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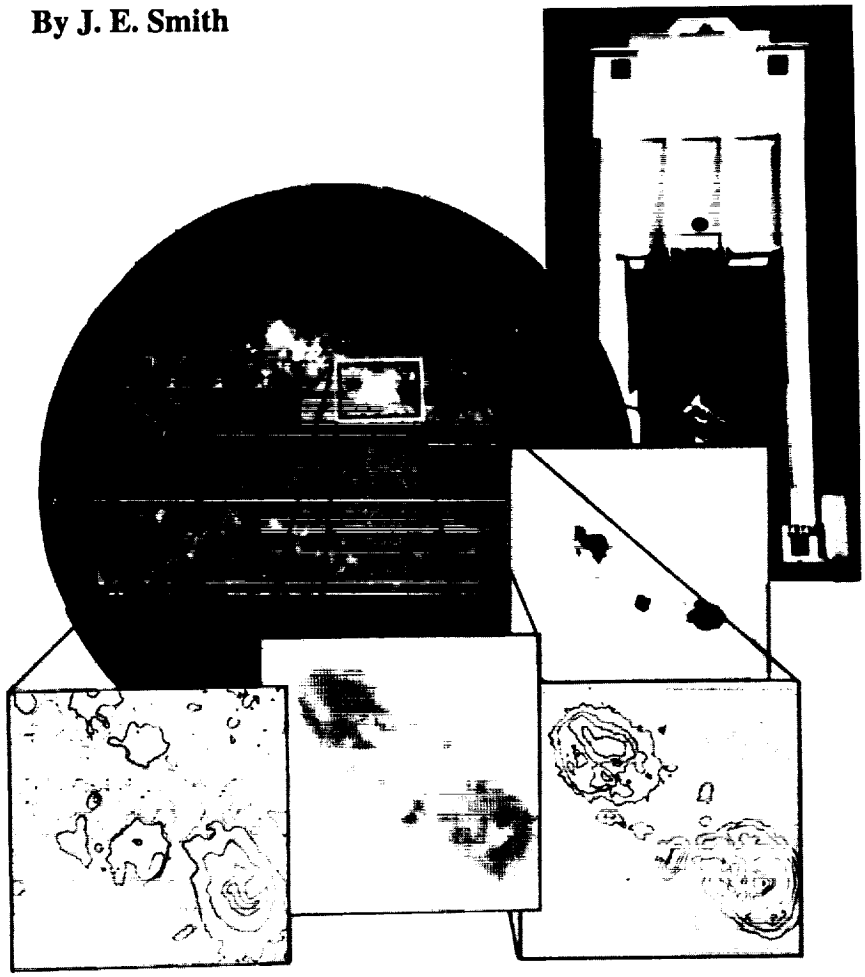
NASA MARSHALL SPACE FLIGHT CENTER SOLAR OBSERVATORY REPORT - JULY-OCTOBER 1993

By J. E. Smith



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13. ABSTRACT *(Maximum 200 words)*

This report provides a description of the NASA Marshall Space Flight Center's Solar Vector Magnetograph Facility and gives a summary of its observations and data reduction during June-October 1993. The systems that make up the facility are a magnetograph telescope, an H-α telescope, a Questar telescope, and a computer code.

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TECHNICAL MEMORANDUM

NASA MARSHALL SPACE FLIGHT CENTER SOLAR OBSERVATORY REPORT JULY-OCTOBER 1993

INTRODUCTION

This report provides a summary of the solar vector magnetic field, H-alpha, and white-light observations made at the NASA/Marshall Space Flight Center (MSFC) Solar Observatory during its daily periods of operation.

The MSFC Solar Observatory facilities consist of the Solar Magnetograph, an f/13, 30-cm Cassegrain system with a 3.5-cm image of the Sun housed on top of a 12.8-meter tower, a 12.5-cm Razdow H-alpha telescope housed at the base of the tower, an 18-cm Questar telescope with a full aperture white-light filter mounted at the base of the tower, a 30-cm Cassegrain telescope located in a second metal dome, and a 16.5-cm H-alpha telescope mounted on side of the Solar Vector Magnetograph. A concrete block building provides office space, a darkroom for developing film and performing optical testing, a workshop, video displays, and a computer facility for data reduction.

THE NASA/MSFC SOLAR MAGNETOGRAPH

The NASA/MSFC Solar Magnetograph is an electro-optical instrument designed to provide information on the states of linear and circular polarization of a narrow wavelength interval (1/8 Å) of the 525.022 nm (5250.22 Å) solar absorption line over a 5.75 x 5.75 arc minute field of view with a spatial resolution of 2.7 arc seconds and a time resolution of approximately 6 minutes for a complete vector magnetogram with a sensitivity of 1/1000. A complete description of the instrument and its calibration and performance characteristics can be found in references 1 and 3.

H-ALPHA FACILITY

The facility houses a 12.5 cm aperture, Razdow H-alpha telescope system. This system consists of an f/8, 1-meter focal length, 5-inch telescope which produces a 16 mm diameter image at the prime focus. The spectral selection is provided by a Halle-Lyot birefringent filter with a 0.5 Å bandpass centered at H-alpha and tunable within ± 1Å. The telescope is equipped with standard mount, drive, and guidance systems, and it provides eyepiece viewing as well as film and TV scan output. The 16.5-cm H-alpha telescope consists of a telecentric Cassegrainian (f/28) objective, Fabry-Perot filter, relay optics, vidicon camera, and film camera. It provides a 4.4-16 arc minute variable field of view, narrow spectral bandwidth, and high spatial resolution.

WHITE-LIGHT TELESCOPE

An 18-cm Questar telescope with a full aperture white-light prefilter is also available for viewing or photographing sunspots and/or other white-light solar features.

COMPUTER CENTER

The data reduction capability consists of a PDP 11/73 computer with 2 megabytes memory, control terminals, color graphics display monitor, line printer, two disk systems, and a magnetic tape recorder. The data acquisition computer is a PDP 11/23 with 2 megabytes memory and is used to control the data storage, the real time analysis, and the operation of the vector magnetograph system. The system hardware is controlled by an Intel microcomputer with a Z80 processor. After receiving commands from the PDP 11/23, the Intel configures the hardware to given specifics and then acquires the data. The Intel controls the timing of the solid state camera system, the polarizing optics, and the data transfer into temporary memory.

DATA DESCRIPTION

The MSFC Vector Magnetograph system records the Sun's photospheric magnetic field over an approximately 6 x 6 arc minute square field of view. The normal mode of operation produces magnetograms with a 128 x 128 data array, yielding a pixel size of 2.8 arc second resolution. It takes about 6 minutes to produce one complete vector set. The data can then be displayed in various contour plots showing the field gradients and directions.

OBSERVING RECORDS

The MSFC magnetograph observations are summarized in Appendix A. H-alpha observing records are summarized in Appendix B. White-light observing records are summarized in Appendix C.

REFERENCES

1. Hagyard, M. J., Cumings, N. P., West, E. A., and Smith, J. E., "The MSFC Solar Vector Magnetograph," *Solar Phys.* **80**, 33 (1982).

2. Hagyard, M. J., Cumings, N. P., and West, E. A., Proceedings of Kunming Workshop on Solar Physics and Interplanetary Travelling Phenomena, C. De Jager and Chen Biao, eds., 1216 (1985).

3. Hagyard, M. J., West, E. A., Gary, G. A., and Smith, J. E., "Coaligned Observations of Solar Magnetic Fields at Different Heights--MSFC Center Director's Discretionary Fund Final Report (Project 88-10)," NASA TM-103516, p. 2 (1990).

Abbreviations used in the records are as follows:

Region	Four digits mean Boulder region number 0-represents calibration 1-represents studies at the Sun center 2-represents studies of any quiet area 3-represents studies of coronal holes
λP	Polarimeter waveplate position 1-represents position to analyze circularly polarized light 2-represents position to analyze linearly polarized light parallel to the analyzer 3-represents position to analyze linearly polarized light 45° to the analyzer
Enh	Number of image enhancements
FP	Ziess filter position
CF	Center filter position of sunspot
C.T.	Correlation tracker 0-represents off 1-represents on
ODA	Optical disk medium in which the data are stored

Appendix A

MAGNETOGRAPH OBSERVATIONS

MAGNETOGRAPH OBSERVATIONS

FILE-NAME	DATE	TIME	REGION	λP	ENH	FP	CF	TAPE	C.T.
S31515.H	01-JUL-93	18:54:03	7530	1	128	1513	1504	ODA	1
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S31524.H	02-JUL-93	18:11:30	7530	1	128	1512	1503	ODA	1
S31527.H	02-JUL-93	18:16:28	7530	1	128	1512	1503	ODA	1
S31530.H	02-JUL-93	18:21:58	7530	1	128	1494	1503	ODA	1
S31535.H	02-JUL-93	18:34:26	7530	1	128	1515	1503	ODA	1
S31538.H	02-JUL-93	18:39:24	7530	1	128	1515	1503	ODA	1
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S31544.H	02-JUL-93	18:51:49	7529	1	128	1511	1502	ODA	1
S31547.H	02-JUL-93	18:56:59	7529	1	128	1511	1502	ODA	1
S31553.H	04-JUL-93	15:17:15	7530	1	128	1492	1501	ODA	1
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S31580.H	04-JUL-93	16:38:24	7530	1	128	1511	1501	ODA	1
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MAGNETOGRAPH OBSERVATIONS

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MAGNETOGRAPH OBSERVATIONS

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FILE-NAME	DATE	TIME	REGION	λP	ENH	FP	CF	TAPE	C.T.
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S32070.H	01-OCT-93	13:43:19	7590	1	128	1495	1504	ODA	1
S32073.H	01-OCT-93	13:49:10	7590	1	128	1504	1504	ODA	1
S32076.H	01-OCT-93	13:55:03	7590	1	128	1513	1504	ODA	1
S32079.H	01-OCT-93	14:00:51	7590	1	128	1513	1504	ODA	1
S32082.H	01-OCT-93	16:16:40	7590	1	128	1513	1504	ODA	1
S32085.H	01-OCT-93	16:22:24	7590	1	128	1513	1504	ODA	1
S32088.H	01-OCT-93	16:27:59	7590	1	128	1516	1504	ODA	1
S32091.H	01-OCT-93	16:33:31	7590	1	128	1515	1504	ODA	1
S32094.H	01-OCT-93	16:39:26	7590	1	128	1519	1504	ODA	1
S32097.H	01-OCT-93	16:45:07	7590	1	128	1519	1504	ODA	1
S32100.H	01-OCT-93	16:50:39	7590	1	128	1522	1504	ODA	1
S32103.H	01-OCT-93	16:57:51	7590	1	128	1522	1504	ODA	1
S32106.H	01-OCT-93	17:03:58	0	1	128	1513	1504	ODA	0
S32109.H	01-OCT-93	17:09:18	0	1	128	1515	1504	ODA	0
S32112.H	01-OCT-93	17:13:38	0	1	128	1519	1504	ODA	0
S32115.H	01-OCT-93	17:17:40	0	1	128	1522	1504	ODA	0
S32119.H	04-OCT-93	13:38:45	7590	1	128	1496	1505	ODA	1
S32122.H	04-OCT-93	13:44:33	7590	1	128	1505	1505	ODA	1
S32125.H	04-OCT-93	13:50:26	7590	1	128	1496	1505	ODA	1
S32128.H	04-OCT-93	13:56:36	7590	1	128	1514	1505	ODA	1
S32131.H	04-OCT-93	14:01:48	7590	1	128	1514	1505	ODA	1
S32134.H	04-OCT-93	14:07:42	7590	1	128	1517	1505	ODA	1
S32137.H	04-OCT-93	14:12:55	7590	1	128	1517	1505	ODA	1
S32140.H	04-OCT-93	14:19:29	7590	1	128	1520	1505	ODA	1
S32143.H	04-OCT-93	14:24:26	7590	1	128	1520	1505	ODA	1
S32146.H	04-OCT-93	14:30:27	7590	1	128	1523	1505	ODA	1
S32149.H	04-OCT-93	14:35:26	7590	1	128	1523	1505	ODA	1
S32152.H	04-OCT-93	15:33:12	7592	1	128	1498	1507	ODA	1
S32155.H	04-OCT-93	15:38:48	7592	1	128	1507	1507	ODA	1
S32158.H	04-OCT-93	15:44:25	7592	1	128	1515	1507	ODA	1
S32161.H	04-OCT-93	15:49:55	7592	1	128	1515	1507	ODA	1
S32164.H	04-OCT-93	15:55:26	7592	1	128	1519	1507	ODA	1
S32167.H	04-OCT-93	16:00:47	7592	1	128	1519	1507	ODA	1
S32170.H	04-OCT-93	16:08:12	7592	1	128	1522	1507	ODA	1
S32173.H	04-OCT-93	16:13:47	7592	1	128	1522	1507	ODA	1
S32176.H	04-OCT-93	16:20:27	0	1	128	1514	1505	ODA	0
S32179.H	04-OCT-93	16:25:18	0	1	128	1517	1505	ODA	0
S32182.H	04-OCT-93	16:34:02	0	1	128	1520	1505	ODA	0
S32185.H	04-OCT-93	16:38:31	0	1	128	1523	1505	ODA	0
S32188.H	04-OCT-93	19:15:50	7590	1	128	1496	1505	ODA	1
S32191.H	04-OCT-93	19:24:01	7590	1	128	1505	1505	ODA	1
S32194.H	04-OCT-93	19:29:53	7590	1	128	1514	1505	ODA	1
S32197.H	04-OCT-93	19:35:22	7590	1	128	1514	1505	ODA	1
S32200.H	04-OCT-93	19:41:09	7590	1	128	1517	1505	ODA	1
S32203.H	04-OCT-93	19:46:54	7590	1	128	1517	1505	ODA	1
S32206.H	04-OCT-93	19:52:24	7590	1	128	1520	1505	ODA	1
S32209.H	04-OCT-93	19:59:18	7590	1	128	1523	1505	ODA	1
S32212.H	04-OCT-93	20:17:12	7592	1	128	1498	1507	ODA	1
S32215.H	04-OCT-93	20:23:51	7592	1	128	1515	1507	ODA	1

MAGNETOGRAPH OBSERVATIONS

FILE-NAME	DATE	TIME	REGION	λP	ENH	FP	CF	TAPE	C.T.
S32218.H	04-OCT-93	20:29:15	7592	1	128	1515	1507	ODA	1
S32221.H	04-OCT-93	20:35:23	7592	1	128	1519	1507	ODA	1
S32224.H	05-OCT-93	13:42:05	7590	1	128	1495	1504	ODA	1
S32227.H	05-OCT-93	13:47:49	7590	1	128	1503	1504	ODA	1
S32230.H	05-OCT-93	13:53:56	7590	1	128	1513	1504	ODA	1
S32233.H	05-OCT-93	14:00:23	7590	1	128	1513	1504	ODA	1
S32236.H	05-OCT-93	14:08:55	7590	1	128	1515	1504	ODA	1
S32239.H	05-OCT-93	14:14:45	7590	1	128	1516	1504	ODA	1
S32242.H	05-OCT-93	14:20:43	7590	1	128	1519	1504	ODA	1
S32245.H	05-OCT-93	14:26:35	7590	1	128	1519	1504	ODA	1
S32248.H	05-OCT-93	14:33:28	0	1	128	1513	1504	ODA	0
S32251.H	05-OCT-93	14:38:18	0	1	128	1515	1504	ODA	0
S32254.H	05-OCT-93	14:42:50	0	1	128	1519	1504	ODA	0
S32257.H	05-OCT-93	14:51:25	7592	1	128	1497	1506	ODA	1
S32260.H	05-OCT-93	14:57:14	7592	1	128	1506	1506	ODA	1
S32263.H	05-OCT-93	15:03:11	7592	1	128	1515	1506	ODA	1
S32266.H	05-OCT-93	15:08:18	7592	1	128	1515	1506	ODA	1
S32269.H	05-OCT-93	15:13:29	7592	1	128	1517	1506	ODA	1
S32272.H	05-OCT-93	15:18:23	7592	1	128	1517	1506	ODA	1
S32275.H	05-OCT-93	15:23:43	7592	1	128	1521	1506	ODA	1
S32278.H	05-OCT-93	15:28:44	7592	1	128	1521	1506	ODA	1
S32281.H	05-OCT-93	19:03:23	7590	1	128	1495	1504	ODA	1
S32284.H	05-OCT-93	19:10:50	7590	1	128	1513	1504	ODA	1
S32287.H	05-OCT-93	19:16:16	7590	1	128	1513	1504	ODA	1
S32290.H	05-OCT-93	19:23:08	7590	1	128	1515	1504	ODA	1
S32293.H	05-OCT-93	19:28:35	7590	1	128	1515	1504	ODA	1
S32296.H	05-OCT-93	19:34:13	7590	1	128	1519	1504	ODA	1
S32299.H	05-OCT-93	19:39:39	7590	1	128	1521	1504	ODA	1
S32302.H	05-OCT-93	19:48:59	7592	1	128	1515	1506	ODA	1
S32305.H	05-OCT-93	19:56:01	7592	1	128	1515	1506	ODA	1
S32308.H	05-OCT-93	20:01:33	7592	1	128	1517	1506	ODA	1
S32311.H	05-OCT-93	20:08:10	7592	1	128	1518	1506	ODA	1
S32314.H	05-OCT-93	20:14:22	7592	1	128	1497	1506	ODA	1
S32317.H	06-OCT-93	15:08:54	7590	1	128	1495	1504	ODA	1
S32320.H	06-OCT-93	15:14:37	7590	1	128	1504	1504	ODA	1
S32323.H	06-OCT-93	15:24:17	7590	1	128	1513	1504	ODA	1
S32326.H	06-OCT-93	15:36:14	7590	1	128	1513	1504	ODA	1
S32329.H	06-OCT-93	15:43:07	7590	1	128	1515	1504	ODA	1
S32332.H	06-OCT-93	16:01:50	7590	1	128	1515	1504	ODA	1
S32335.H	06-OCT-93	16:08:11	7590	1	128	1519	1504	ODA	1
S32338.H	06-OCT-93	16:13:19	7590	1	128	1519	1504	ODA	1
S32341.H	06-OCT-93	16:19:25	0	1	128	1513	1504	ODA	0
S32344.H	06-OCT-93	16:23:48	0	1	128	1515	1504	ODA	0
S32347.H	06-OCT-93	16:27:57	0	1	128	1519	1504	ODA	0
S32350.H	07-OCT-93	18:34:08	7592	1	128	1495	1504	ODA	1
S32353.H	07-OCT-93	18:40:08	7592	1	128	1504	1504	ODA	1
S32356.H	07-OCT-93	18:46:23	7592	1	128	1513	1504	ODA	1
S32359.H	07-OCT-93	18:52:27	7592	1	128	1513	1504	ODA	1
S32362.H	07-OCT-93	18:58:06	7592	1	128	1515	1504	ODA	1
S32365.H	07-OCT-93	19:05:43	7592	1	128	1516	1504	ODA	1

MAGNETOGRAPH OBSERVATIONS

FILE-NAME	DATE	TIME	REGION	λP	ENH	FP	CF	TAPE	C.T.
S32368.H	07-OCT-93	19:11:42	7592	1	128	1519	1504	ODA	1
S32373.H	08-OCT-93	16:04:24	7592	1	128	1493	1503	ODA	1
S32376.H	08-OCT-93	16:10:05	7592	1	128	1503	1503	ODA	1
S32379.H	08-OCT-93	16:15:46	7592	1	128	1512	1503	ODA	1
S32382.H	08-OCT-93	16:21:12	7592	1	128	1512	1503	ODA	1
S32385.H	08-OCT-93	16:41:08	7592	1	128	1515	1503	ODA	1
S32388.H	08-OCT-93	16:46:36	7592	1	128	1515	1503	ODA	1
S32391.H	08-OCT-93	16:51:55	7592	1	128	1517	1503	ODA	1
S32394.H	08-OCT-93	16:57:13	7592	1	128	1517	1503	ODA	1

Appendix B

H-ALPHA OBSERVATIONS

H ALPHA OBSERVATIONS

DATE	DOY	REGION	TIME	FRAMES	ACTIVITY	TAPE
08-17-93	229	7563	1818-1824	50000- 60000	FLARE	118
08-25-93	237	7566	1642-1648	60000- 70000	FLARE	118
09-30-93	273	7590	1614-1620	70000- 80000	FLARE	118
10-01-93	274	7590	1616-1622	80000- 90000	FLARE	118
10-05-93	278	7592	1940-1950	92200-102000	FLARE	118

Appendix C

WHITE-LIGHT OBSERVATIONS

WHITE LIGHT OBSERVATIONS

DATE	TIME	EXPS	WEATHER
07-07-93	1250	1	CLEAR
	1255	2	
07-08-93	1332	2	CLEAR
07-30-93	1325	2	CLEAR

WHITE LIGHT OBSERVATIONS

DATE	TIME	EXPS	WEATHER
10-04-93	1317	2	CLEAR
10-05-93	1315	2	CLEAR
10-06-93	1453	2	CLEAR

APPROVAL

NASA MARSHALL SPACE FLIGHT CENTER
SOLAR OBSERVATORY REPORT
JULY-OCTOBER 1993

By

J. E. Smith

This report has been reviewed for technical accuracy and contains no information concerning national security or nuclear energy activities or programs. The report, in its entirety, is unclassified.

Gregory S. Wilson
Director, Space Sciences Laboratory

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