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Joint Solar Dynamics Project Data Summary (3rd) Solar Magnetic Field Chromospheric and Coronal Observations Near the Time of the 18 March 1988 Solar Eclipse

National Center for Atmospheric Research
Boulder, CO

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November 1988

The Third Joint Solar Dynamics Project Data Summary

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D.G. Sime,
C.J. Garcia,
W.E. Lundin, and
E.A. Yasukawa, NCAR

D.L. Mickey and
B. Labonte, University of Hawaii

HIGH ALTITUDE OBSERVATORY

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
BOULDER, COLORADO

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The success of the previous Joint Solar Dynamics Project (SOLDYN I and II) observing periods (see NCAR Technical Notes TN-202+STR and TN-213+STR) demonstrated the power of the integrated operation and co-ordination of instruments available in the Hawaiian islands in producing a wide-ranging observational record of conditions on the sun. Examination and analysis of the data collected at those times made it clear that this instrumentation would also allow the collection of a valuable record of the sun near the time of the 1988 March 18 total solar eclipse. Such a record would be helpful in the High Altitude Observatory (HAO) eclipse expedition scientific analysis efforts, and would also provide a valuable context for the community at large in which to interpret its own eclipse and associated observations.

This Technical Note presents the observations made during this effort in the interval 1-30 March 1988. As far as possible, daily observations made with the Mark-III K-coronameter of the Mauna Loa Solar Observatory (MLSO) are included.

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PREFACE

The success of the previous Joint Solar Dynamics Project (SOLDYN I and II) observing periods (see NCAR Technical Notes TN-202+STR and TN-213+STR demonstrated the power of the integrated operation and co-ordination of instruments available in the Hawaiian islands in producing a wide-ranging observational record of conditions on the sun. Examination and analysis of the data collected at those times made it clear that this instrumentation would also allow the collection of a valuable record of the sun near the time of the 1988 March 18 total solar eclipse. Such a record would be helpful in the High Altitude Observatory (HAO) eclipse expedition scientific analysis efforts, and would also provide a valuable context for the community at large in which to interpret its own eclipse and associated observations.

This Technical Note presents the observations made during this effort in the interval 1-30 March 1988. As far as possible, daily observations made with the Mark-III K-coronameter of the Mauna Loa Solar Observatory (MLSO) as well as photographic records of the sun in Hα, and from the flare patrol at Mees Solar Observatory (MSO) on Haleakala, Maui, are included. We also present daily observations of the longitudinal component of the photospheric magnetic field made at MSO. Finally, the coronal and magnetic field observations are assembled into synoptic maps for the interval around the eclipse.

D. G. Sime, November 1988

High Altitude Observatory

Boulder, Colorado

I. INTRODUCTION

The general goal of this HAO/University of Hawaii Joint Solar Dynamics Project is to establish the relationships that exist between the solar magnetic field which is detected in the photosphere and the structure and evolution of the corona. The SOLDYN programs of 1982 and 1983 (see Fisher et al., 1982a, and Sime et al., 1983) demonstrated our ability to use existing instruments to gather data of value in the pursuit of that goal. During those programs, which ran from 14 June to 13 August 1982 and 3-17 June, 1983, daily coordinated observations were made of the sun and corona using the Mark-III K-coronameter and the prominence monitor at HAO's Mauna Loa Solar Observatory (MLSO) and the Stokes polarimeter, Hα flare patrol and Ca II cameras, and the Hα coronagraph at the University of Hawaii's Mees Solar Observatory (MSO). This wide ranging record of the sun enabled us to begin to address specific questions in partial satisfaction of our goal (Fisher et al., 1984 and Sime et al., 1984) and encouraged us to believe that additional observations in March 1988 would be of value. Specifically, although in some ways less extensive than the previous years' efforts, these new data would allow us to address two ends:

(1) Document the state of the sun, from the photosphere up through the chromosphere and out into the corona for the approximately four week interval around the total solar eclipse of 18 March 1988, and

(2) Identify the relationship between the photospheric magnetic fields and the temperature and density structure of the corona.

In this NCAR Technical Note, we present the reduced observations made during this SOLDYN III period and necessary to achieve these goals. They are presented both in the form of daily photographic and photo-electric measurements, and in synoptic format for the period.

To satisfy the scientific requirements of the program, the following complement of observations was defined for each day:

Mauna Solar Solar Observatory (MLSO):

(1) One contour plot of the inner coronal pB distribution as a function of position angle and height from 1.3 to 2.1 $R_\odot$

(2) Two plots of inferred pB as a function of latitude and longitude, called SHELLS, for heights above the limb of 1.3 $R_\odot$ and 1.7 $R_\odot$

(3) One daily NDIFF difference image plot, a subtraction of the previous day's synoptic pB image from the present day's data

(4) One Hα, 0.5Å FWHM, disk image

(5) One Hα, 8.1Å, FWHM, full-limb image

Mees Solar Observatory (MSO):

(1) One Stokes polarimeter scan of (at least the center of) the disk at λ6303

(2) One Hα, 0.5Å FWHM, on-band filtergram of the full disk

(3) One Hα, $\approx$ 7.6Å FWHM, full-limb image

Efforts to make the full disk scans with the MSO Stokes polarimeter were concentrated on the several days on either side of the eclipse so that the magnetic field near the limb on eclipse day could be estimated.

In spite of a period of disorganized weather and high overcast affecting the island chain, the skill and perseverance of the two observatory site crews paid off in a largely complete set of observations. The full basic daily set of data was achieved on 24 out of 30 days; a tribute to the effectiveness of both individual and team efforts. Data were gathered on 80% of SOLDYN III observing days as shown in Table 2. Unfortunately, no observations were available during the eclipse (calendar) day; the closest coronal observations were made some 16 1/2 hours after the eclipse had occurred.

In contrast to the situation in 1982 and 1983, the sun was moderately active during the observing period. This is due to the onset of the ascending phase of the activity cycle, and the appearance of the first signs of the solar maximum configuration in the corona (Sime et al., 1988). The active regions which were quite well spread out over longitude in contrast to the 1982 observations. Five coronal transients were observed with the Mark-III during the SOLDYN-III operations or by deduction from the daily NDIFF. The activity as noted by the observers is summarized in Table 3.

II. MLSO DATA PRODUCTS

The observations carried out at MLSO provided 2 data sets: photo-electric measurements of the polarized coronal radiance, and photographic records of the limb and disk of the sun.

Mark-III

The Mark-III K-coronameter is a 23 cm diameter objective imaging K-coronameter, which produces digital images at the rate of three images every 184 s. This system has been described by Fisher et al. (1981), and is the major piece of instrumentation at MLSO. Digital images are recorded onto 1,600 bpi nine-track magnetic tape for archiving and subsequent analysis. During the SOLDYN III period, three types of reduced data were also produced routinely. These were:

(1) A calibrated contour plot of the coronal pB distribution (NMAP)

(2) Two inferred coronal pB distributions plotted onto spherical projections, one each for heights of 1.3 $R_\odot$ and 1.7 $R_\odot$ (SHELLS)

(3) Daily contour plots of the one-day difference pB distribution (NDIFF).

For more discussion of these data products, the reader is directed to the discussion by Rock and Seagraves (1982); some more detail is given below.

P-MON

The prominence monitor at MLSO is an internally occulted telescope which is used to observe the sun's limb, and which provided the photographic data from MLSO. The solar image, 11.5-mm in diameter, is recorded on 35-mm SO-2415 film giving a plate scale of 166.9 arc seconds/mm. The Hα disk is observed by using a 1/2Å FWHM λ6563 filter. The observing format used is a three frame graded sequence of an under-, nominal-, and over-exposed image of the limb through an 8.1Å FWHM interference filter usually followed by a single disk image. Several pauses are programmed into the routine to allow the observer to view the sun using a video system camera so that he is aware of any activity on the chromosphere. One loop of the film sequence requires 4 min to complete. This monitoring program was run continuously from about 1 h after dawn until shutdown at approximately local noon or when cloudy weather prevented further operations. The MLSO crew was able to operate the prominence monitor 24 days out of the 30 days of the solar dynamics observing program.

NMAP

The NMAP program is a development of the 1MAP program which became part of the MLSO observing procedure on 31 January 1982. It replaces all previous coronal mapping programs for the daily data archive. The map is proportioned to represent the instrument's actual field of view, which extends roughly between 1.2 and 2.1 $R_\odot$. To give an immediate idea of the coronal pB amplitude, there is a single polar plot of pB in the center of the graph, which represents data taken at the height of 1.35 $R_\odot$. For this plot, the center is the zero pB level, and the inner circle is at the 20 pB level. Units of pB are given in units of $10^{-8}\,B_\odot$ (percent polarization), where $B_\odot$ is the mean brightness of disk center at the effective wavelength of 8200Å.

SHELLS

SHELLS plots are drawn from data that represent a single height in the corona. Each day, a scan is taken from which the data at three heights are extracted and simultaneously recorded onto the systems disk. This represents a small portion of the daily data taken, however, it

permits convenient long-term storage of data in a limited area of the systems disk allowing us to maintain an on-line archive at MLSO. These data have been collected since 8 August 1980. These data, which are also used for the more familiar HISTORY plots (Fisher, et al., 1982b), are reproduced in a spherical projection in a contoured display which can be taken to represent the coronal structure as if viewed against the disc. Under the assumption that no coronal evolution occurs after the limb passage at which the data were taken, these data represent that state of the corona for a one-half rotation interval.

These plots may be used for prediction to determine where and when coronal activity, which is likely to be present above active regions, might appear at either limb. They may also be used to compare with solar photographs for any requested time if placed over an appropriately sized solar image. The east limb plot for DOY N will show the distribution of coronal material as seen from the earth on DOY N.

NDIFF

MLSO uses a differencing system to detect changes in the corona. Two images are stored on the system disk of the control computer and the first image is subtracted from the second. The results are presented as a contour plot. All features present in both images disappear, leaving only the changes that have occurred. Depletions are drawn in solid contour lines. Enhancements (areas where the corona has grown brighter) are drawn in dashed contour lines. This plot will also show fluctuations in sky polarization and system noise. Using NDIFF the observer is able to interpret accurately the activity level in near real time. Plots that show significant changes are archived in Hilo. Used on line, this procedure can take as little as 10 min. At some point during the observing period, the observer selects the best image for the day. A difference plot is made with the corresponding image from the previous day. These daily difference plots are of interest because they are one way of inferring transient and evolutionary coronal changes over a variety of time scales ranging from 6 min to one day.

The NDIFF plot is uncorrected for instrumental effects, most notably the effect of a triangular sample slit, but it is possible to interpret this real-time data plot with the help of Table 1. In the first three columns, height above the limb is given in units of the fractional height of the field of view in the NDIFF plot, height in arc seconds, and in units of $R_\odot$ above the true limb of the sun. As many as three contours may be plotted on the NDIFF map. Depleted regions are indicated by a solid contour line. The absolute value of the inferred difference in pB detected is actually a function of height due to the triangular sampling slit. This variation is shown by the values of the NDIFF contour levels as a function of height -- columns four through six in Table 1. Thus, an indication of a depleted region enclosed by two solid contours at midpoint between the limb and the edge of the field of view implies a ΔpB between $2.4 \times 10^{-8} B_\odot$ and $3.7 \times 10^{-8} B_\odot$ has occurred between the two images used to estimate the NDIFF plot. More information concerning the NDIFF plot is given by Rock and Seagraves (1982).

TABLE 1

ΔpB vs. Height

Height			Contour Levels ($\times 10^{-8} B_\odot$)		
r(fractional height in NDIFF)	h(arc sec)	$R_\odot$	1st	2nd	3rd
0.0	350	1.36	1.9	3.8	5.7
0.5	710	1.73	1.2	2.4	3.7
1.0	1160	2.20	0.7	1.6	2.4

III. MSO DATA PRODUCTS

The synoptic program conducted at MSO on Haleakala for SOLDYN III was directed toward obtaining two distinct but related sets of observations.

The principal series, photo-electric observations, using the Haleakala Stokes polarimeter (see Mickey, 1985), was designed to lead to vector magnetic field and line of sight velocity measurements in the photosphere. The second set of observations consists of complementary photographic observations of the chromosphere and photosphere as well as of limb prominences for correlation and comparison with the white light coronal structure. This was designed largely as a back up for the MLSO photographic data in the event that MLSO was covered by clouds and MSO was not. In fact this contingency did not have to be dealt with during the study interval.

Stokes Polarimeter

The Haleakala Stokes polarimeter consists of a 15-cm aperture, f:16 telescope with a pinhole field stop at the prime focus, a rotating quarter-wave plate modulator, and a compact high-resolution echelle spectrometer. A 128-element detector array in each of the two beams at the spectrometer focus provides simultaneous recording across a 3Å spectral range. The polarimeter produces line profiles in each of the Stokes parameters I, Q, U, V, which are displayed in real time for the observer and stored on magnetic media for off-line processing.

The magnetically sensitive line selected for this study was Fe I λ6302.5, a simple Zeeman triplet with an equivalent width of 80 mÅ and a lower-level excitation potential of 3.67eV. The line is free from blends, is insensitive to temperature, and there are telluric O_2 lines at λ6302.0 and λ6302.76 which can be used as references for velocity determinations. The spectrometer entrance slit was set to provide a geometrical instrumental bandpass of 40 mÅ. In practice, the spectrometer resolution is about 50 mÅ.

For each day, a rectangular raster was obtained which covered the entire solar disk, with a point spacing of 28 arcsec. Points in the corners of the raster which were off the disk were skipped to speed up the scan, resulting in a total of about 3500 data points for each day. Integra-

tion time at each point was 1.1 seconds; the full raster took 72 minutes to complete. The pinhole field stop was selected to provide a 30 arcsecond diameter field for a given data point.

The line-of-sight magnetic field data presented here were derived from the Stokes profiles by the integral technique described by Ronan et. al. (1988)., which uses the integrated amplitude of the Stokes V signal as a measure of the magnetic field. This approach, of course, measures the average magnetic field in the field of view, ignoring the idea that the flux may be concentrated in small elements within the field. The derived quiet-sun fields in these data show a gaussian distribution with a rms amplitude of approximately 1G. An instrumental offset of 1-5G has been subtracted from each day's data, but drifts during the raster scan show up as broad horizontal bands. These in turn are visible as faint diagonal bands on the synoptic map.

To date the data have been reduced, as presented in this Technical Note, to provide the longitudinal component of the photospheric magnetic field. Work is continuing to derive vector magnetic fields and photospheric line of sight velocity distributions as well.

Flare Patrol

The flare patrol telescope, using an Hα birefringent filter with a 0.5Å band pass, monitored the full disk recording a 14-mm solar image on 35-mm film. It ran continuously during the polarimeter scan at a rate of one exposure every 10 min, but had the capability during periods of flare activity, to have the rate increased to as much as 10/min. Following the scan, a set of graded exposures was taken for calibration purposes and to show prominences on the longer exposures.

IV. DATA COVERAGE

A coverage list, Table 2, summarizes the combined operations during the observing program. The times during which each instrument operated are logged as a function of date and day of year (DOY); the existence of an observation or identification of activity is indicated with a "X". All times are in U.T.

TABLE 2. SOLDYN III DATA COVERAGE

OBSERVATIONS FOR 18 MARCH 1988 ECLIPSE

DATE		DOY	NMAP (UT)	NDIFF	SHELLS 1.3 Ro	SHELLS 1.7 Ro	MSO Stokes	ACTIVITY
1	MAR	61	1900	X	X	X		
2	MAR	62	1903	X	X	X		
3	MAR	63	1911	X	X	X		
4	MAR	64	NO DATA	NO DATA	X	X		X
5	MAR	65	1904	X	X	X		
6	MAR	66	1904	X	X	X		
7	MAR	67	1910	X	X	X		
8	MAR	68	1911	X	X	X		
9	MAR	69	1901	X	X	X		
10	MAR	70	1911	X	X	X	X	
11	MAR	71	1908	X	X	X	X	
12	MAR	72	1906	X	X	X	X	X
13	MAR	73	1908	X	X	X	X	
14	MAR	74	1934	X	X	X		
15	MAR	75	1906	X	X	X	X	
16	MAR	76	1901	X	X	X		
17	MAR	77	NO DATA	NO DATA	X	X		
18	MAR	78	1914	X	X	X		
19	MAR	79	1756	X	X	X	X	X
20	MAR	80	1907	X	X	X	X	X
21	MAR	81	1755	X	X	X	X	X
22	MAR	82	1903	X	X	X		
23	MAR	83	1930	X	X	X		
24	MAR	84	NO DATA	NO DATA	X	X		
25	MAR	85	NO DATA	NO DATA	X	X		
26	MAR	86	NO DATA	NO DATA	X	X		
27	MAR	87	NO DATA	NO DATA	X	X		
28	MAR	88	1739	X	X	X		
29	MAR	89	1901	X	X	X		
30	MAR	90	1909	X	X	X		

V. SOLAR ACTIVITY DURING THE SOLDYN III PERIOD

As an aid to the reader, a short summary of solar activity detected by us during the observational phase of the project is given below in Table 3. This list is not intended to be a comprehensive specification of the level of activity, but it merely reflects that fraction of the total activity captured in the joint project data set. There is a short comment concerning the specific limb events observed; the approximate maximum height above the limb and heliocentric position angle are given as a function of date, DOY, and U.T. A general comment concerning disk activity is also included for each DOY. The limb activity summary is taken from the MLSO prominence monitor real-time video data and the P-MON automatic log book.

TABLE 3: SOLDYN III ACTIVITY SUMMARY

DATE	DOY	ACTIVITY	TIME	P.A.	R_V	FILM	TAPES
3/3/88	63	1. EPL 2. Transient 3. Faint EPL	1930 - 2330 2100 - 2330 2138 - 2205	160-190 160-190 ~110	1.6 1.3	MLSO - 6-88	V67647 V67648 V67649 V67650 V67651 V67652
3/12/88	72	1. Slight depletion	1945 - 2000	30-40		MLSO - 7-88	V67653 V67668 V67669
3/19/88	79	1. Transient large sudden depletion 2. Coronal enhancement	1814 - 1857 1833 - 1930	280-300 130-170		MLSO - 8-88	V67658 V67659 V67660
3/20/88	80	1. Slow EPL 2. Possible transient	1737 - 2345 ~2000 - 2100	25-39 130-150	1.3	MLSO - 8-88	V67662 V67663
3/21/88	81	1. Active prominence 2. Active prominence 3. Large loop prominence 4. Possible coronal transient 5. Possible coronal transient	1745 - 1930 1745 - 1930 1845 - 2200 1845 - 1930 1750 - 2030	225-270 220-230 130-145 270-290 90-130		MLSO - 8-88	V67664 V67665 V67666 V67667

VI. DAILY SOLAR DATA

The data recorded during the SOLDYN III observations are presented on the following pages in a format which uses two facing pages per DOY, as indicated in Fig. 1. The date and DOY are indicated on each page. Observations of the photosphere and chromosphere are on the even-numbered (left-hand) pages, while the corresponding coronal data are presented on the odd-numbered (right-hand) pages. The even-numbered pages contain the solar data as described in Section III, with the left hand image showing the Hα sun, and the image on the right showing the limb patrol in Hα. In the lower center of the page is the daily magnetic field observation shown as a a raster array of data superimposed on the part of the disk of the sun scanned that day. Dark areas represent positive field. All images are oriented with geocentric north at the top; the shadow of the pylon which supports the occulting disc in the prominence monitor limb image indicates the location of the solar south pole.

The odd-numbered pages contain the coronal data described in Section II, with the NMAP shown at the top left and the daily NDIFF shown at top right. The lower left frame contains the SHELLS produced for observations at 1.3 $R_\odot$, while the lower right frame contains the SHELLS for 1.7 $R_\odot$.

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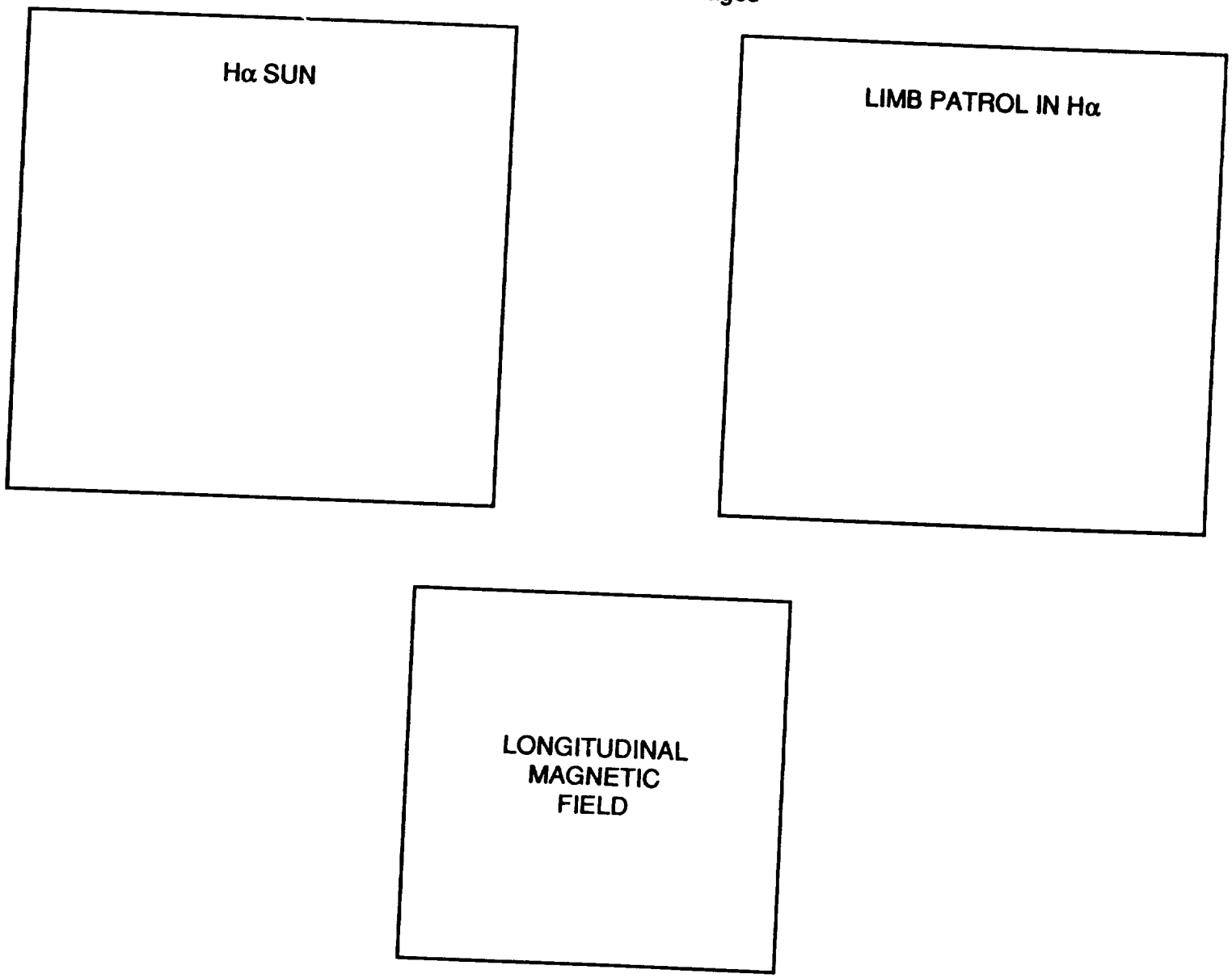
Fig. 1. Page Layouts
Even-numbered Pages



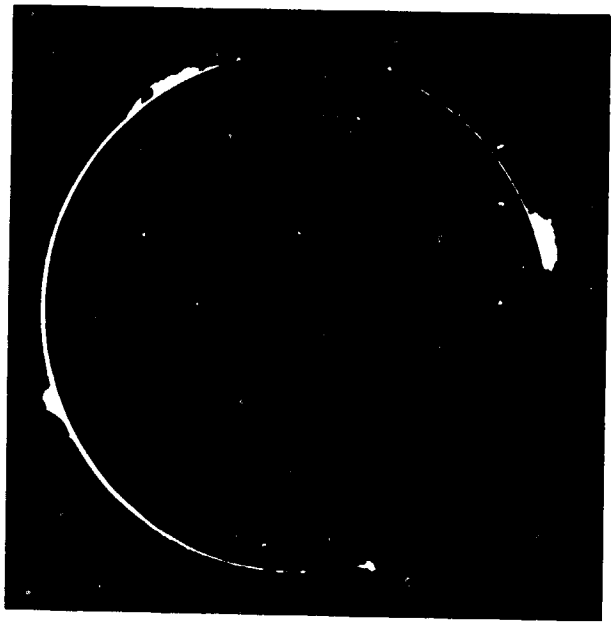
Odd-Numbered Pages

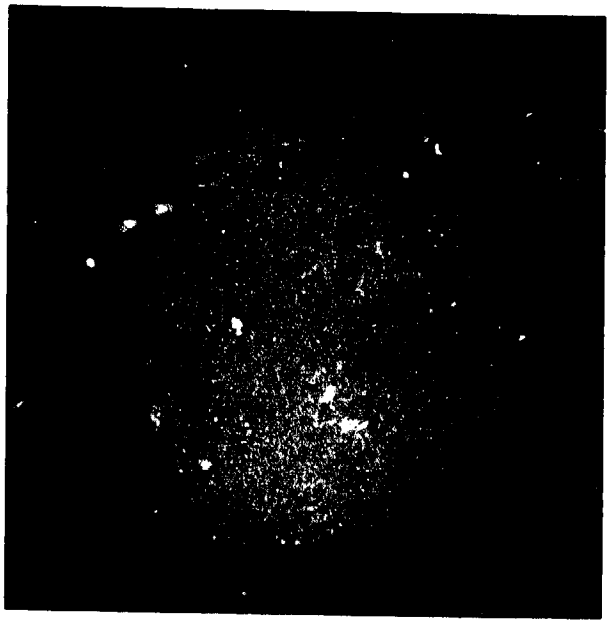
NMAP

NDIFF

SHELLS 1.3 $R_\odot$

SHELLS 1.7 $R_\odot$

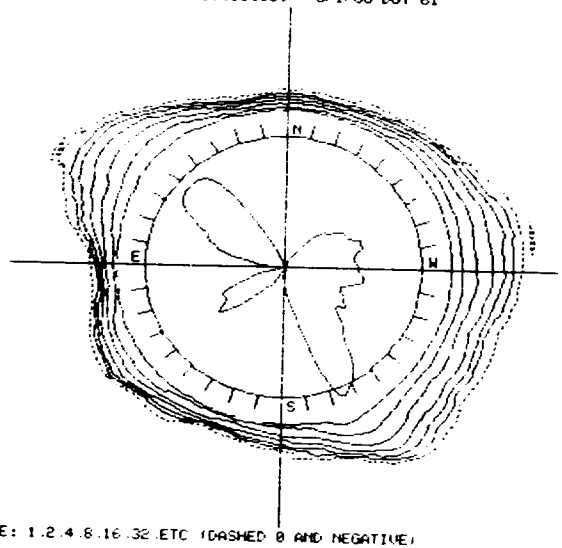




NO DATA

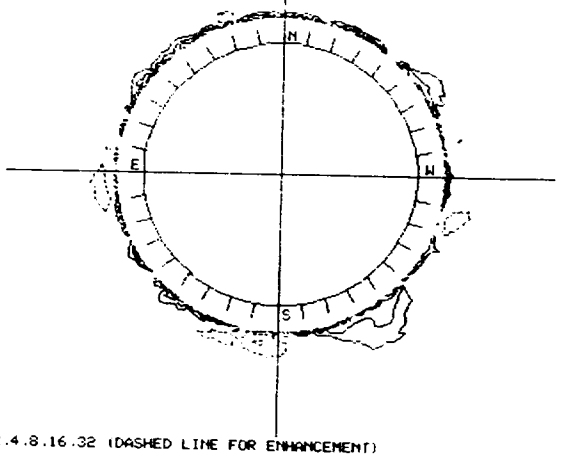
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:00:10. 3/1/88 DOY 61
MARK-III CHANNEL 0
'NMAP' Q COMPONENT

	DEG	PB		
STR	50	18	3	-2
HOL	87	2	-2	-2
HOL	99	1	-2	-3
STR	125	10	-2	-3
HOL	153	0	-3	-4
HOL	179	2	-2	-3
STR	209	19	4	-2
STR	241	9	1	-2
STR	268	10	2	-1
STR	290	11	1	-2
HOL	334	0	-2	-2
HOL	17	0	-2	-2
BRI	51	18	3	-1
BRI	129	10	-2	-3
BRI	206	21	1	-2
BRI	237	10	1	-2
BRI	263	11	2	-1
BRI	293	10	1	-2



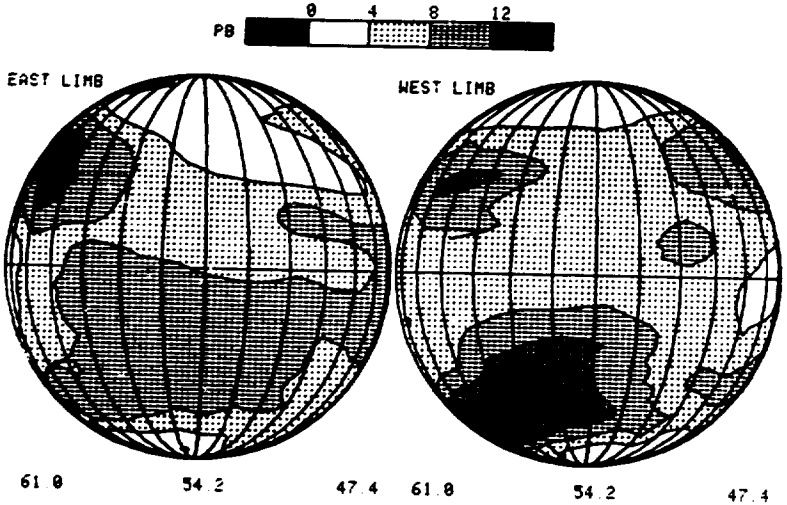
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:00:10. 3/1/88 DOY 61
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:03:09. 3/2/88 DOY 62
NCAR-HAO-MLSO
NDIFF PROGRAM

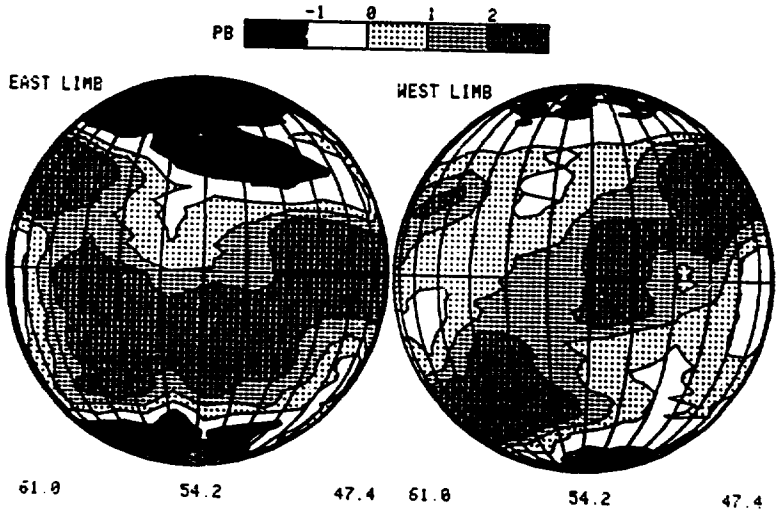


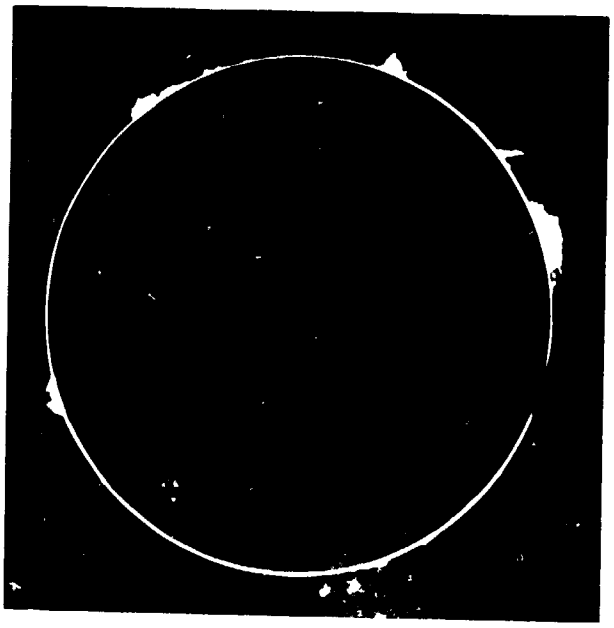
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

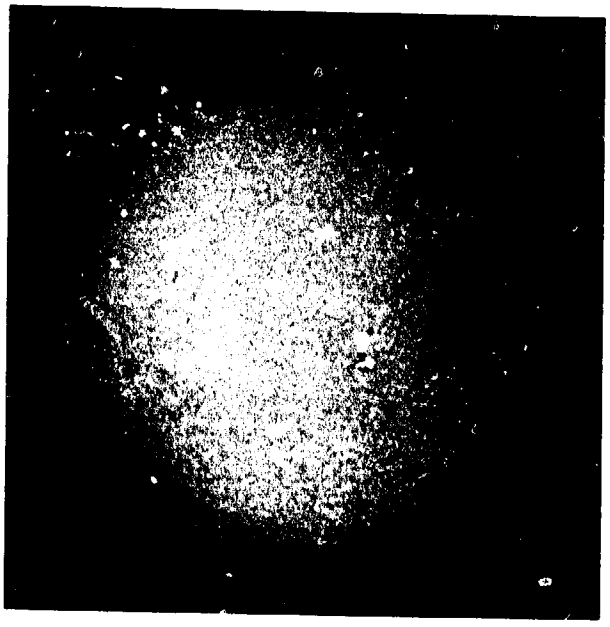
SHELLS DOY 61.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 61.0 1988 MIDDLE CORONA NCAR-HAO-MLSO







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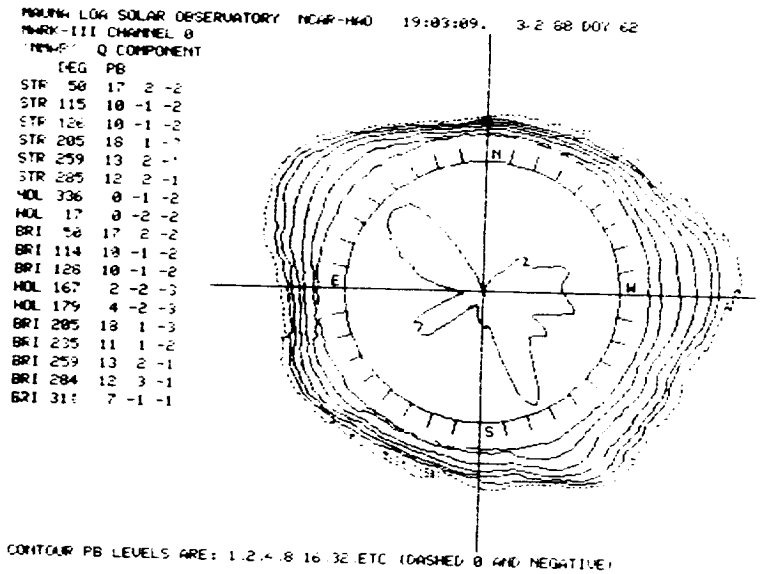
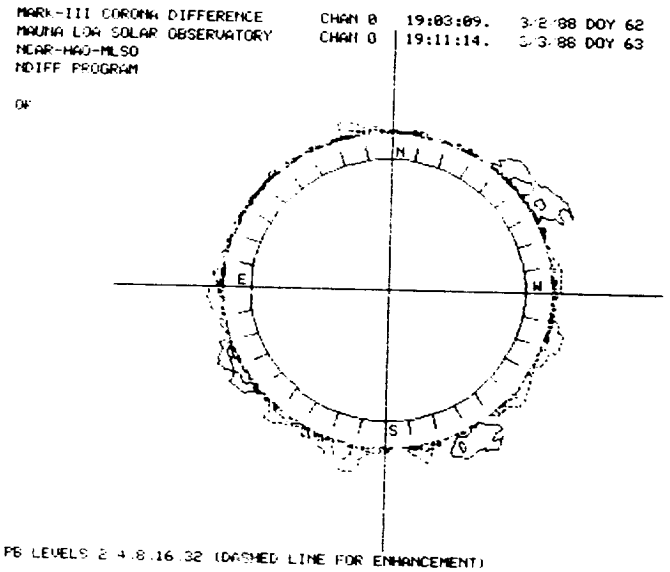
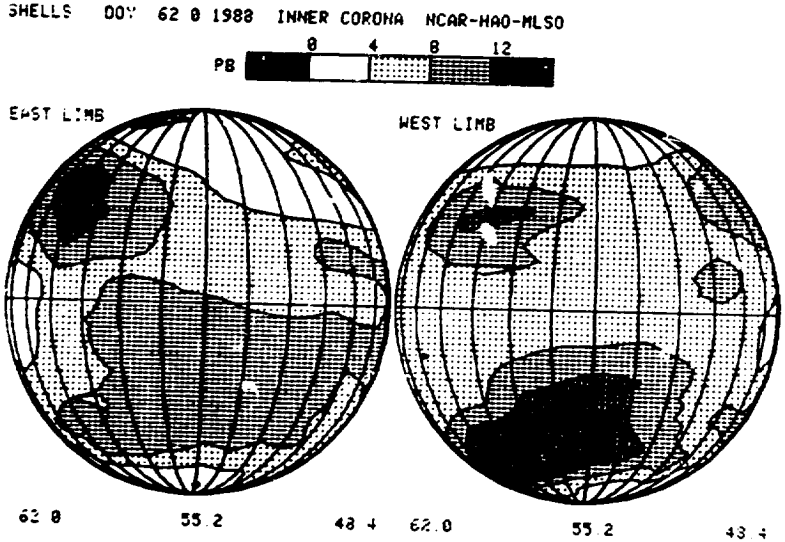
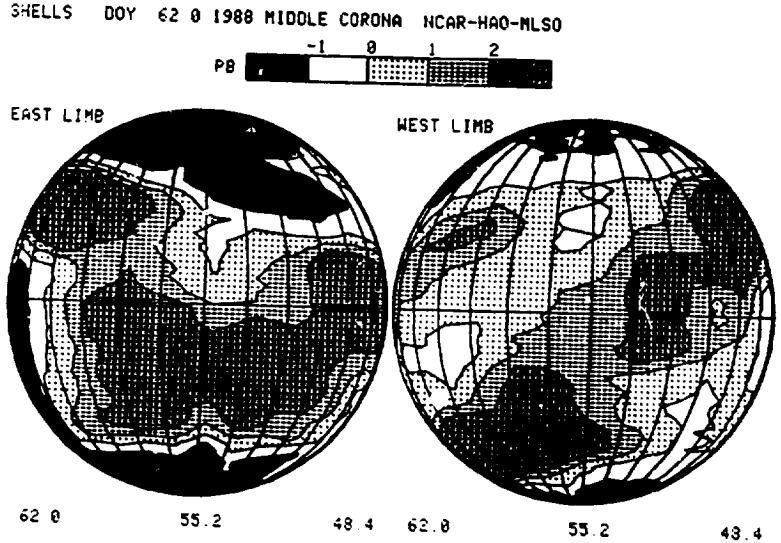
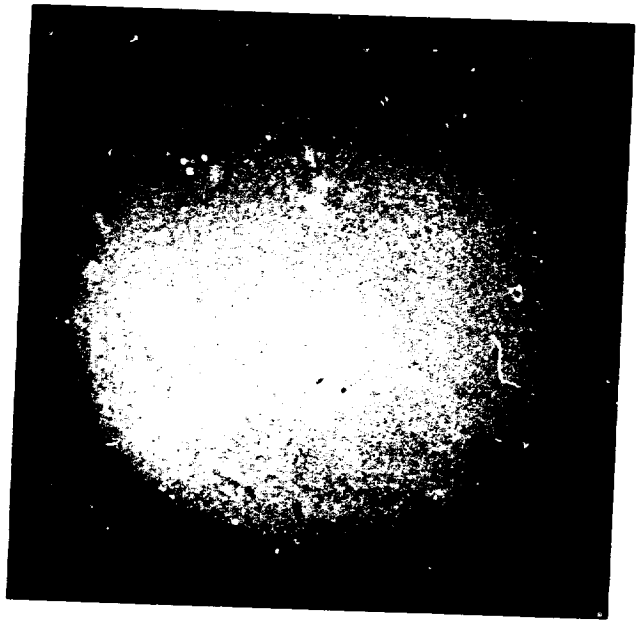
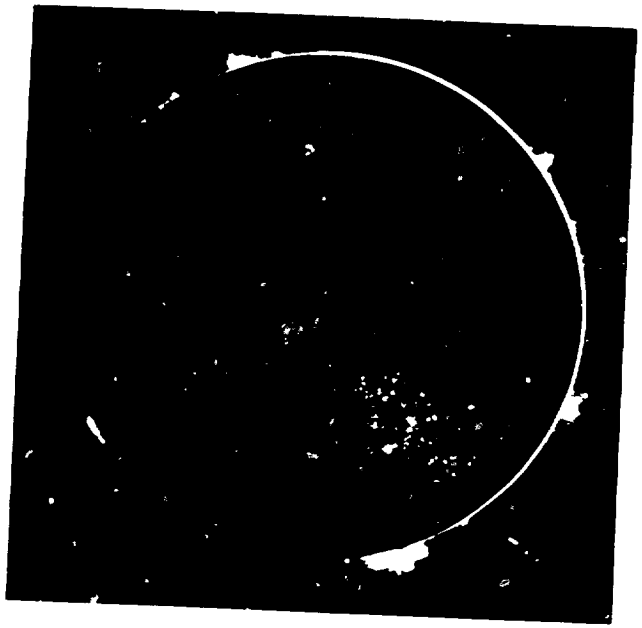

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:03:09. 3-2-88 DOY 62
MARK-III CHANNEL 0
Q COMPONENT
DEG PB
STR 50 17 2 -2
STR 115 10 -1 -2
STR 126 10 -1 -2
STR 205 18 1 -3
STR 259 13 2 -1
STR 285 12 2 -1
HOL 336 0 -1 -2
HOL 17 0 -2 -2
BRI 50 17 2 -2
BRI 114 10 -1 -2
BRI 126 10 -1 -2
HOL 167 2 -2 -3
HOL 179 4 -2 -3
BRI 205 18 1 -3
BRI 235 11 1 -2
BRI 259 13 2 -1
BRI 284 12 3 -1
BRI 315 7 -1 -1
N
E
W
S
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32 ETC (DASHED 0 AND NEGATIVE)


MARK-III CORONA DIFFERENCE CHAN 0 19:03:09. 3-2-88 DOY 62
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:11:14. 3-3-88 DOY 63
NCAR-HAO-MLSO
NDIFF PROGRAM
N
E
W
S
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)


SHELLS DOY 62 0 1988 INNER CORONA NCAR-HAO-MLSO
PB
0 4 8 12
EAST LIMB
WEST LIMB
62 0
55.2
48 4
62.0
55.2
43.4


SHELLS DOY 62 0 1988 MIDDLE CORONA NCAR-HAO-MLSO
PB
-1 0 1 2
EAST LIMB
WEST LIMB
62 0
55.2
48.4
62.0
55.2
43.4





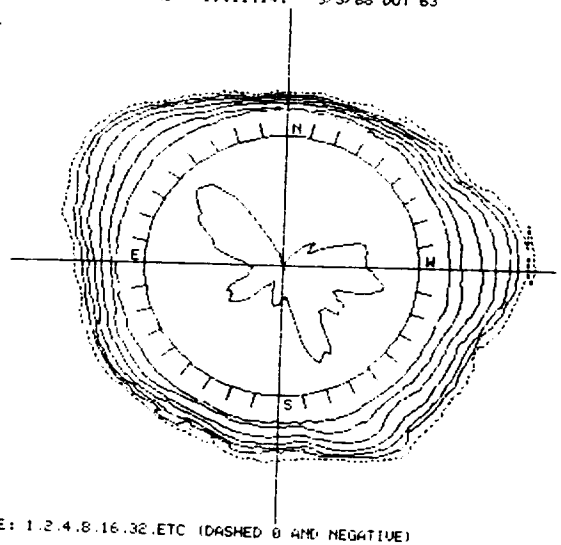
NO DATA

MAUNA LOA SOLAR OBSERVATORY

NO DATA

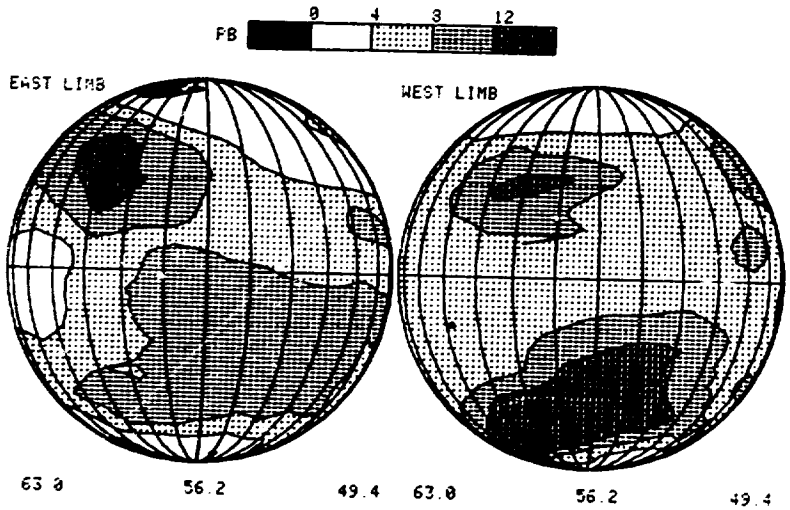
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:11:14. 3/3/88 DOY 63
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	48	16	2	-2
BRI	116	8	-1	-3
BRI	126	9	-2	-3
BRI	167	5	-3	-4
BRI	204	14	0	-3
BRI	209	14	2	-3
BRI	230	10	0	-2
BRI	236	10	0	-2
BRI	260	14	2	-2
BRI	282	12	2	-2
BRI	289	10	1	-2
BRI	312	5	-1	-2
HOL	330	1	-2	-2
HOL	6	0	-2	-2
STR	54	15	3	-1
STR	120	7	-2	-3
STR	169	6	-2	-4
STR	213	11	2	-2
STR	225	9	1	-2
STR	273	12	3	-1
STR	311	5	-1	-2

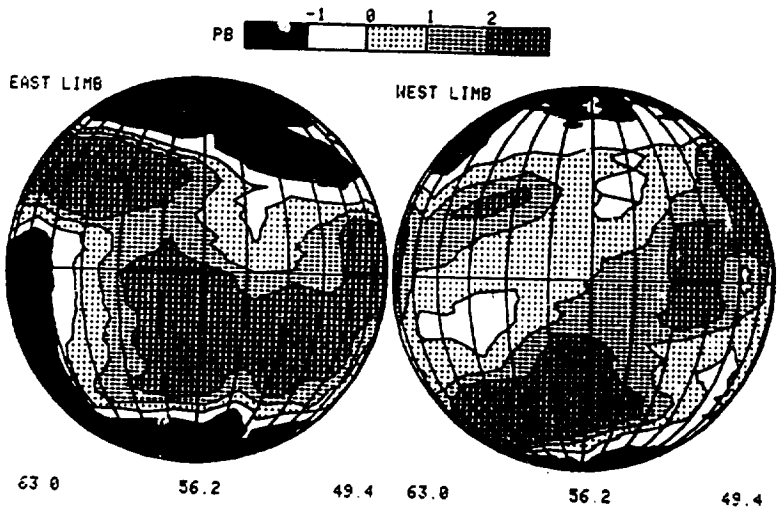


CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

SHELLS DOY 63 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 63.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



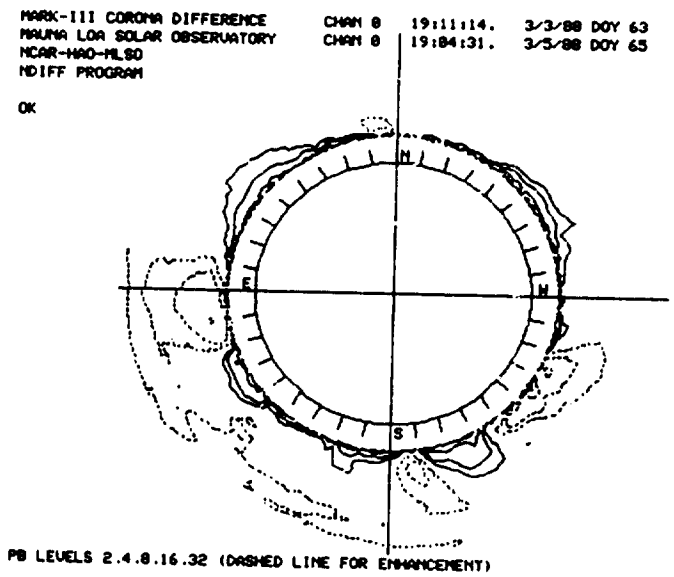
NO DATA

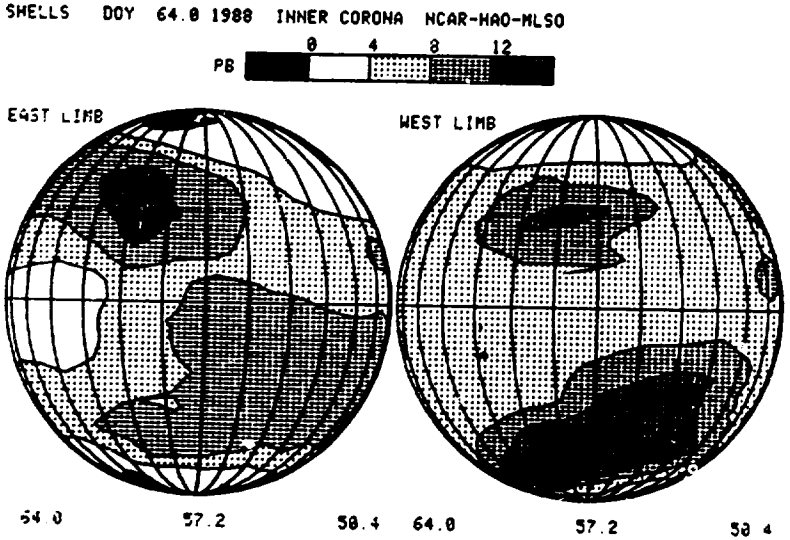
NO DATA

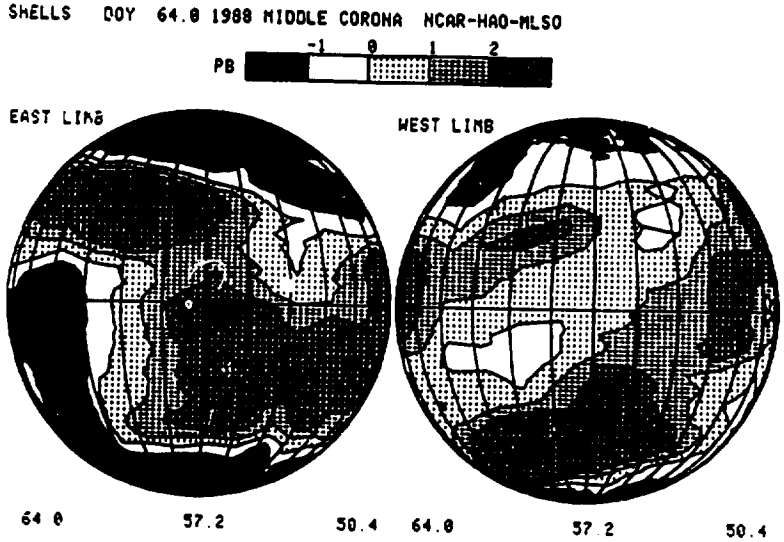
NO DATA

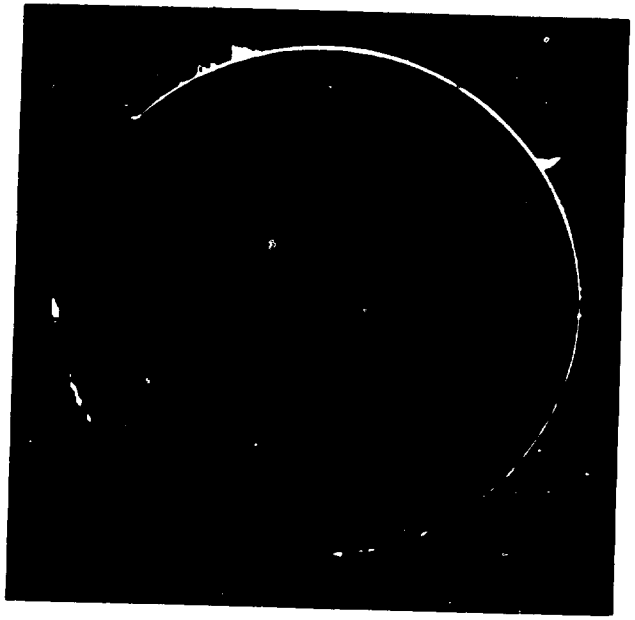
MAUNA LOA SOLAR OBSERVATORY

NO DATA





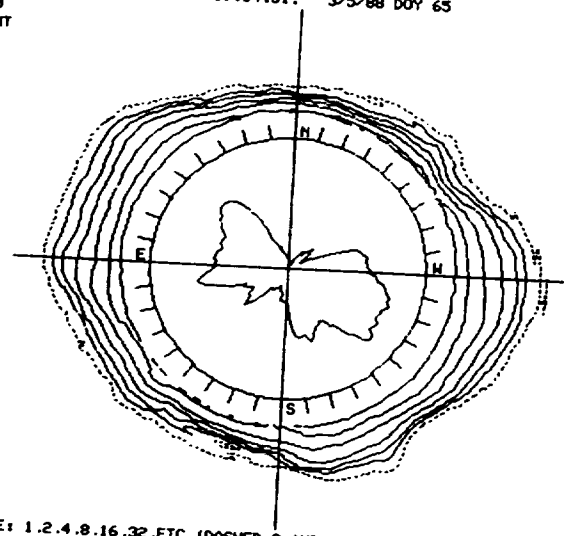




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:04:31. 3/5/88 DOY 65
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

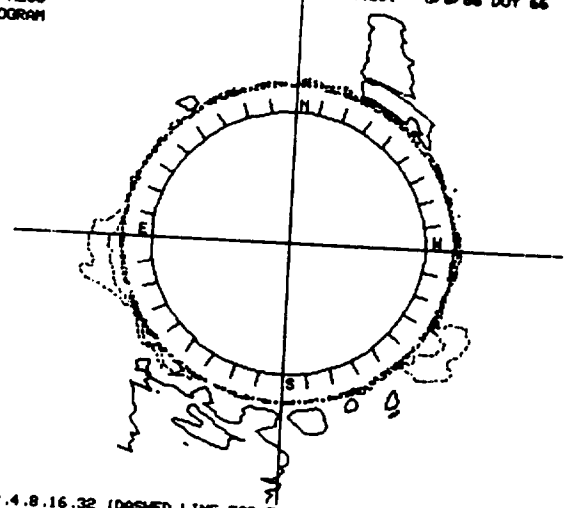
	DEG	PB		
BRI	45	13	1	-2
BRI	68	10	1	-1
BRI	82	10	2	0
BRI	108	13	1	-1
BRI	133	8	0	-1
BRI	189	10	0	-2
BRI	199	11	1	-2
BRI	232	15	0	-2
BRI	237	15	1	-2
BRI	250	15	2	-1
BRI	280	11	2	-1
BRI	314	4	0	-1
HOL	338	1	-1	-1
HOL	6	2	-1	-1
STR	54	12	2	-1
STR	92	11	3	-1
STR	133	8	0	-1
HOL	158	3	-1	-2
HOL	168	3	-2	-2
STR	203	10	1	-2
STR	267	12	3	-1
HOL	305	2	-1	-1
STR	313	4	0	-1



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

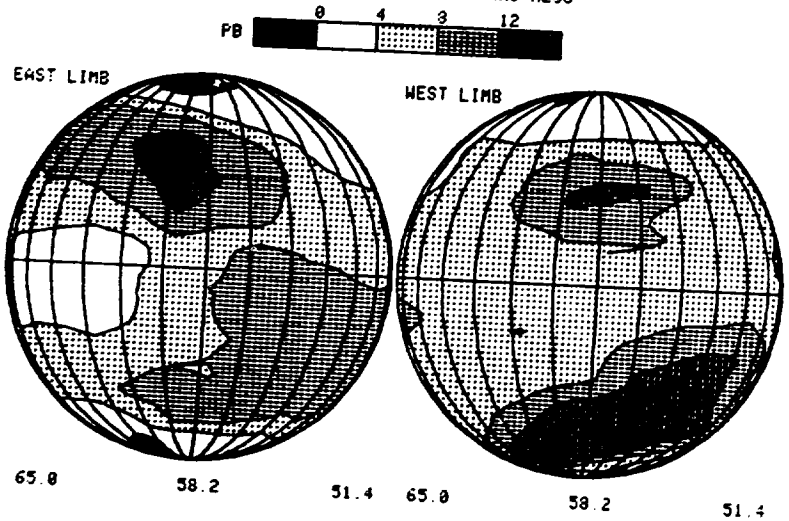
MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
NDIFF PROGRAM

CHAN 0 19:04:31. 3/5/88 DOY 65
CHAN 0 19:04:28. 3/6/88 DOY 66

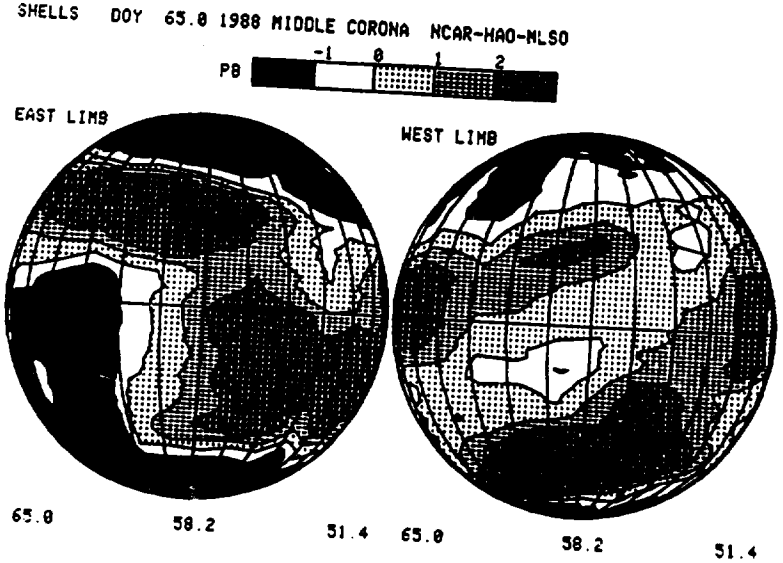


PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 65 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 65.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



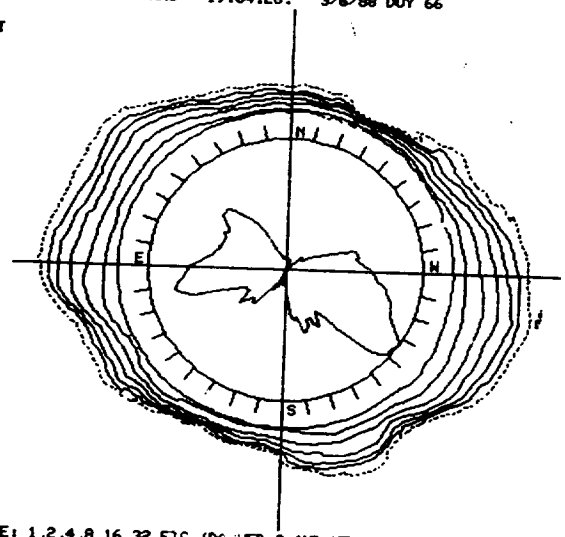
NO DATA

NO DATA

NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:04:28. 3/6/88 DOY 66
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

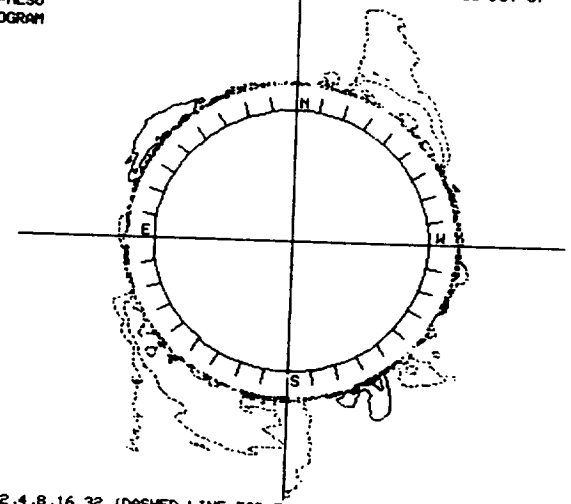
	DEG	PB		
STR	48	12	2	-2
STR	101	15	1	-1
HOL	117	6	-1	-1
HOL	124	6	0	-1
STR	131	6	-1	-1
HOL	154	0	-5	-5
HOL	174	2	-4	-4
STR	205	7	1	-2
STR	235	19	2	-2
STR	259	14	3	-1
HOL	307	2	0	-1
HOL	20	2	-1	-2
BRI	48	12	2	-2
BRI	101	15	1	-1
BRI	128	0	-1	-1
BRI	199	9	0	-2
BRI	212	0	-1	-2
BRI	231	18	1	-2



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

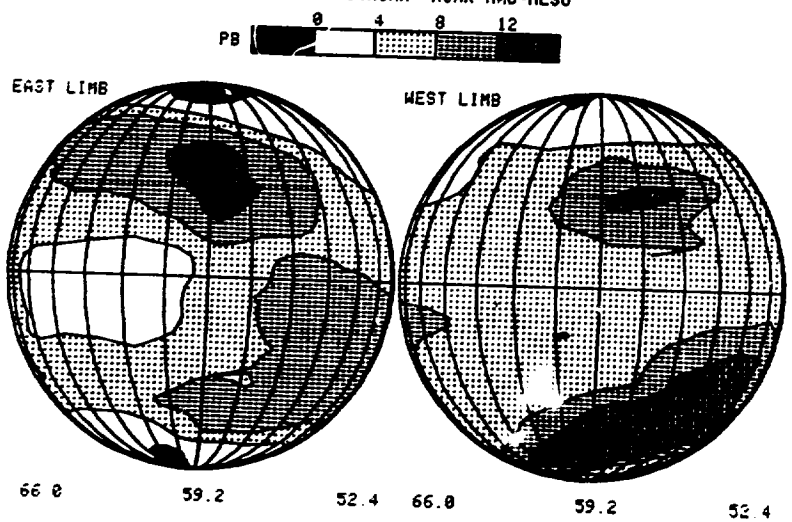
MARK-III CORONA DIFFERENCE CHAN 0 19:04:28. 3/6/88 DOY 66
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:10:49. 3/7/88 DOY 67
NCAR-HAO-MLSO
NDIFF PROGRAM

OK

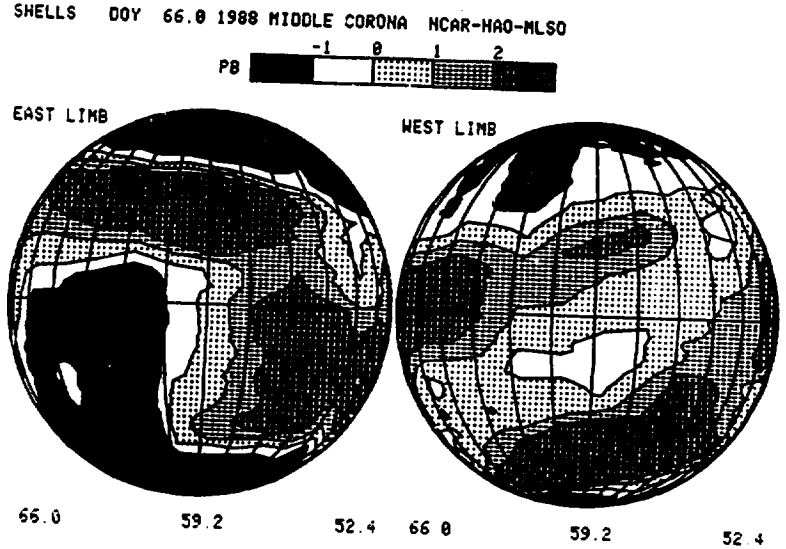


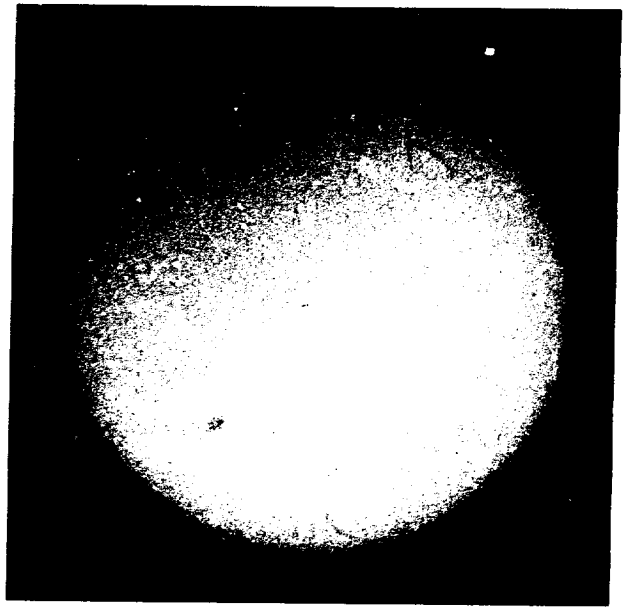
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

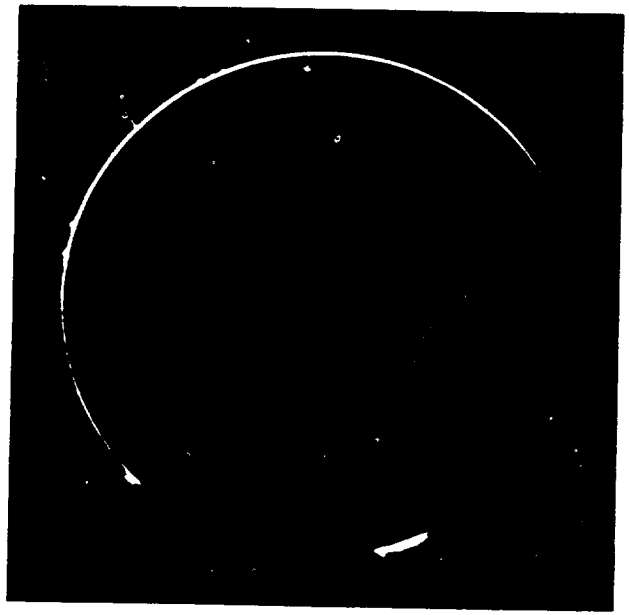
SHELLS DOY 66.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 66.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



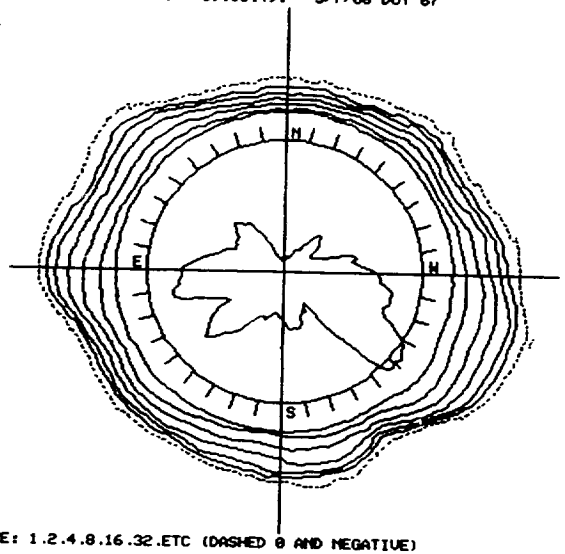




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:10:49. 3/7/88 DOY 67
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

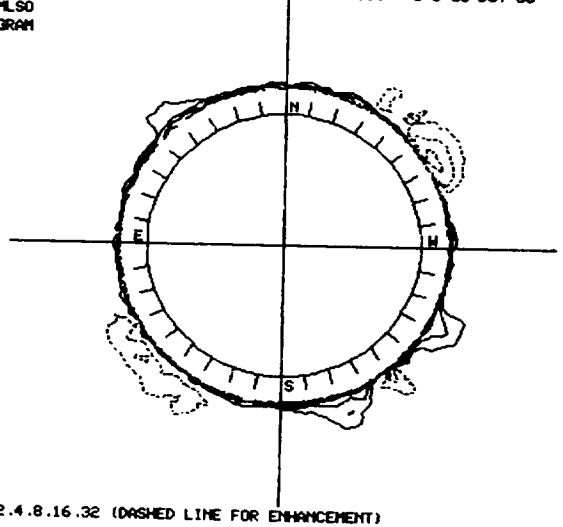
	DEG	PB		
BRI	45	10	1	-1
BRI	102	16	1	-1
BRI	131	14	0	-1
BRI	159	7	-1	-2
BRI	195	9	0	-1
BRI	227	20	1	-2
BRI	233	20	3	-2
BRI	253	16	3	-1
BRI	267	13	2	-1
BRI	284	10	0	-1
BRI	316	7	0	-1
HOL	356	2	-1	-1
HOL	14	2	-1	-1
STR	48	9	2	-1
STR	92	14	3	-1
STR	127	13	0	-1
STR	192	9	0	-1
HOL	210	5	-1	-2
STR	239	19	3	-1
STR	255	15	3	0
STR	315	7	0	-1



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

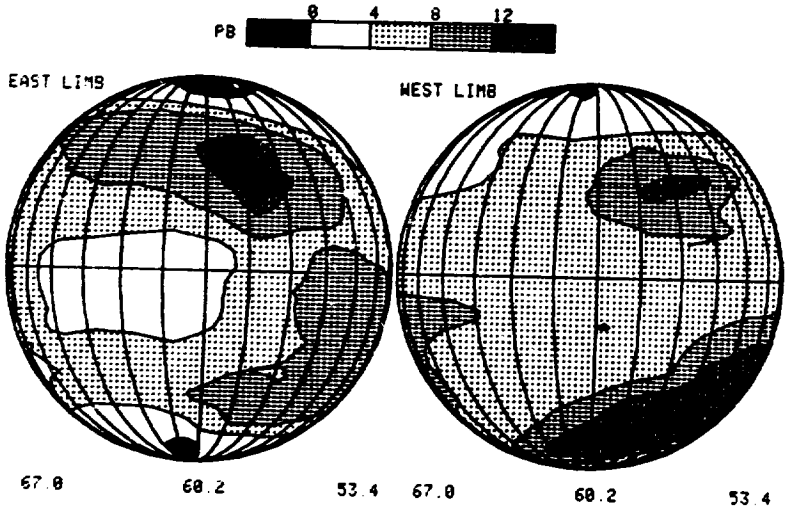
MARK-III CORONA DIFFERENCE CHAN 0 19:10:49. 3/7/88 DOY 67
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:11:13. 3/8/88 DOY 68
NCAR-HAO-MLSO
MDIFF PROGRAM

OK

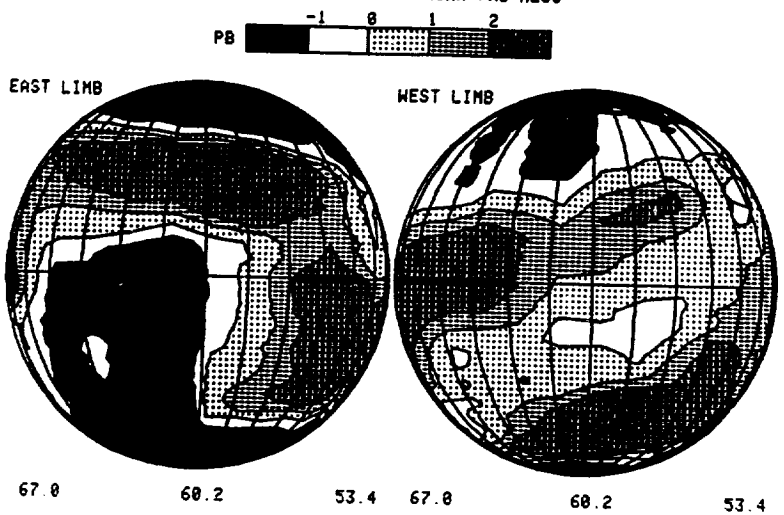


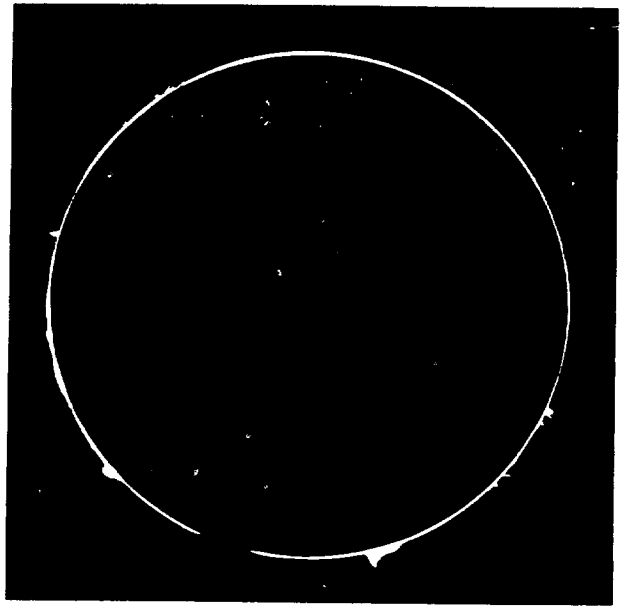
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 67.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 67.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

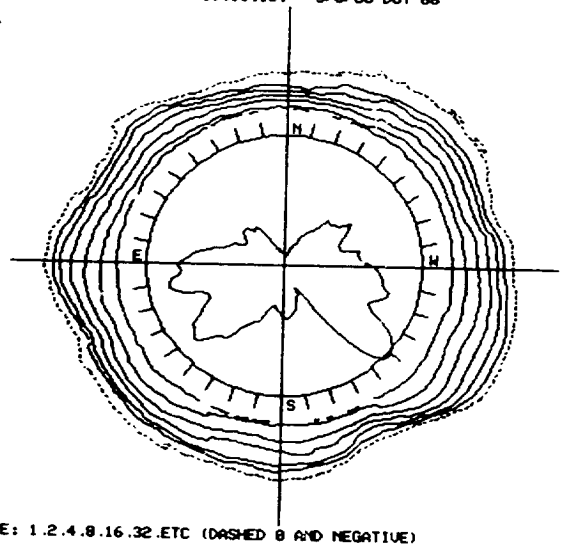




NO DATA

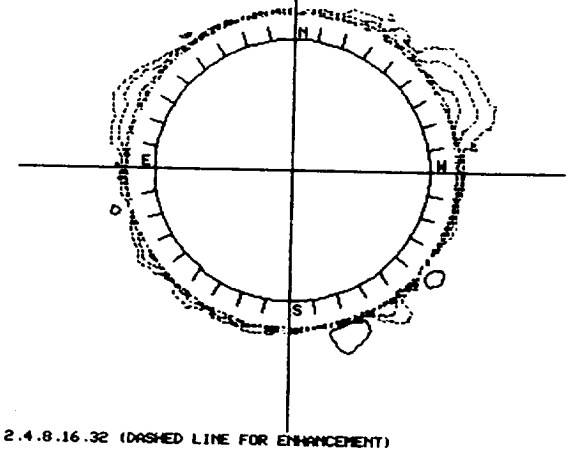
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:11:13. 3/8/88 DOY 68
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	36	7	-1	-2
BRI	46	7	0	-2
BRI	91	15	3	-1
BRI	104	16	1	-2
BRI	134	16	0	-1
BRI	144	13	0	-1
BRI	156	9	0	-1
BRI	186	7	0	-1
BRI	228	19	2	-2
BRI	255	15	2	-1
BRI	281	10	0	-2
BRI	304	11	0	-1
BRI	318	9	0	-1
HOL	351	1	-1	-1
HOL	6	2	-1	-1
STR	46	7	0	-2
STR	91	15	3	-1
STR	131	16	0	-1
STR	187	7	0	-1
HOL	209	4	-1	-2
STR	232	19	3	-2
STR	254	15	2	-1
STR	278	10	1	-2
STR	315	9	1	-1



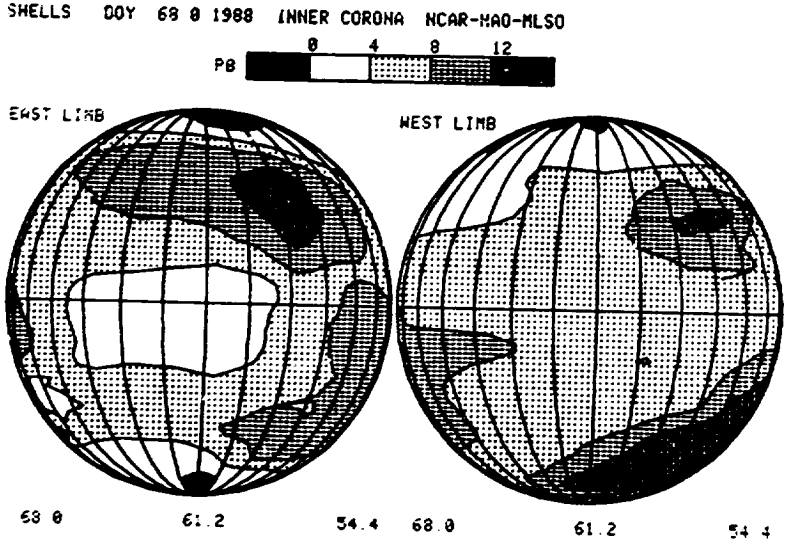
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:11:13. 3/8/88 DOY 68
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:01:50. 3/9/88 DOY 69
NCAR-HAO-MLSO
NDIFF PROGRAM

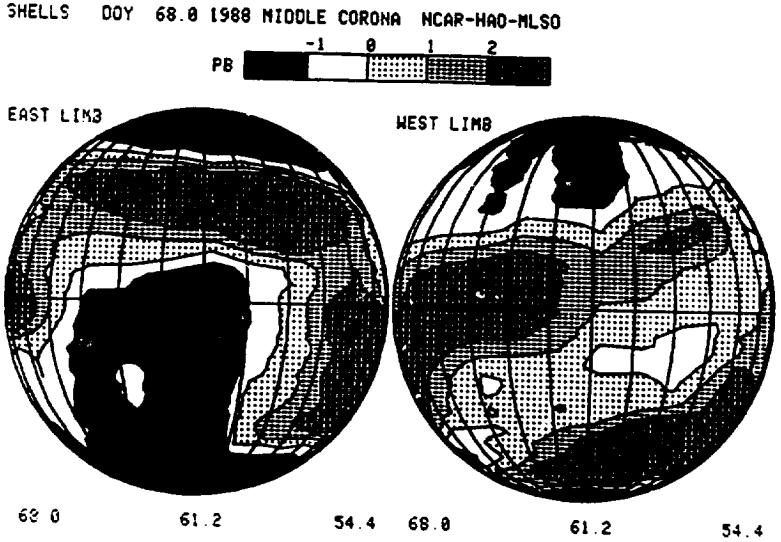


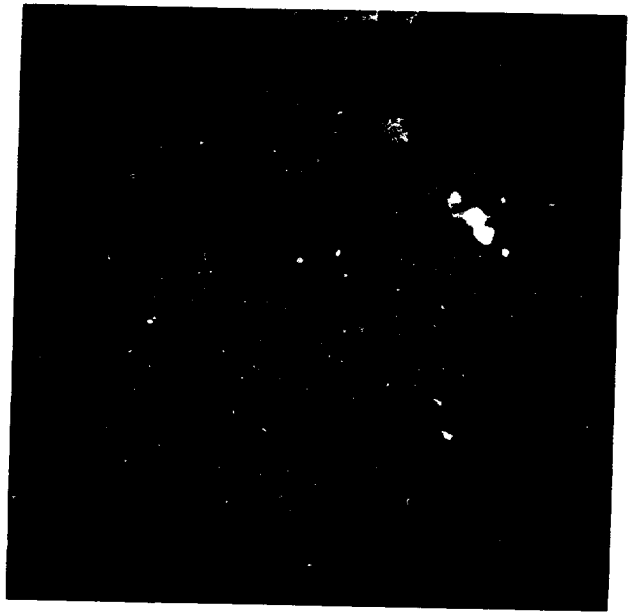
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

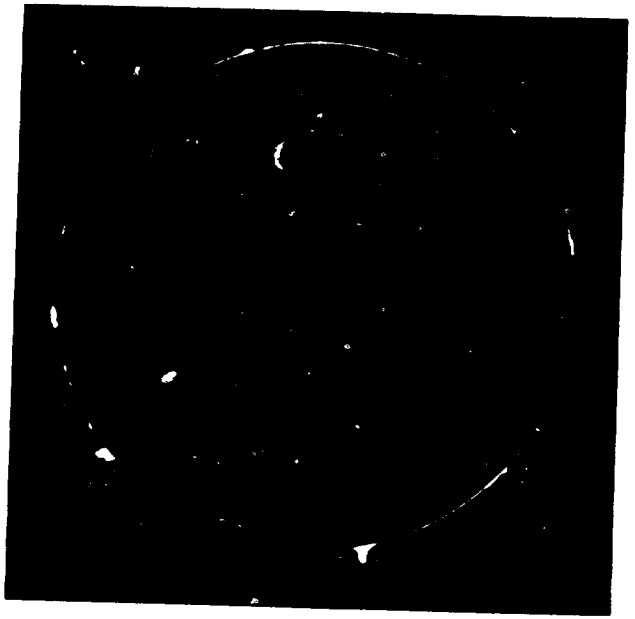
SHELLS DOY 68 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 68.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



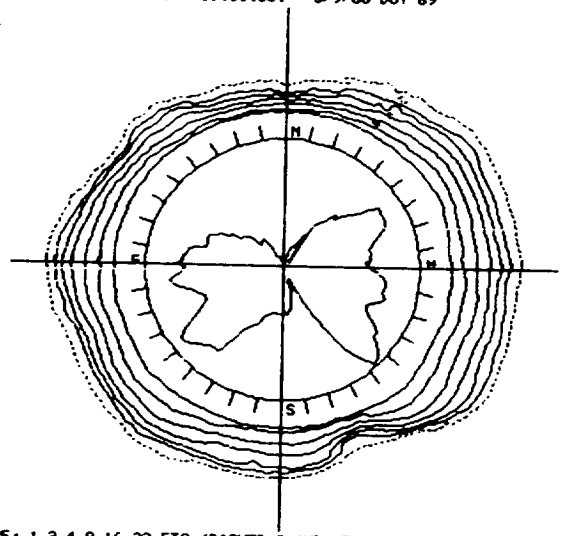




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:01:50. 3/9/88 DOY 69
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

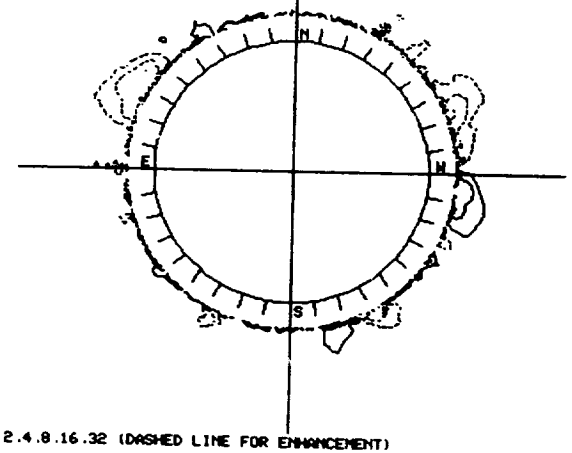
	DEG	PB		
STR	37	5	0	-2
STR	93	14	2	-1
STR	129	17	1	-1
HOL	198	2	-2	-2
HOL	207	2	-2	-2
STR	225	18	2	-2
STR	257	14	2	-1
STR	302	16	2	-1
HOL	349	2	-1	-1
HOL	24	2	-1	-1
BRI	69	11	0	-2
BRI	93	14	2	-1
BRI	100	15	1	-1
BRI	129	17	1	-1
BRI	226	18	2	-2
BRI	257	14	2	-1
BRI	281	12	1	-1
BRI	305	16	2	-1



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

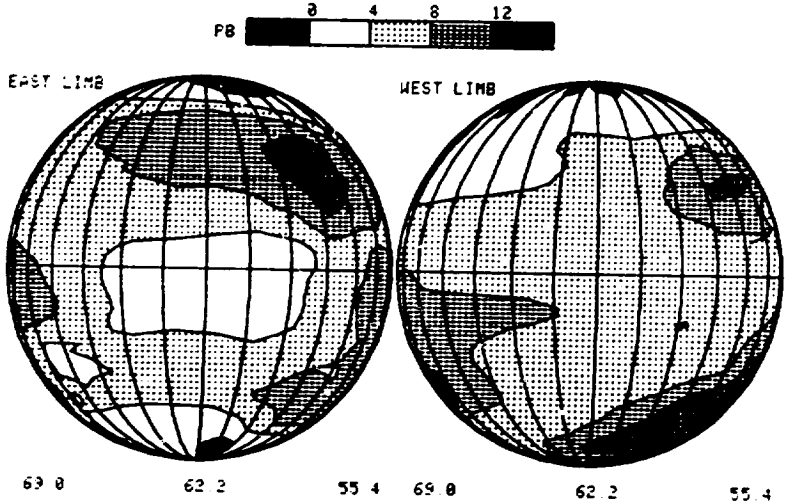
MARK-III CORONA DIFFERENCE CHAN 0 19:01:50. 3/9/88 DOY 69
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:11:53. 3/10/88 DOY 70
NCAR-HAO-MLSO
NDIFF PROGRAM

OK

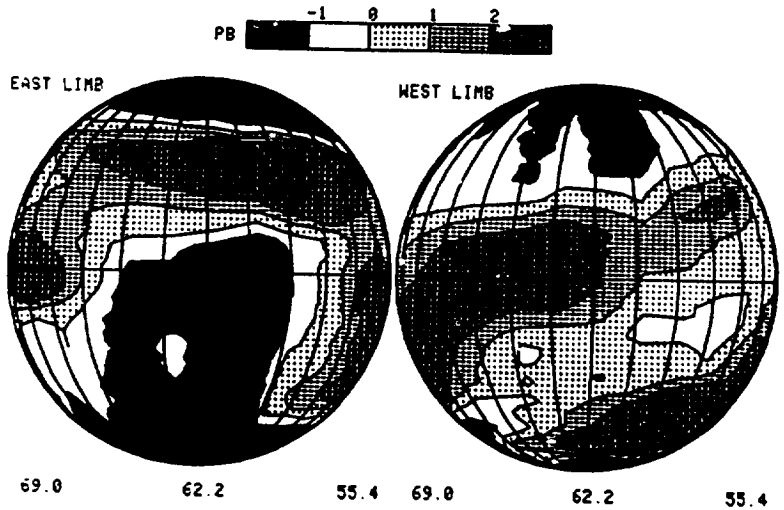


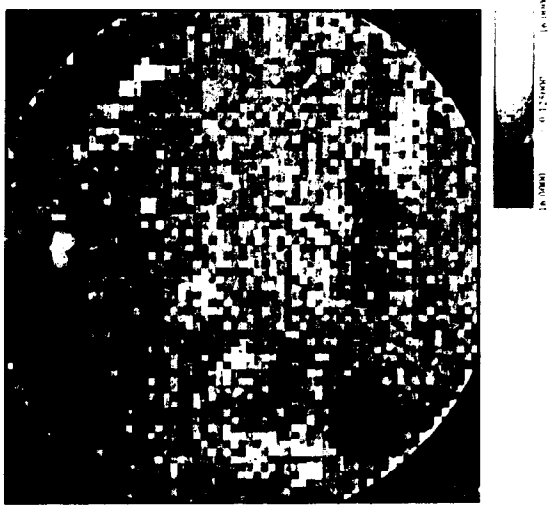
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

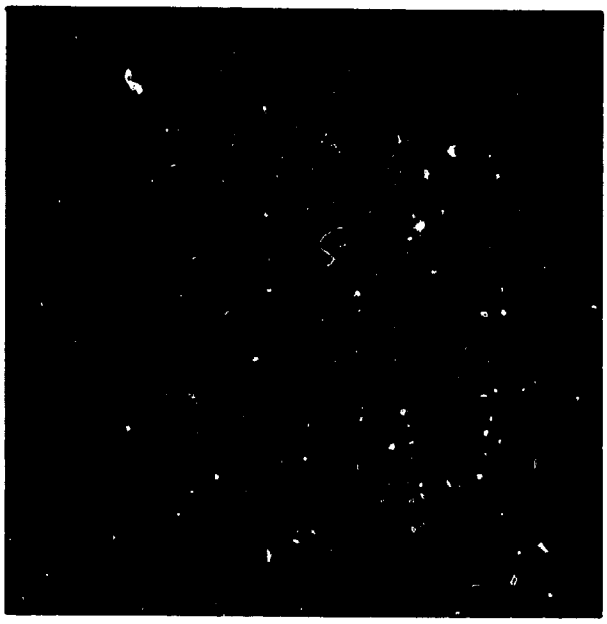
SHELLS DOY 69.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 69.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

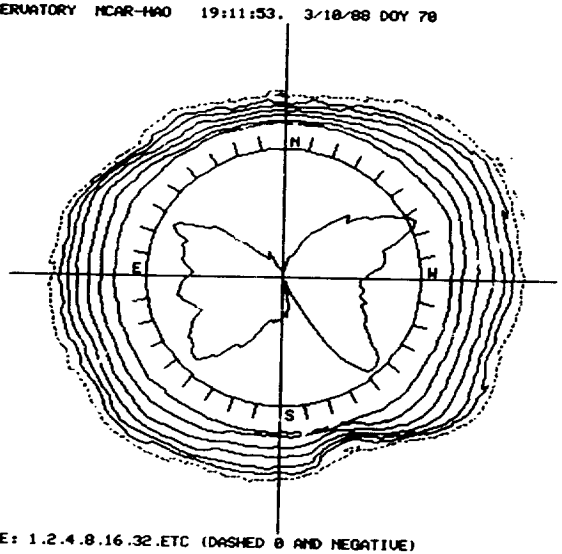






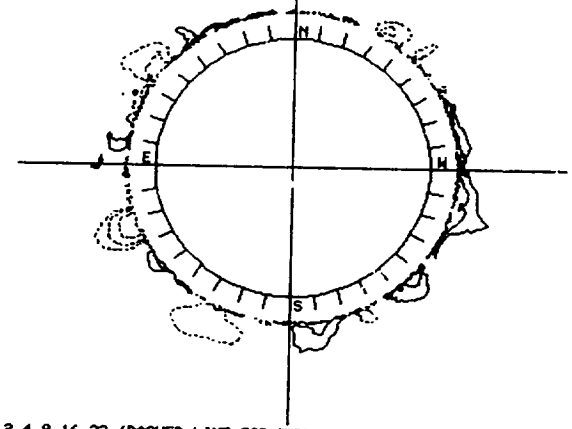
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:11:53. 3/10/88 DOY 70
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	63	17	0	-2
BRI	80	14	1	-1
BRI	99	15	1	-1
BRI	133	17	2	-1
BRI	151	12	0	-2
BRI	223	18	1	-2
BRI	243	13	2	-1
BRI	253	12	1	-1
BRI	279	14	2	-1
BRI	295	20	2	-1
BRI	317	12	1	-1
HOL	351	2	-1	-1
HOL	18	1	-1	-2
STR	70	14	1	-2
STR	99	15	1	-1
STR	133	17	2	-1
HOL	195	2	-1	-2
HOL	203	1	-1	-2
STR	236	14	2	-1
STR	239	18	2	-1



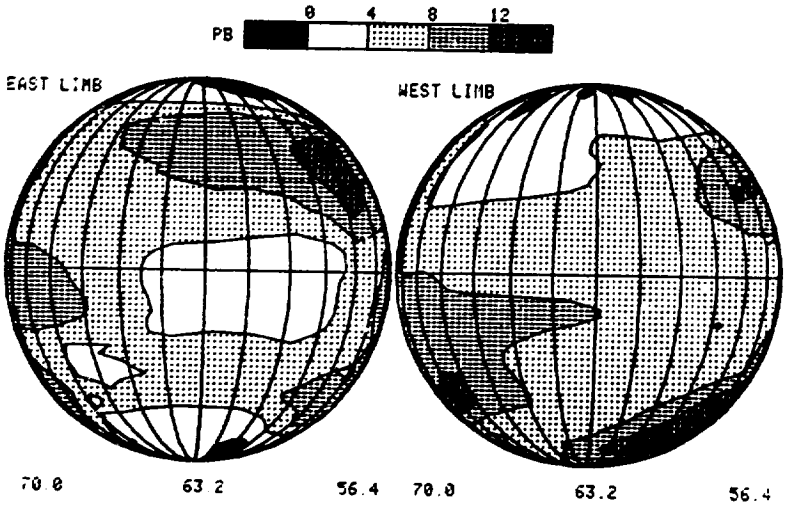
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:11:53. 3/10/88 DOY 70
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:08:51. 3/11/88 DOY 71
NCAR-HAO-MLSO
NDIFF PROGRAM

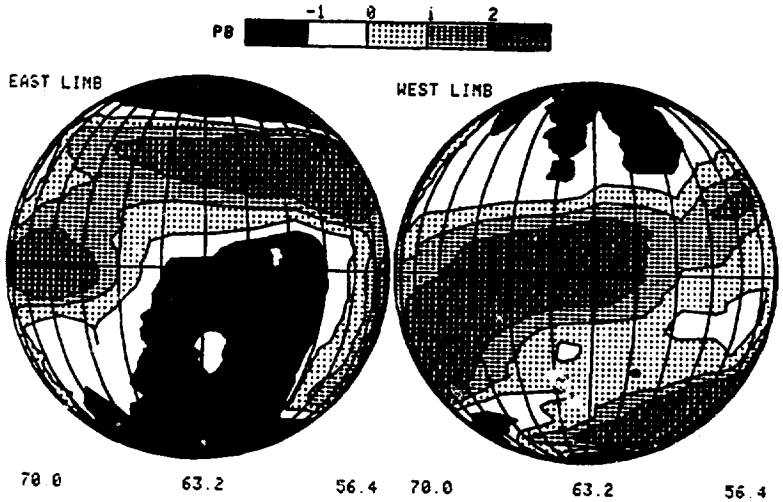


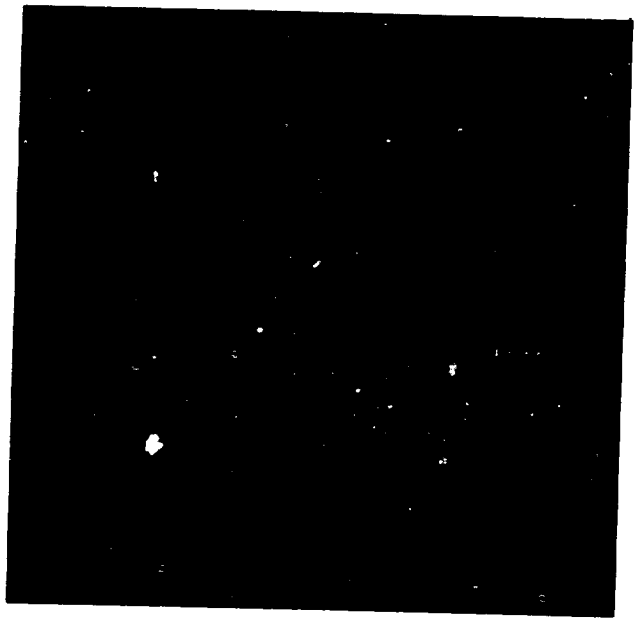
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 70.0 1988 INNER CORONA NCAR-HAO-MLSO

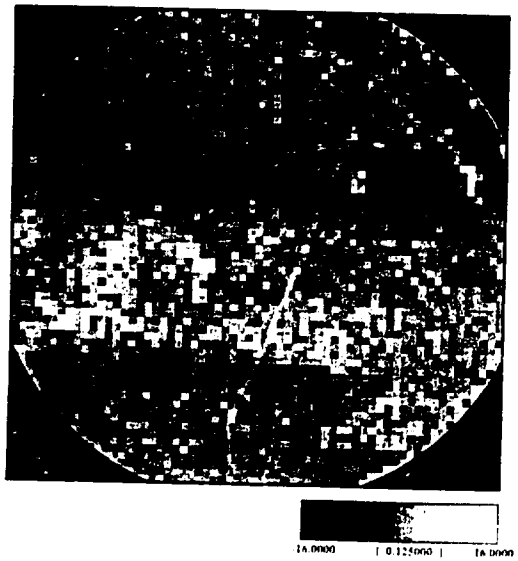


SHELLS DOY 70.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



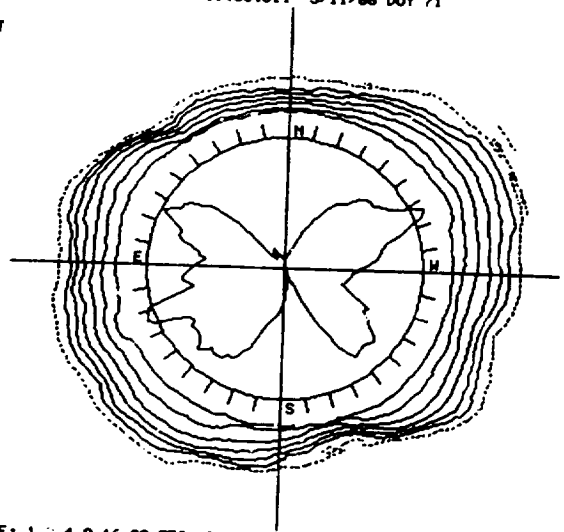


B 1988 Mar 11



MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:08:51. 3/11/88 DOY 71
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

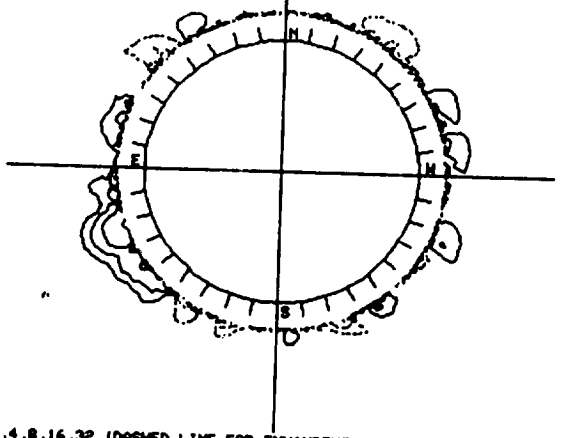
	DEG	PB		
STR	63	18	1	-2
STR	96	14	1	-1
STR	113	20	2	-1
STR	140	15	2	-1
HOL	180	2	-1	-2
HOL	205	2	-1	-2
STR	230	16	3	-2
STR	271	11	1	-1
STR	296	20	3	0
HOL	350	2	-1	-1
HOL	23	2	-1	-2
BRI	66	17	1	-2
BRI	73	15	2	-1
BRI	90	14	1	-1
BRI	115	19	2	-1
BRI	136	17	2	-1
BRI	221	16	0	-2
BRI	232	16	3	-1
BRI	296	20	3	0



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

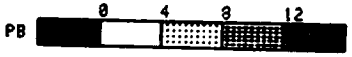
MARK-III CORONA DIFFERENCE CHAN 0 19:08:51. 3/11/88 DOY 71
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:06:59. 3/12/88 DOY 72
NCAR-HAO-MLSO
NDIFF PROGRAM

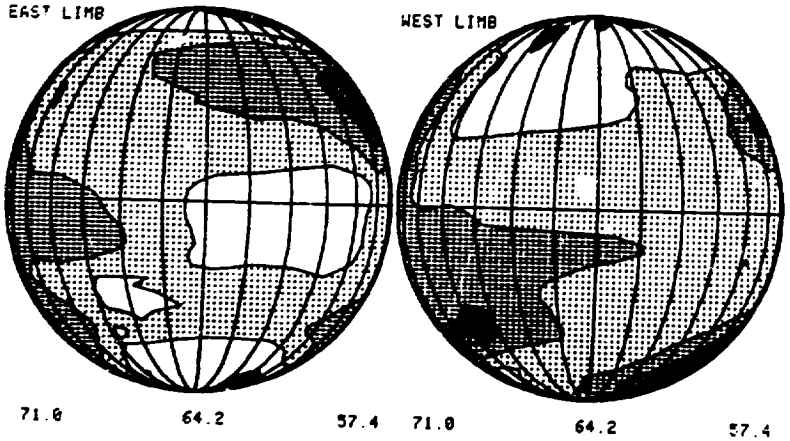
OK



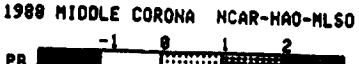
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

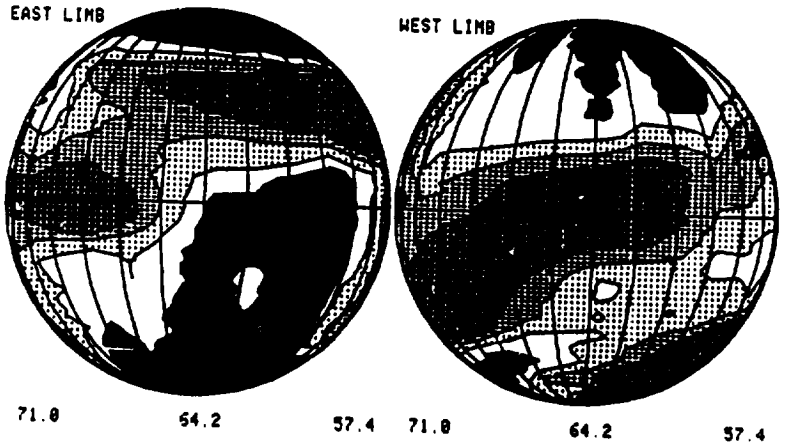
SHELLS DOY 71.0 1988 INNER CORONA NCAR-HAO-MLSO

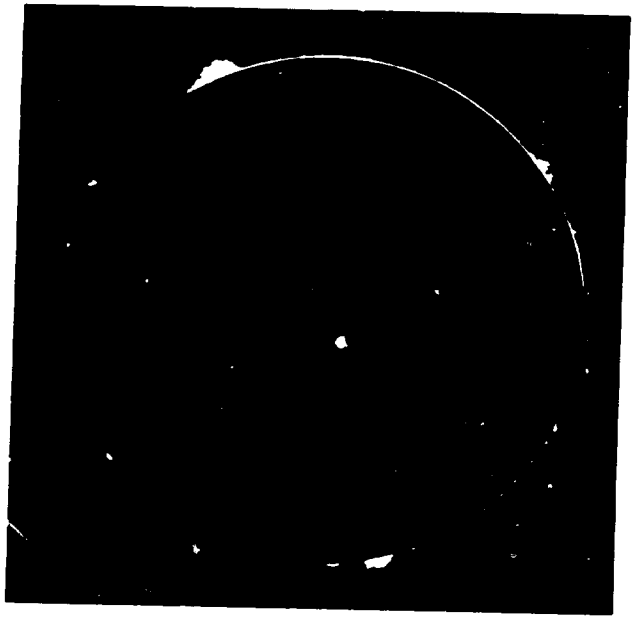




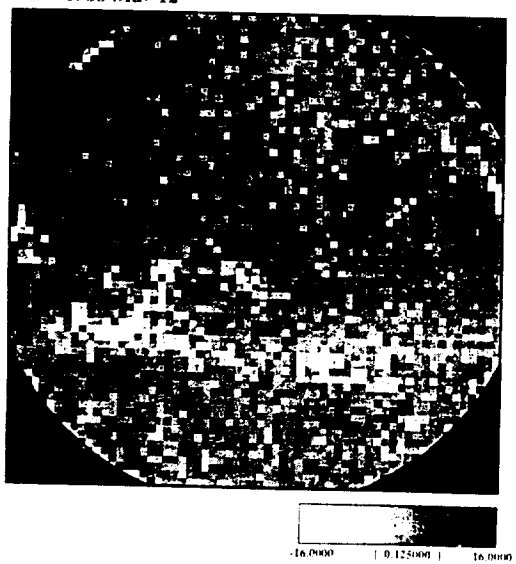
SHELLS DOY 71.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

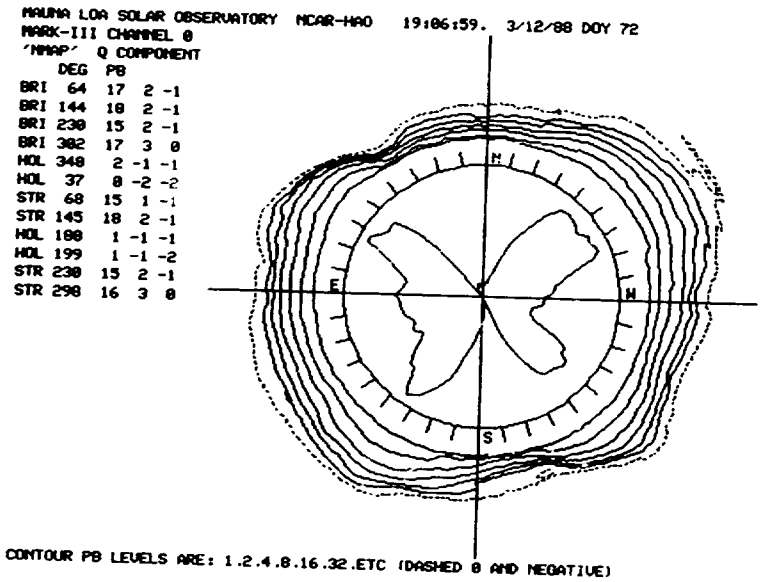


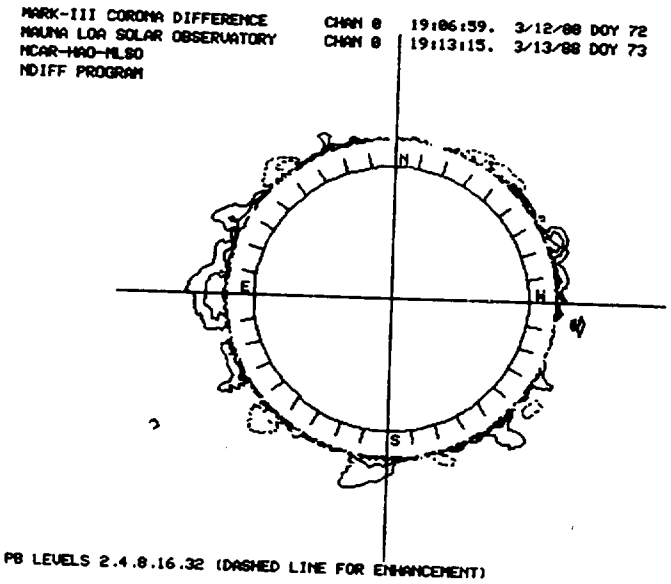


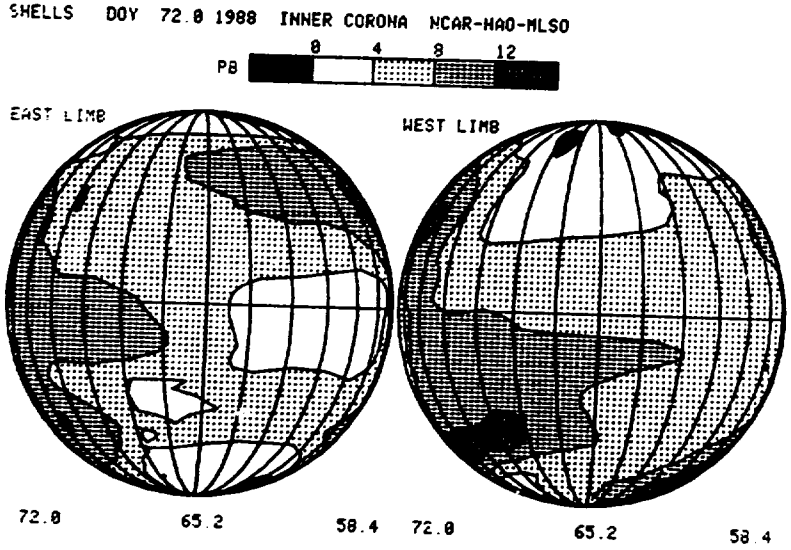


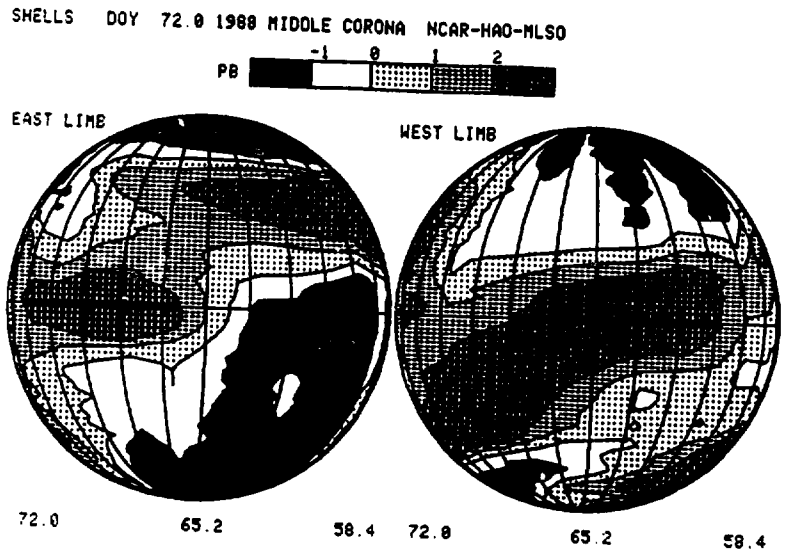
B 1988 Mar 12

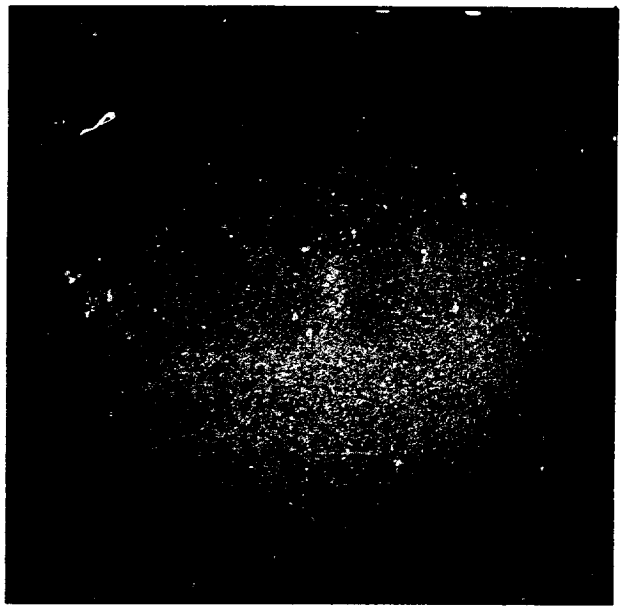


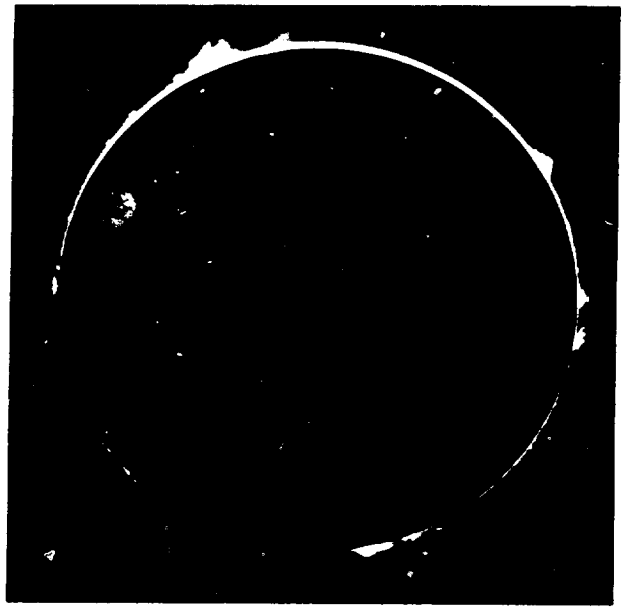

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:06:59. 3/12/88 DOY 72
MARK-III CHANNEL 0
'MMAP' Q COMPONENT
DEG PB
BRI 64 17 2 -1
BRI 144 18 2 -1
BRI 230 15 2 -1
BRI 302 17 3 0
HOL 348 2 -1 -1
HOL 37 0 -2 -2
STR 68 15 1 -1
STR 145 18 2 -1
HOL 188 1 -1 -1
HOL 199 1 -1 -2
STR 230 15 2 -1
STR 298 16 3 0
N
E
W
S
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)


MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
NDIFF PROGRAM
CHAN 0 19:06:59. 3/12/88 DOY 72
CHAN 0 19:13:15. 3/13/88 DOY 73
N
E
W
S
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

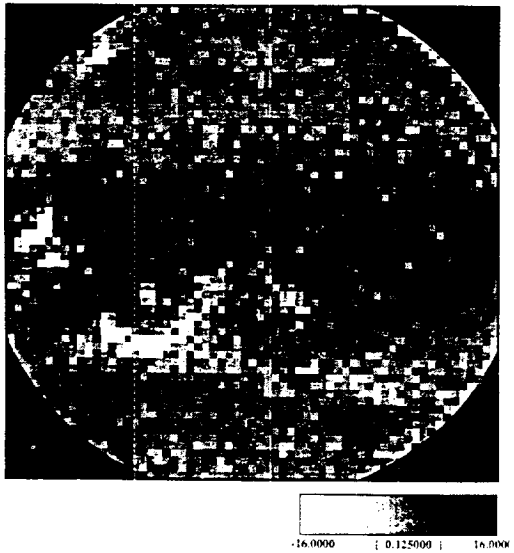

SHELLS DOY 72.0 1988 INNER CORONA NCAR-HAO-MLSO
PB
0 4 8 12
EAST LIMB
WEST LIMB
72.0 65.2 58.4
72.0 65.2 58.4


SHELLS DOY 72.0 1988 MIDDLE CORONA NCAR-HAO-MLSO
PB
-1 0 1 2
EAST LIMB
WEST LIMB
72.0 65.2 58.4
72.0 65.2 58.4



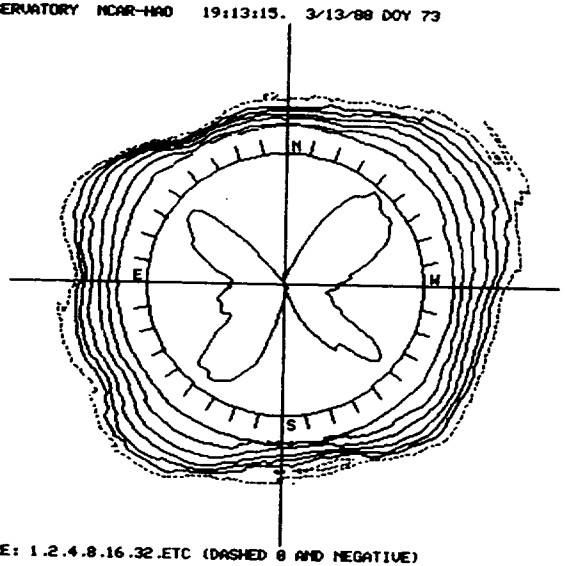


B 1988 Mar 13



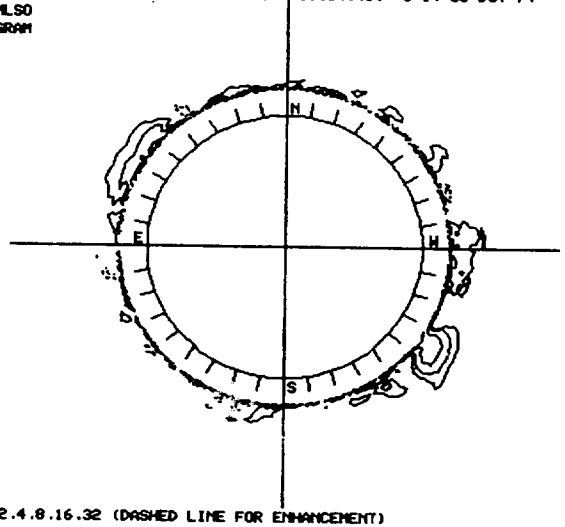
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:13:15. 3/13/88 DOY 73
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	51	17	-1	-2
BRI	102	9	0	-1
BRI	145	17	2	-2
BRI	216	12	0	-2
BRI	232	17	0	-2
BRI	304	17	3	-1
BRI	316	17	2	-1
HOL	344	2	-1	-1
HOL	30	0	-2	-2
STR	64	14	2	-1
STR	107	9	0	-1
STR	142	17	2	-1
HOL	179	1	-1	-1
HOL	201	3	-1	-2
STR	227	15	1	-2
STR	298	16	3	0



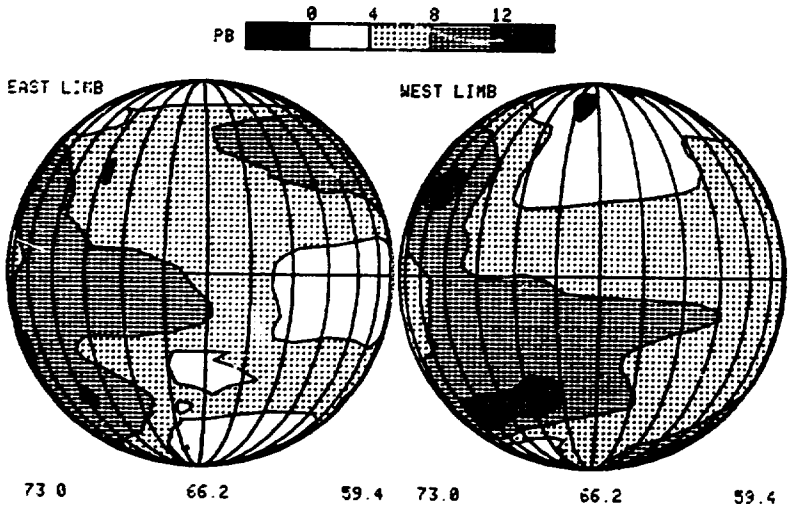
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:13:15. 3/13/88 DOY 73
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:34:40. 3/14/88 DOY 74
NCAR-HAO-MLSO
NDIFF PROGRAM

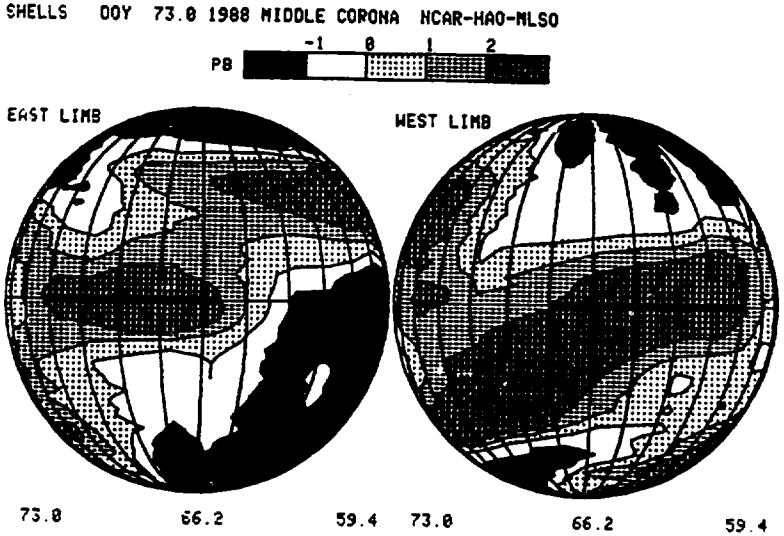


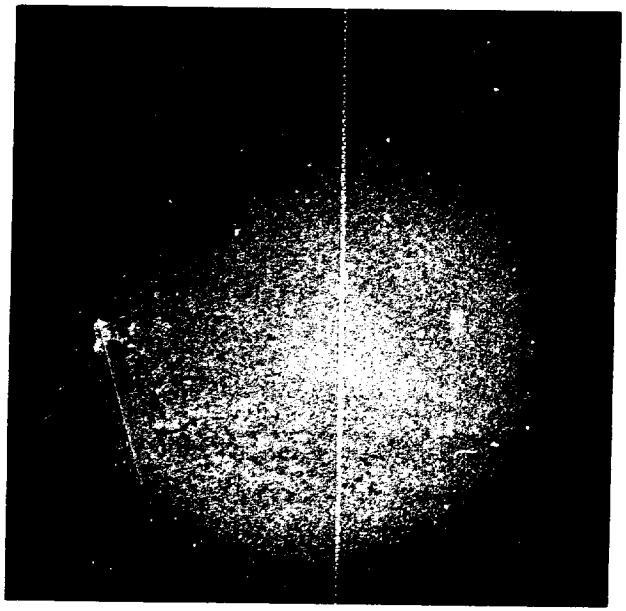
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

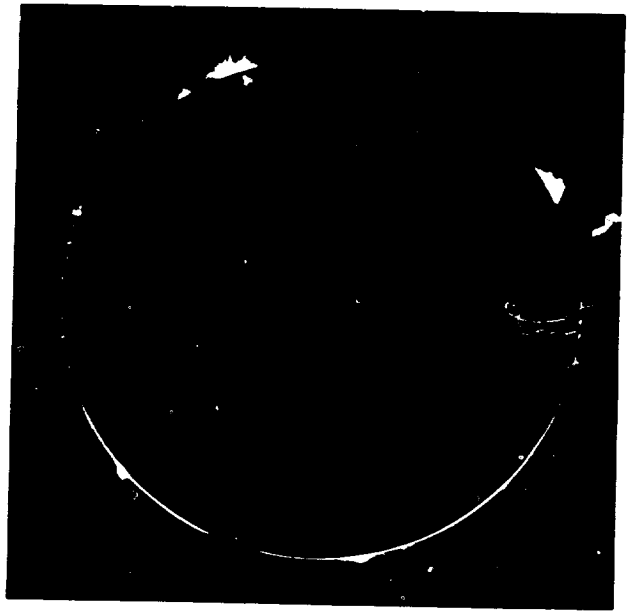
SHELLS DOY 73.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 73.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



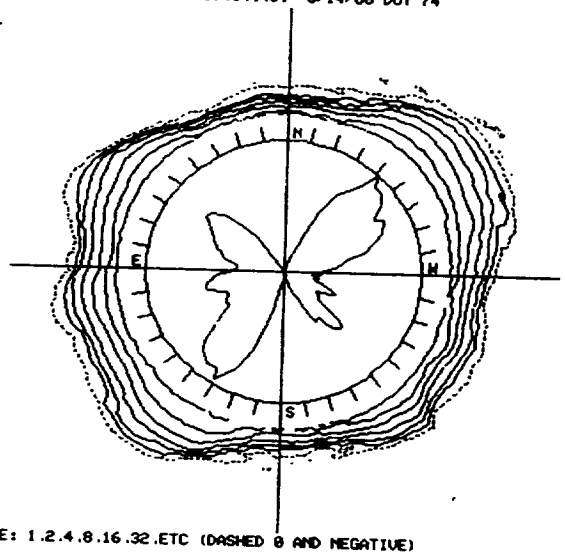




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:34:40. 3/14/88 DOY 74
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

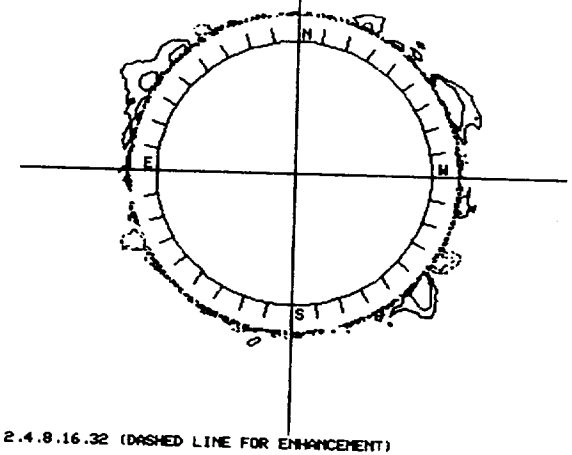
	DEG	PB		
STR	55	13	0	-2
STR	105	11	0	-1
STR	144	17	2	-1
HOL	172	1	-1	-2
HOL	197	2	-1	-2
STR	225	11	0	-2
STR	246	7	-1	-2
STR	314	17	3	-1
HOL	343	2	-1	-1
HOL	30	0	-2	-2
BRI	54	13	-1	-2
BRI	107	10	0	-1
BRI	150	10	2	-2
BRI	225	11	0	-2
BRI	240	7	-1	-2
BRI	300	15	3	0
BRI	314	17	3	-1



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

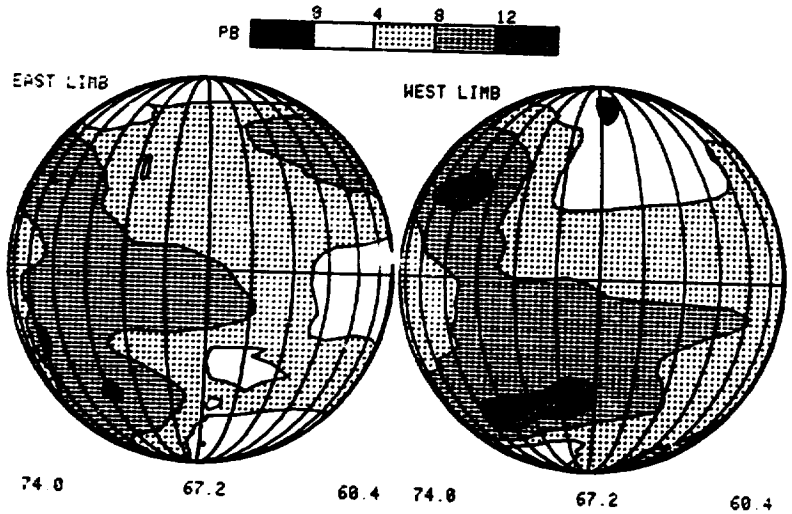
MARK-III CORONA DIFFERENCE CHAN 0 19:34:40. 3/14/88 DOY 74
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:06:50. 3/15/88 DOY 75
NCAR-HAO-MLSO
NDIFF PROGRAM

OK

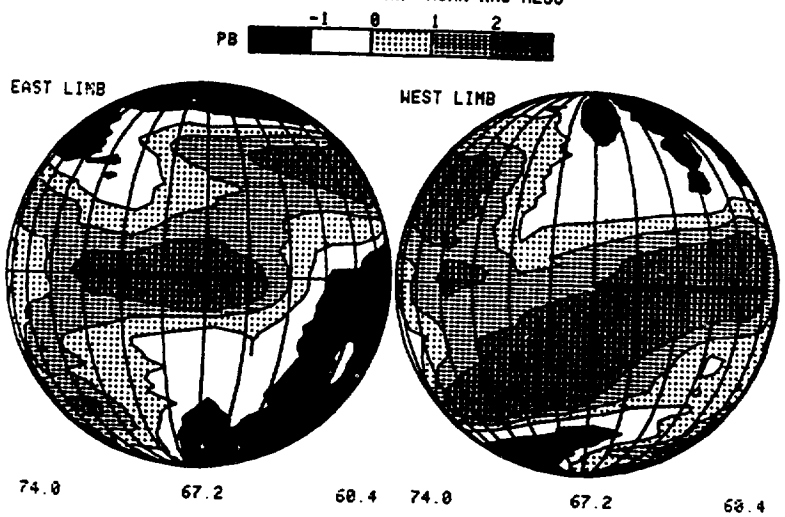


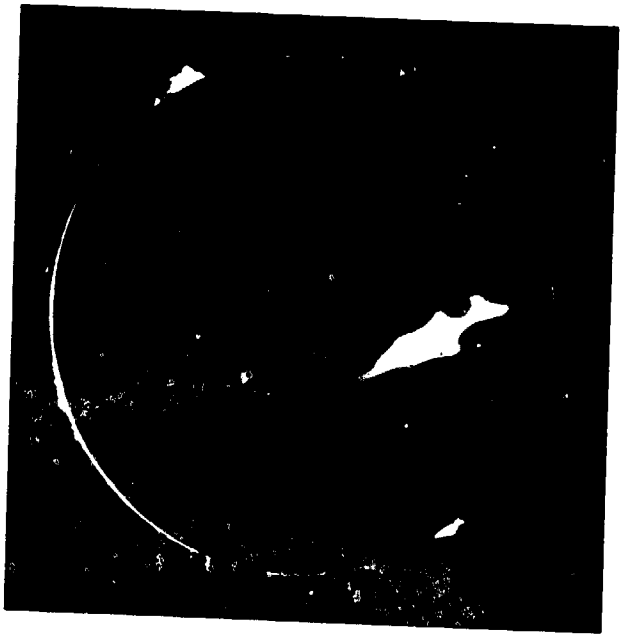
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

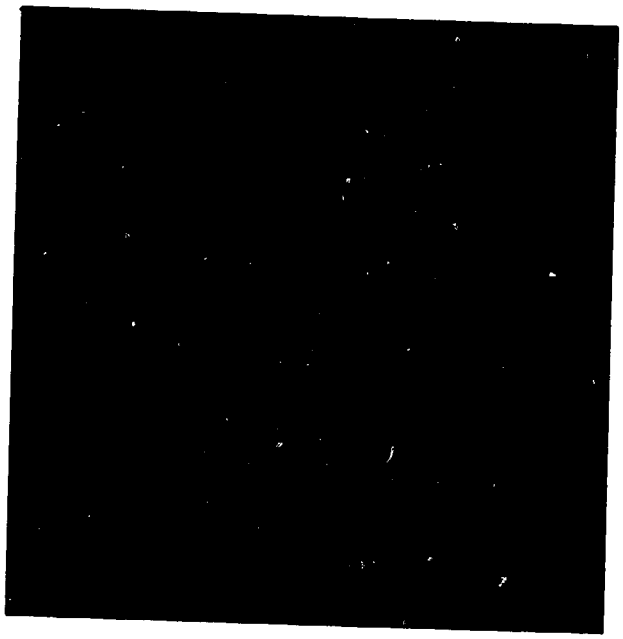
SHELLS DOY 74.0 1988 INNER CORONA NCAR-HAO-MLSO



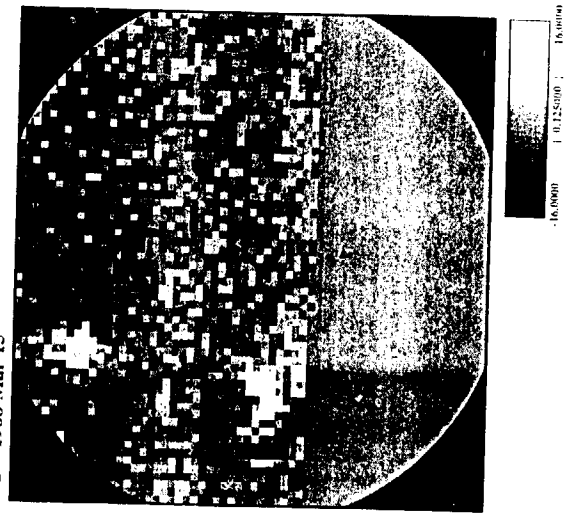
SHELLS DOY 74.0 1988 MIDDLE CORONA NCAR-HAO-MLSO





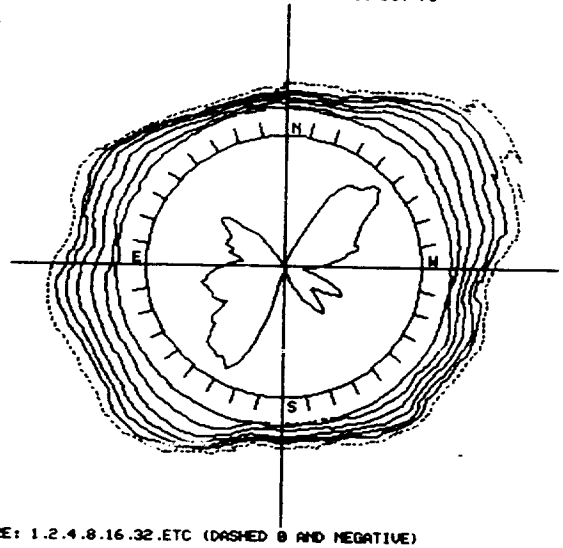


B 1988 Mar 15



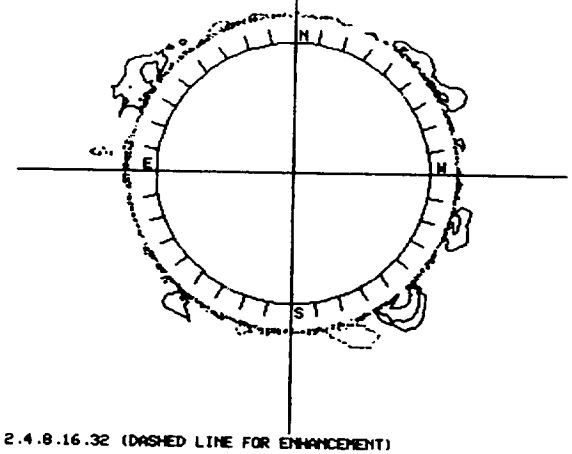
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:06:50. 3/15/88 DOY 75
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	52	11	-1	-2
BRI	64	9	1	-1
BRI	75	8	0	-1
BRI	104	11	1	-1
BRI	152	17	0	-2
BRI	218	9	-1	-2
BRI	243	9	-1	-2
BRI	286	10	1	-1
BRI	313	17	3	-1
BRI	324	14	1	-1
HOL	353	0	-2	-2
HOL	27	0	-2	-2
STR	65	9	1	-1
STR	99	11	2	-1
STR	137	16	2	-1
HOL	171	1	-2	-2
HOL	191	1	-2	-3
STR	219	8	-1	-2
STR	249	7	0	-2
STR	285	10	1	1
STR	306	16	3	0



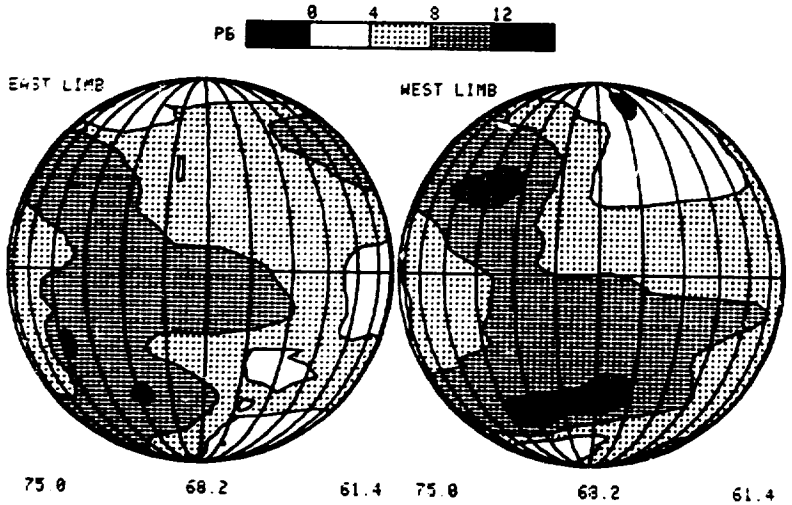
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:06:50. 3/15/88 DOY 75
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:01:50. 3/16/88 DOY 76
NCAR-HAO-MLSO
NDIFF PROGRAM

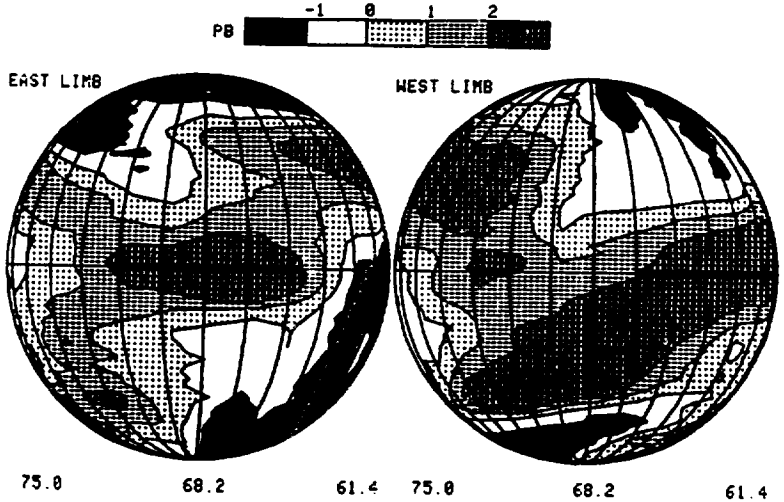


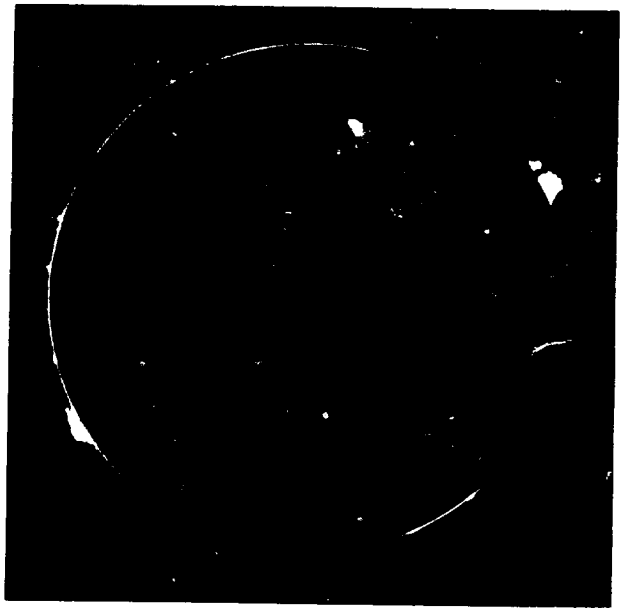
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 75.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 75.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

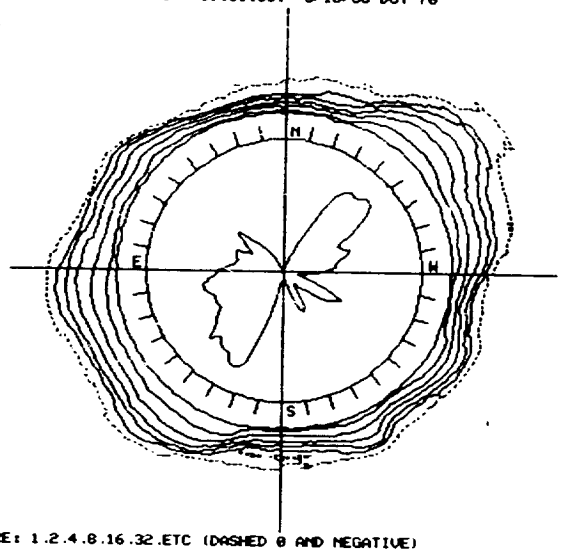




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:01:50. 3/16/88 DOY 76
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
STR	42	9	-1	-2
STR	98	11	2	-1
STR	143	14	1	-1
HOL	170	1	-1	-1
HOL	192	2	-1	-2
STR	208	6	-1	-2
STR	240	8	0	-2
STR	289	9	1	-1
STR	314	15	3	-1
HOL	340	2	-1	-1
HOL	24	1	-1	-1
BRI	51	8	-1	-2
BRI	70	7	-1	-1
BRI	102	11	2	-1
BRI	153	16	0	-1
BRI	207	6	-1	-2
BRI	243	8	0	-2
BRI	291	8	1	-1
BRI	312	15	4	0

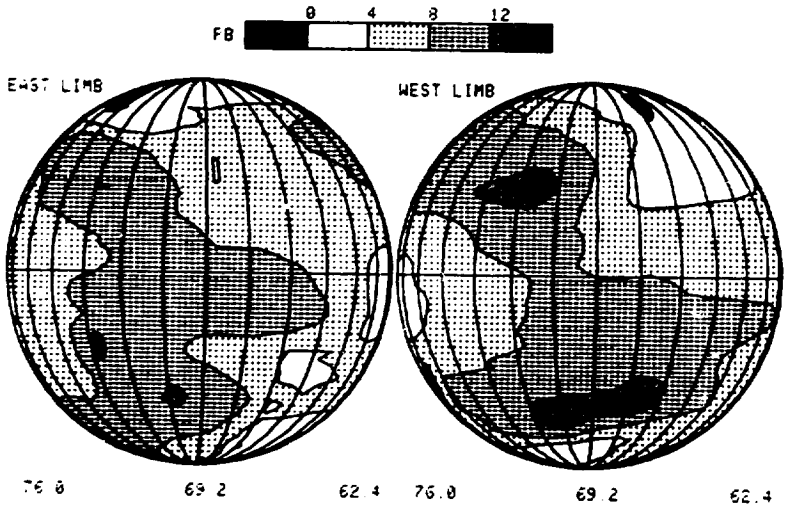


CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

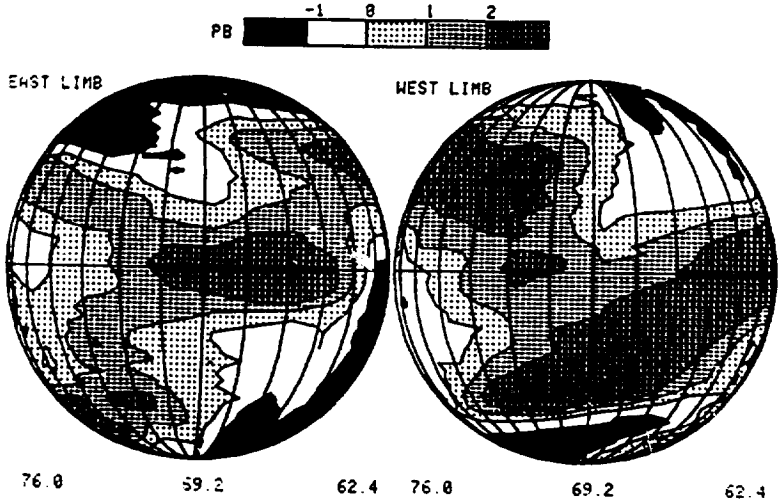
MAUNA LOA SOLAR OBSERVATORY

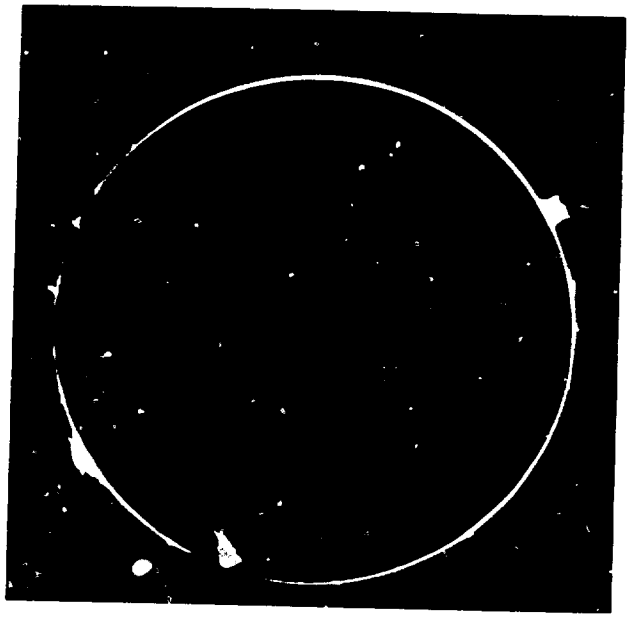
NO DATA

SHELLS DOY 76 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 76.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

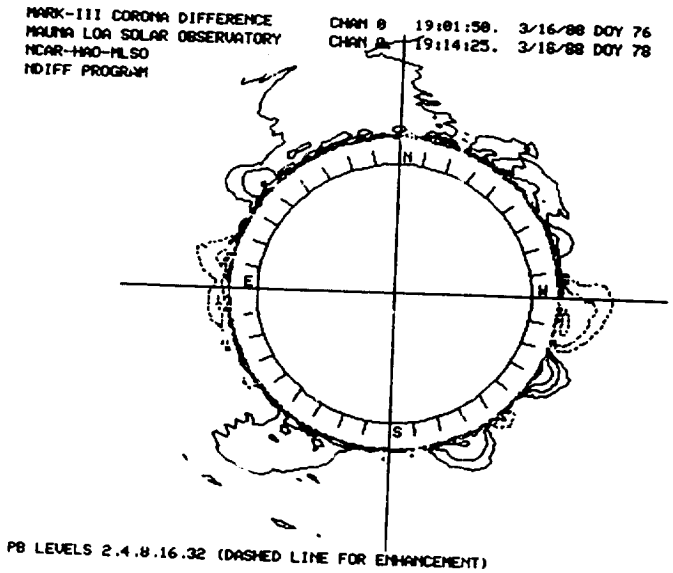


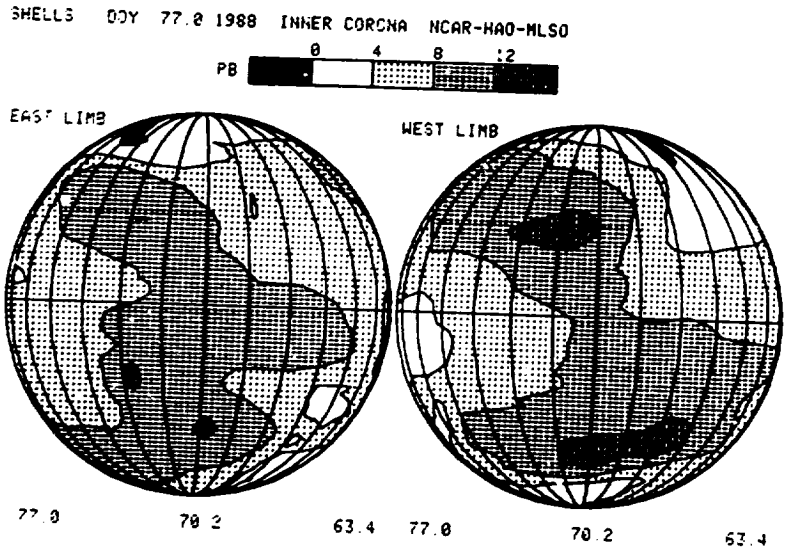


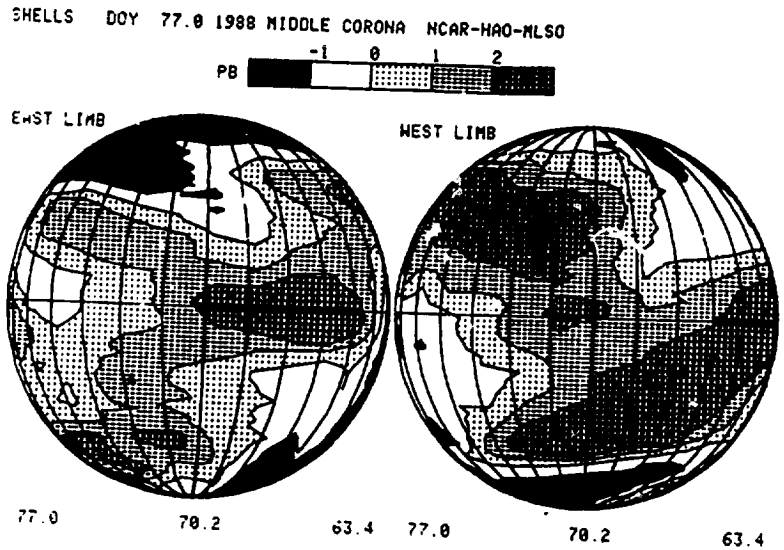
NO DATA

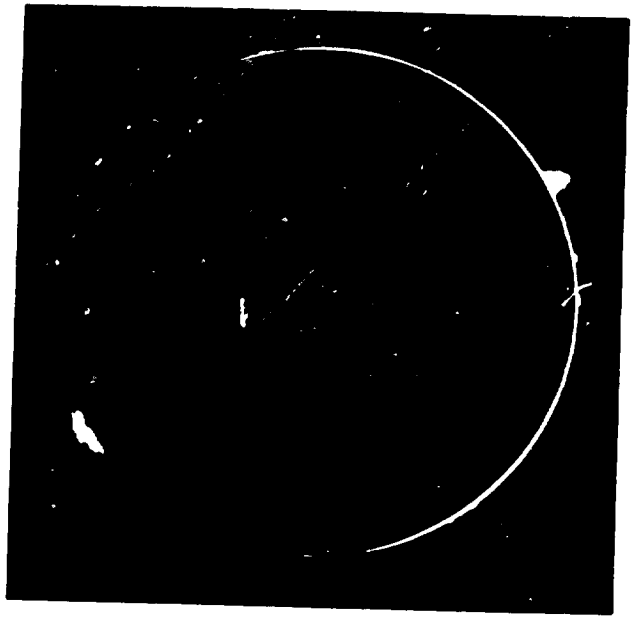
MAUNA LOA SOLAR OBSERVATORY

NO DATA

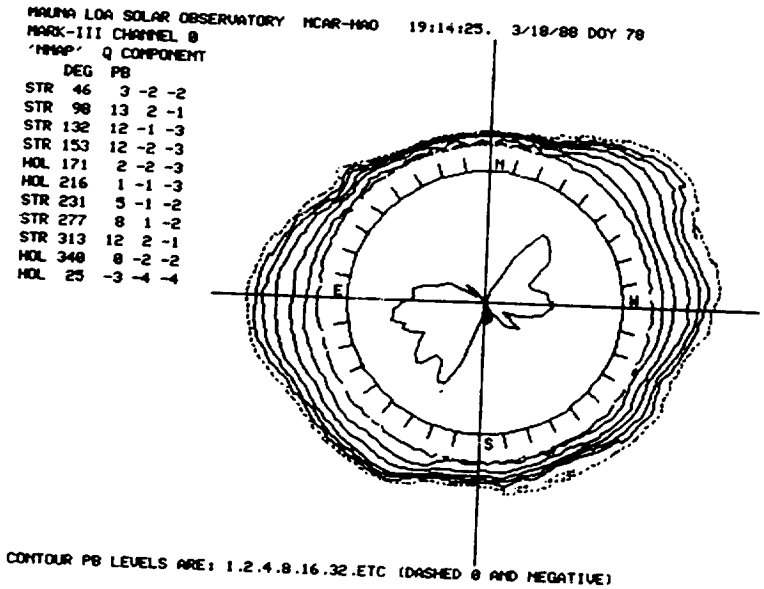


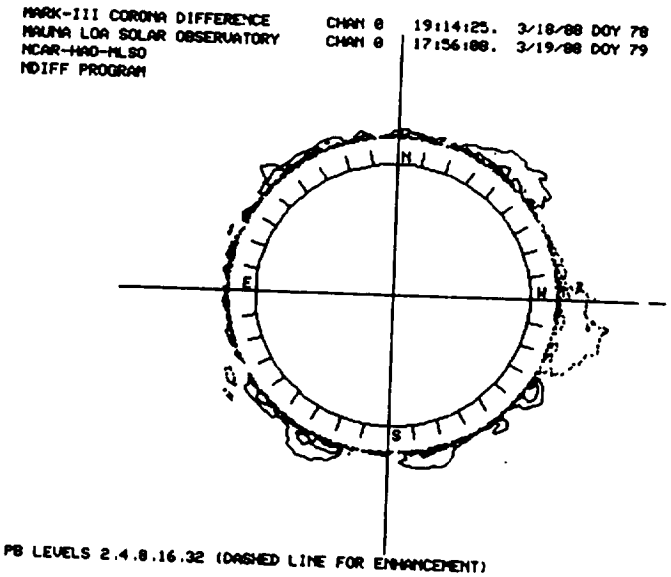


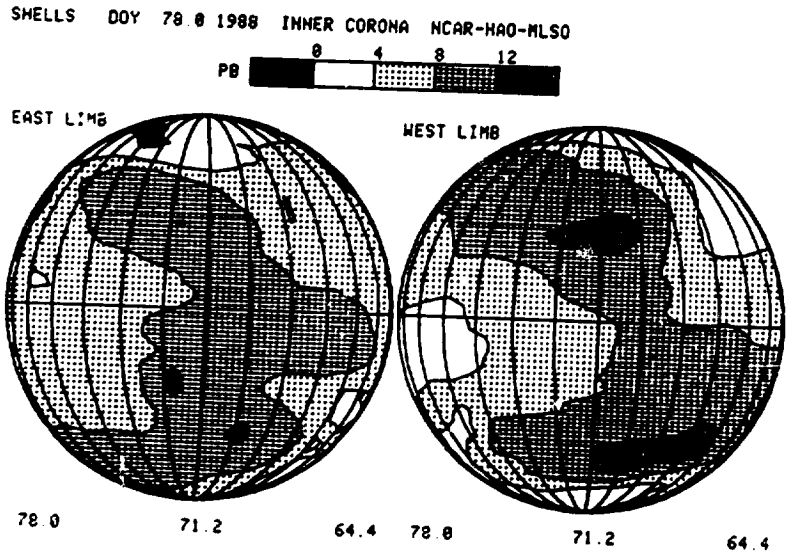


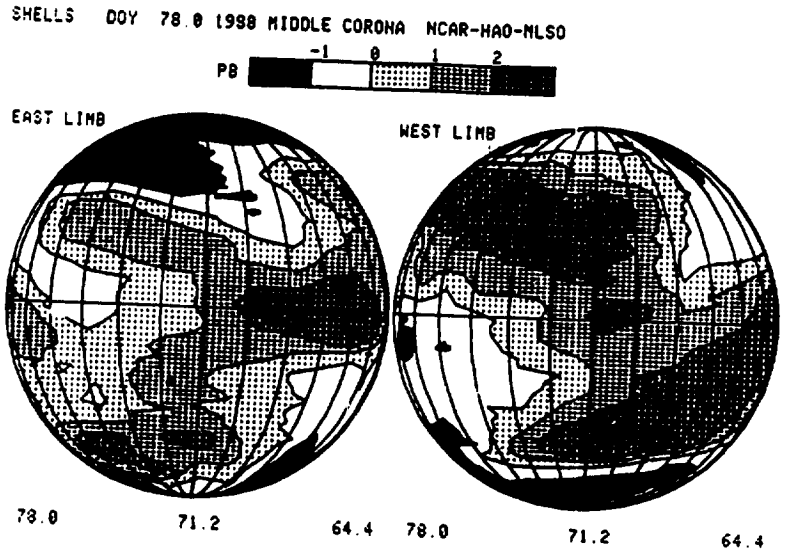


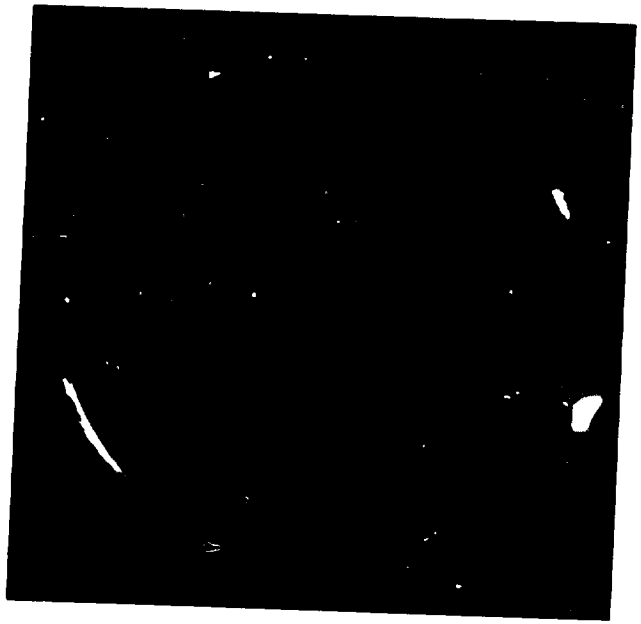
NO DATA


MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:14:25. 3/18/88 DOY 78
MARK-III CHANNEL 0
'MMAP' Q COMPONENT
DEG PB
STR 46 3 -2 -2
STR 98 13 2 -1
STR 132 12 -1 -3
STR 153 12 -2 -3
HOL 171 2 -2 -3
HOL 216 1 -1 -3
STR 231 5 -1 -2
STR 277 8 1 -2
STR 313 12 2 -1
HOL 340 0 -2 -2
HOL 25 -3 -4 -4
N
E
W
S
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

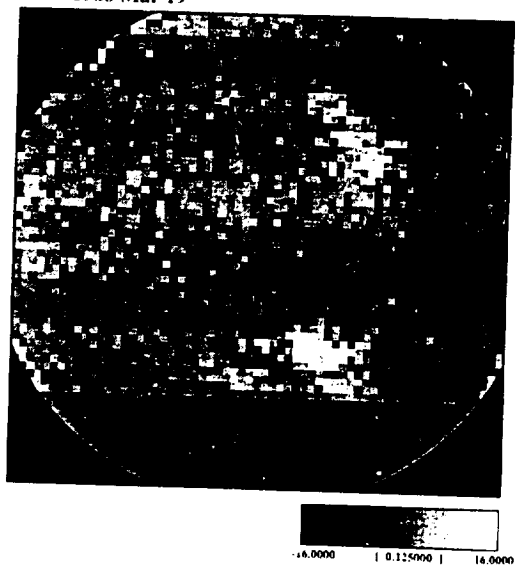

MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
MDIFF PROGRAM
CHAN 0 19:14:25. 3/18/88 DOY 78
CHAN 0 17:56:00. 3/19/88 DOY 79
N
E
W
S
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)


SHELLS DOY 78.0 1988 INNER CORONA NCAR-HAO-MLSO
PB
0 4 8 12
EAST LIMB
WEST LIMB
78.0 71.2 64.4
78.0 71.2 64.4


SHELLS DOY 78.0 1988 MIDDLE CORONA NCAR-HAO-MLSO
PB
-1 0 1 2
EAST LIMB
WEST LIMB
78.0 71.2 64.4
78.0 71.2 64.4

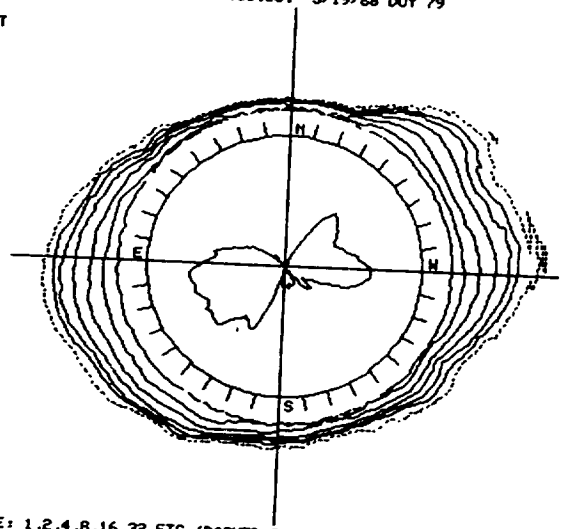


B 1988 Mar 19



MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 17:56:00. 3/19/88 DOY 79
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	84	10	2	-1
BRI	100	13	3	-1
BRI	133	12	0	-2
BRI	150	9	-3	-3
BRI	236	3	-1	-2
BRI	276	11	3	-1
BRI	324	9	-1	-2
STR	99	13	3	-1
HOL	187	1	-3	-3
HOL	212	1	-2	-2
STR	230	4	-1	-2
STR	276	11	3	-1
STR	307	9	2	-1
HOL	359	-2	-4	-3
HOL	28	-3	-4	-4

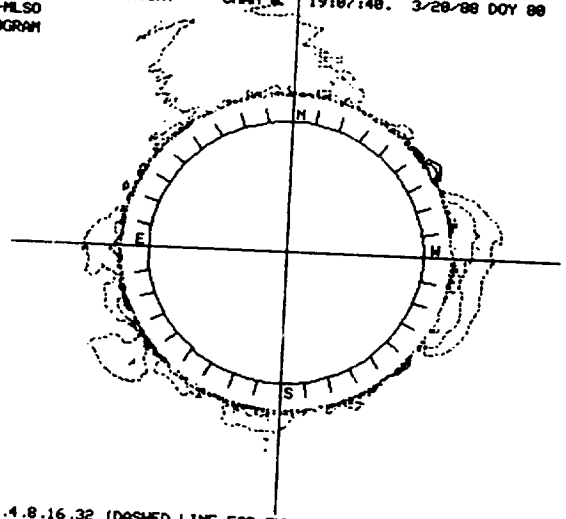


CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
NDIFF PROGRAM

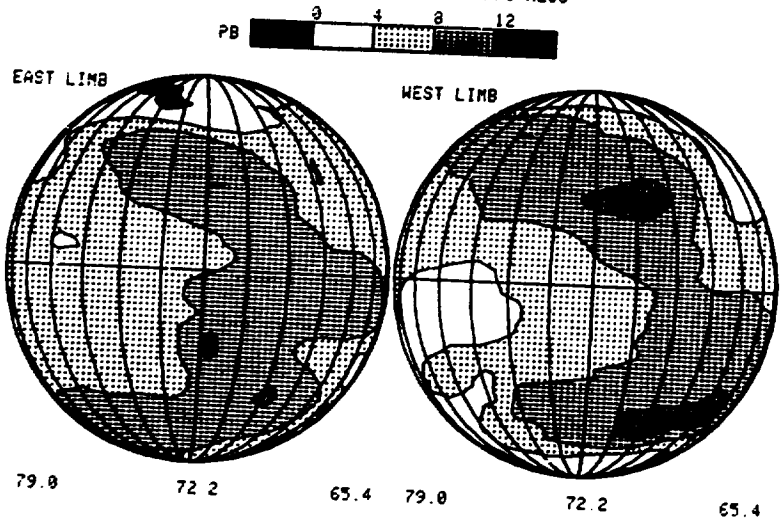
OK

CHAN 0 17:56:00. 3/19/88 DOY 79
CHAN 0 19:07:40. 3/20/88 DOY 80

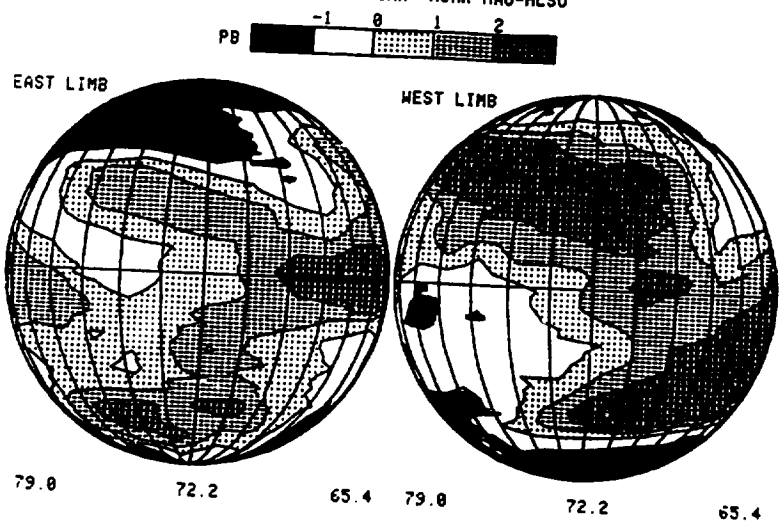


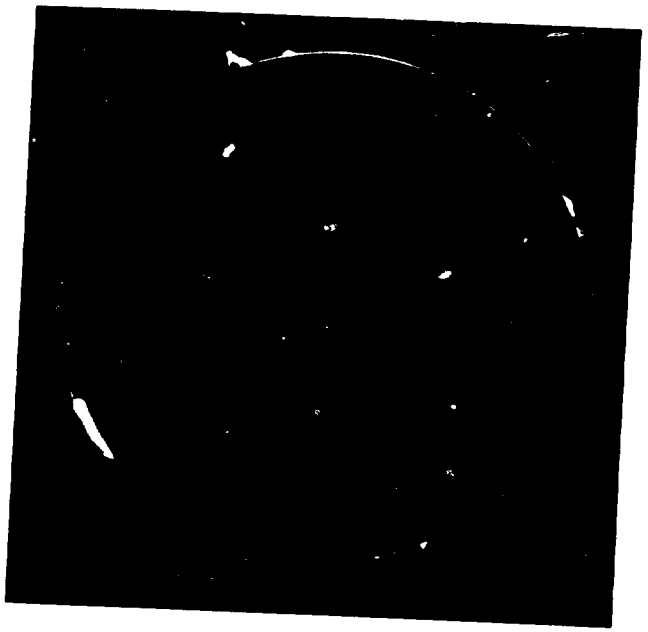
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 79.0 1988 INNER CORONA NCAR-HAO-MLSO

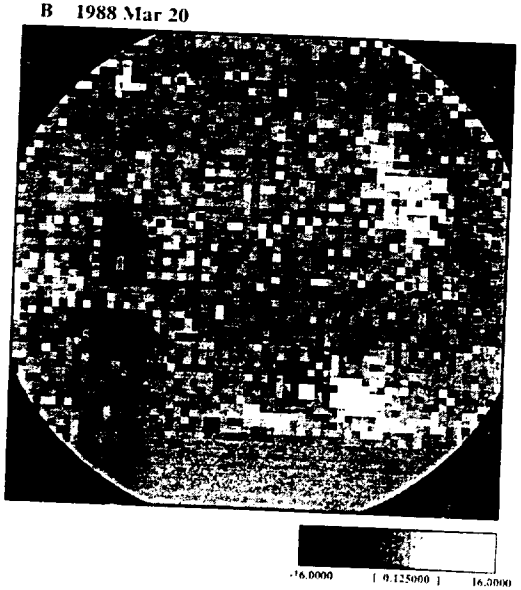


SHELLS DOY 79.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



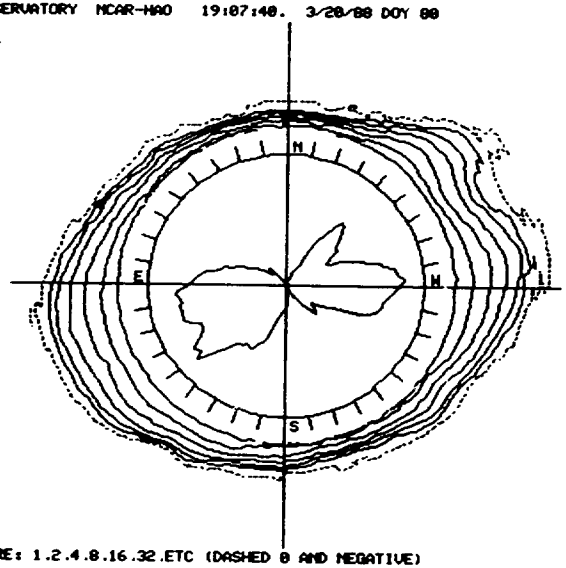


B 1988 Mar 20



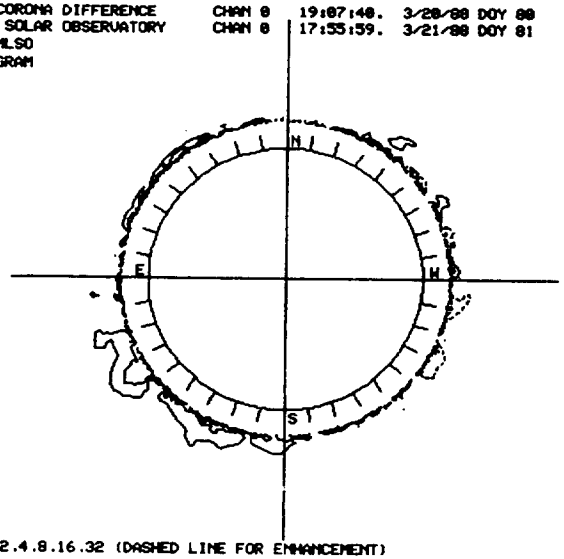
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:07:40. 3/20/88 DOY 80
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	96	16	3	-1
BRI	109	15	3	-1
BRI	131	16	2	-2
BRI	153	10	-1	-2
BRI	231	5	0	-2
BRI	275	16	4	-1
BRI	320	12	1	-1
HOL	348	0	-1	-2
HOL	12	0	-2	-2
STR	100	15	4	-1
STR	127	15	2	-1
STR	151	10	-1	-2
HOL	187	2	-2	-2
HOL	204	1	-2	-3
STR	233	5	-1	-2
STR	278	15	4	0
STR	311	9	2	-1



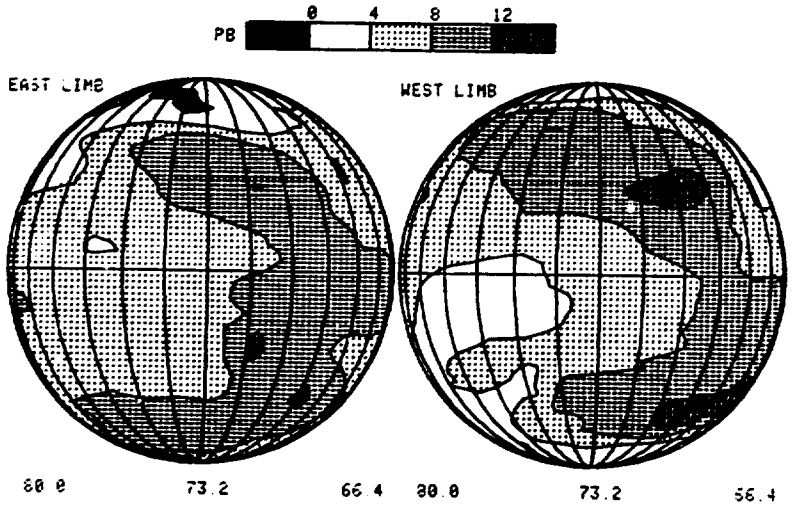
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:07:40. 3/20/88 DOY 80
MAUNA LOA SOLAR OBSERVATORY CHAN 0 17:55:59. 3/21/88 DOY 81
NCAR-HAO-MLSO
NDIFF PROGRAM

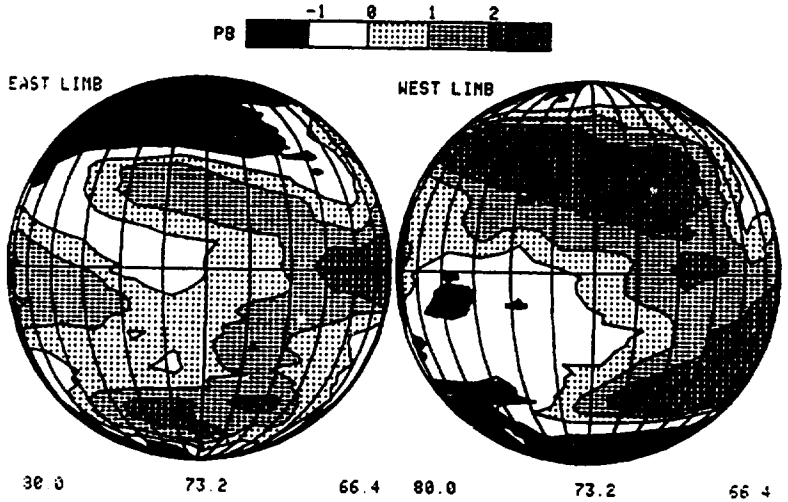


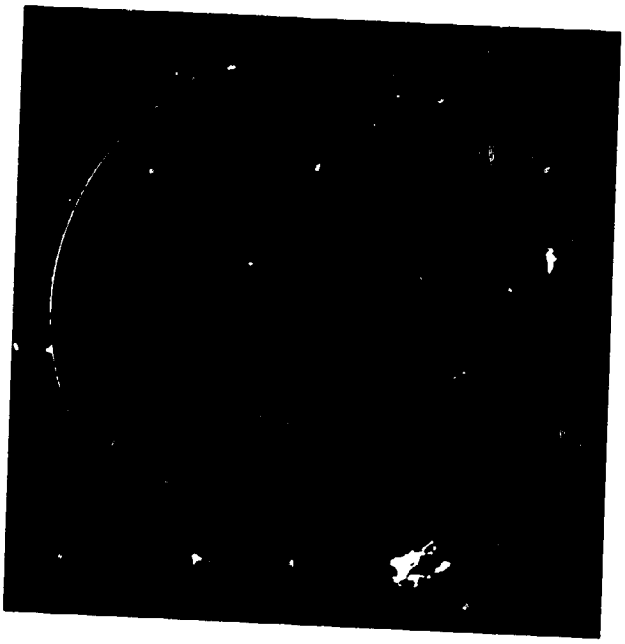
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 80.0 1983 INNER CORONA NCAR-HAO-MLSO

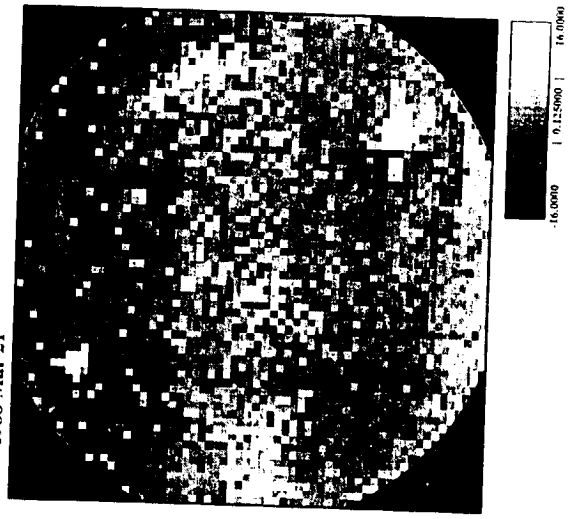


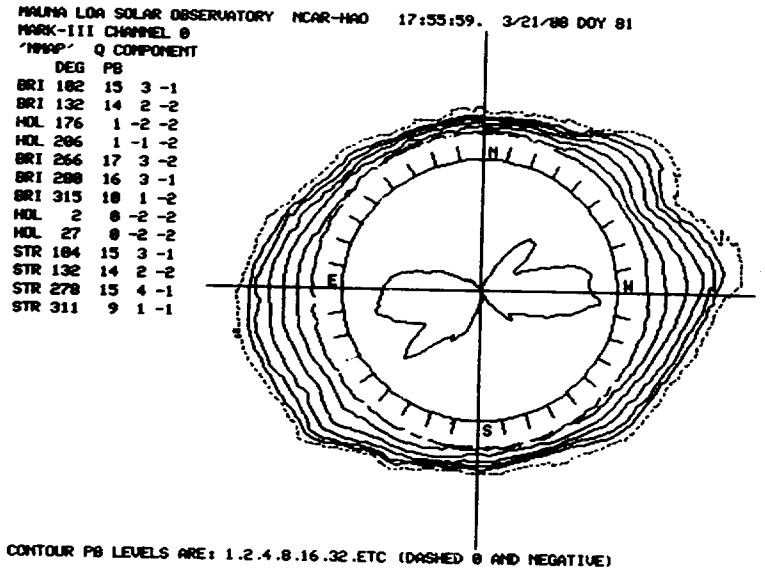
SHELLS DOY 80.0 1988 MIDDLE CORONA NCAR-HAO-MLSO

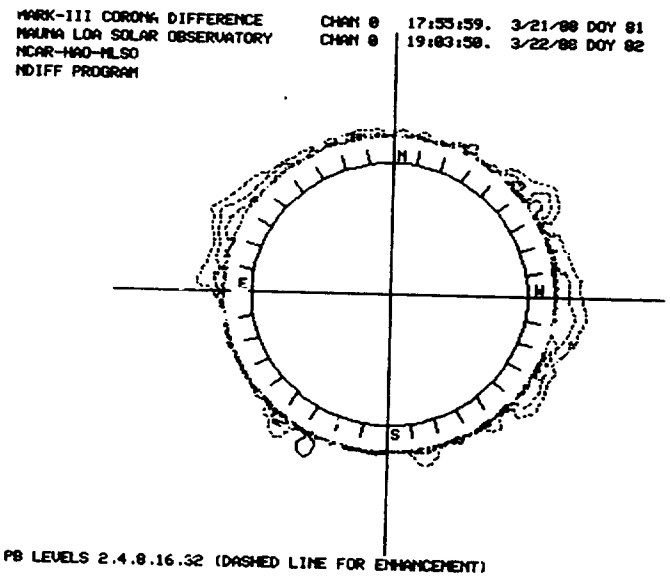


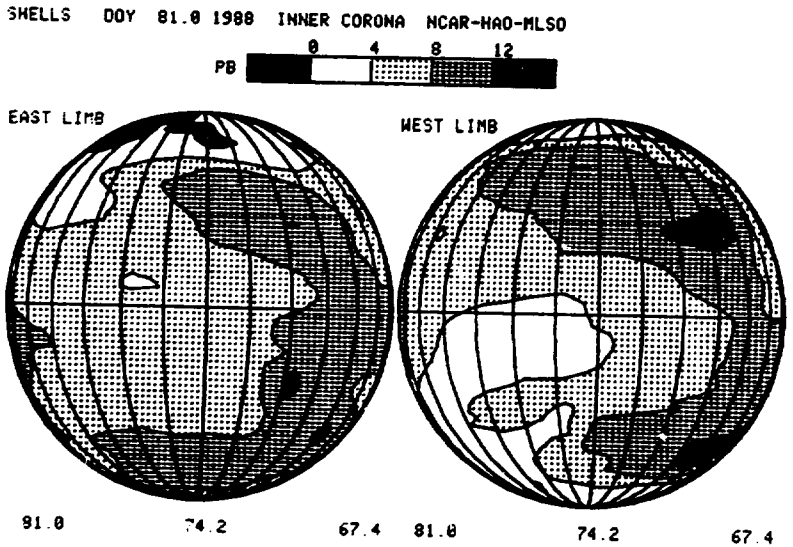


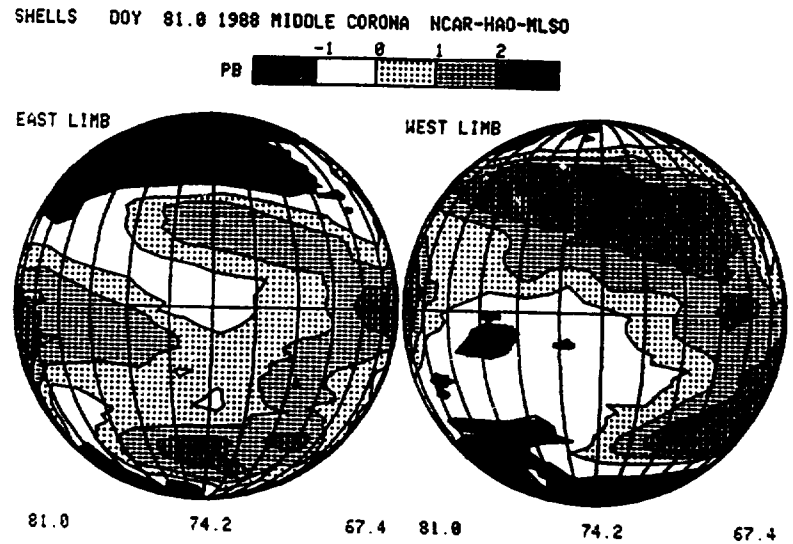
B 1988 Mar 21

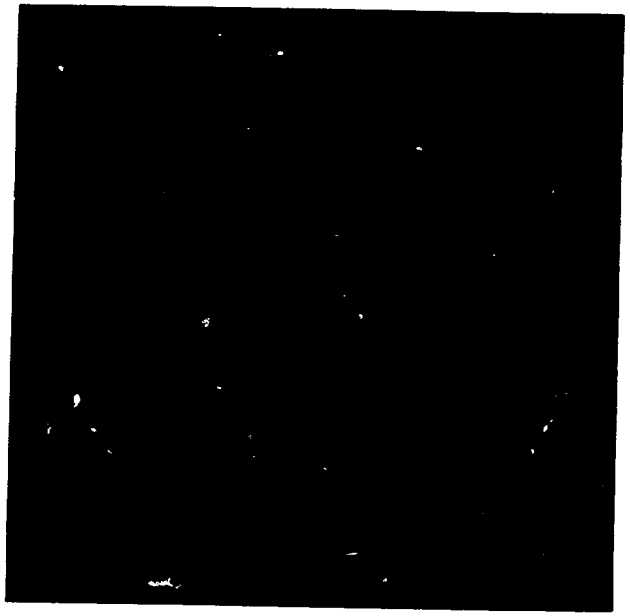



MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 17:55:59. 3/21/88 DOY 81
MARK-III CHANNEL 0
'MMAP' Q COMPONENT
DEG PB
BRI 102 15 3 -1
BRI 132 14 2 -2
HOL 176 1 -2 -2
HOL 206 1 -1 -2
BRI 266 17 3 -2
BRI 288 16 3 -1
BRI 315 10 1 -2
HOL 2 0 -2 -2
HOL 27 0 -2 -2
STR 104 15 3 -1
STR 132 14 2 -2
STR 278 15 4 -1
STR 311 9 1 -1
N
E
W
S
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)


MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
NDIFF PROGRAM
CHAN 0 17:55:59. 3/21/88 DOY 81
CHAN 0 19:03:50. 3/22/88 DOY 82
N
E
W
S
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)


SHELLS DOY 81.0 1988 INNER CORONA NCAR-HAO-MLSO
PB
0 4 8 12
EAST LIMB
WEST LIMB
81.0 74.2 67.4 81.0 74.2 67.4

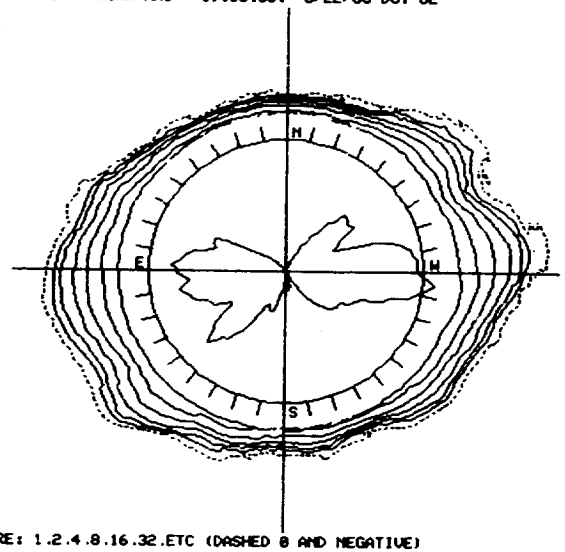

SHELLS DOY 81.0 1988 MIDDLE CORONA NCAR-HAO-MLSO
PB
-1 0 1 2
EAST LIMB
WEST LIMB
81.0 74.2 67.4 81.0 74.2 67.4



NO DATA

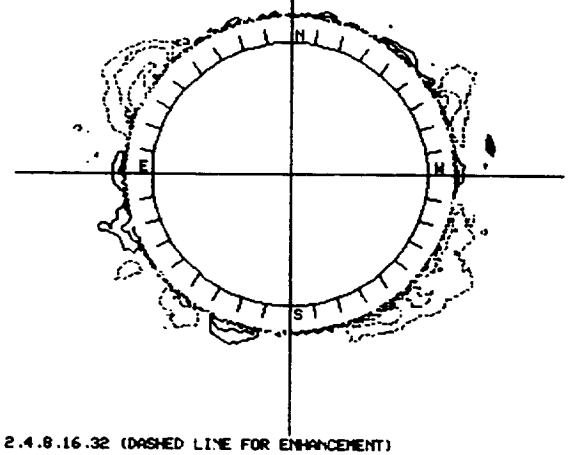
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:03:50. 3/22/88 DOY 82
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	65	10	0	-2
BRI	87	16	2	-1
BRI	100	15	2	-1
BRI	134	15	2	-2
BRI	162	5	-2	-2
BRI	192	2	-2	-3
BRI	234	8	-1	-3
BRI	263	21	2	-2
BRI	314	11	1	-2
HOL	349	0	-2	-2
HOL	30	0	-2	-2
STR	63	11	0	-2
STR	96	14	3	-1
STR	133	14	2	-2
STR	160	6	-1	-2
HOL	178	1	-2	-2
STR	194	2	-2	-3
HOL	284	1	-2	-3
STR	231	8	0	-3
STR	275	18	5	-1
STR	308	11	1	-1



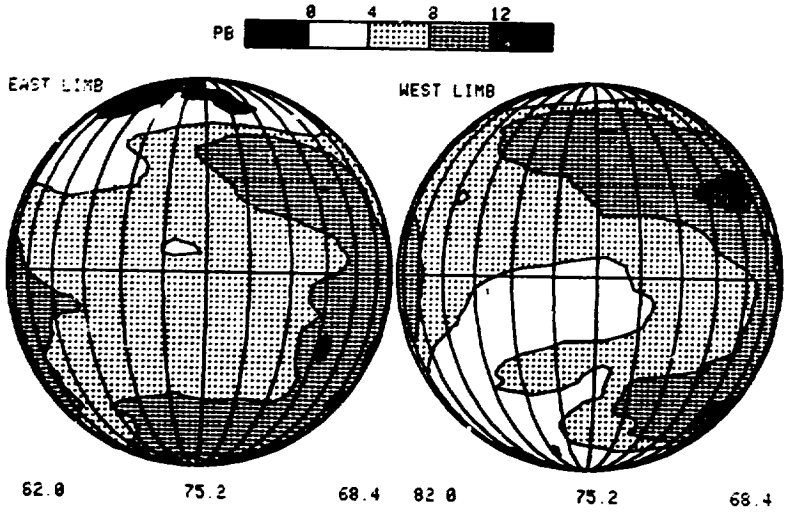
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

MARK-III CORONA DIFFERENCE CHAN 0 19:03:50. 3/22/88 DOY 82
MAUNA LOA SOLAR OBSERVATORY CHAN 0 19:30:45. 3/23/88 DOY 83
NCAR-HAO-MLSO
NDIFF PROGRAM

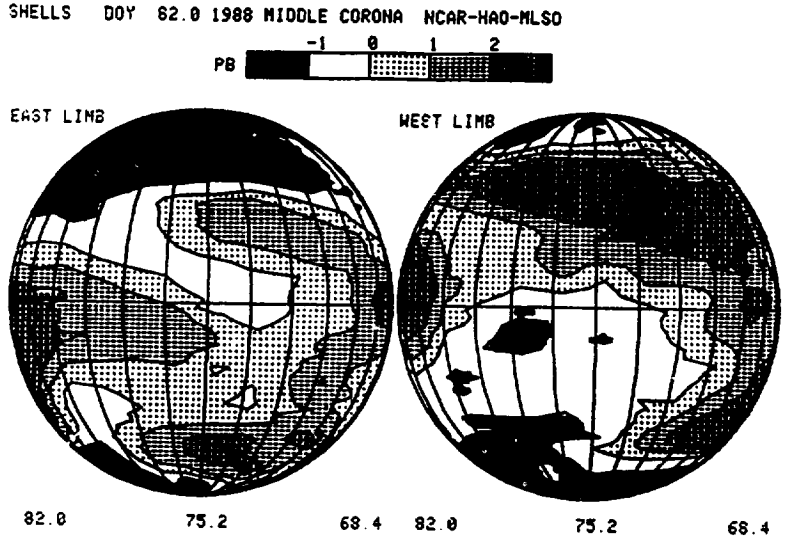


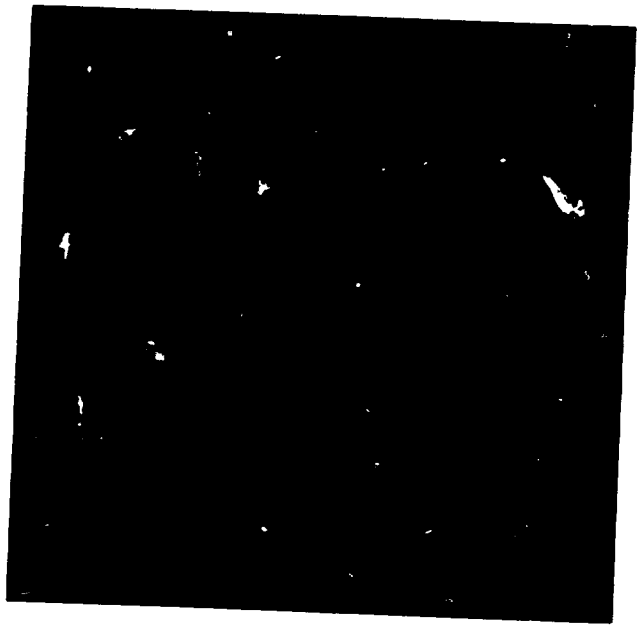
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

SHELLS DOY 82 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 82.0 1988 MIDDLE CORONA NCAR-HAO-MLSO





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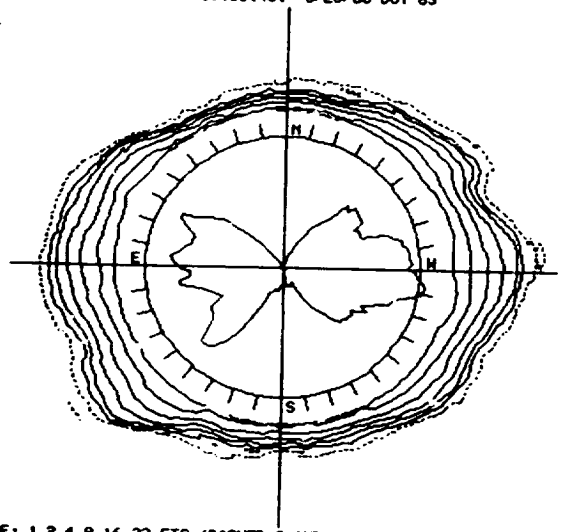
MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:30:45. 3/23/88 DOY 83
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
STR	63	16	1	-2
STR	86	15	3	-1
STR	100	14	2	-1
STR	136	16	3	-1
HOL	153	4	-1	-2
HOL	206	2	-1	-2
STR	226	12	0	-2
STR	273	10	4	-1
STR	307	13	0	-1
HOL	340	1	-1	-1
HOL	35	0	-1	-2
BRI	64	15	1	-2
BRI	86	15	3	-1
BRI	100	14	2	-1
BRI	136	16	3	-1
BRI	228	12	0	-2
BRI	263	20	4	-1
BRI	312	13	0	-1

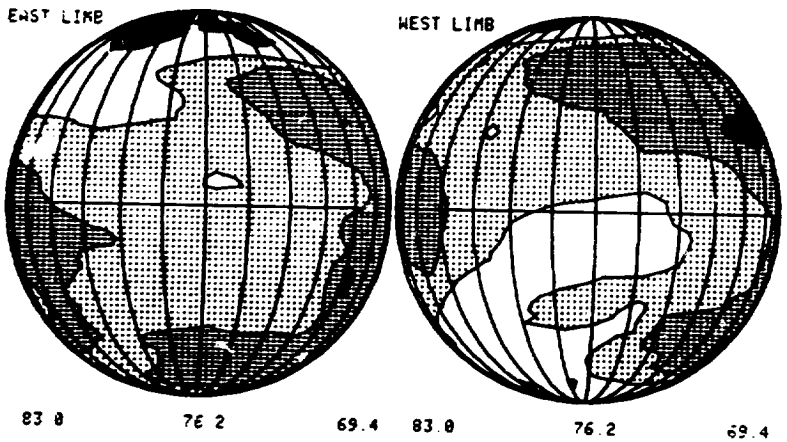


CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

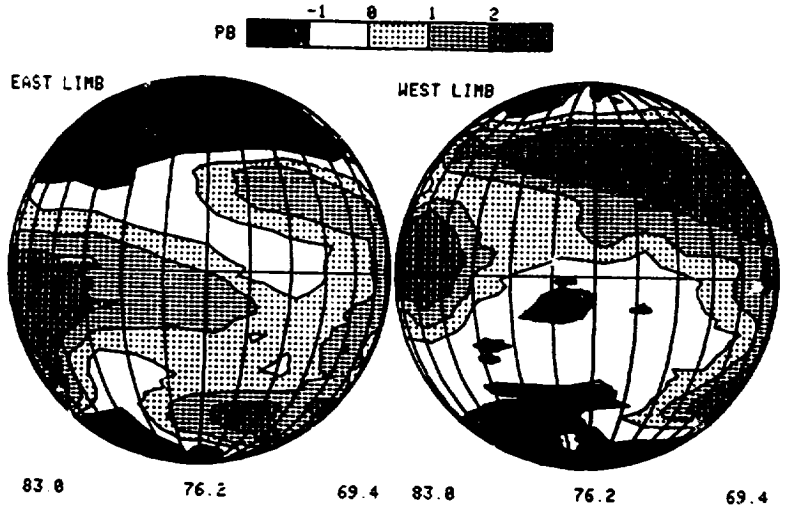
MAUNA LOA SOLAR OBSERVATORY

NO DATA

SHELLS DOY 83.0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 83.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



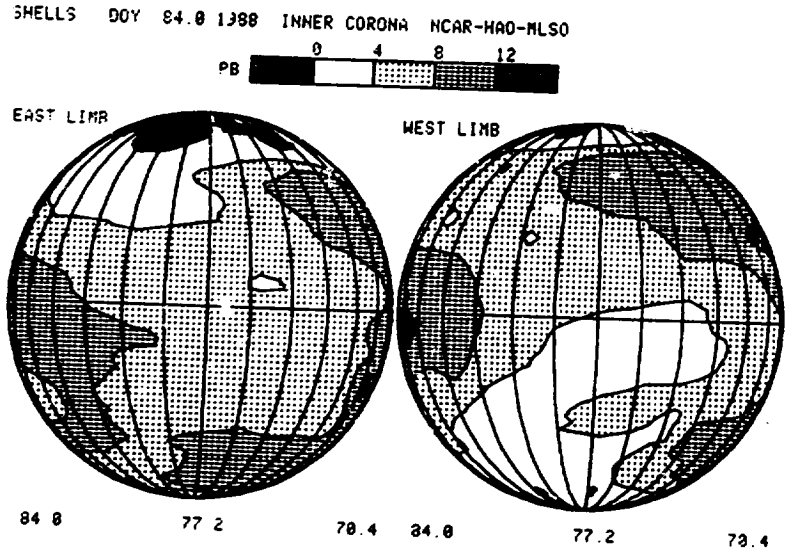
NO DATA

NO DATA

NO DATA

MAUNA LOA SOLAR OBSERVATORY

NO DATA



MAUNA LOA SOLAR OBSERVATORY

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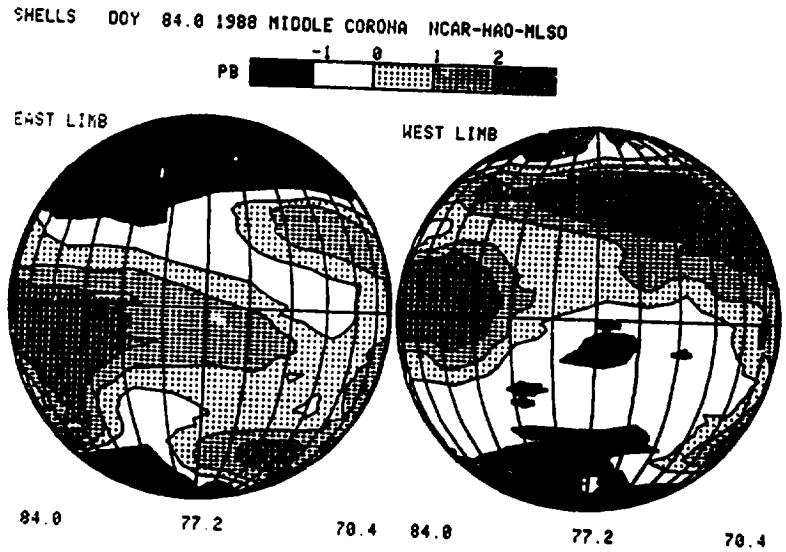

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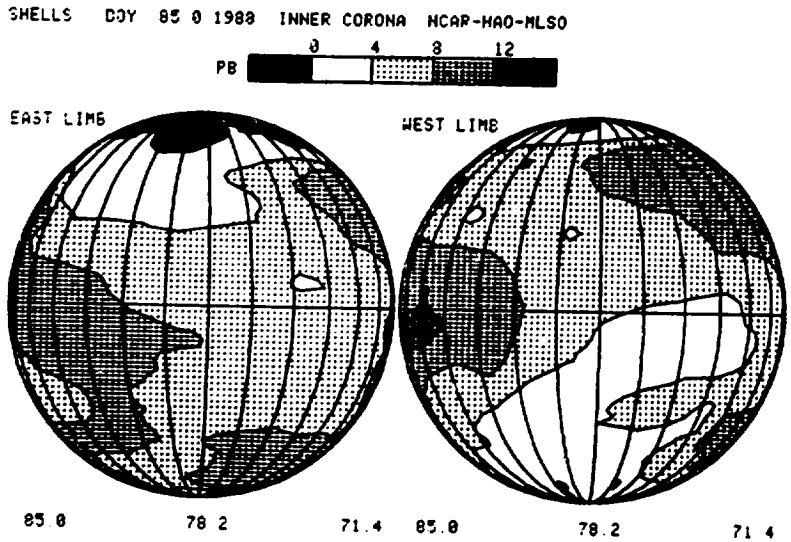

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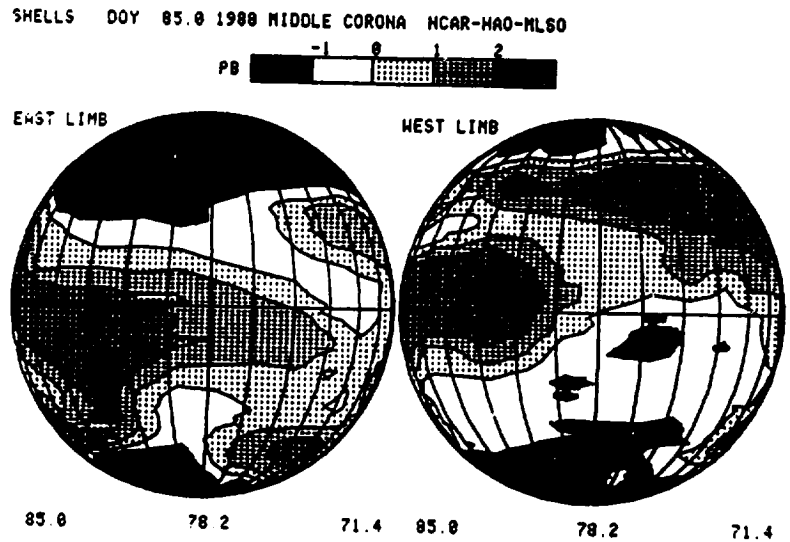

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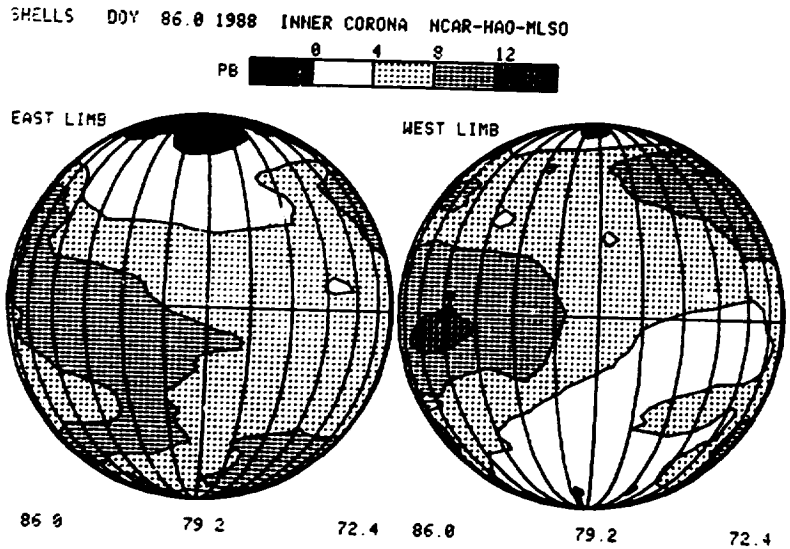

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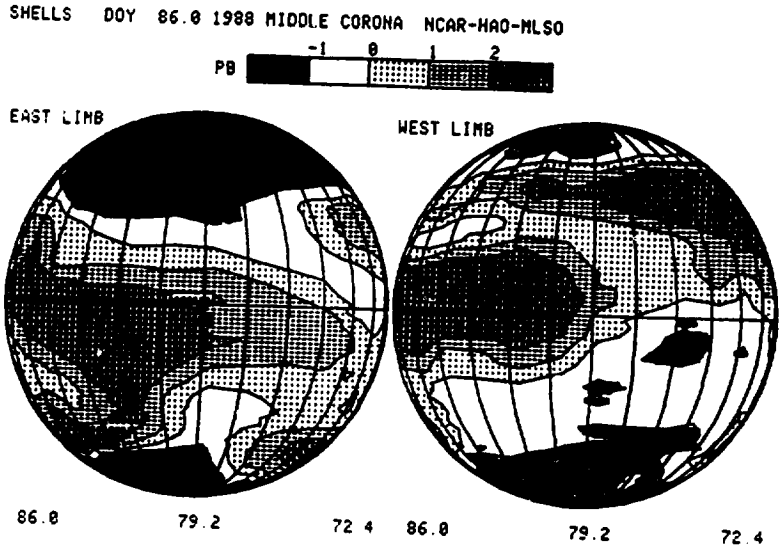

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MAUNA LOA SOLAR OBSERVATORY

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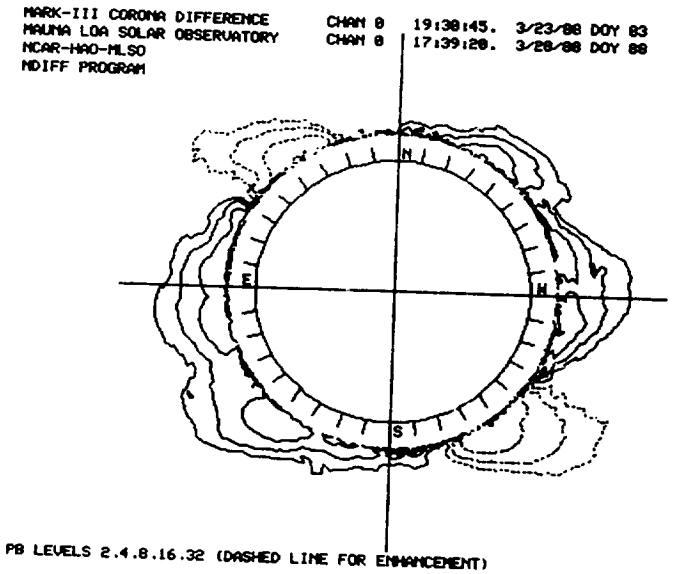
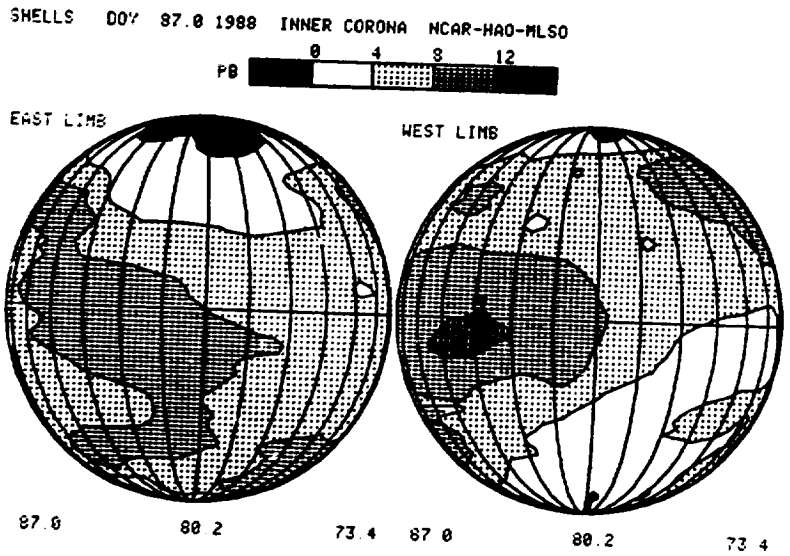
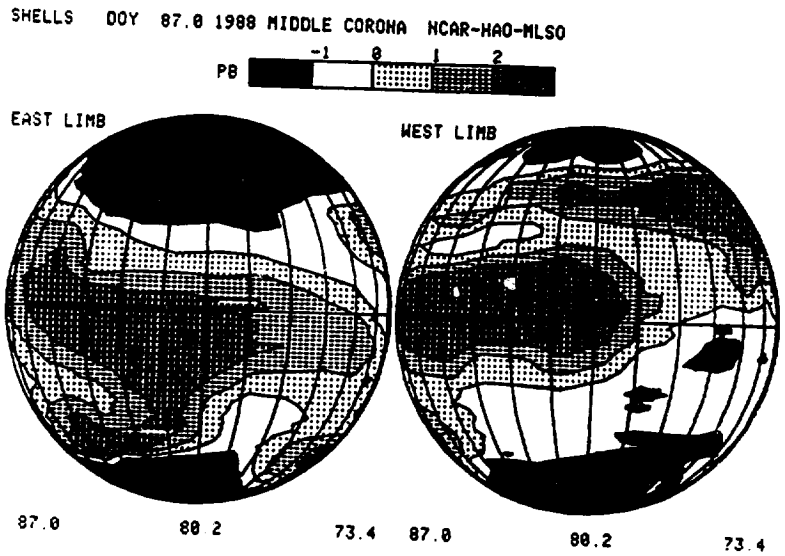
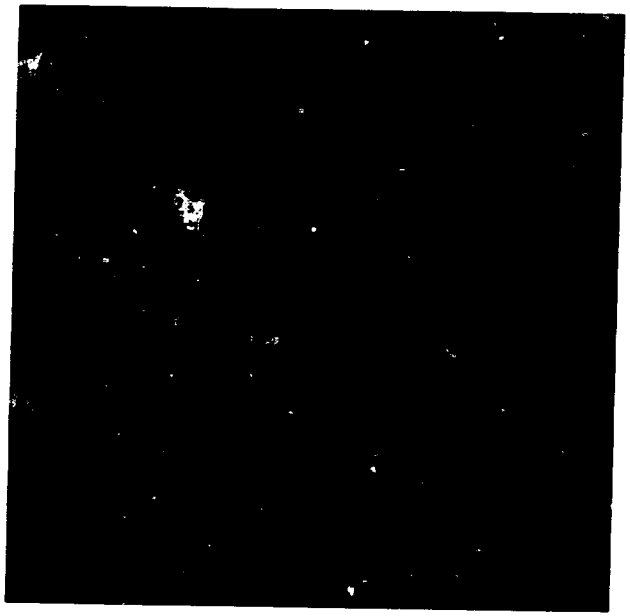
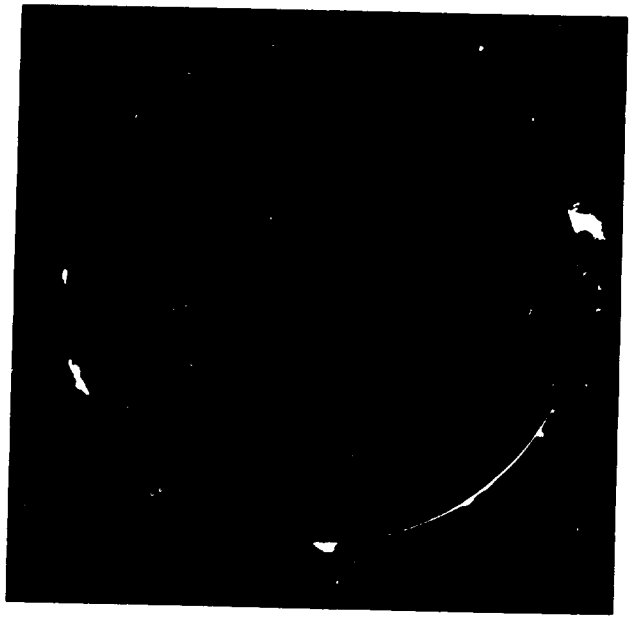






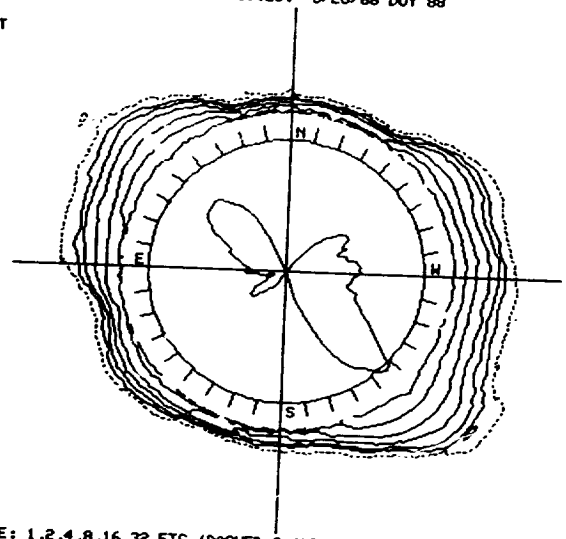




NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 17:39:20. 3/28/88 DOY 88
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

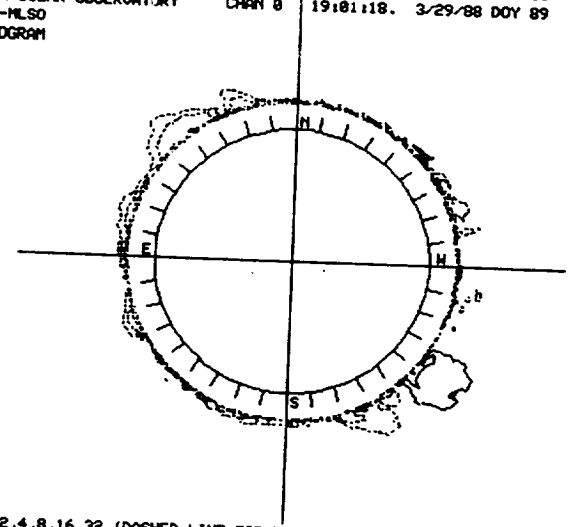
	DEG	PB		
BRI	48	14	2	-1
BRI	71	8	1	-1
BRI	89	6	0	-1
BRI	126	6	-1	-2
BRI	225	20	5	-1
BRI	275	10	1	-2
BRI	302	10	0	-2
HOL	327	0	-2	-2
HOL	17	0	-2	-2
STR	51	14	2	-1
HOL	106	2	-1	-2
STR	127	5	-1	-2
HOL	150	0	-2	-3
HOL	186	1	-2	-2
STR	227	20	5	0
STR	273	10	1	-2
STR	300	10	0	-2



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

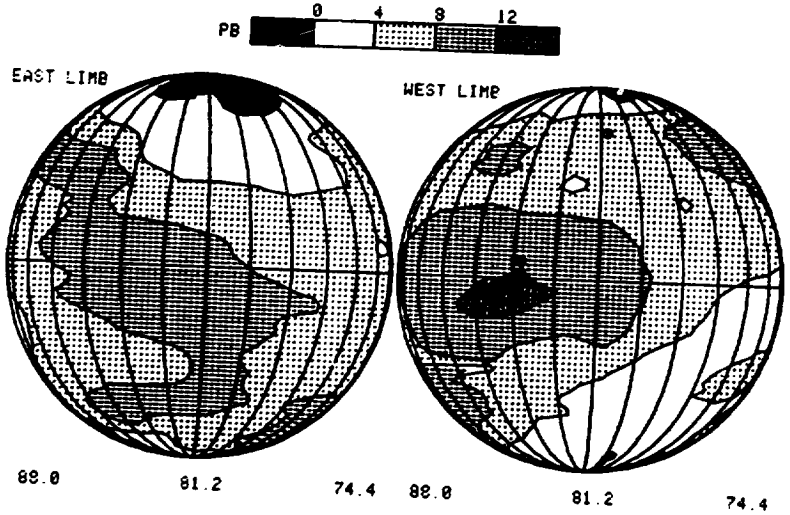
MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
MDIFF PROGRAM

CHAN 0 17:39:20. 3/28/88 DOY 88
CHAN 0 19:01:18. 3/29/88 DOY 89

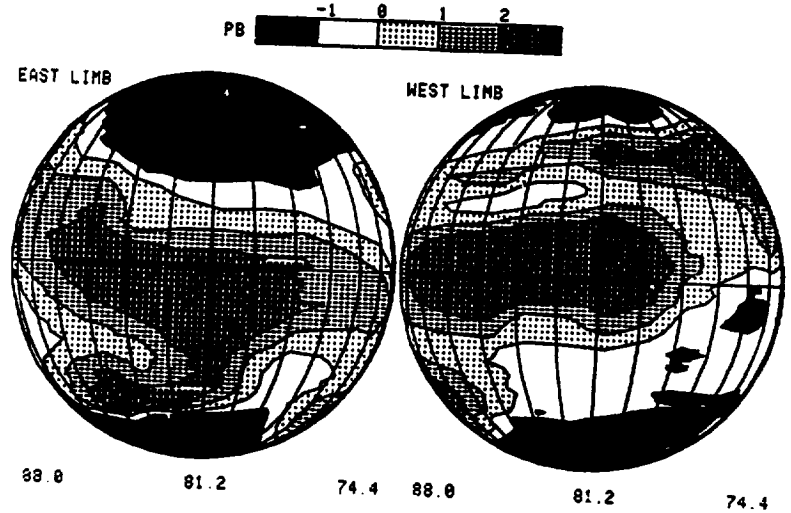


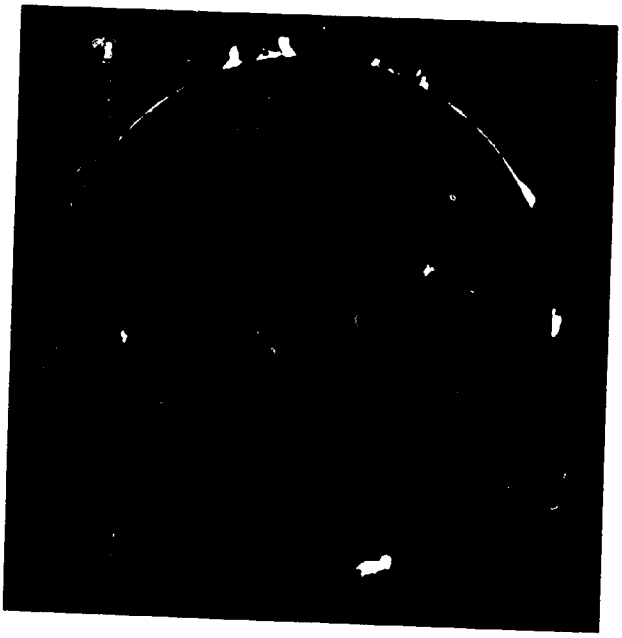
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)

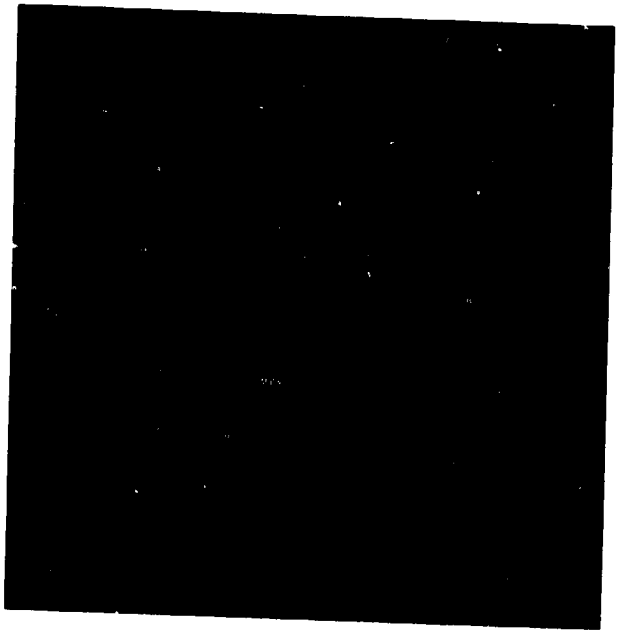
SHELLS DOY 88 0 1988 INNER CORONA NCAR-HAO-MLSO



SHELLS DOY 88.0 1988 MIDDLE CORONA NCAR-HAO-MLSO







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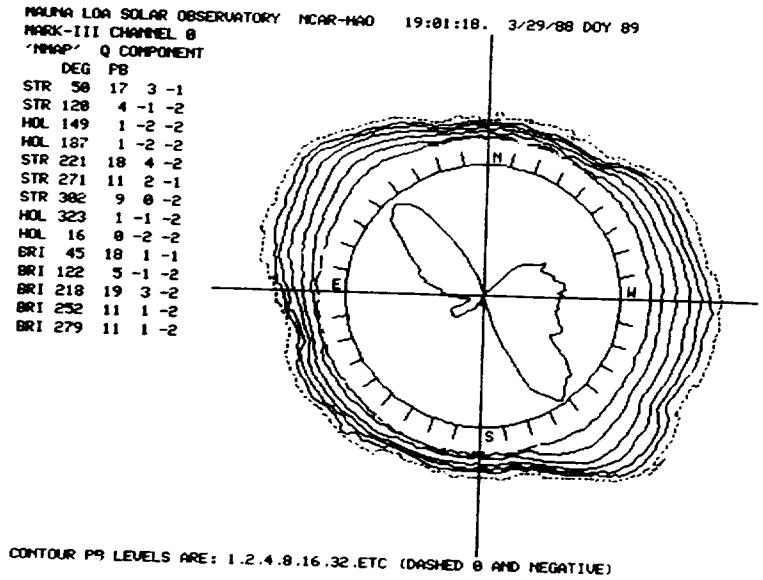
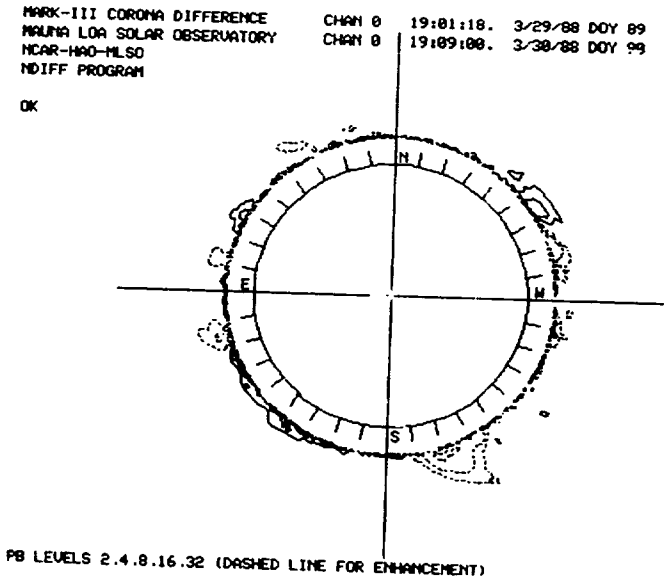
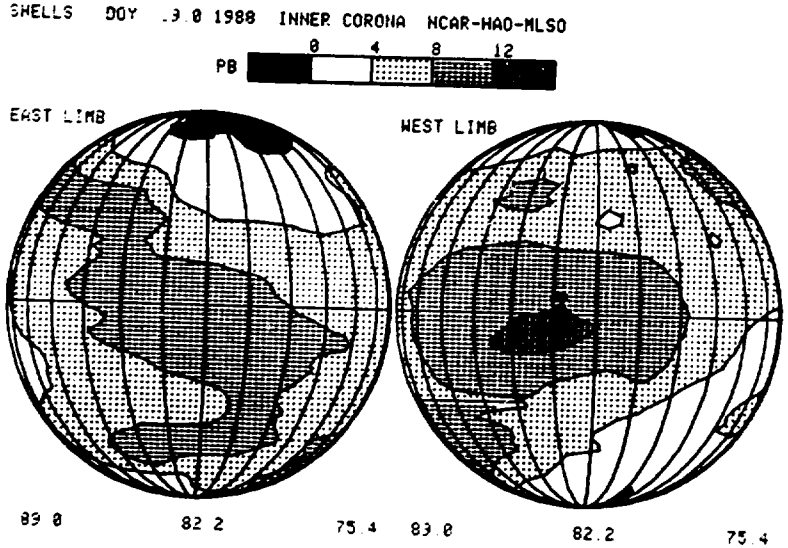
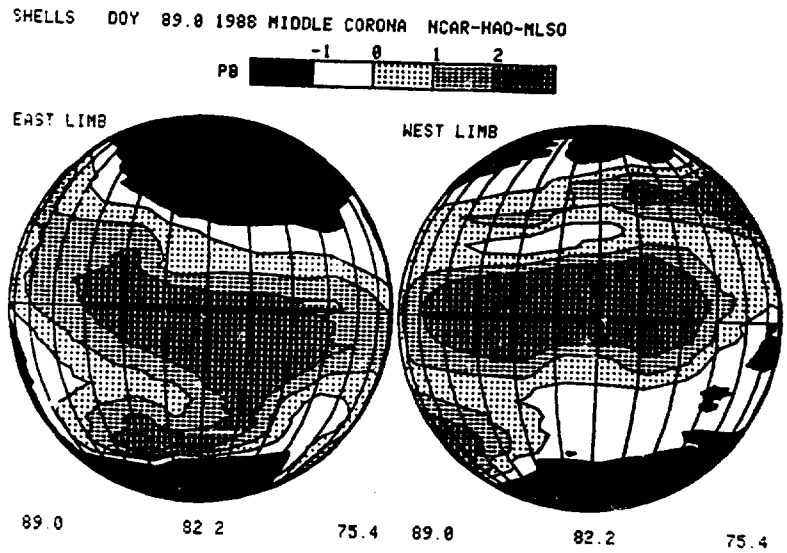
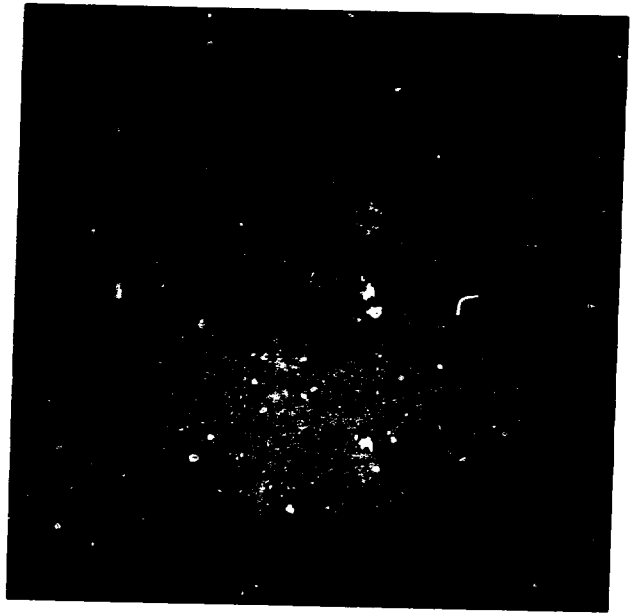

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:01:18. 3/29/88 DOY 89
MARK-III CHANNEL 0
'MMAP' Q COMPONENT
DEG PB
STR 50 17 3 -1
STR 120 4 -1 -2
HOL 149 1 -2 -2
HOL 187 1 -2 -2
STR 221 18 4 -2
STR 271 11 2 -1
STR 302 9 0 -2
HOL 323 1 -1 -2
HOL 16 0 -2 -2
BRI 45 18 1 -1
BRI 122 5 -1 -2
BRI 218 19 3 -2
BRI 252 11 1 -2
BRI 279 11 1 -2
N
E
W
S
CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)


MARK-III CORONA DIFFERENCE
MAUNA LOA SOLAR OBSERVATORY
NCAR-HAO-MLSO
NDIFF PROGRAM
OK
CHAN 0 19:01:18. 3/29/88 DOY 89
CHAN 0 19:09:00. 3/30/88 DOY 99
N
E
W
S
PB LEVELS 2.4.8.16.32 (DASHED LINE FOR ENHANCEMENT)


SHELLS DOY 89.0 1988 INNER CORONA NCAR-HAO-MLSO
PB
0 4 8 12
EAST LIMB
WEST LIMB
89.0 82.2 75.4
89.0 82.2 75.4

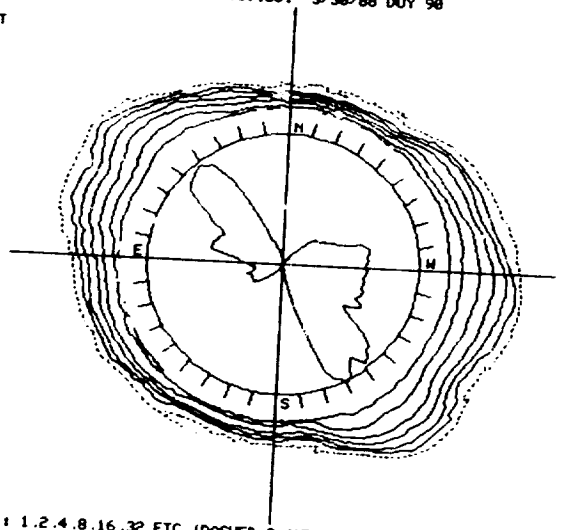

SHELLS DOY 89.0 1988 MIDDLE CORONA NCAR-HAO-MLSO
PB
-1 0 1 2
EAST LIMB
WEST LIMB
89.0 82.2 75.4
89.0 82.2 75.4



NO DATA

MAUNA LOA SOLAR OBSERVATORY NCAR-HAO 19:09:00. 3/30/88 DOY 90
MARK-III CHANNEL 0
'MMAP' Q COMPONENT

	DEG	PB		
BRI	43	10	1	-1
BRI	73	10	1	-1
BRI	100	5	-1	-2
BRI	210	20	2	-2
BRI	222	10	3	-1
BRI	244	12	1	-2
BRI	200	14	1	-2
HOL	323	0	-1	-2
HOL	3	0	-1	-2
STR	52	17	3	-1
STR	73	10	1	-1
HOL	147	1	-2	-2
HOL	187	1	-2	-2
STR	215	17	3	-2
STR	225	17	3	-1
STR	263	12	3	-1



CONTOUR PB LEVELS ARE: 1.2.4.8.16.32.ETC (DASHED 0 AND NEGATIVE)

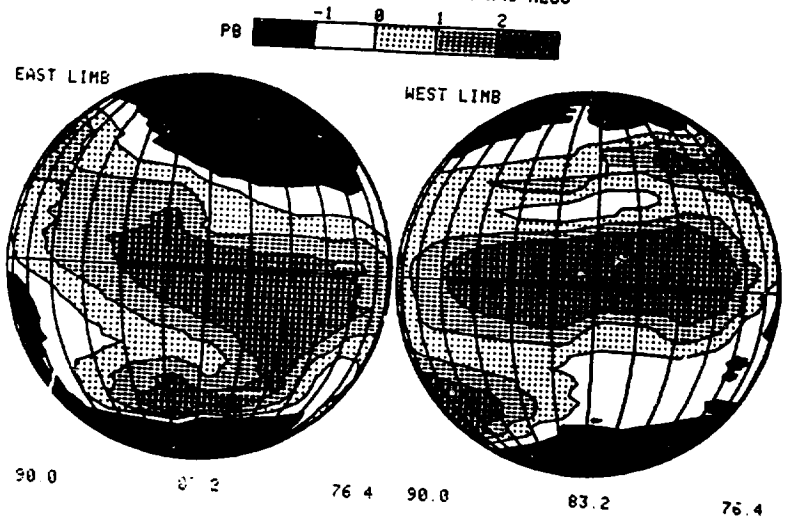
MAUNA LOA SOLAR OBSERVATORY

NO DATA

MAUNA LOA SOLAR OBSERVATORY

NO DATA

SHELLS DOY 90.0 1988 MIDDLE CORONA NCAR-HAO-MLSO



VII. SYNOPTIC SOLAR DATA

For understanding the large scale structure of the corona, synoptic maps may be more helpful than the individual daily observations. Here we present such maps, both of the photospheric magnetic field, and of the coronal distribution of polarized white light radiance, organized into the whole rotation format which displays the global structure (Fisher, et al., 1982b) and shown for the Carrington rotations 1799 and 1800.

The magnetic field maps have been created by mapping successive swaths of observations derived from the daily scans onto a rectangular projection of latitude and longitude similar to the pB maps below. Where more than one observation occurs for a given location, the several observations have been averaged. To this end, the coordinates of each point have been converted to Carrington latitude and longitude, and data (in some cases from several days' observations) have been weighted by $\cos^4(L - L_o)$, where $L - L_o$ is the distance from the central meridian at the time of the observation, before being added into the synoptic map file. The map as shown here thus represents weighted averages for each two-degree interval in latitude and longitude. The magnetic field chart is shown for an entire rotation, encompassing 360° of longitude from 180° in Carrington rotation 1799 to 180° in rotation 1800. The relative weights are indicated also in the subsequent chart.

The synoptic representation of the white light corona has been formed by mapping the daily limb scans onto a rectangular map, with the day numbers of limb passage marked. This procedure is the same as that described in Fisher et al., 1982b, with the exception that the data is now presented with cross hatching to emphasize the contour levels. Maps formed from both east and west limb passages are presented, and are shown for both the inner (1.3 $R_\odot$) and middle (1.7 $R_\odot$) corona with the day number of limb passage indicated for even days only. Days for which no data are available are marked with an "X".

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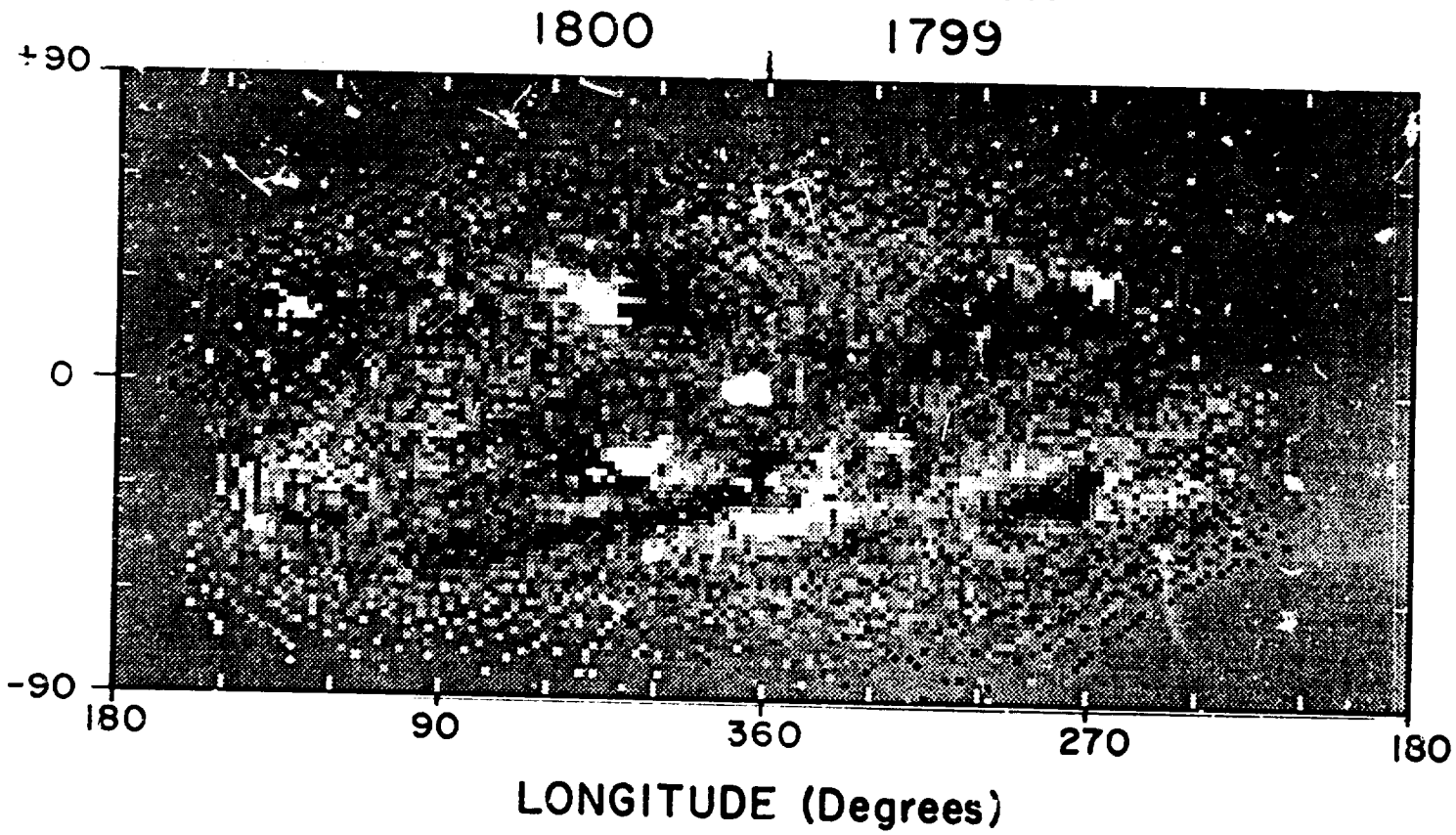
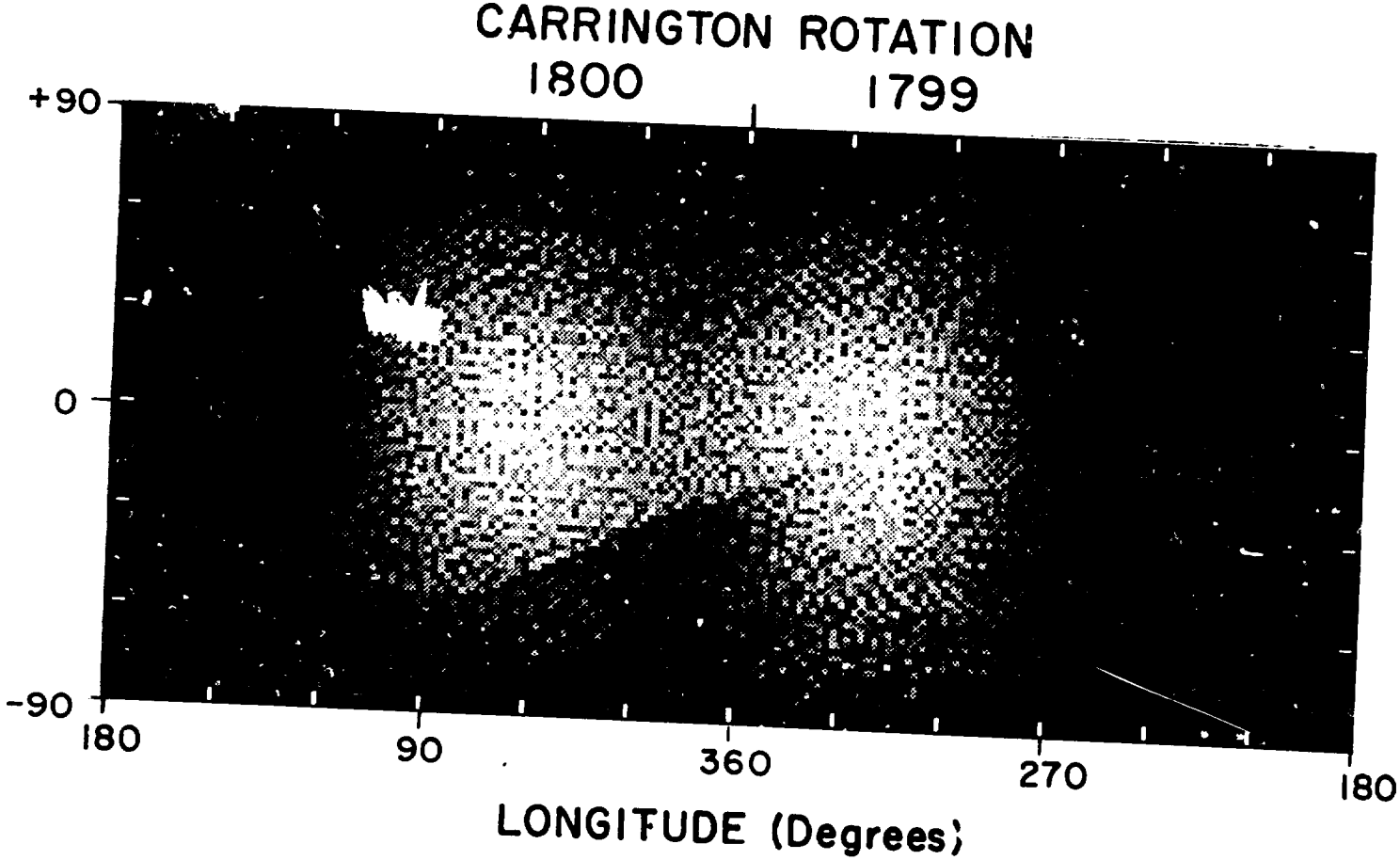
SYNOPTIC MAP OF MSO LONGITUDINAL MAGNETIC FIELD

CARRINGTON ROTATION



WEIGHTS OF ESTIMATES IN SYNOPTIC MAP OF MSO LONGITUDINAL MAGNETIC FIELD

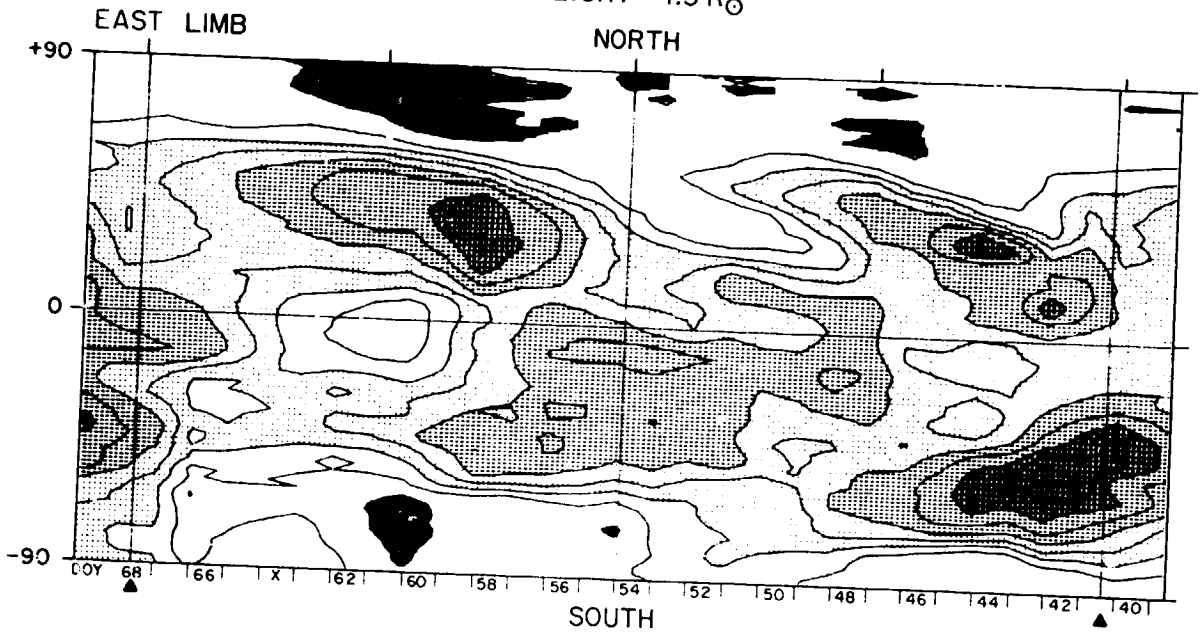


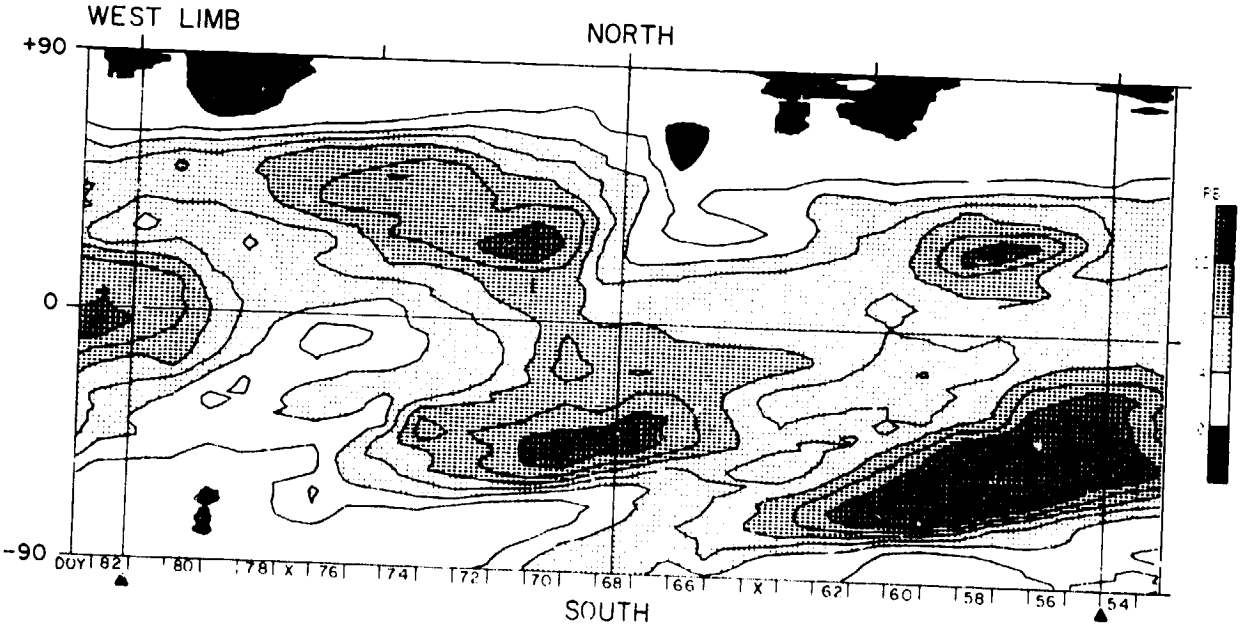
HIGH ALTITUDE OBSERVATORY MAUNA LOA

MK III K-CORONAMETER

CARRINGTON ROTATION 1799

HEIGHT = 1.3 $R_\odot$



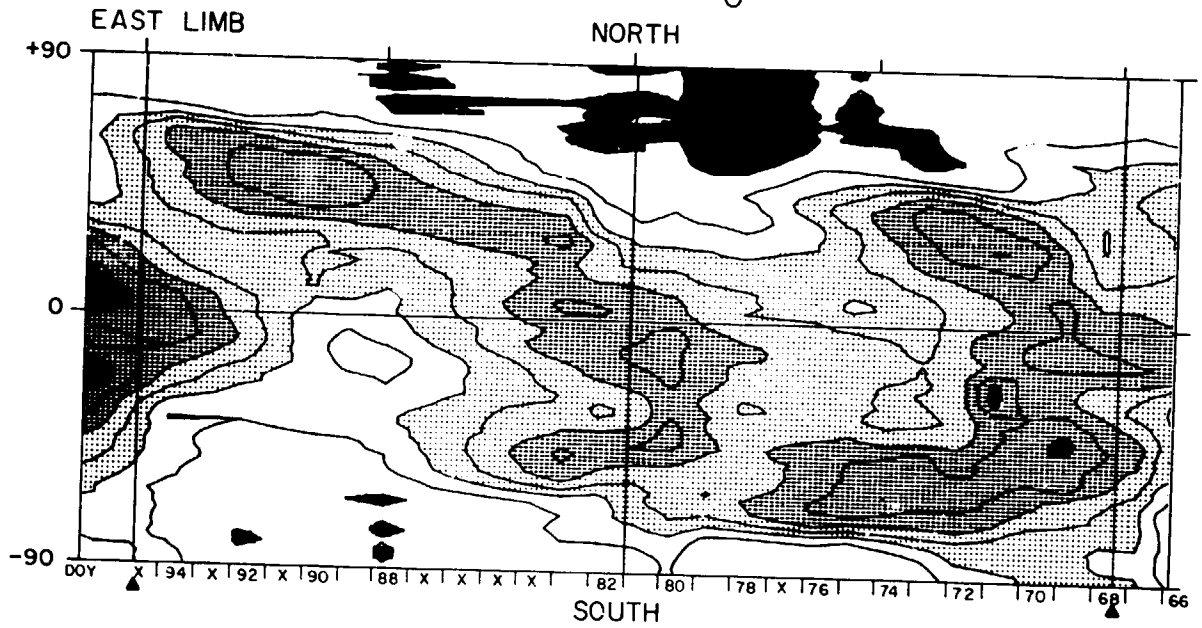


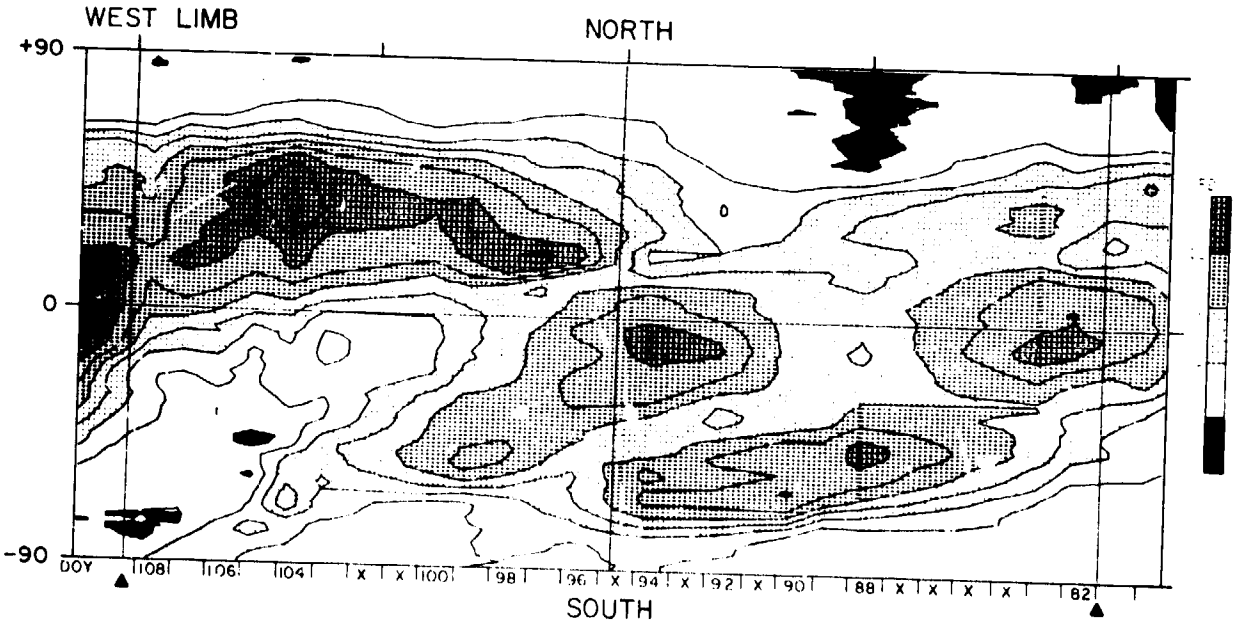
HIGH ALTITUDE OBSERVATORY MAUNA LOA

MK III K-CORONAMETER

CARRINGTON ROTATION 1800

HEIGHT = 1.3 $R_\odot$



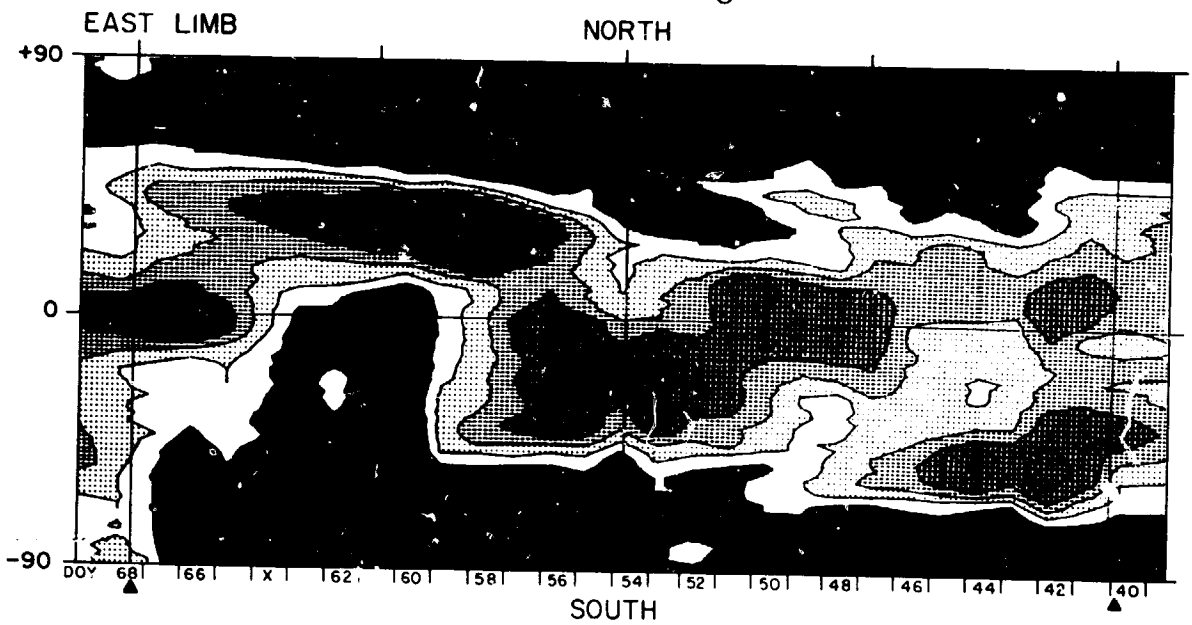


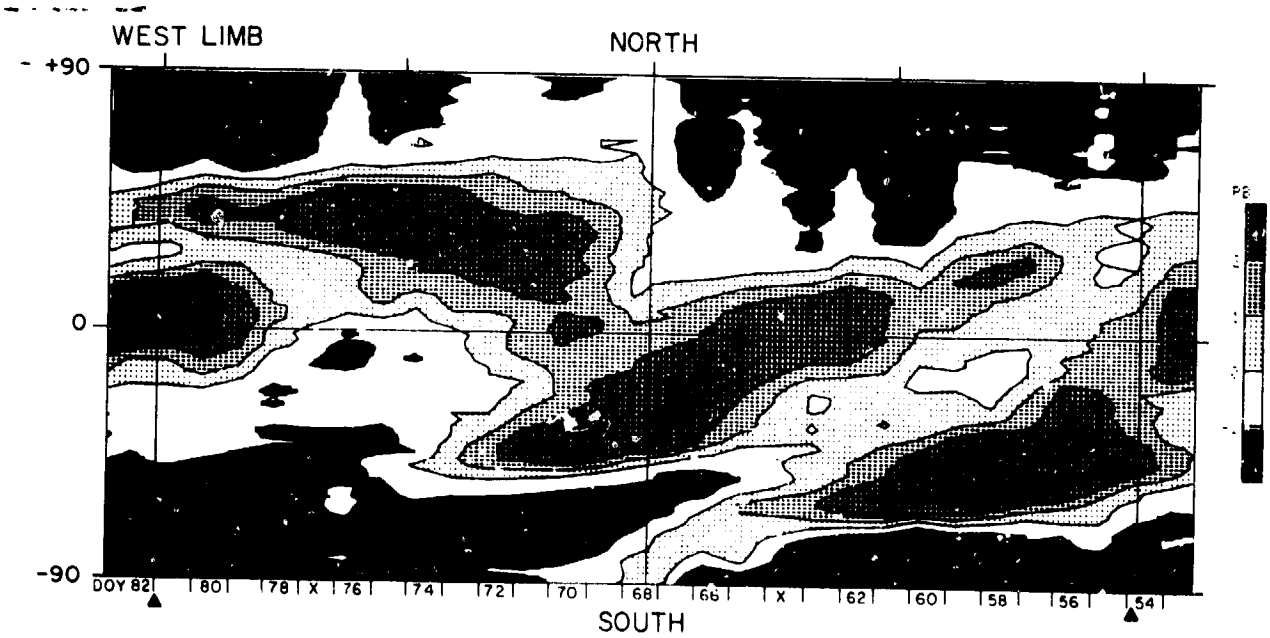
HIGH ALTITUDE OBSERVATORY MAUNA LOA

MK III K-CORONAMETER

CARRINGTON ROTATION 1799

HEIGHT = 1.7 $R_\odot$



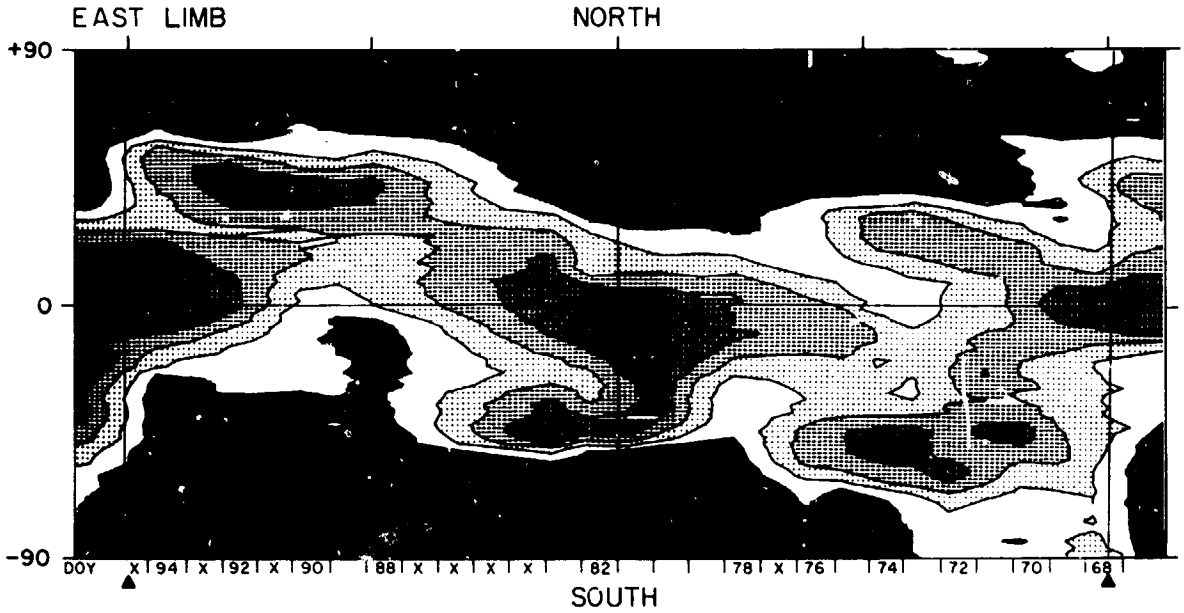


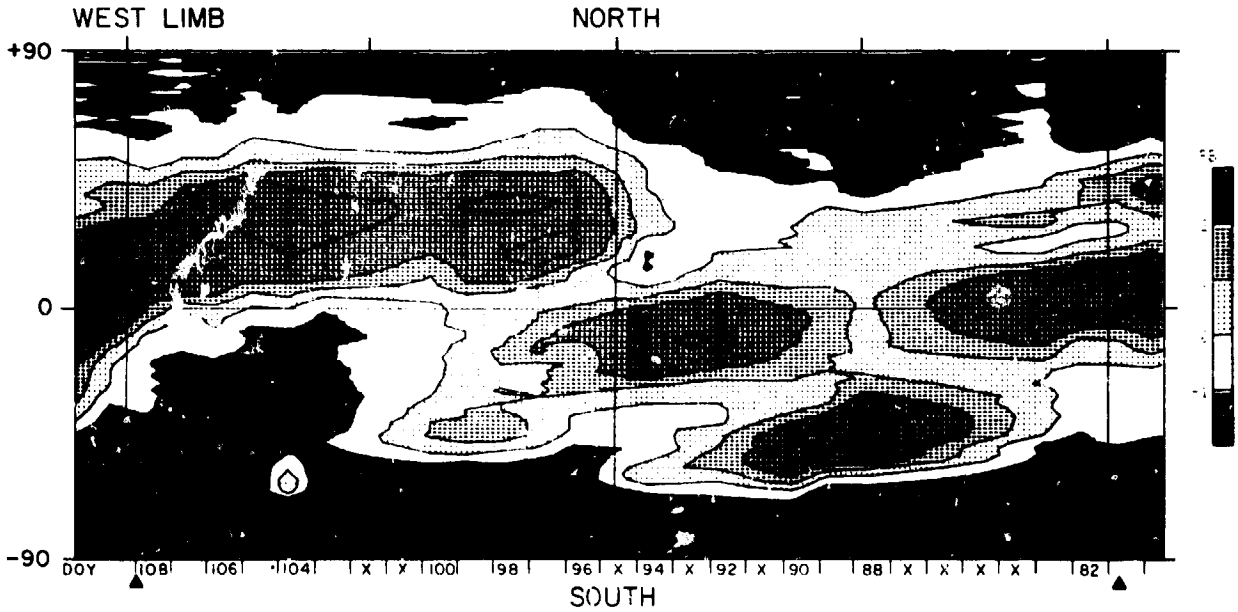
HIGH ALTITUDE OBSERVATORY MAUNA LOA

MK III K-CORONAMETER

CARRINGTON ROTATION 1800

HEIGHT = 1.7$R_\odot$





ACKNOWLEDGMENTS

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Fisher, R. R., C. J. Garcia, K. A. Rock, P. H. Seagraves, E. A. Yasukawa, M. K. McCabe, D. L. Mickey, J. R. Najita, J. R. Lieberman, and M. G. Hardy. *Joint solar dynamics project data summary 14 June - 13 August 1982, Volume I: Chromospheric and coronal observations.* NCAR Technical Note NCAR/TN-202+STR, National Center for Atmospheric Research, Boulder, Colorado, 149 pp., 1982a.

Fisher, R., C. Garcia, K. Rock, P. Seagraves, and E. Yasukawa. *The white light solar corona, an atlas of K-coronameter synoptic charts August 1980 - September 1981.* NCAR Technical Note NCAR/TN-188+STR, NCAR, Boulder, Colorado 119 pp., 1982b.

Fisher, R. R., M. K. McCabe, D. L. Mickey, P. H. Seagraves, and D. G. Sime. The sun as a star. *Astrophys. J.,* **280,** 873, 1984.

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