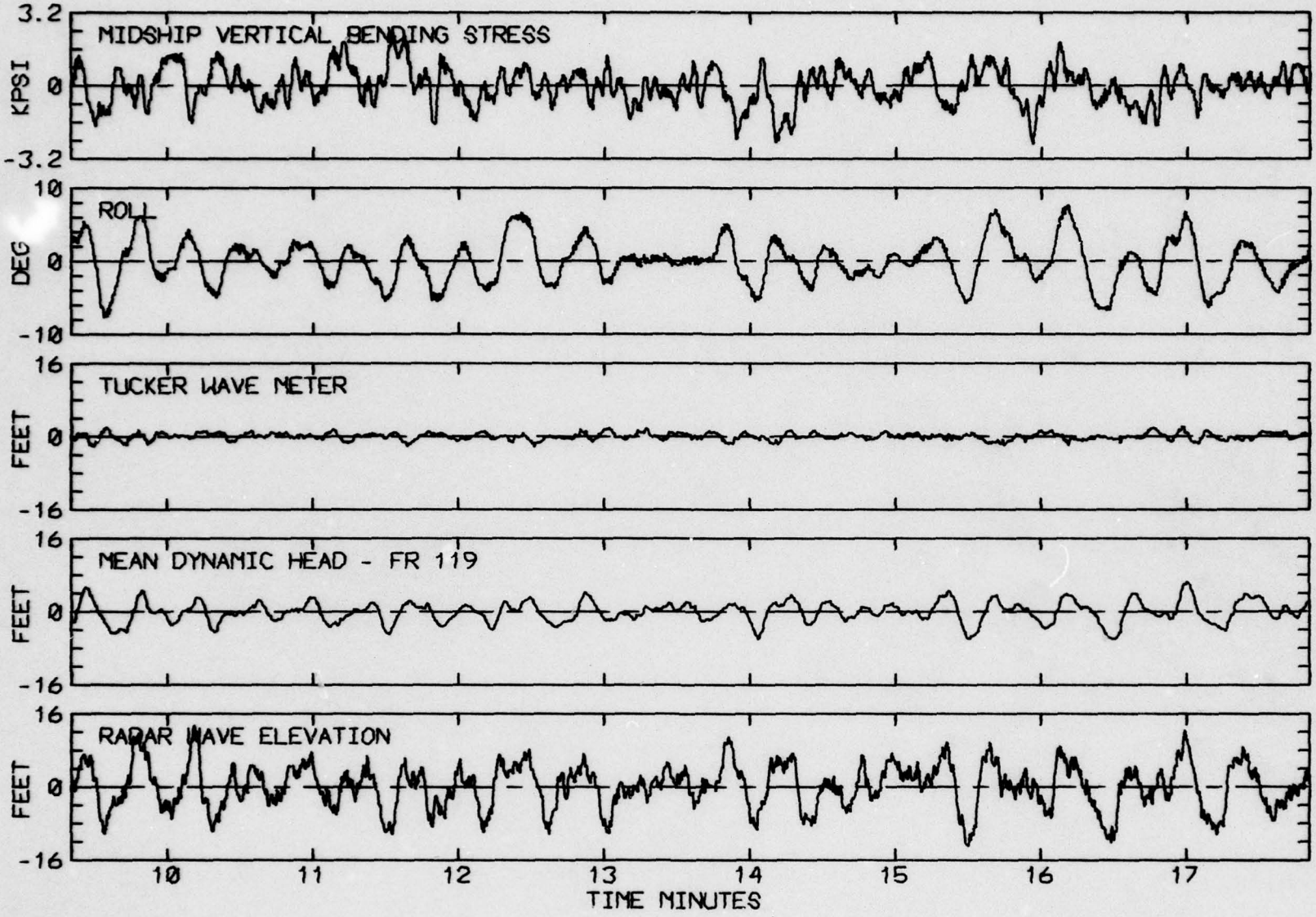
ROLL	10.8 DEG
PITCH	0.75 DEG
DK HSE VERT ACCEL	0.16 G
DK HSE LAT ACCEL	0.25 G
RADAR SLANT RANGE	19.2 FEET
VERTICAL RANGE	15.9 FEET
DISPL AT RADAR	11.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	557	153	162
MAXIMUM HEIGHT	3.3	11.4	23.6
10TH HIGHEST HTS	1.8	7.8	18.9
3RD HIGHEST HTS	1.3	5.1	12.8
4.0 RMS(SPECTRA)	2.9	8.2	18.7



RUN 2001 -- VOYAGE 36E -- TAPE 177 -- INDEX 17 -- INTERVAL 1



RUN 2001 -- VOYAGE 36E -- TAPE 177 -- INDEX 17 -- INTERVAL 1

LOG BOOK DATA

DATE AND TIME	03-02-74 1600
POSITION	46-36 N 25-47 W
COURSE AND SPEED	078 . 32.4 KNOTS
SEA STATE	2
WAVE HEIGHT	2 FEET
" REL DIR	78 PORT
SWELL HEIGHT	6 FEET
" REL DIR	123 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

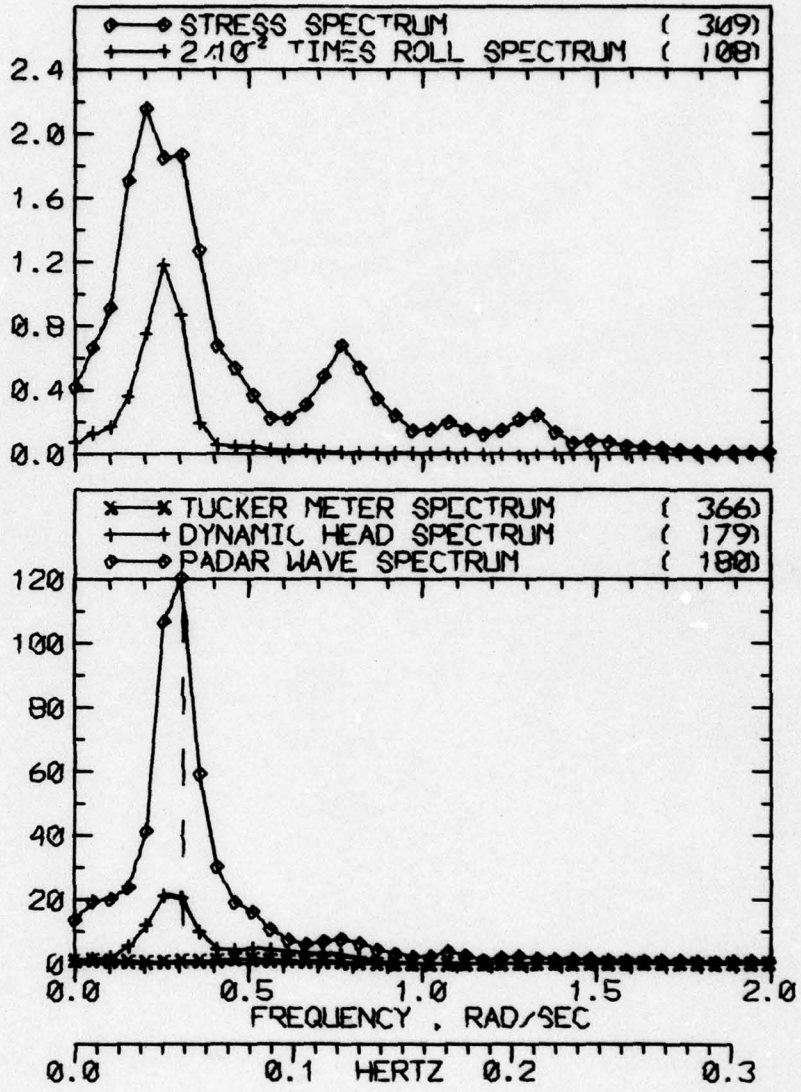
MAXIMUM PK-TR	6.2 KPSI
4.0 X RMS	3.8 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

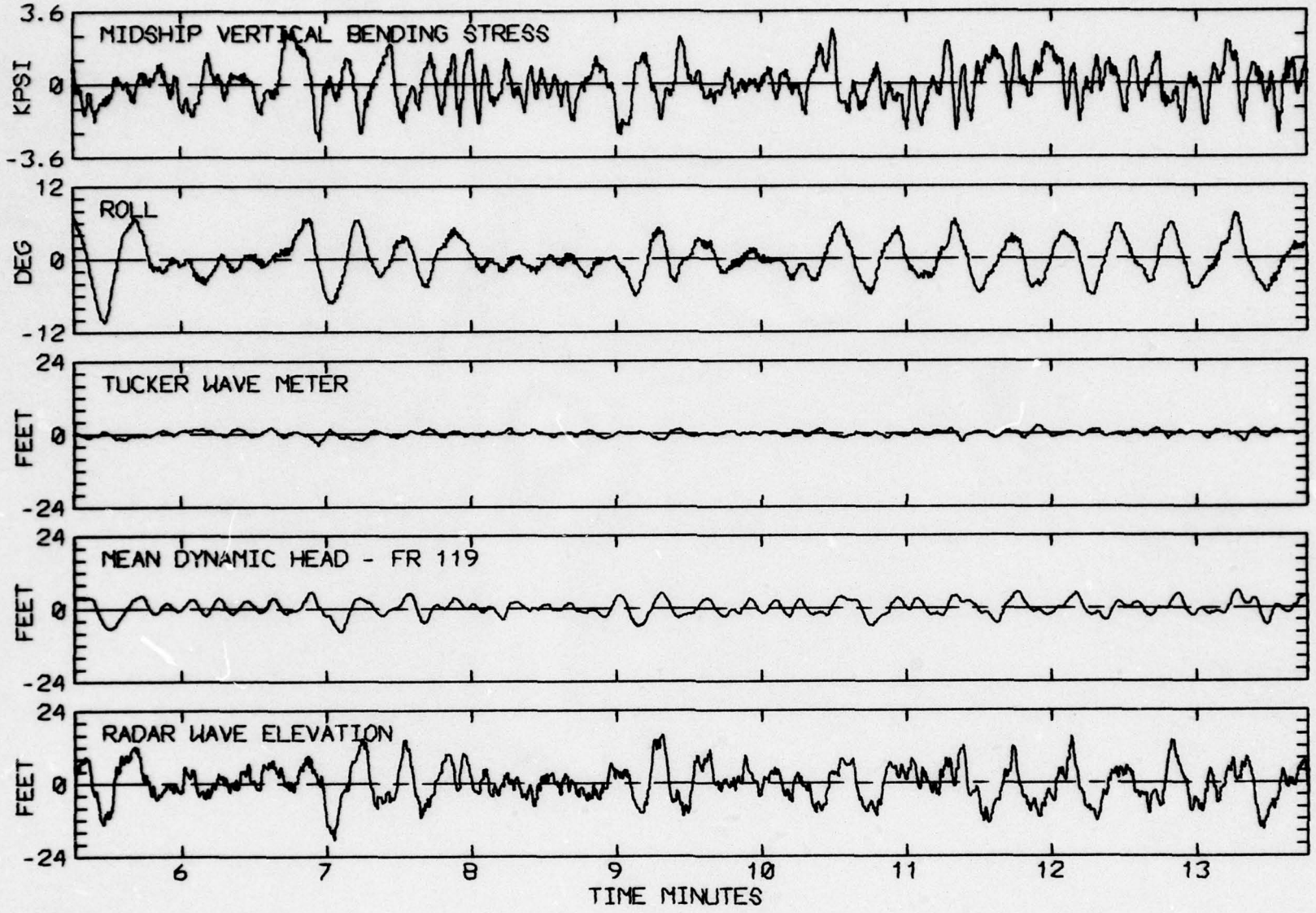
ROLL	12.7 DEG
PITCH	0.85 DEG
DK HSE VERT ACCEL	0.20 G
DK HSE LAT ACCEL	0.29 G
RADAR SLANT RANGE	22.3 FEET
VERTICAL RANGE	19.1 FEET
DISPL AT RADAR	14.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	449	128	147
MAXIMUM HEIGHT	4.6	13.3	27.9
10TH HIGHEST HTS	2.3	10.3	22.4
3RD HIGHEST HTS	1.5	7.2	15.7
4.0 RMS(SPECTRA)	3.6	9.3	21.4



RUN 2005 -- VOYAGE 36E -- TAPE 177 -- INDEX 18 -- INTERVAL 5



RUN 2005 -- VOYAGE 36E -- TAPE 177 -- INDEX 18 -- INTERVAL 5

LOG BOOK DATA

DATE AND TIME	03-02-74 2000
POSITION	46 36 N 25-47 W
COURSE AND SPEED	077 . 32.4 KNOTS
SEA STATE	4
WAVE HEIGHT	2 FEET
" REL DIR	99 PORT
SWELL HEIGHT	6 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

CLDY /

MIDSHIP VERTICAL BENDING STRESS

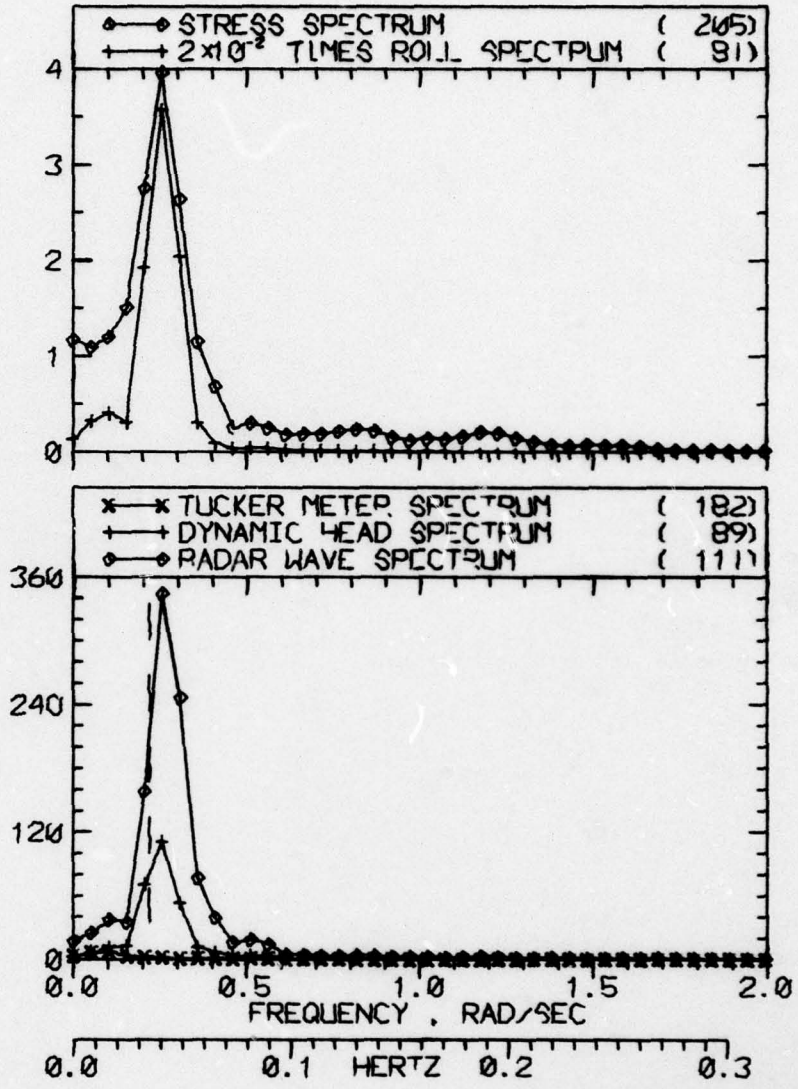
MAXIMUM PK-TR	4.4 KPSI
4.0 X RMS	4.0 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

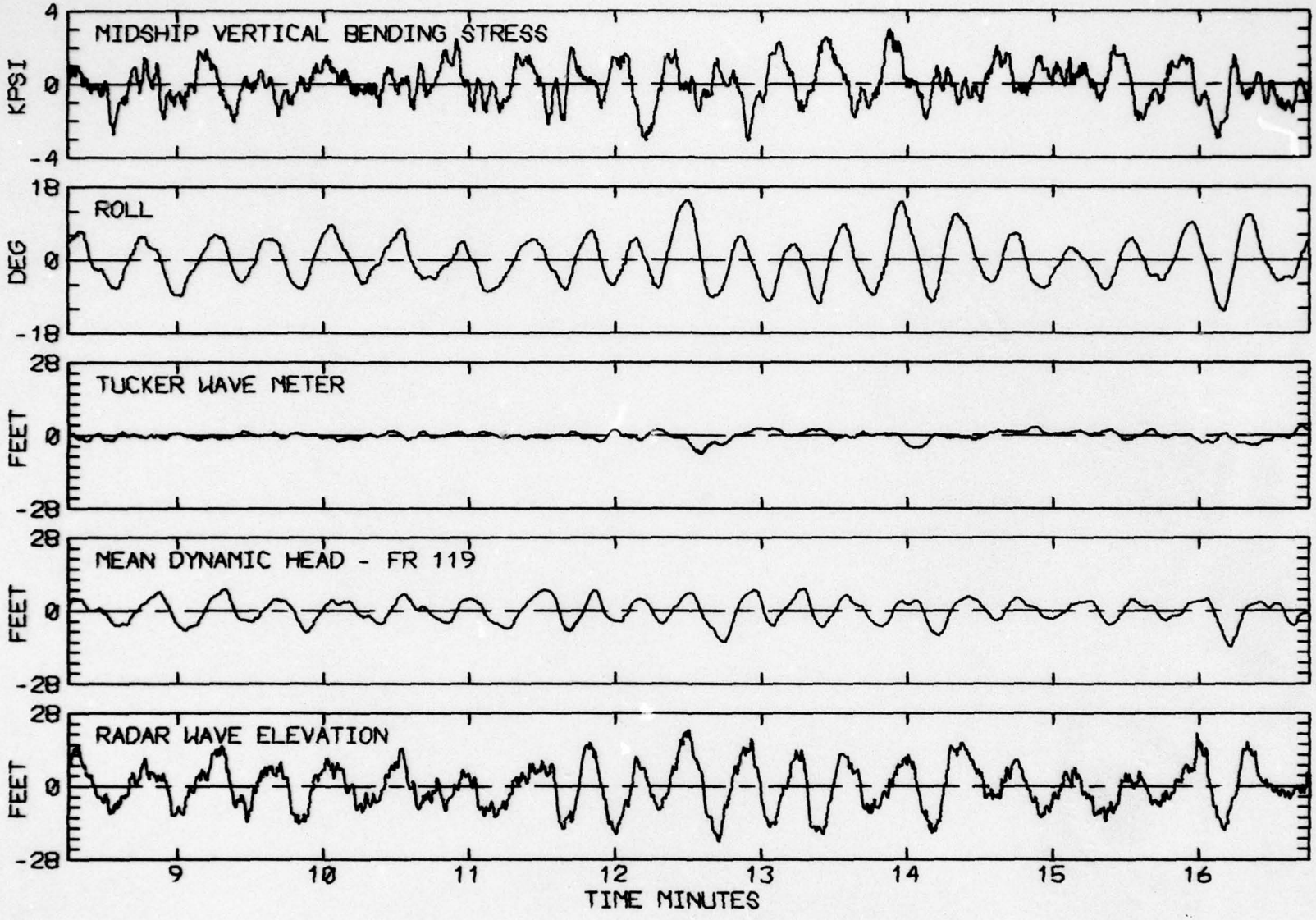
ROLL	19.5 DEG
PITCH	0.79 DEG
DK HSE VERT ACCEL	0.17 G
DK HSE LAT ACCEL	0.43 G
RADAR SLANT RANGE	27.3 FEET
VERTICAL RANGE	21.9 FEET
DISPL AT RADAR	16.5 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	374	86	106
MAXIMUM HEIGHT	4.1	19.4	42.8
10TH HIGHEST HTS	2.7	15.1	32.6
3RD HIGHEST HTS	1.7	11.9	24.3
4.0 RMS(SPECTRA)	5.3	15.8	29.9



RUN 2010 -- VOYAGE 36E -- TAPE 177 -- INDEX 19 -- INTERVAL 10



RUN 2010 -- VOYAGE 36E -- TAPE 177 -- INDEX 19 -- INTERVAL 10

LOG BOOK DATA

DATE AND TIME	03-02-74 2400
POSITION	46-36 N 25-47 W
COURSE AND SPEED	078 . 32.2 KNOTS
SEA STATE	3
WAVE HEIGHT	4 FEET
" REL DIR	78 PORT
SWELL HEIGHT	6 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

CLDY /

MIDSHIP VERTICAL BENDING STRESS

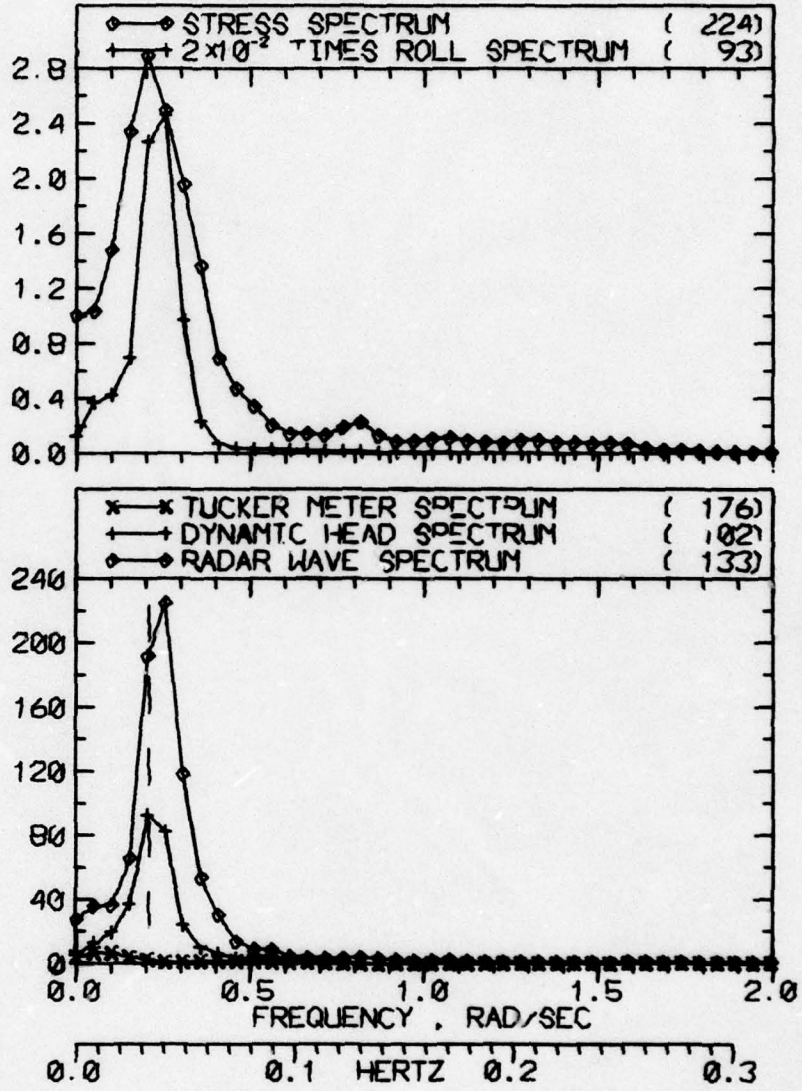
MAXIMUM PK-TR	4.7 KPSI
4.0 X RMS	3.9 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

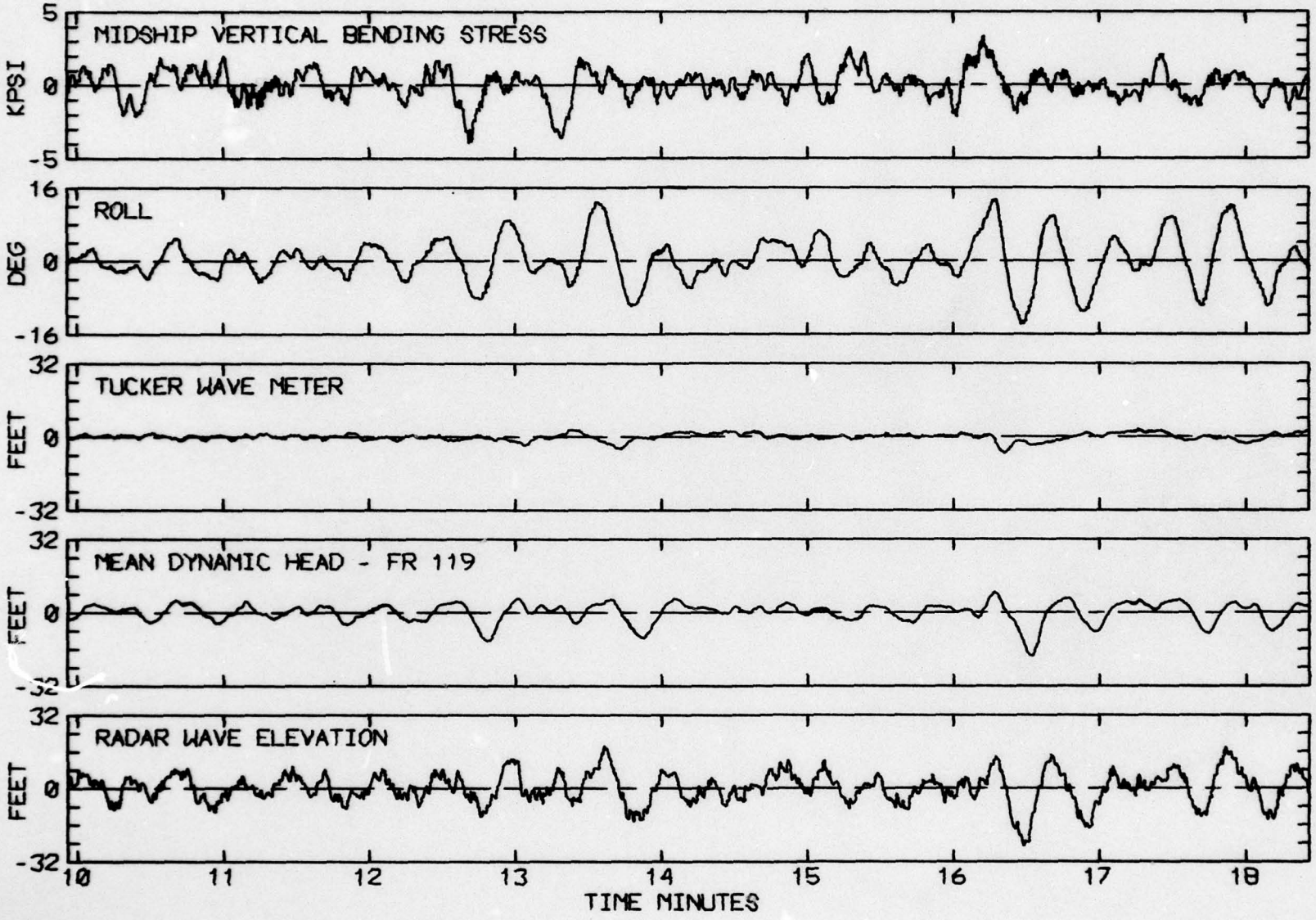
ROLL	17.8 DEG
PITCH	0.79 DEG
DK HSE VERT ACCEL	0.14 G
DK HSE LAT ACCEL	0.38 G
RADAR SLANT RANGE	24.4 FEET
VERTICAL RANGE	19.0 FEET
DISPL AT RADAR	15.1 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN. HEAD/RADAR		
P-T SAMPLE SIZE	328	66	118
MAXIMUM HEIGHT	6.6	28.3	39.3
10TH HIGHEST HTS	3.2	17.8	27.2
3RD HIGHEST HTS	2.0	12.7	19.0
4.0 RMS(SPECTRA)	5.2	15.8	26.6



RUN 2013 -- VOYAGE 36E -- TAPE 177 -- INDEX 20 -- INTERVAL 13



RUN 2013 -- VOYAGE 36E -- TAPE 177 -- INDEX 20 -- INTERVAL 13

LOG BOOK DATA

DATE AND TIME	03-03 74 0400
POSITION	46-36 N 25-47 W
COURSE AND SPEED	078 . 32.5 KNOTS
SEA STATE	4
WAVE HEIGHT	4 FEET
" REL DIR	78 PORT
SWELL HEIGHT	6 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

CLDY /

MIDSHIP VERTICAL BENDING STRESS

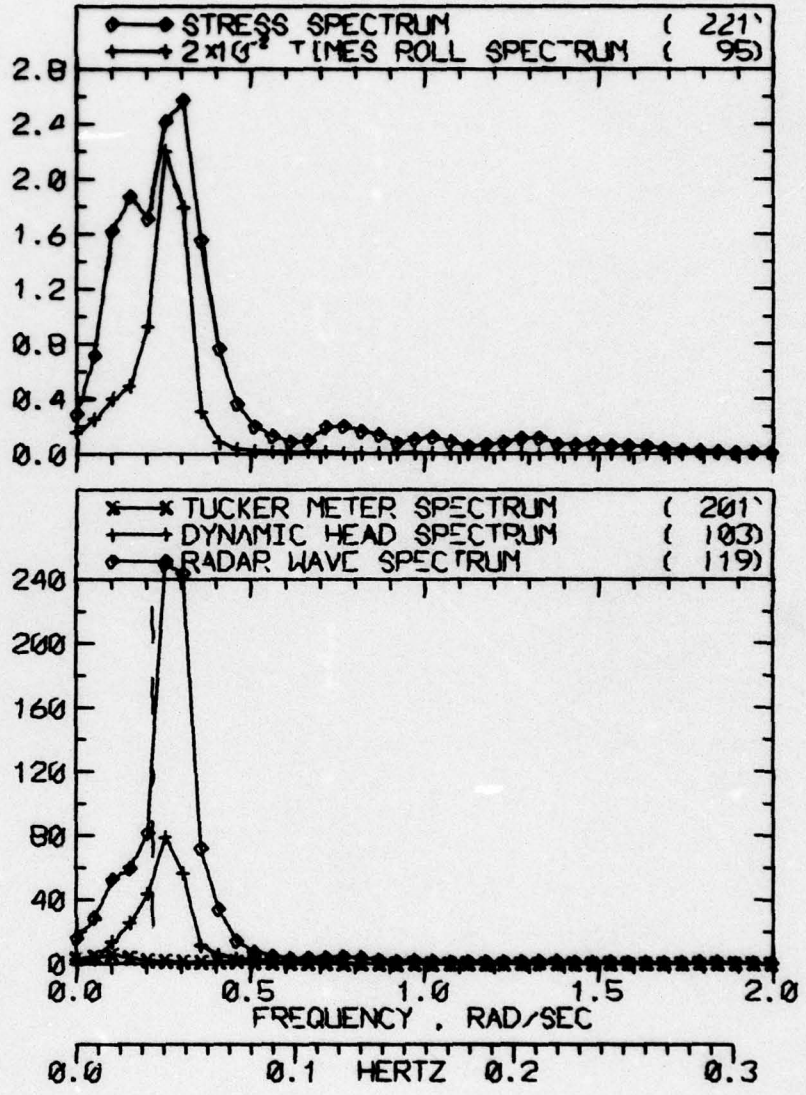
MAXIMUM PK-TR	4.8 KPSI
4.0 X RMS	3.7 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

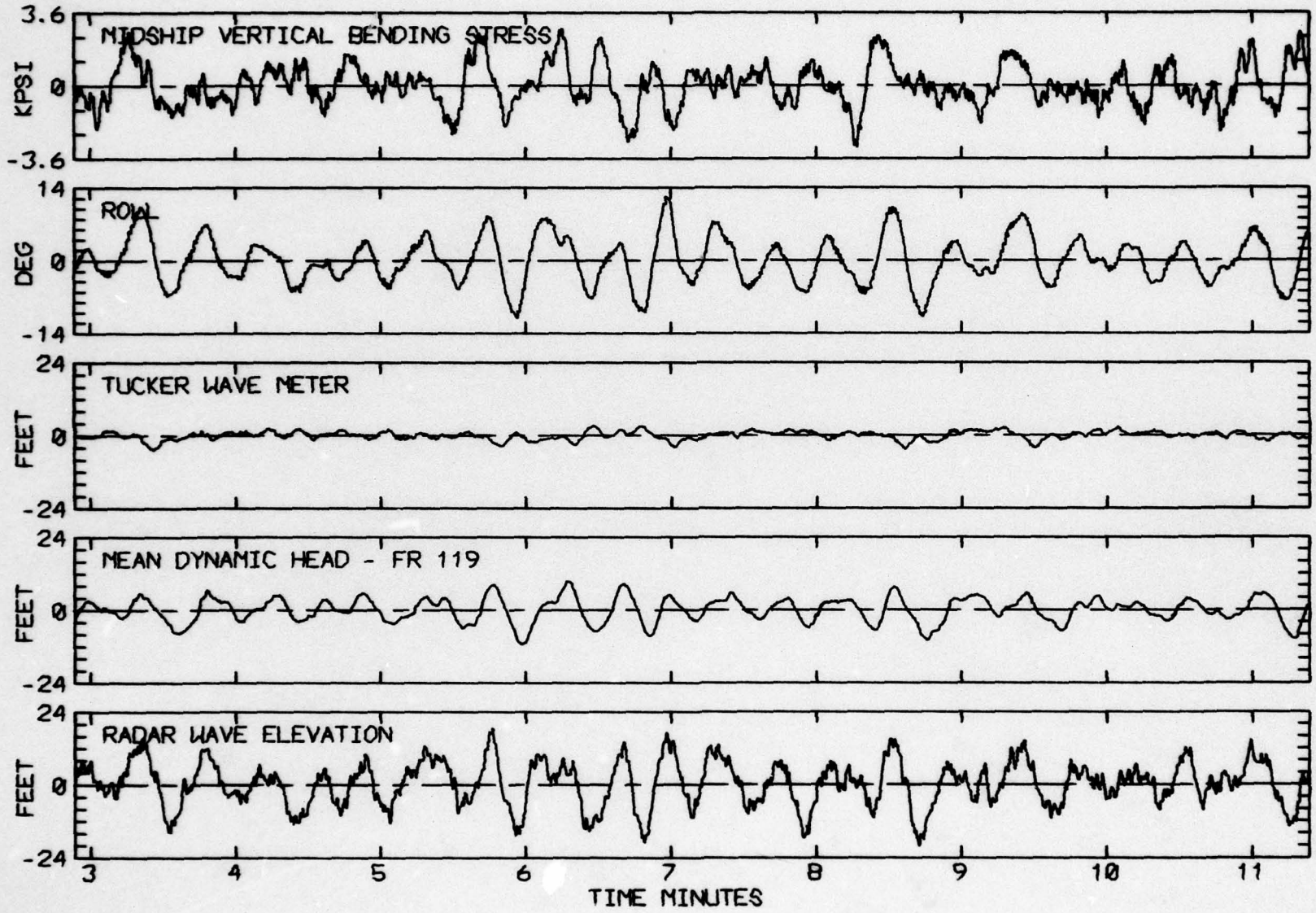
POLL	16.6 DEG
PITCH	0.79 DEG
DK HSE VERT ACCEL	0.14 G
DK HSE LAT ACCEL	0.37 G
RADAR SLANT RANGE	25.2 FEET
VERTICAL RANGE	20.2 FEET
DISPL AT RADAR	14.7 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	392	81	119
MAXIMUM HEIGHT	5.1	19.9	35.6
10TH HIGHEST HTS	3.0	15.0	28.1
3RD HIGHEST HTS	1.9	10.8	19.1
4.0 RMS(SPECTRA)	4.9	14.4	27.5



RUN 2017 -- VOYAGE 36E -- TAPE 177 -- INDEX 21 -- INTERVAL 17



RUN 2017 -- VOYAGE 36E -- TAPE 177 -- INDEX 21 -- INTERVAL 17

LOG BOOK DATA

DATE AND TIME	03-03-74 0800
POSITION	46-36 N 25-47 W
COURSE AND SPEED	077 . 32.4 KNOTS
SEA STATE	4
WAVE HEIGHT	5 FEET
" REL DIR	54 PORT
SWELL HEIGHT	6 FEET
" REL DIR	124 PORT

---- VISUAL WEATHER / COMMENTS ----

PT CLDY /

MIDSHIP VERTICAL BENDING STRESS

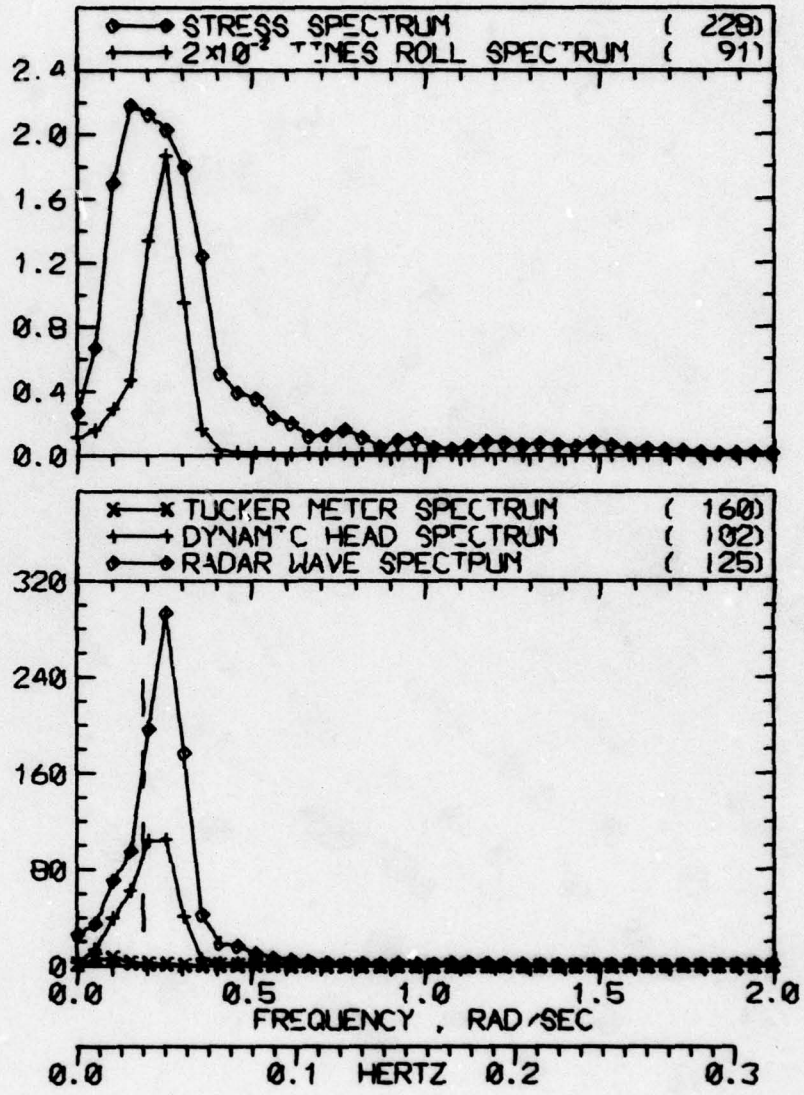
MAXIMUM PK-TR	5.7 KPSI
4.0 X RMS	3.6 KPSI

SUMMARY OF MOTIONS (4.0 X RMS)

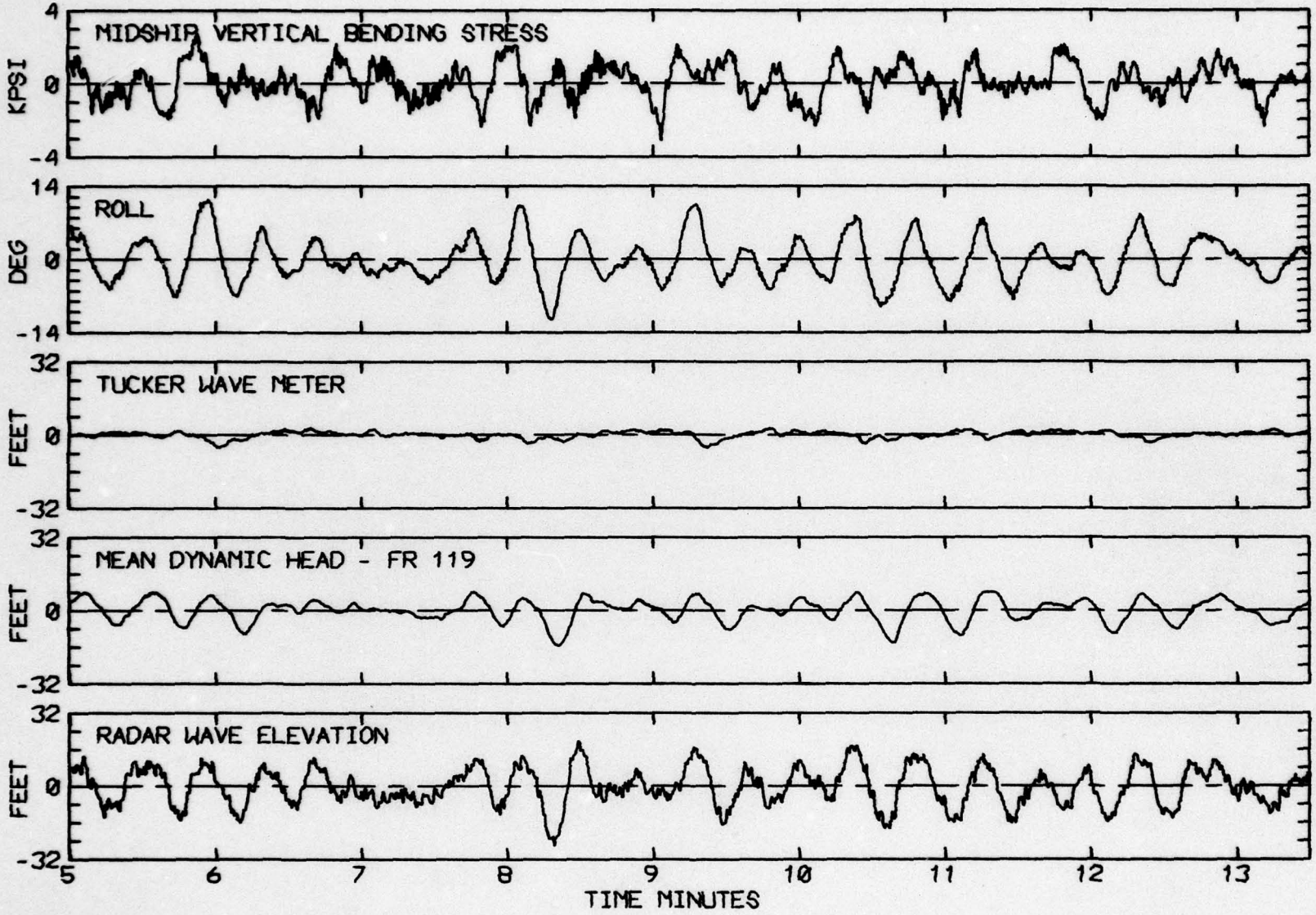
ROLL	15.0 DEG
PITCH	0.73 DEG
DK HSE VERT ACCEL	0.12 G
DK HSE LAT ACCEL	0.36 G
RADAR SLANT RANGE	23.6 FEET
VERTICAL RANGE	19.0 FEET
DISPL AT RADAR	15.8 FEET

WAVE HEIGHT STATISTICS (FEET)

	TUCKER/DYN.	HEAD/RADAR	
P-T SAMPLE SIZE	305	73	127
MAXIMUM HEIGHT	6.4	22.1	39.4
10TH HIGHEST HTS	3.1	18.3	28.3
3RD HIGHEST HTS	1.8	14.0	19.3
4.0 RMS(SPECTRA)	4.9	17.8	29.3



RUN 2021 -- VOYAGE 36E -- TAPE 177 -- INDEX 22 -- INTERVAL 21



RUN 2021 -- VOYAGE 36E -- TAPE 177 -- INDEX 22 -- INTERVAL 21

APPENDIX

THE DATA REDUCTION AND PRESENTATION PROCEDURE ACCORDING TO THE DEVELOPMENT IN REFERENCE 4

The data reduction procedure for each interval involved:

a. Four main computation programs, the last one of which produced a complete file of results for each interval.

b. Two lister programs to supply immediate indications of some of the results.

c. One file consolidation program which produced one file for each voyage leg containing everything but the time histories of radar wave and mean dynamic head.

d. Two programs to generate the final graphical presentations for each interval.

Items b through d amount to bookkeeping operations. The work was done in the four main computation programs.

The first computation program carried out the procedure described in Reference 4 for the radar. At its conclusion the radar wave spectrum and the computed time history were written in temporary files as was the time history of vertical displacement at the radar.

The second program involved reduction of the Tucker data. Both the original data and the displacement file produced by the first program were accessed. The procedure was carried out so that time histories of mean dynamic head and the Tucker Meter signal were available. These were spectrum analyzed, and all results written in a temporary file.

The third computation program accessed the various wave-related time histories (radar, Tucker, and mean dynamic head) and performed a peak-trough analysis on the middle 16-1/2 minutes of each. (Because of the tapering described in Reference 4 both the radar and mean dynamic head data are not valid for the first and last two minutes of sample.) The object of the peak-trough analysis was to produce double amplitude statistics. The zero crossing convention was used; that is, a crest was defined as the largest instantaneous value in an excursion <u>above</u> the sample mean, a trough was the smallest instantaneous value in an excursion <u>below</u> the sample mean. The double amplitude is the difference in elevation between crest and succeeding trough. In this approach small fluctuations are more or less ignored if they are riding on top of large ones. The results resemble the double amplitudes which would be estimated by hand from an oscillograph record except that the hand analyst would probably visually fair through superimposed noise whereas the computer does not. The effect is that while the computer gets about the same number of double amplitudes as the human analyst, the computer's answers tend to be higher if the records are noisy. From the double amplitudes found, the average of 1/3 and 1/10 highest were computed, and the position in the sample of the largest double amplitude was noted. All results, including the actual double amplitudes were written in a temporary file.

The fourth computation program accessed the original data and performed spectrum analyses upon the midship vertical bending stress and roll. It then accessed all previously written temporary files and produced a new file containing all of the results for the interval. These results included log-book data, results of the first analysis of raw data (Ref.3,5), five spectra along with all analysis parameters, all results from the peak-trough analysis, and the two new time histories, the radar wave and the mean dynamic head. These files were meant to be stored on magnetic tape for possible future reference.

The final presentation of results for each interval is contained on two charts. The first type of chart (which appears on the even numbered pages of this report) contains the scalar spectra and a tabulation of results. The second type of chart (odd numbered pages) involves sample time histories. Both are identified at the bottom with the DL run number, the voyage number, the analog tape and interval numbers, and the index number assigned by Teledyne.

Referring to any even page, the tabulation at the left is intended as a summary of the most significant numbers pertaining to the interval. At the top is as much of the original log-book data as it seemed reasonable to squeeze in. This includes date, time, position, and ship speed, as well as the visual estimates of wave and swell heights and directions. Directions are counted from the bow to port or starboard in degrees. The "sea state" is apparently the Beaufort wind. The final line in the first section of the tabulation includes comments on visual weather and, after the slash, any other comment appearing in the log.

The second box in the tabulation involves midship longitudinal stress results. Only two of the many numbers which are available could be included as indices. The first is the maximum peak to trough stress excursion as obtained in Reference 1 or 2. The second index is the significant stress (4 times rms) as derived from the area of the stress spectrum obtained in the present reduction.

The third box in the tabulation is a summary of motions. Again the "significant" motions (4 rms) are indicated. The value for roll was derived from spectrum area, that for pitch and accelerations from the rms of the basic data. (Unless there are significant linear trends in the data the differences are slight between "raw" and "spectrum" rms.) The last three items in the list involve various stages in the radar data reduction. The first is the slant range as recorded. The "vertical range is $R_c(t)$ of the radar analysis. This entry is essentially the vertical component of the range relative to the position of the accelerometer package. The number was derived from the spectrum. The last entry is the significant displacement at the radar (significant doubly integrated acceleration). It too was derived from spectrum analyses.

In a sense, the table at the bottom of the tabulation contains the final numerical answers. Items in the first column pertain to the uncorrected Tucker Meter signal. The second column pertains to the mean dynamic

head developed in conjunction with the analysis of the Tucker meter, and the third column pertains to wave elevations derived from the radar system. The first row in the table is the number of double amplitudes found in the middle 16-1/2 minutes of the sample. Below this are noted the maximum height found and the averages of the 1/10 and 1/3 highest double amplitudes. The final line in the table is the significant (4 rms) height derived from the spectral analyses. Ordinarily it is expected that the last two lines of the table will be about the same.

At the right of any even page are plots of the five computed spectra. It was decided to standardize the frequency scale from 0 to 2 rad/sec. In the great majority of intervals everything of interest is contained in this range. In some intervals one spectrum or another is non-negligible beyond 2 rad/sec but nothing much has been seen beyond 2.5 rad/sec for any of the quantities analyzed except in the stress spectrum where something may often be noticed around the frequency of the first mode of vertical vibration. The folding frequency of the analyses is above 20 rad/sec; no aliasing is expected, Reference 3.

The stress and roll spectra are plotted together. The vertical scale is for the stress spectrum. The roll spectrum has been multiplied by the factor noted in the legend before plotting. Dimensions of the stress spectral density are ($kpsi^2$/rad/sec) and those of the roll spectral density are (deg^2/rad/sec).

All three wave related spectra (Tucker, mean dynamic head, and radar) are plotted together to the same scale. The dimension of the wave spectral density is ($feet^2$/rad/sec). In the wave spectrum plot there is a vertical (slightly joggled) dashed line. This line marks the position of the low frequency cutoff, ω_o, discussed in Reference 4 in conjunction with double integration of the vertical accelerations. It is correct to interpret the position of this line as meaning that the double integration has been done correctly for higher frequencies, and incorrectly for lower frequencies.

There are several details about the spectrum analyses which are not documented in the plots because they are constant throughout the data reduction. First, the normalization of the spectra is such that the spectrum area equals variance. All spectra are derived from a Fast Fourier Transform analysis of an 8192 point sample. The fundamental results is 4096 spectral estimates of 2 degrees of freedom each. These estimates are uniformly spaced in frequency at a delta-frequency of 0.00511 rad/sec. In order to improve statistical reliability, the basic spectral estimates were averaged in blocks of 20 estimates at intervals of 10 estimates. The resulting averages are thus equi-speced on the frequency scale at intervals of $\Delta\omega$ = 0.0511 rad/sec. This also means that adjacent spectral estimates as shown in the plot are not quite independent -- to about the same degree as spectral estimates from the older autocorrelation methods are not independent.

As a result of the averaging, each spectral estimate has 40 degrees of freedom associated with it. Accordingly, the 90% confidence bounds on the spectra shown in the charts may be formed by multiplying the values given by 0.72 and 1.51. Had the process sampled continued indefinitely and a large number of 20.5 minute samples been obtained and analyzed, nine out of ten of these new estimates of spectral density would be expected to lie within the bounds so constructed. The practical implication is simply that the influence of sampling variability upon the given numerical results is roughly the same as that associated with the result of most other full scale wave measurement exercises.

The last detail of the spectrum analysis is the "total degrees of freedom." This number is included in parentheses at the end of each line of legend because it depends upon the shape of each individual spectrum. It is an estimate of the proper number of degrees of freedom to use in constructing confidence bounds on the sample variance. If each of the numbers in the present 8192 point time histories had been picked randomly the "total degrees of freedom" would be 8191. This is not the case -- adjacent members of all the present time series are highly correlated so that the equivalent "random" sample size is much smaller. In the present data set the "total degrees of freedom" (TDF) is expected to vary between 60 and 600. Approximate 90% confidence bounds on the variances assuming a Normal zero mean process, may be constructed by multiplying the estimate by two factors derived from the percentage points of the Chi-square distribution. Examples of the values of these factors are given as follows:

TDF	Factor for Lower Bound	Factor for High Bound
60	.72	1.32
120	.80	1.27
200	.84	1.17
400	.89	1.12
600	.91	1.10

These are factors for the variances. The square root applies to the rms values so that very roughly the 90% confidence bounds on rms range from the sample rms ± 15% for TDF = 60 to the sample rms ± 5% for TDF = 600. The practical implications of these results are quite similar to those mentioned in connection with the confidence bounds on the spectra. There is only so much "precision" obtainable from one 20 minute sample of wave elevation -- that which was attacined in the present work appears comparable to that achieved in the past in similar studies. With respect to comparisons between wave meters or between data and predictions of rms ship responses there can be little justification to a concern about differences of 5 to 15% magnitude.

The sample time histories on the odd numbered pages need little explanation, except perhaps to say that the duration of the sample shown (8-1/2 minutes) was a compromise between a desire to display as much of

the 16-1/2 minutes of derived wave time histories as was possible in one page; and the desire to spread the time scale out so that individual fluctuations were visible for intervals involving high ship speed in head seas. To produce the charts an 8-1/2 minute portion of the available 16-1/2 minutes of sample was chosen such that the largest radar wave double amplitude is shown -- as well as (if possible) the largest mean dynamic head double amplitude.

It may be fairly asked why the effort in producing plotted time histories for each interval was considered worthwhile. The answer to the question is fairly simple. While the present data in its original analog form has been scanned systematically by eye, the process involved oscillograph records with a time scale of about 15 minutes to the inch. At this time compression only a gross idea of what was happening can be formed, no detailed assessment of the believability of the data can be made, and, most importantly, the odd malfunction which is enough to upset the spectrum estimates or the statistics may often go unnoticed. This last is considered most important in the radar data. It was pointed out in References 3 and 5 that an attempt was made to weed out intervals where the radar had evidently lost signal and re-established a new reference range. In this process only the most obvious instances could be identified; no guarantees could be made that all instances of moderate or small magnitude had been eliminated.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1 REPORT NUMBER: SL-7-19 — 2 GOVT ACCESSION NO.	3 RECIPIENT'S CATALOG NUMBER
4 TITLE (and Subtitle): RADAR AND TUCKER WAVEMETER DATA FROM SEA-LAND McLEAN - VOYAGES 35 AND 36E	5. TYPE OF REPORT & PERIOD COVERED: Technical
	6. PERFORMING ORG. REPORT NUMBER: SIT-DL-77-1935
7 AUTHOR(s): J. F. DALZELL	8. CONTRACT OR GRANT NUMBER(s): N00024-74-C-5451
9 PERFORMING ORGANIZATION NAME AND ADDRESS: Stevens Institute of Technology, Hoboken, N.J.	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: SF-422-703-06, Task 17593 - SR-1221
11 CONTROLLING OFFICE NAME AND ADDRESS: Department of the Navy, Naval Sea Systems Command, Washington, D.C. 20362	12. REPORT DATE: August 1978
	13. NUMBER OF PAGES: 142
14 MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): Ship Structure Committee, U.S. Coast Guard Headquarters, Washington, D.C. 20590	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16 DISTRIBUTION STATEMENT (of this Report)

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Distribution Unlimited

17 DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

UNLIMITED

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Distribution Unlimited

18 SUPPLEMENTARY NOTES

19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

So that more precise correlations between full scale observations and analytical and model results could be carried out, one of the objectives of the instrumentation program for the SL-7 class container ships was the provision of instrumental measures of the wave environment. To this end, two wave meter systems were installed on the S.S. SEA-LAND McLEAN. Raw data was collected from both systems during the second (1973-1974) and third (1974-1975) winter data collecting seasons.

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It was the purpose of the present work to reduce this raw data, to develop and implement such corrections as were found necessary and feasible, and to correlate and evaluate the final results from the two wave meters. In carrying out this work it was necessary to at least partly reduce several other channels of recorded data, so that, as a by-product, reduced results were also obtained for midship bending stresses, roll, pitch, and two components of acceleration on the ship's bridge.

As the work progressed it became evident that the volume of documentation required would grow beyond the usual dimensions of a single technical report. For this reason the analyses, the methods, the detailed results, discussions, and conclusions are contained in a series of ten related reports.

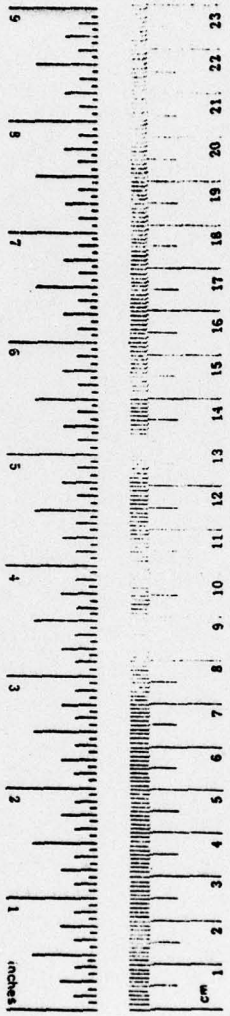
This report is one of the six in the series in which the detailed results of the data reduction process are presented. Included in this report is the reduced data from the Second Season Voyages 35 and 36E.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

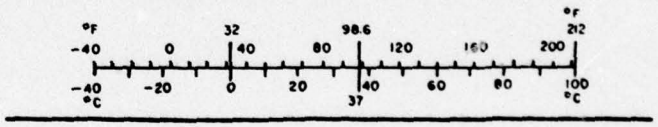
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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