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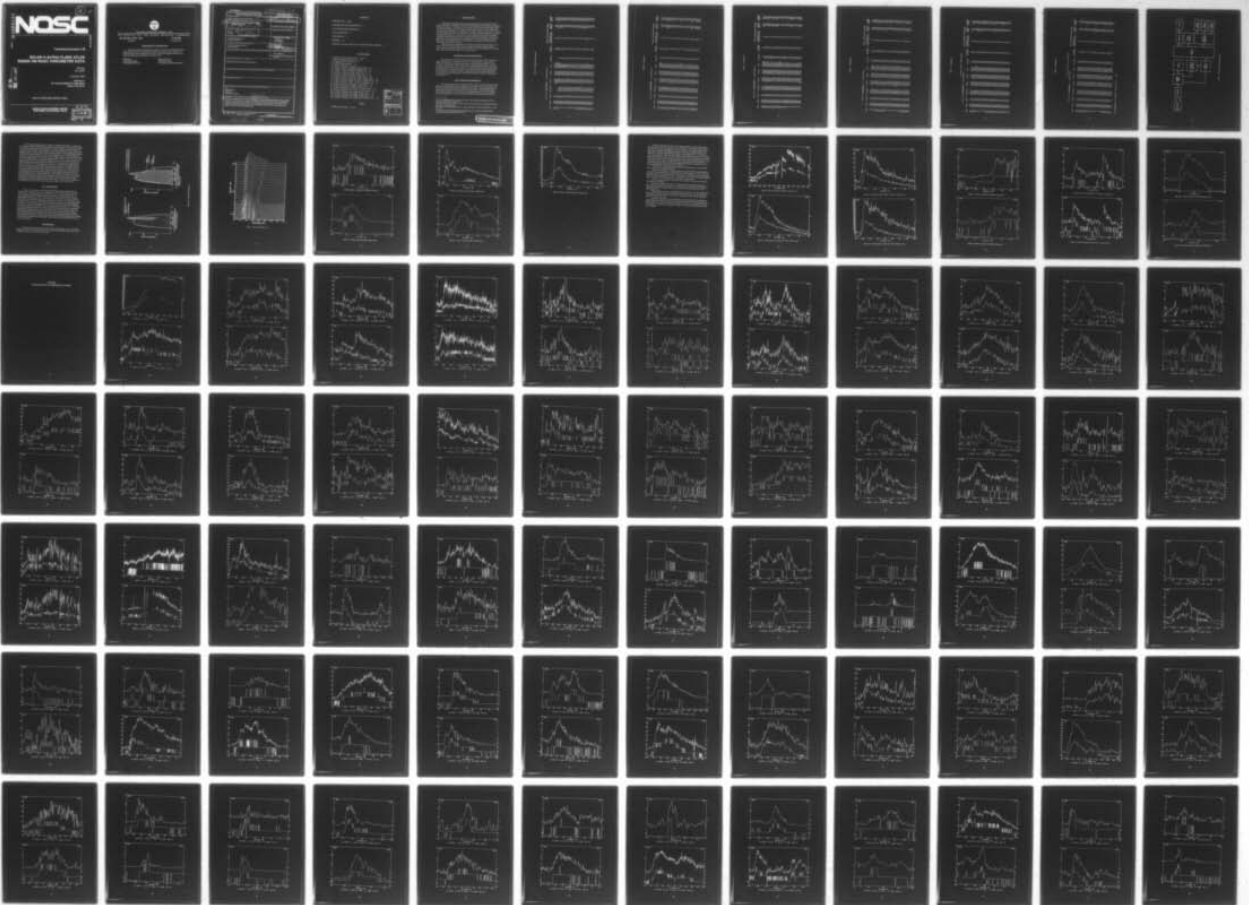
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SOLAR H-ALPHA FLARE ATLAS BASED ON NOSC VIDEOMETER DATA.(U)
JAN 78 P E ARGO, W LOOMIS
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Technical Document 140

SOLAR H-ALPHA FLARE ATLAS BASED ON NOSC VIDEOMETER DATA

PE Argo
W Loomis

5 January 1978

Prepared for
Air Force Geophysics Laboratory
Bedford, MA 01730

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Under authority of
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Environmental Sciences Department

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INTRODUCTION

Solar H_{α} flare measurements are commonly used as the reference point for solar geophysical studies, even though a review of the collected H_{α} data reveals wide discrepancies between observations.¹ Therefore, the Naval Ocean Systems Center has developed a digital solar flare measuring system that employs semiautomated computer-video techniques for use in flare patrol networks. The "videometer" has made possible the study of fine temporal structure during optical flares and offers direct comparison with both radio and x-ray data.² Periodically from early 1971, two systems were run simultaneously; the series included a separation test in which one system was moved to Hawaii (from San Diego). During these operations, 150 flare observations were catalogued, with 23 being seen by both systems. Most of the events observed have been small (subflares), although a 3B flare observed on 24 January 1971 will also be shown.

This document is a compendium of the flare data collected between January 1971 and June 1974. A summary of the peak area, brightness, and times is given in table 1; more complete time history profiles on an event-by-event basis are displayed in the ensuing pages. These profiles are the major reason for this report.

VIDEOMETER SYSTEM DESCRIPTION

The videometer system has been described in detail elsewhere,^{3,4} so it will be discussed only briefly here. The system consists of a 5-inch telescope, a high-resolution (945-line) TV system, and associated electronics, an 8K digital minicomputer, and the necessary readout devices. The overall system concept is diagrammed in fig 1; an artist's conception of the system is shown in fig 2. The tracking telescope, 0.8Å H_{α} hybrid filter, and closed-circuit television system form one unit (which is positioned at an appropriate viewing location). A computer, interface, stripchart recorder, and video monitor form the second unit, which, along with the input/output teletype, is housed in a building near the telescope site.

ACTIVE REGION MEASUREMENTS

The videometer digitizes the brightness levels of picture elements in an array taken within a rectangular region, usually enclosing an active region (see fig 3). Each element in the array covers approximately one millionth of the solar disc. The brightness levels can range from 1 to 64, with 1 being a very dark sunspot and 64 set higher than the highest expected flare brightness. The elements at each brightness level (1-64) are summed so that the stored data are in an "area" (number of points)-versus-brightness-level format.

¹ Air Force Cambridge Research Laboratory TR 73-0181, The Construction and Testing of a Pair of Matched Solar Telescopes, 14 March 1973

² NELC TR 1890, Solar Videometer: An Automatic Solar Flare Identification and Classification System, by PE Argo et al, 23 August 1973

³ Ward, FR, et al, Solar Flare Observations from a Pair of Matched Instruments, Solar Physics, 31, p 131-141, 1973.

⁴ Argo, PE, et al, Analysis of Digital H_{α} Solar Flare Measurements, International Symposium Solar-Terrestrial Physics, Sao Paulo, Brazil, June 1974.

Table 1. H-Alpha flare catalogue.

TIME OF OCCURRENCE (UNIVERSAL)				DATA SPECIFICATIONS							
DAY	MON	YEAR	REGION	START	PEAK	END	SYSTEM	S.U.B. CLASS.	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
24	JAN	71		2026	2047	2051A		IN	6	90	121
24	JAN	71		2302	2334	2127A		3B	5	94	134
5	MAY	72	R176	1828	1838	2345A	R	-F	17	1192	1282
5	MAY	72	R176	1830	1838	1850A	R	-F	6	1128	147
5	MAY	72	R176	2014	2027	1842A	R	-F	5	1175	305
7	MAY	72	R176	1831	2026	2042	R	-F	9	91	293
7	MAY	72	R176	1831	1837	2006	R	-F	3	58	141
7	MAY	72	R178	1900	1906	1916	L	U	3	64	149
8	MAY	72	R178	1720	1727	1746	A	U	3	42	195
8	MAY	72	R178	1721	1727	1747	B	-F	3	44	110
8	MAY	72	R178	2001	2019	2032	A	-F	4	79	149
8	MAY	72	R178	2031	2031	2031	B	-F	4	131	164
8	MAY	72	R178	2041	2046	2044	A	-F	4	179	133
9	MAY	72	R178	2040	2047	2105	B	U	4	158	190
10	MAY	72	R160	1542	1558	1610	A	U	5	119	215
10	MAY	72	R180	1540	1601	1616	B	-U	3	43	105
10	MAY	72	R176	1625	1637	1654	B	U	4	103	169
10	MAY	72	R176	1625	1638	1658	A	U	6	111	168
10	MAY	72	R176	1735	1741	1658	B	U	7	180	227
10	MAY	72	R176	1736	1741	1748	A	-F	7	142	174
10	MAY	72	R176	1815	1820	1800	B	-F	9	162	172
10	MAY	72	R176	1815	1820	1904	A	-N	15	157	226
11	MAY	72	R185	1939	1946	2001A	B	-F	3	305	326
11	MAY	72	R185	1949	1947	1954	B	-F	18	59	145
11	MAY	72	R180	2119	2127	1951	A	U	3	43	199
11	MAY	72	R180	2120	2129	2214	B	-F	5	78	149
11	MAY	72	R180	2120	2129	2150	B	-F	5	68	177

Table 1. (Continued)

TIME OF OCCURRENCE (UNIVERSAL)				DATA SPECIFICATIONS							
DAY	MON	YEAR	REGION	START	PEAK	END	SYSTEM	S.G.B. CLASS.	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
11	MAY	72	R180	2221	2301	2308A	A	-F	3	67	167
11	MAY	72	R180	2245	2303	2308A	A	-F	4	168	323
12	MAY	72	R180	1909	1510	1517	A	-F	3	14	52
12	MAY	72	R180	1929	1931	1933	A	-B	4	81	100
12	MAY	72	R180	1929	1931	1933	A	-B	4	128	247
12	MAY	72	R180	1954	2004	2014	B	-F	6	206	418
12	MAY	72	R180	1954	2004	2014	B	-F	7	283	418
12	MAY	72	R180	2104	2110	2118	B	U	5	89	101
12	MAY	72	R180	2135	2139	2148	B	U	3	95	138
13	MAY	72	R186	R1425	1427	1528	B	-N	9	250	327
13	MAY	72	R186	1751	1752	1805	B	-N	2	25	53
13	MAY	72	R186	1750	1752	1805	A	-N	4	48	82
13	MAY	72	R184	1928	1928	1943	B	-F	2	33	84
13	MAY	72	R184	1928	1928	1943	A	-F	3	47	85
13	MAY	72	R184	2247	2251	2310	B	-F	4	41	85
13	MAY	72	R184	2247	2249	2310	A	-F	2	40	85
13	MAY	72	R180	2308	2317	2327A	B	U	3	97	101
14	MAY	72	R186	1728	1734	1744	A	U	3	63	170
14	MAY	72	R186	1731	1735	1741	A	U	4	52	86
14	MAY	72	R184	1738	1738	1743	B	U	3	41	51
14	MAY	72	R186	1822	1838	1918	B	U	6	69	83
14	MAY	72	R186	1852	1858	1918	A	-F	3	52	75
17	MAY	72	R186	2105	2109	2133	B	-F	9	116	139
17	MAY	72	R193	2230	2243	2024A	B	-F	16	932	1370
17	MAY	72	R193	2225	2331	2344	B	-F	3	45	69
18	MAY	72	R195	1820	1822	1838	A	-F	9	38	50
18	MAY	72	R186	1953	1955	2010	A	-N	2	209	263
18	MAY	72	R186	1953	1955	2010	A	-N	9	269	292
18	MAY	72	R195	2024	2027	2102	B	-B	12	212	258
18	MAY	72	R195	2024	2027	2102	B	-B	8	304	332

Table 1. (Continued)

TIME OF OCCURRENCE (UNIVERSAL)				DATA SPECIFICATIONS							
DAY	MON	YEAR	REGION	START	PEAK	END	SYSTEM	S.G.B. CLASS.	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
18	MAY	72	R160	2034	2132	2220A	A	-F	5	171	247
18	MAY	72	R160	1828	1940	2220A	B	-F	6	220	278
20	OCT	72	R448	1821	1822	1858	HW	-N	2	38	103
21	OCT	72	R448	2041	2027	2155A	HW	-N	4	85	185
24	OCT	72	R453	2002	2008	2024	HW	-F	7	368	526
24	OCT	72	R448	2111	2122	2133	HW	-F	5	87	99
25	OCT	72	R460	2321	0056	0205A	HW	-F	1	290	362
25	OCT	72	R460	1924	1928	1930	LP	-B	9	111	140
25	OCT	72	R460	1957	2000	2005	LP	-N	5	130	140
25	OCT	72	R460	2147	2205	2214A	LP	-N	3	240	61
25	OCT	72	R460	2326	2328	2332	LP	-N	6	165	195
25	OCT	72	R460	2342	2343	2352	LP	-N	8	11	30
26	OCT	72	R460	0008	0014	0028A	LP	-N	2	31	34
31	OCT	72	R460	1959	2005	2008A	LP	-F	3	51	108
31	OCT	72	R460	2000	2005	2008	HW	-F	2	30	90
31	OCT	72	R460	2029	2051	2107	HW	-N	2	14	47
1	NOV	72	R460	2108	2112	2124	HW	-N	2	19	99
2	NOV	72	R479	2307	2314	2340A	LP	-U	2	81	130
2	MAR	73	R044	1812	1831	1855	LP	-B	4	40	40
3	MAR	73	R044	2018	2020	2033	LP	-N	2	185	306
3	APR	73	R064	1827	1853	1926	LP	-N	5	17	121
3	APR	73	R064	2027	2044	2104	LP	-U	2	29	152
3	APR	73	R064	2103	2105	2110	LP	-B	5	78	16
4	APR	73	R064	2201	2205	2212	LP	-B	5	10	16
5	APR	73	R067	1821	1823	1828	LP	-F	1	36	30
5	APR	73	R071	2021	2032	2051	LP	-N	2	54	179
6	APR	73	R078	1721	1733	1737	LP	-F	2	147	258
7	APR	73	R078	1723	1743	1738A	LP	-N	4	168	219
7	APR	73	R078	1738	1743	1804	LP	-N	4	168	219

Table 1. (Continued)

TIME OF OCCURENCE (UNIVERSAL)				DATA SPECIFICATIONS							
DAY	MON	YEAR	REGION	START	PEAK	END	SYSTEM	S.G.B. CLASS.	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
7	APR	73	R078	1857	1909	1923	LP	-F	3	253	253
7	APR	73	R077	2250	2257	2312A	LP	-F	3	98	198
11	APR	73	R077	1744	1750	1757	LP	-F	6	188	188
11	APR	73	R077	1528	1523	1534	LP	-B	1	162	338
11	APR	73	R077	1620	1623	1745	LP	-B	1	599	2772
11	APR	73	R077	1838	1846	1935A	LP	-B	12	216	101
24	APR	73	R062	2022	2041	2105	LP	-B	4	216	28
20	APR	73	R062	1917	1920	1929	LP	-N	2	28	28
28	APR	73	R082	R 1928	2003	1928A	LP	-F	6	230	250
28	APR	73	R085	1734	1750	2045	LP	-F	4	114	131
1	MAY	73	R092	1821	1841	1846	LP	-F	2	114	212
1	MAY	73	R092	1912	1915	1920	LP	-F	3	59	112
2	MAY	73	R092	1914	1919	1920	LP	-F	3	91	199
2	MAY	73	R092	1753	1757	1834	LP	-F	3	88	188
2	MAY	73	R092	2038	2051	1806	LP	-B	5	224	390
7	MAY	73	R092	2148	2152	2158	LP	-N	3	29	29
7	MAY	73	R092	2002	2010	2158	LP	-N	2	29	29
7	MAY	73	R092	2037	2057	2108A	LP	-F	2	197	197
7	MAY	73	R092	B 2227	2112	2108A	LP	-F	2	197	197
9	MAY	73	R092	2227	2318	2142	LP	-F	4	215	208
17	MAY	73	R092	1630	1936	2353A	LP	-F	2	139	45
18	MAY	73	R103	1907	1909	1951	LP	-B	4	139	139
21	MAY	73	R103	1527	1531	1928	LP	-B	4	114	114
21	MAY	73	R103	1639	1659	1549	LP	-B	4	94	94
23	MAY	73	R103	1745	1752	1710	LP	-F	2	144	144
24	MAY	73	R103	2357	0001	1811	LP	-F	2	144	144
24	MAY	73	R103	1807	1822	0035	LP	-F	4	100	100
25	MAY	73	R107	1411	1410	1935	LP	-N	1	132	189
27	MAY	73	R193	1057	1712	1753	LP	-N	1	132	189

Table 1. (Continued)

TIME OF OCCURRENCE (UNIVERSAL)				H ALPHA FLARE CATALOGUE				DATA SPECIFICATIONS			
DAY	MUN	YEAR	REGION	START	PEAK	END	SYSTEM	S.G.B. CLASS.	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
30	AUG	73	R209	1931	1939	2010	LP	-N	8	172	229
31	AUG	73	R203	1613	1616	1624	LPP	-F	4	171	101
31	AUG	73	R208	1730	1739	1744	LPP	-F	2	16	172
31	AUG	73	R203	1841	1847	1859	LPP	-U	3	29	60
4	SEP	73	R209	2143	2150	2203A	LPP	-N	7	130	130
4	SEP	73	R212	1551	1555	1611	LPP	-N	7	353	506
4	SEP	73	R219	1627	1634	1650	LPP	-F	2	20	49
4	SEP	73	R215	1708	1712	1753	LPP	-F	6	124	180
6	SEP	73	R219	1817	1819	1934	LPP	-F	5	56	185
7	SEP	73	R219	1719	1724	1734	LPP	-F	3	22	188
7	SEP	73	R219	2101	2110	2115	LPP	-F	2	48	76
10	SEP	73	R219	1809	1809	1824	HW	-F	1	18	165
10	SEP	73	R219	1807	1811	1824	LPP	-U	2	66	175
10	SEP	73	R219	1840	1846	1858	LPP	-F	3	35	266
10	SEP	73	R214	1843	1847	1858	HW	-F	3	86	86
10	SEP	73	R215	1959	2021	2047	LPP	-F	3	136	136
10	SEP	73	R219	2011	2026	2032	LPP	-U	2	32	60
10	SEP	73	R219	2023	2026	2042	LPP	-U	3	92	78
11	SEP	73	R224	1649	1654	1701	LPP	-F	3	78	108
11	SEP	73	R219	1651	1655	1703	LPP	-U	3	138	138
11	SEP	73	R224	2111	2112	2116	LPP	-F	2	28	67
11	SEP	73	R219	2111	2114	2116	LPP	-U	2	16	75
12	SEP	73	R224	1915	1920	1930	LPP	-F	2	2	95
12	SEP	73	R224	1925	1957	2000	LPP	-U	2	68	68
25	SEP	73	R227	1710	1722	1744	LPP	-F	2	28	67
25	SEP	73	R227	1855	1905	1913	LPP	-F	2	16	75
25	OCT	73	R247	1912	1917	1935	LPP	-N	2	2	1
25	OCT	73	R245	2029	2034	2034	LPP	-N	1	68	68
25	OCT	73	R262	1712	1731	1831	LPP	-N	4	68	68

Table 1. (Continued)

H ALPHA FLARE CATALOGUE										
TIME OF OCCURRENCE (UNIVERSAL)				DATA SPECIFICATIONS			S.G.B. CLASS.			
DAY	MON	YEAR	REGION	START	PEAK	END	SYSTEM	CHANGE IN PEAK BRIGHT.	UPPER AREA	LOWER AREA
25	OCT	73	R262	2035	2039	2040	LP	3	47	73
25	OCT	73	R264	2044	2048	2100	LP	3	45	89
25	OCT	73	R264	2125	2131	2131	LP	3	19	53
29	OCT	73	R267	1825	1837	2144	LP	2	11	55
31	OCT	73	R267	1944	1946	1844	LP	1	13	59
27	NOV	73	R267	1930	1946	1951	LP	1	18	34
27	NOV	73	R267	81930	1943	2112	LP	3	41	193
27	NOV	73	R267	2053	2055	1952	LP	2	24	62
2	DEC	73	R267	1828	1830	2100	LP	4	58	79
2	DEC	73	R267	1901	1903	1835	LP	2	23	56
18	DEC	73	R300	1700	1703	1908	LP	2	38	38
1	JUN	74	R416	1542	1546	1713	LP	3	118	189
3	JUN	74	R416	1950	1955	1551	LP	5	202	329
3	JUN	74	R414	2058	2102	2032	LP	2	18	40
3	JUN	74	R414	2211	2220	2249	LP	3	102	193
3	JUN	74	R414	2343	2349	2359A	LP	3	193	49
4	JUN	74	R416	1623	1625	1636	LP	2	24	85
6	JUN	74	R417	1420	1423	1457	LP	2	60	380
6	JUN	74	R417	1537	1541	1626	LP	10	277	390
10	JUN	74	R426	1407	1410	1418	LP	2	51	145
10	JUN	74	R426	1713	1743	1815	LP	3	60	145
10	JUN	74	R426	1850	1857	1904	LP	2	60	145
14	JUN	74	R426	1417	1422	1451	LP	7	490	490
14	JUN	74	R426	1612	1617	1634	LP	2	17	88
19	JUN	74	R428	1417	1435	1434	LP	2	42	88
21	JUN	74	R428	1433	1435	1445	LP	3	16	50

THE NUMBER OF FLARES CATALOGUED = 177

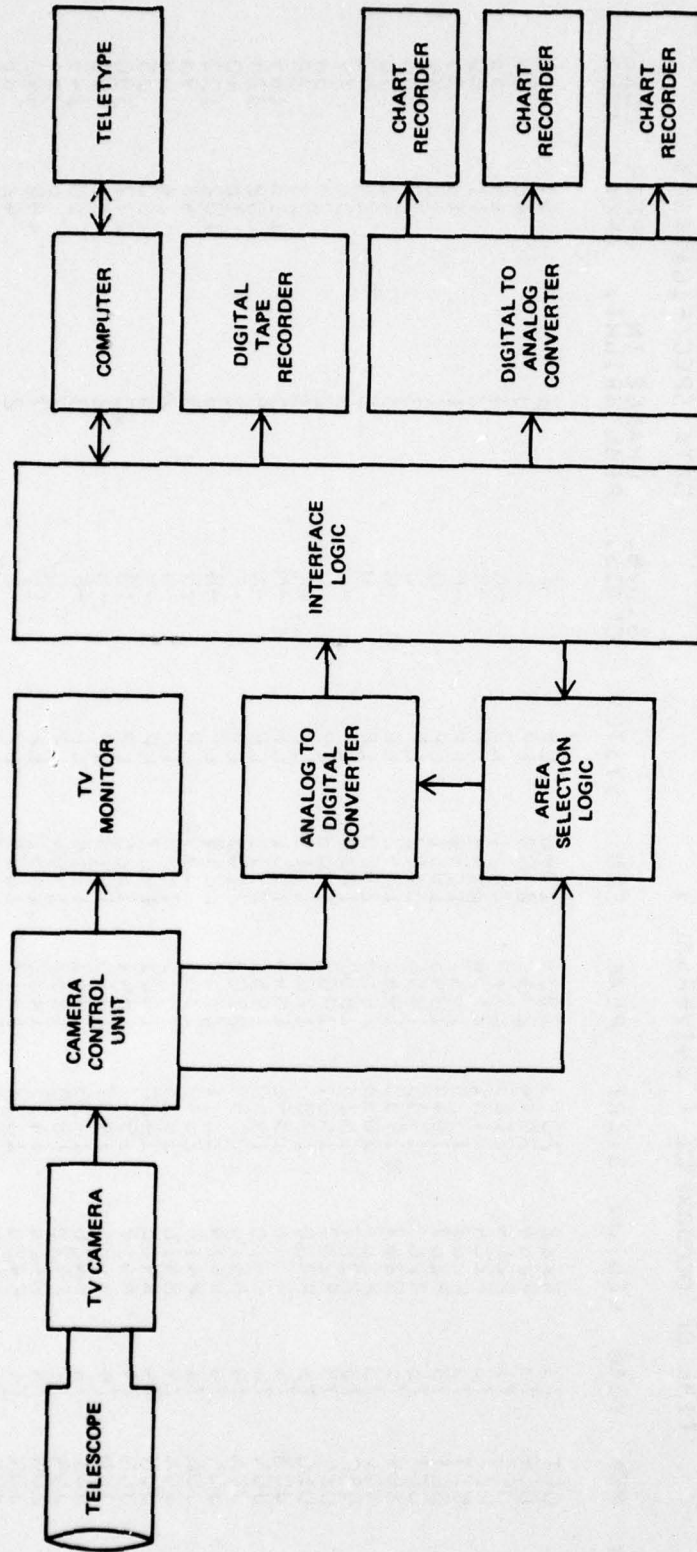


Figure 1. Solar flare data acquisition system.

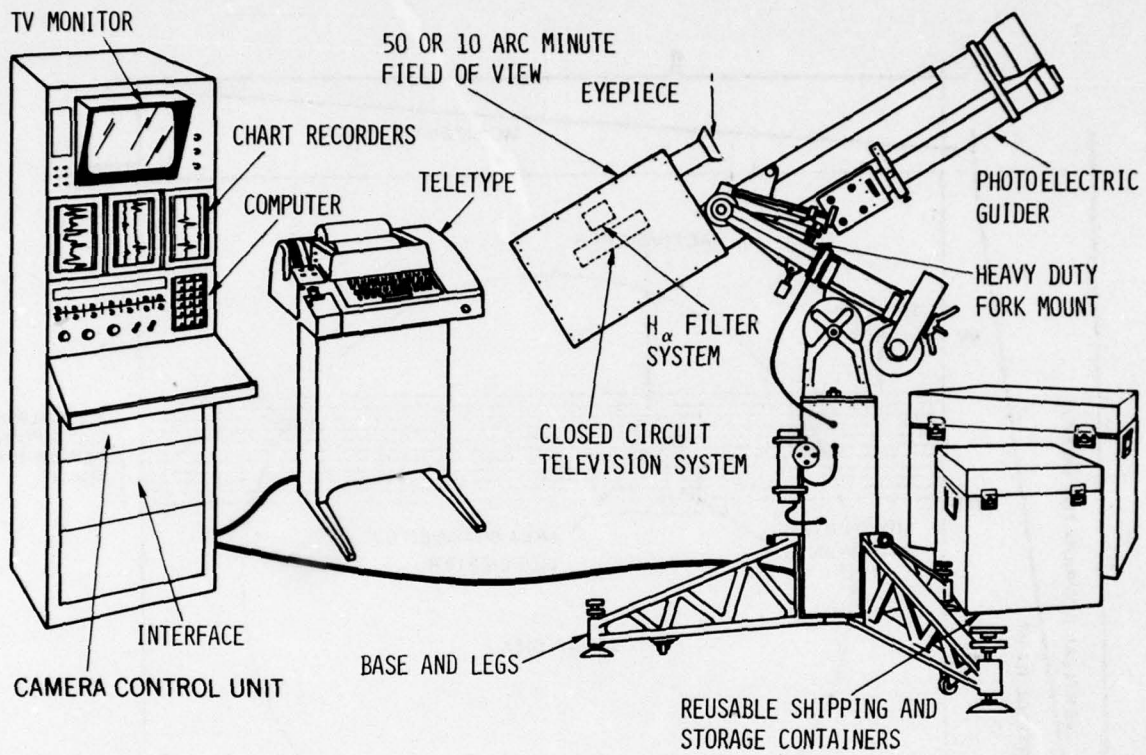


Figure 2. Solar flare digital videometer system.

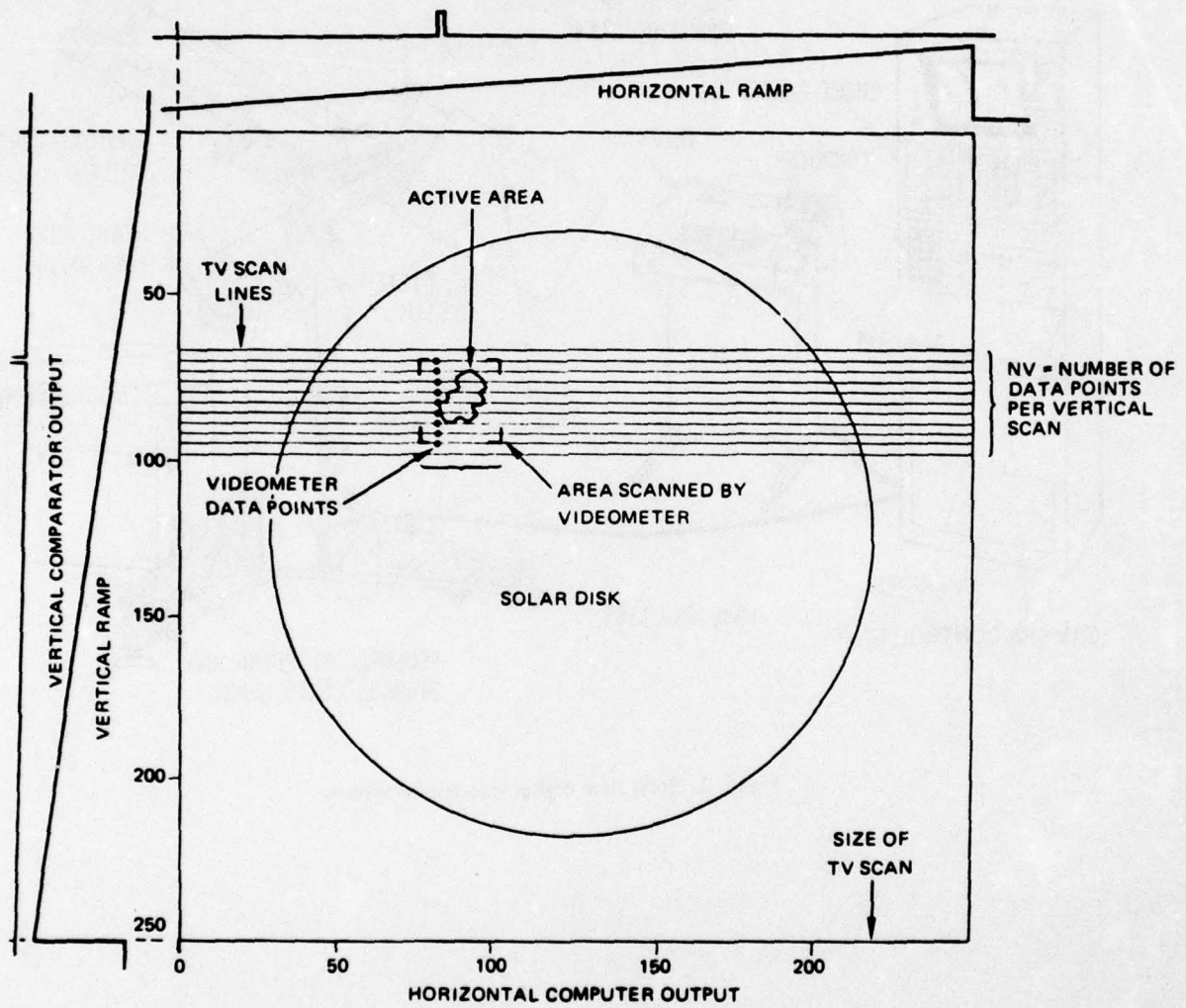


Figure 3. Videometer scan of TV output.

This area-versus-brightness curve is called a "brightness distribution." Notice that this technique discards all positional information within the region. A region which contains a minimum of solar features typically will have a range of brightness values from three to five units wide (see fig 4a), with the largest number of points (area) existing in two or three brightness levels. An active region will have a wider distribution (fig 4a), although the largest number of elements will again lie in two or three brightness levels. The brightness levels below this "average brightness" are indicative of the filamentary and sunspot features, while the higher brightness levels correspond to the plage region. A flare, viewed optically, is typically seen as an increase in the maximum brightness level, as well as enhanced areas in the brighter plage regions. Figure 4b shows data from the system collected at the peak of a flare on 12 March 1972. The dashed curve is the pre-event brightness distribution and is used as the reference level from which the flare data are measured. The brightness distribution of the region at flare maximum falls beneath the solid line in the figure, with the actual flare defined as the increased area in the brighter (higher) levels. Time histories for optical flaring events are then readily available by performing the subtraction of the pre-flare distribution from the flaring distribution, as indicated above for each measurement. By varying the lowest bin used in the actual flare area, subtractions can look at the strictly energetic portion (higher brightness levels) or include the more diffuse and less bright flaring region (lower flare brightened levels; fig 4b). Figure 5 shows the time variations of the distribution from the active region, which gave a 3B flare on 24 January 1971.

DATA DESCRIPTION

Table 1 gives a summary of the flare data recorded by the videometer systems, spanning a time range from early 1971 through June 1974. During this period the videometer systems were undergoing design development and so the data cannot strictly be intercompared throughout. The 24 January 1971 data were taken during the very early design phase, and must stand alone. The data from 5-7 May 1972 were taken with both systems from the La Posta Astrogeophysical Observatory at Campo, CA; in this same series, the data from 8-18 May 1972 were with the videometer separated, system B being located in Saugus, CA. Between May and October 1972, the systems were improved by installing new, more sensitive video amplifiers, and so the following data (October 1972 - June 1974) also must be considered separately. The shape of the time histories should be comparable throughout the whole data set—it is the actual values that cannot be intercompared. The upper and lower flare areas indicated in the table are those corresponding to the higher and lower thresholds (bin level), respectively, used in the distribution subtraction process. If the numbers are the same, it indicates that the pre-event active region did not show enough contrast to the distinguished two thresholds. The profiles are all presented with respect to the lower threshold.

TIME PROFILES

The time profile plots (fig 6 and beyond) contain both the flare "area" and the peak brightness variations. The area scale is on the left and the peak brightness (or "peak") is on the right; the area curve is above the peak curve.

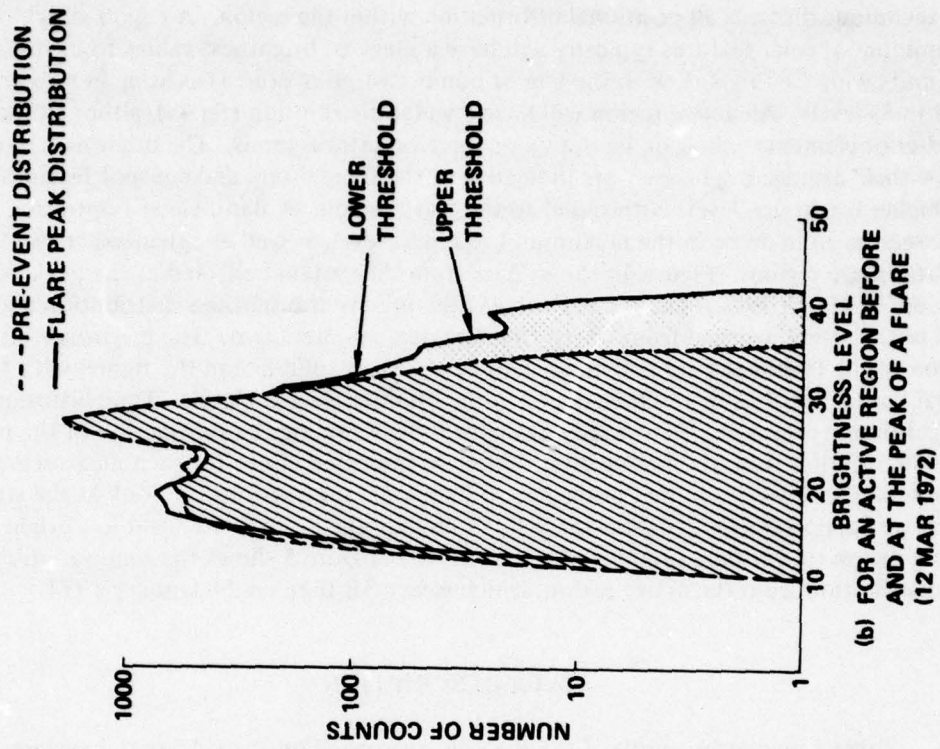
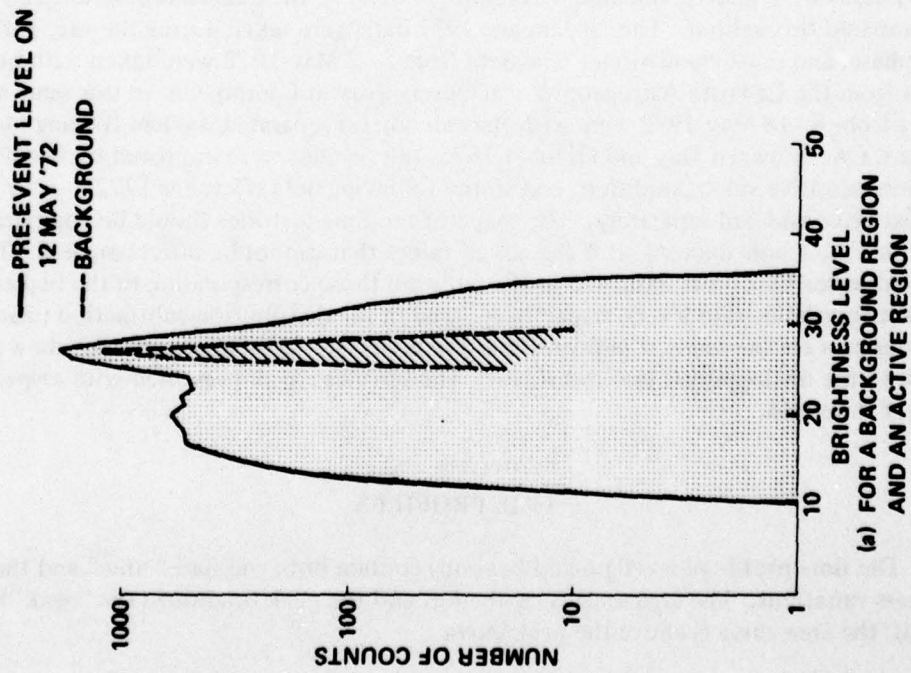


Figure 4a-b. Brightness distributions.

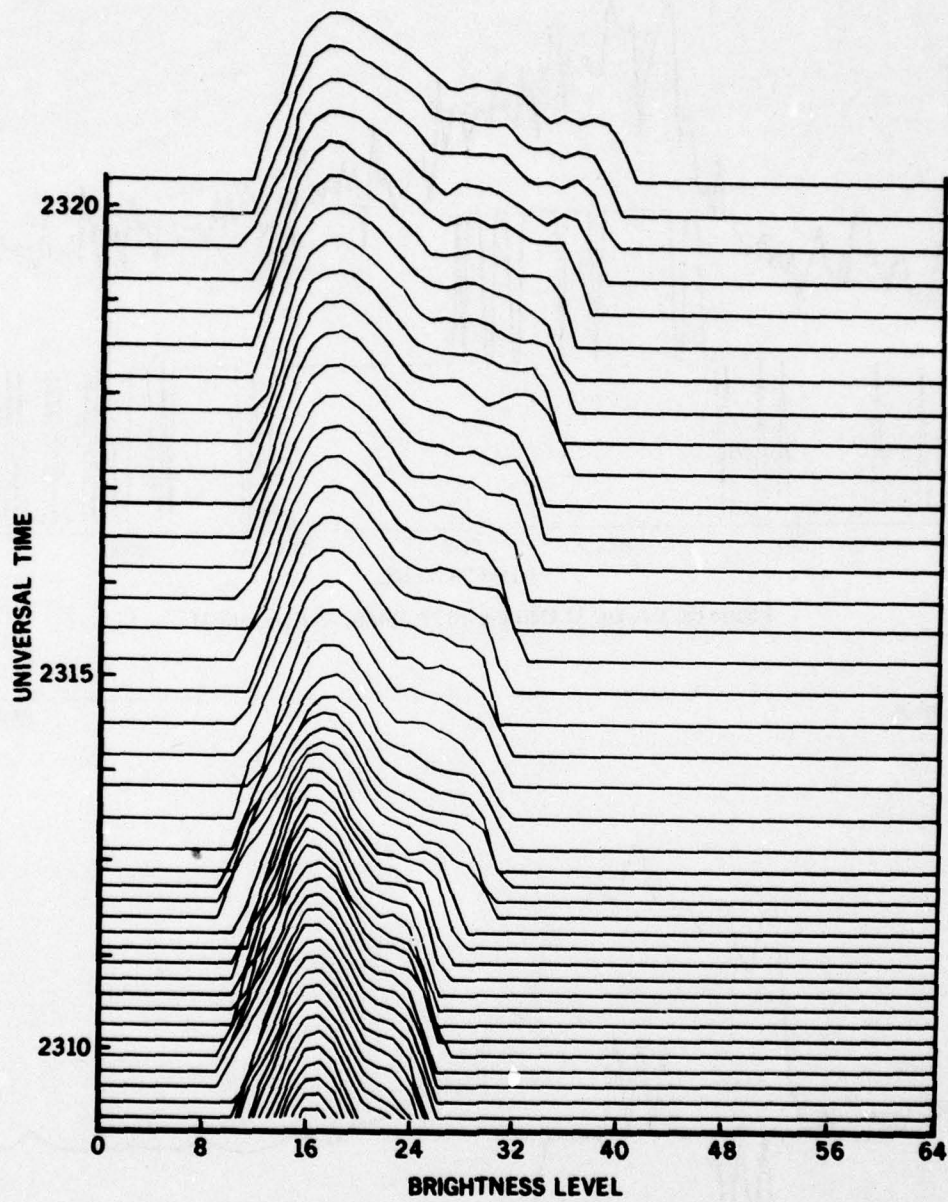


Figure 5. 2-B flare, 24 January 1971.

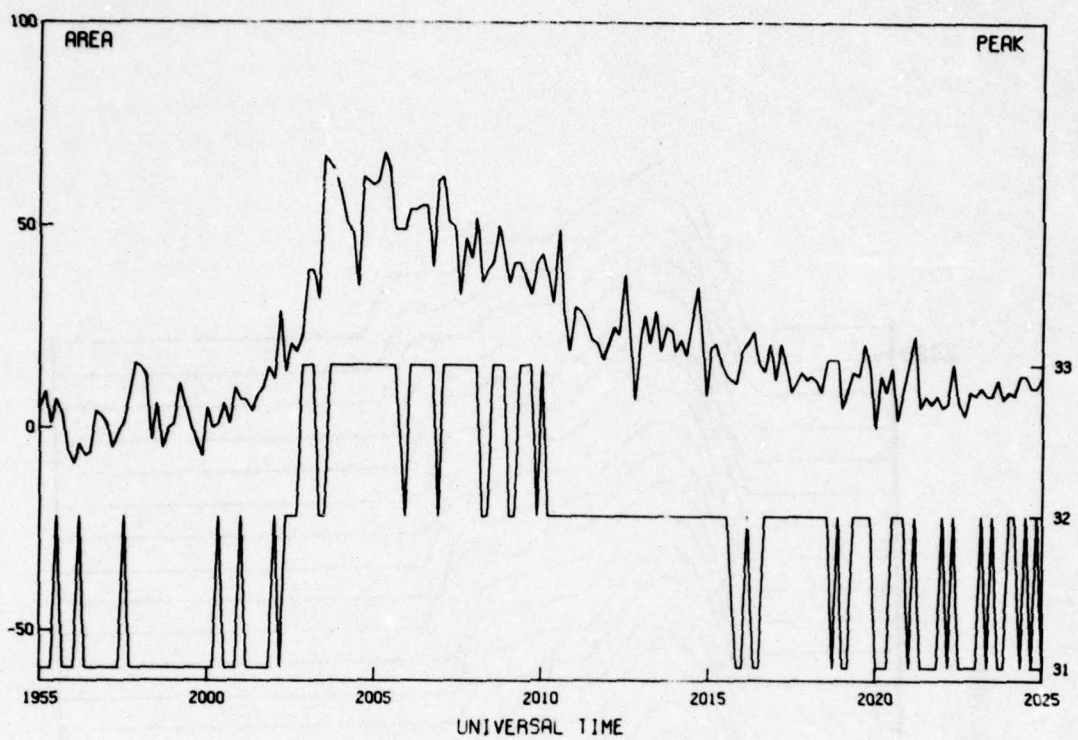


Figure 6a. Hawaii, 31 October 1972; R460, -F flare, bin 31.

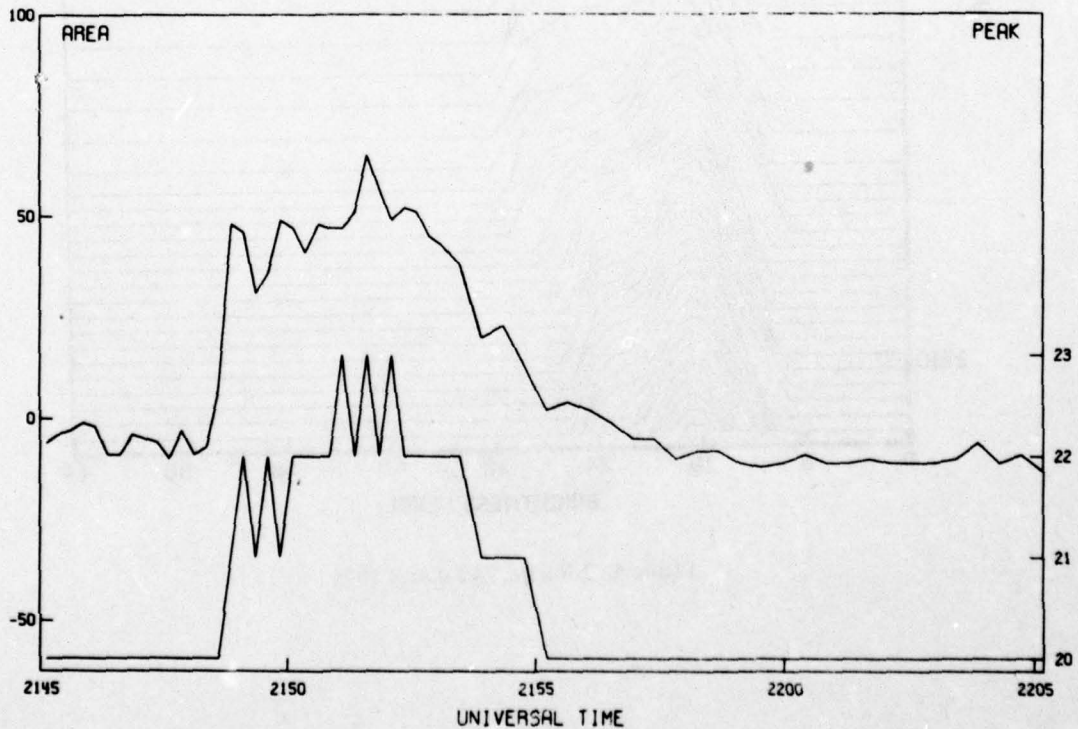


Figure 6b. La Posta, 2 May 1973; R092, -N flare, bin 20.

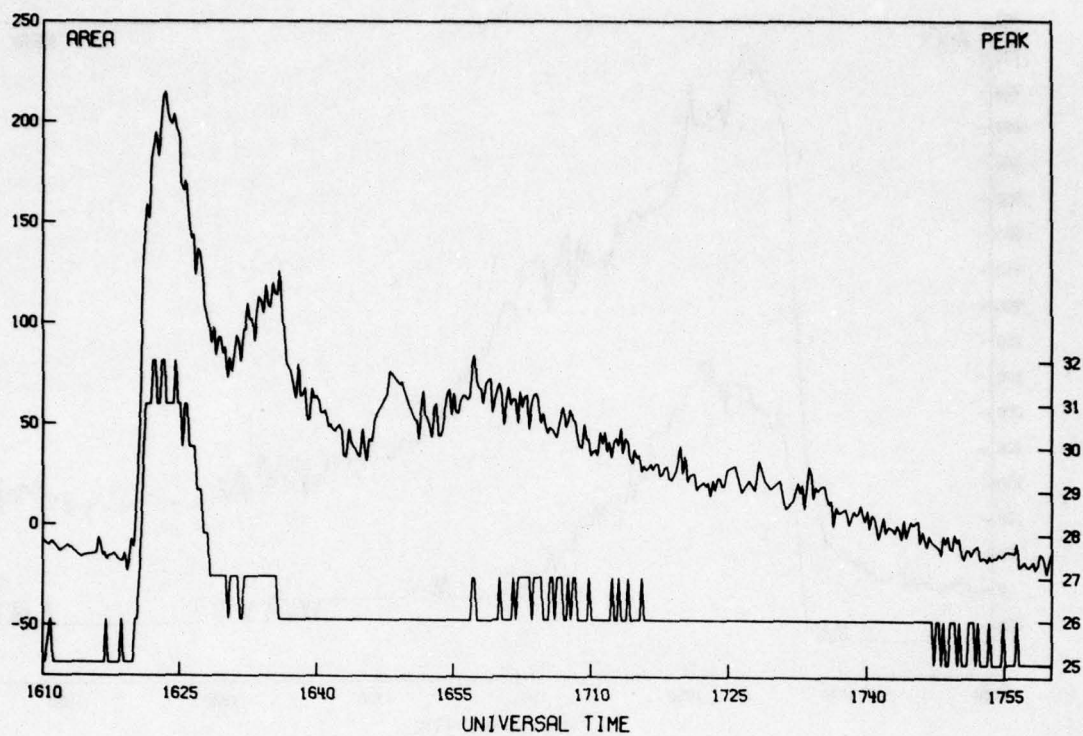


Figure 6c. La Posta, 11 April 1973; R077, -B flare, bin 25.

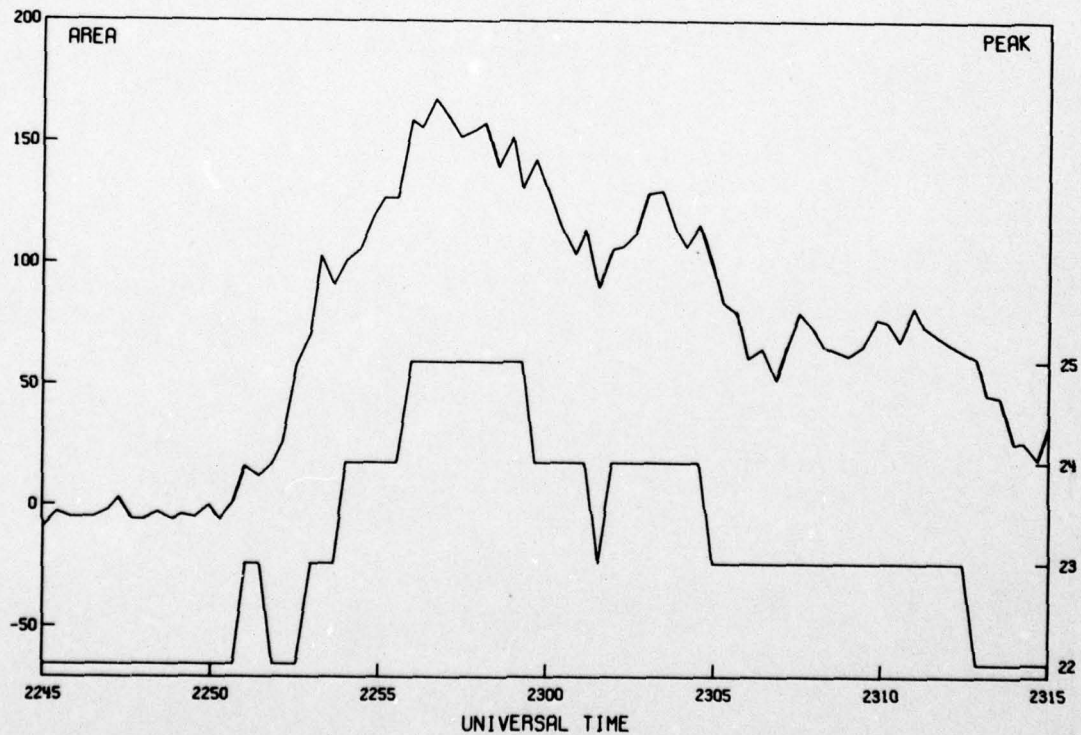


Figure 6d. La Posta 7 April 1973; R078, 1N flare, bin 22.

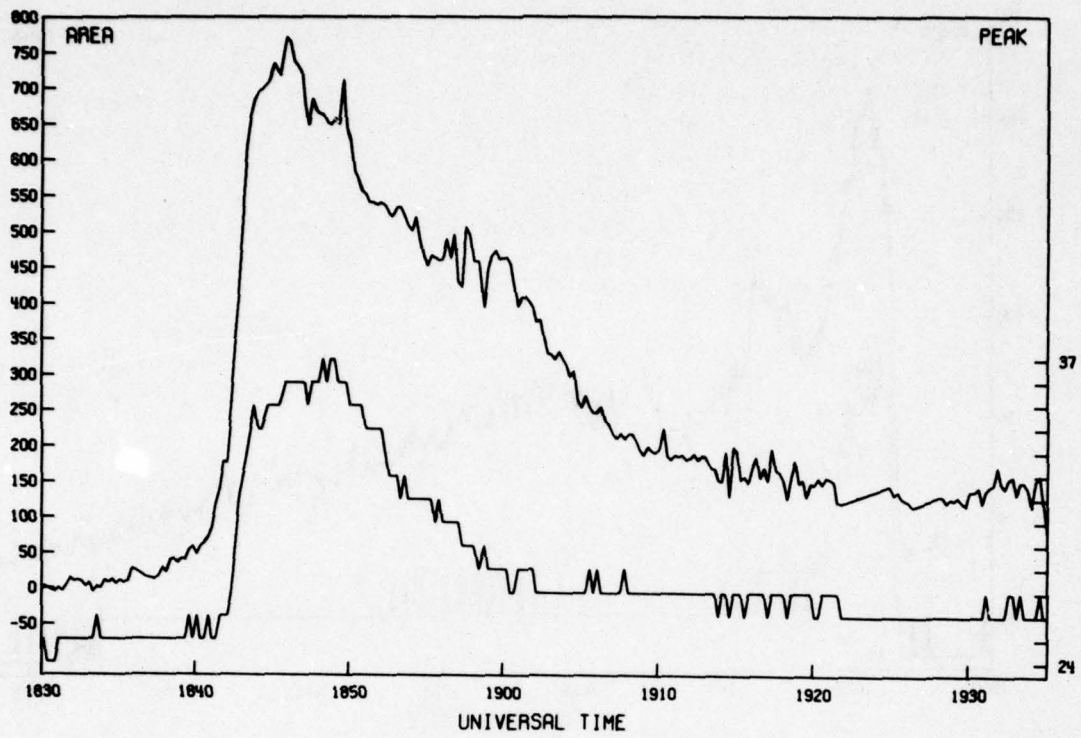


Figure 6e. La Posta, 11 April 1973; R077, 1B flare, bin 24.

Rather than discuss each of the 150 events separately, the authors have chosen specific sample events, both "classical" and "anomalous." The standard classification of solar flares has an area scale from the type 0 (or -) subflare to the largest (type 4) flare. There is also a brightness classification, ranging from faint (F) through normal (N), to bright (B). Our choice of representative classical events ranges from a -F to a 1B, and can be seen in fig 6a-e. These events rise rapidly, reach a definite peak, and have a smooth monotonic return to the pre-event level. Notice that the time, peak, and area axes are not similar from event to event, but rather are scaled to keep each event filling the plot. These events were chosen so that the classification from solar geophysical data (the labeled classification) corresponds to the size and brightness measured by the videometer, in the sense that subflares are smaller than type 1 flares, etc.

The videometer and solar geophysical data do not always agree on event classification, however, as indicated in fig 7a-d.

Figure 7a is a classified -F flare that had very large enhanced areas and brightness increases, but apparently because of the long time to the event peak (~1 1/2 hr), the event slipped by observers virtually unnoticed. The -N (fig 7b-c) appears to have no such problem, and in profile shape appears "classic." Although its area is less than a 2B that followed (fig 7d; ~300 vs ~1350), the brightness variations are actually greater.

The preceding "anomalous" events have been included to stress the usefulness of the digitized time profiles.

The next two figures (8a-b and 9a-b) show flare data collected during the La Posta-Hawaii separation test. There was an unfortunately small amount of simultaneous flare data because of the small number of events and the lack of simultaneity in solar observing periods.

Figures 10a-d are a series of flares happening on 25 October 1972 from region 460. These events are well behaved in that subflares are smaller than type 1 flares and B flares are brighter than N flares. None of the events was long-lived; notice that the 1B is gone within ~5 minutes of its start.

In the data presentation, circles at data points indicate shifts in the background average brightness of greater than one bin; data gaps are indicative of extreme background shifts (usually >5). Shifts in the background level tend to come from obscurations of the sun (clouds, etc), and if these changes are too large, we expect our normalization routines to be unreliable.

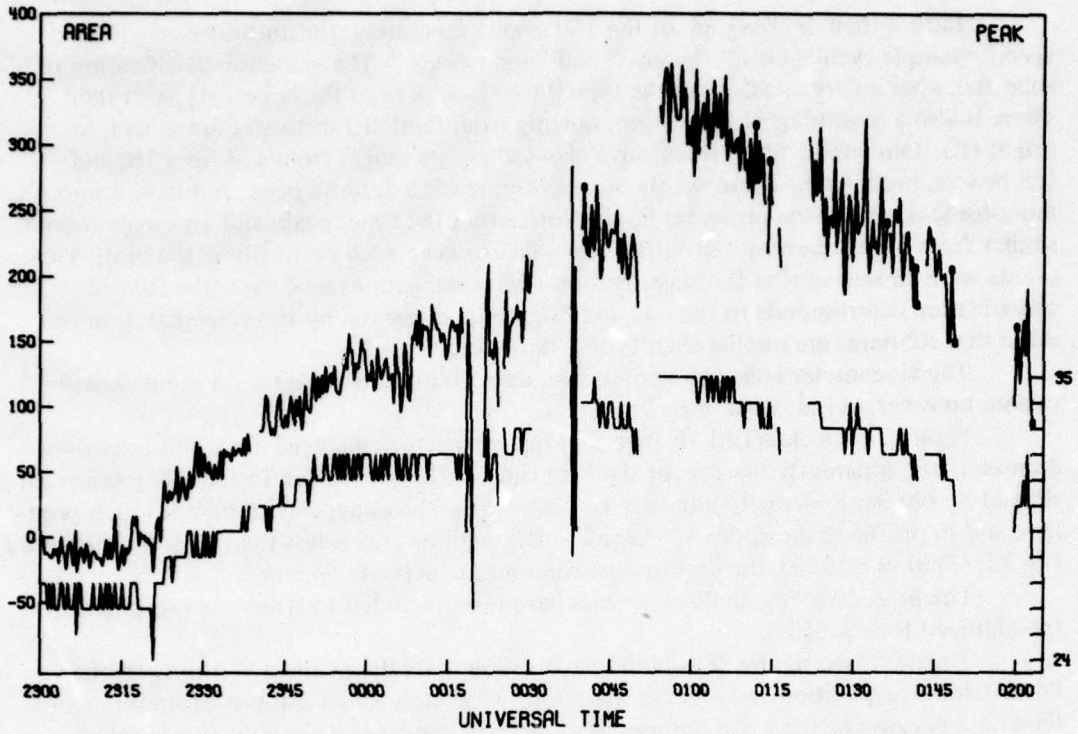


Figure 7a. Hawaii, 24 October 1972; R448, -F flare, bin 26.

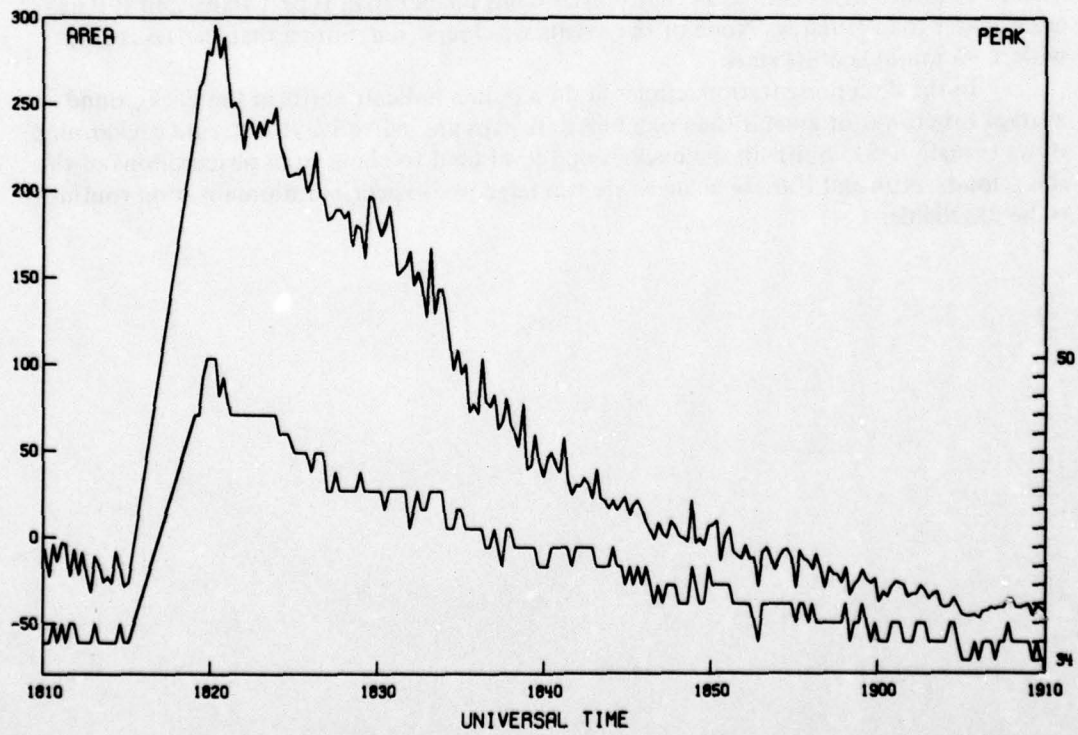


Figure 7b. La Posta, System A, 10 May 1972; R176, -N flare, bin 34.

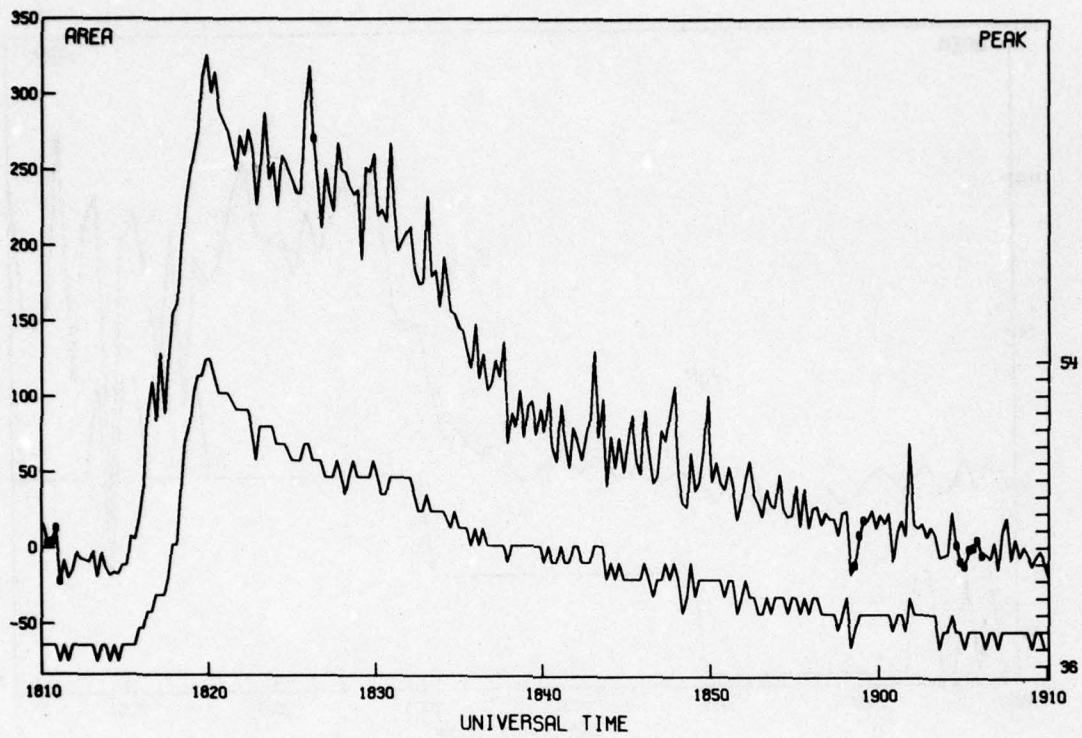


Figure 7c. La Posta, System B, 10 May 1972; R176, -N flare, bin 36.

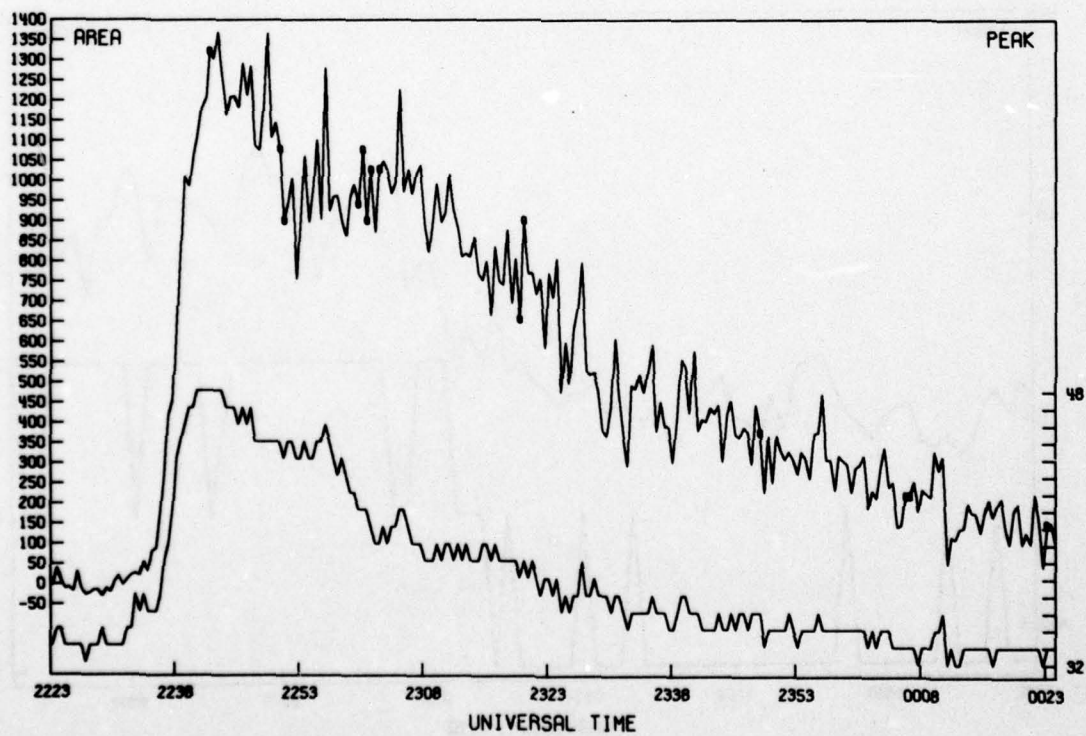


Figure 7d. La Posta, System B, 17 May 1972; R195, 2B flare, bin 30.

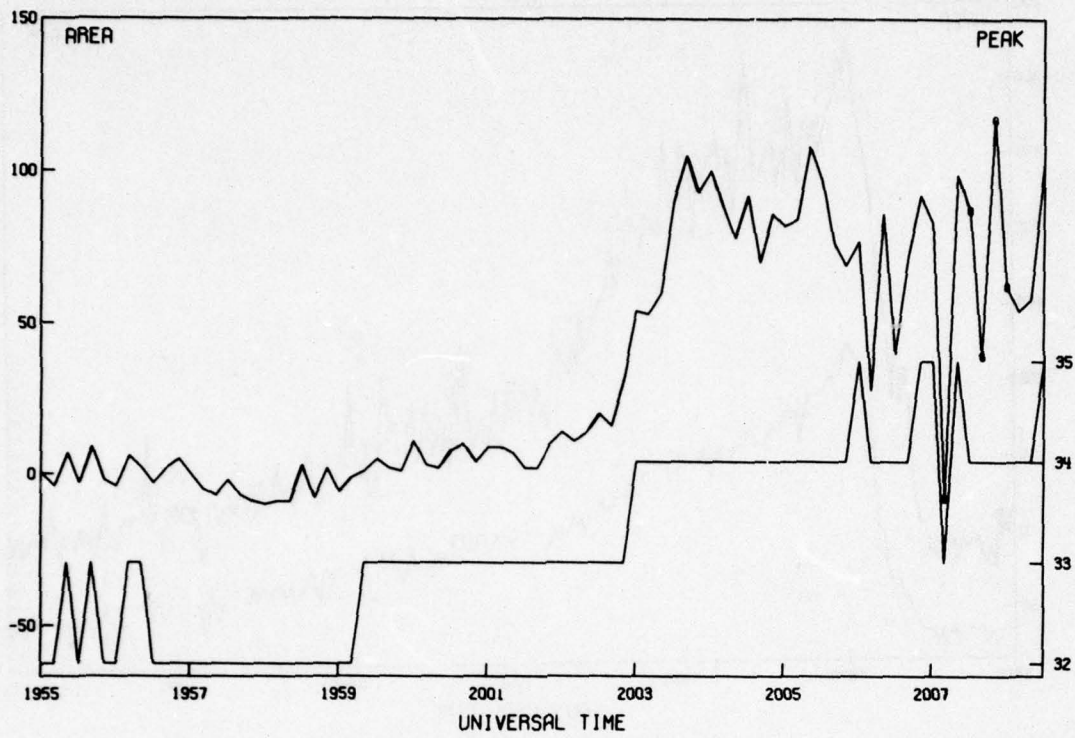


Figure 8a. La Posta, 31 October 1972; R460, -F flare, bin 32.

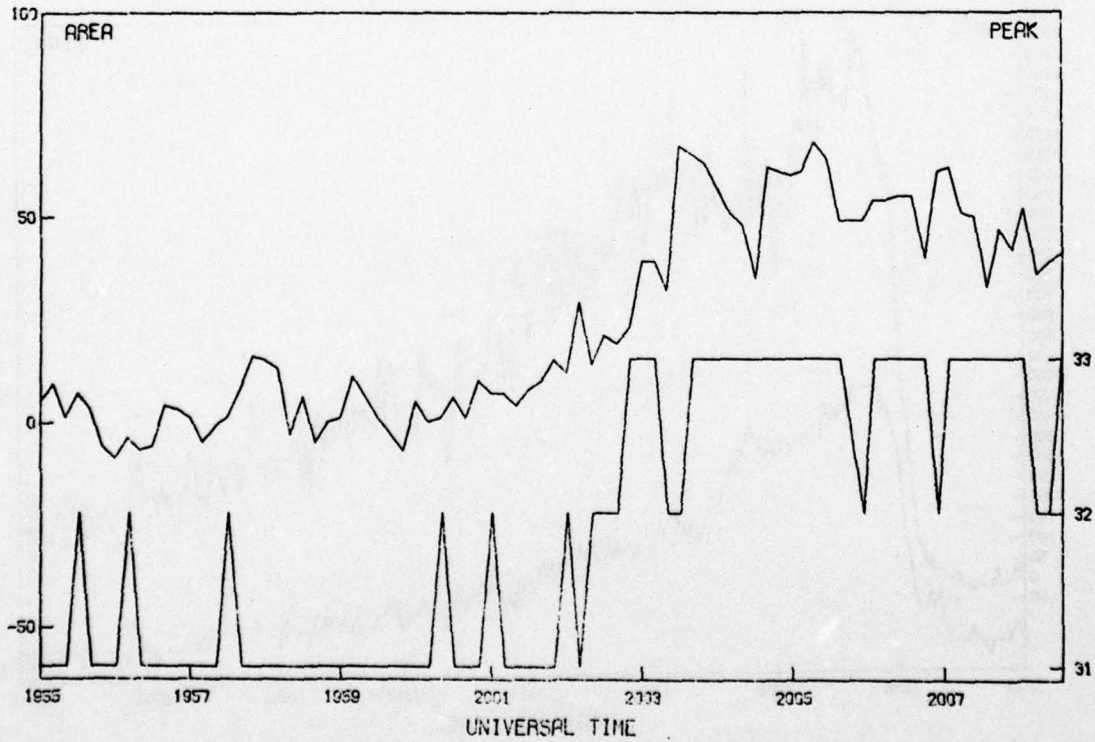


Figure 8b. Hawaii, 31 October 1972; R460, -F flare, bin 31.

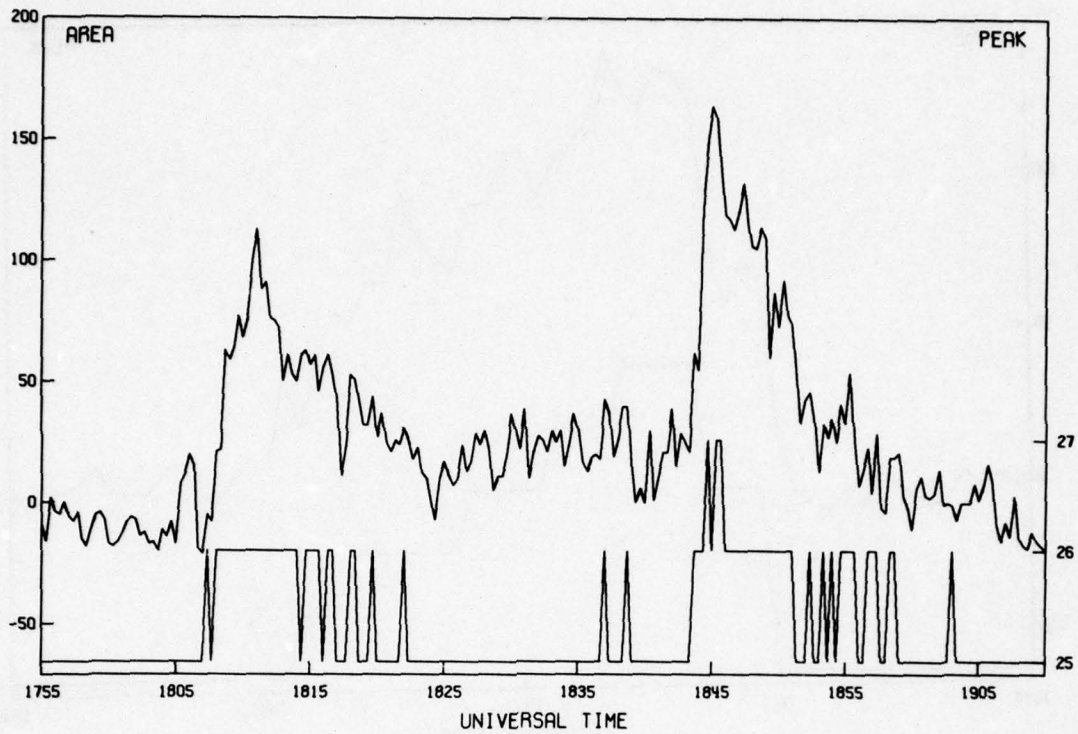


Figure 9a. La Posta, 10 September 1973; R219, U -F flares, bin 25.

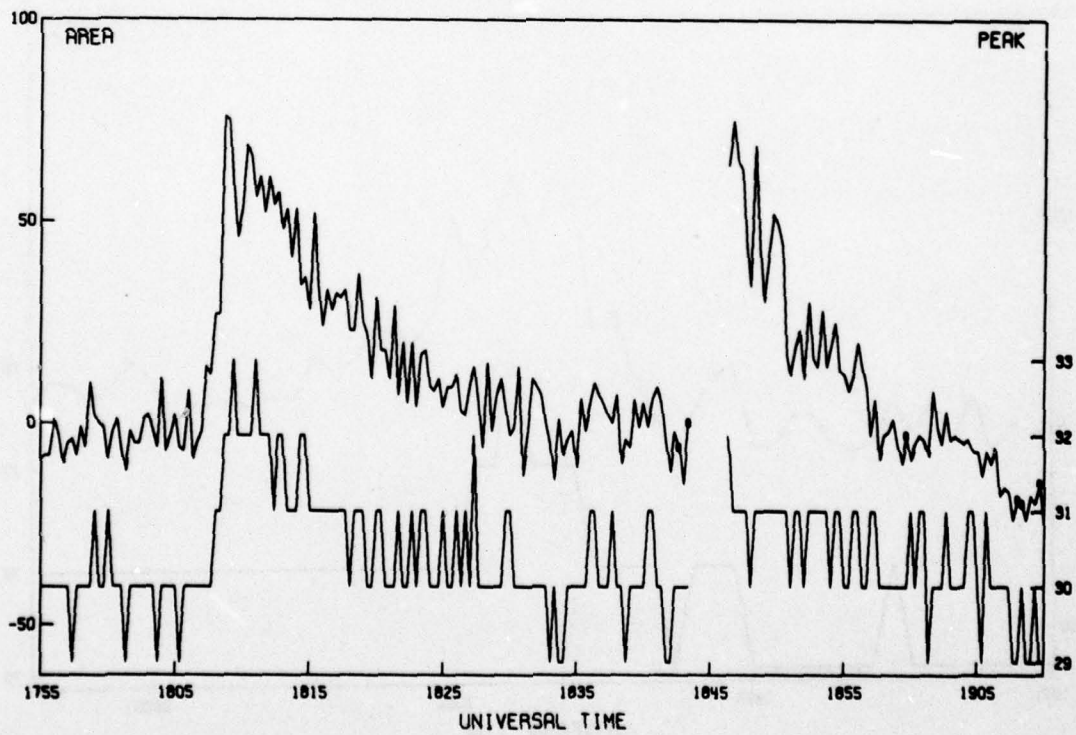


Figure 9b. Hawaii, 10 September 1973; R219, U -F flares, bin 29.

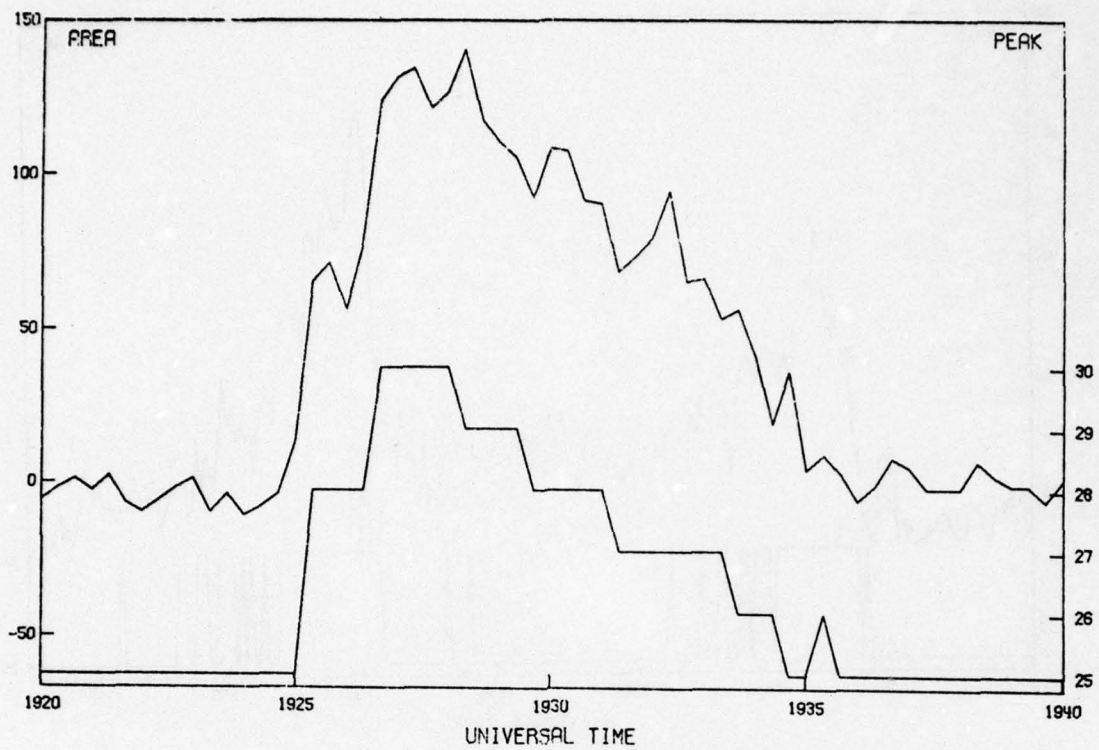


Figure 10a. La Posta, 25 October 1972; R460, -B flare, bin 25.

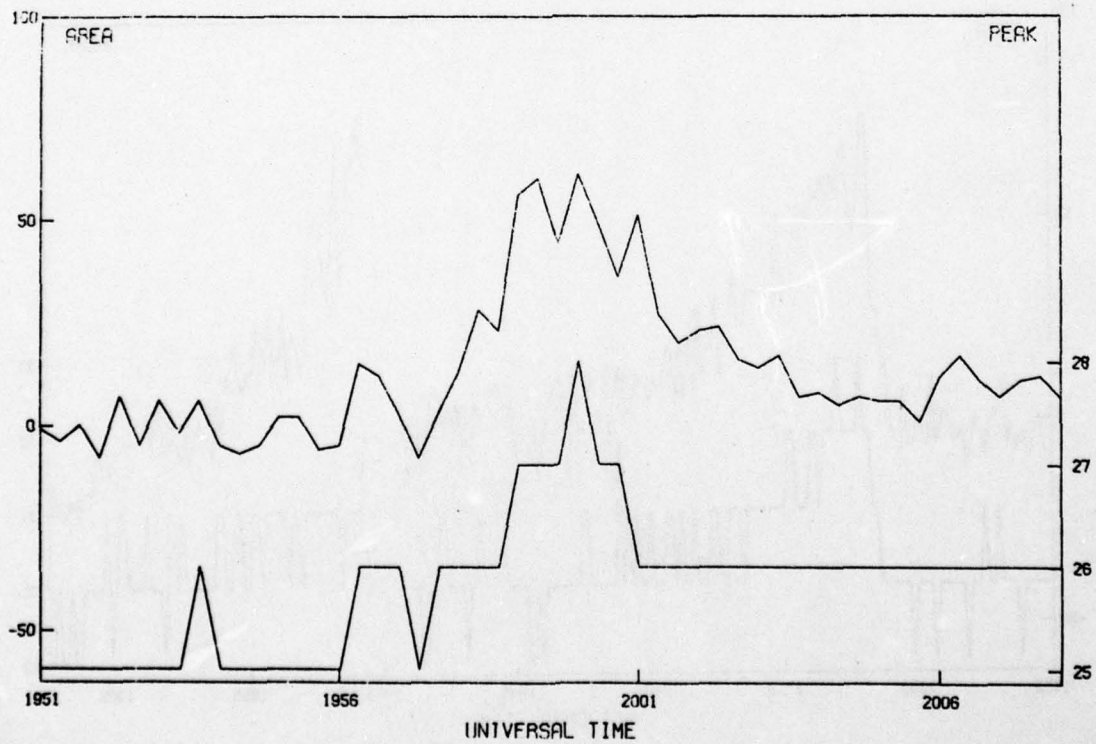


Figure 10b. La Posta, 25 October 1972; R460, -N flare, bin 25.

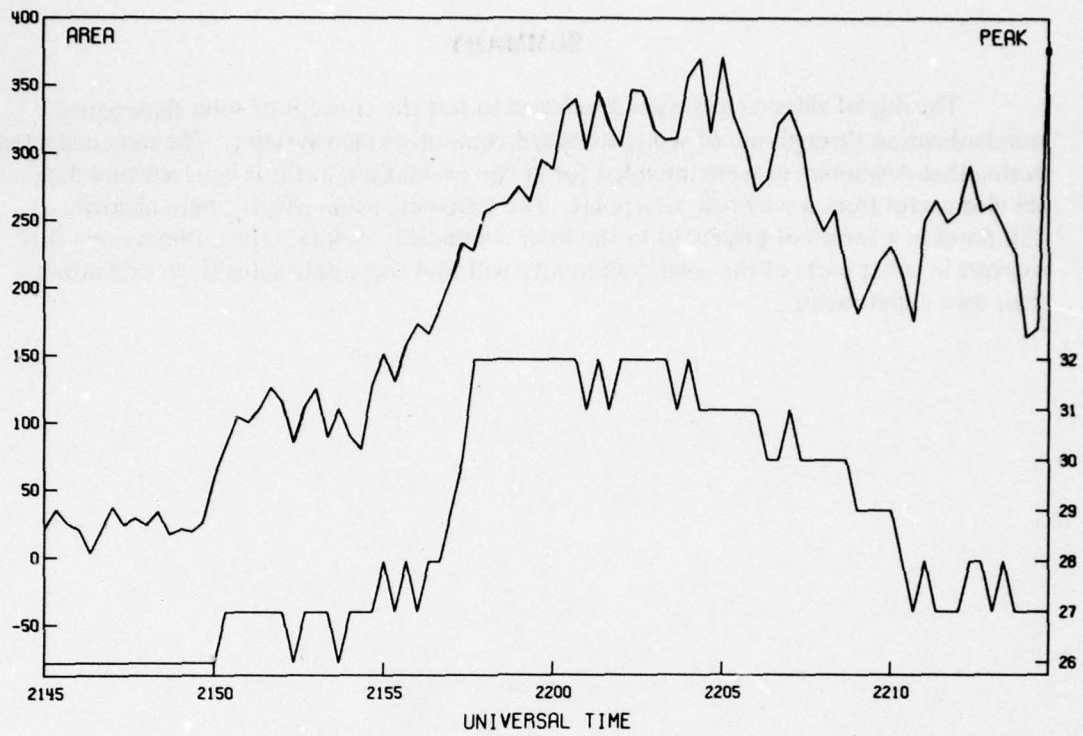


Figure 10c. La Posta, 25 October 1972; R460, 1N flare, bin 25.

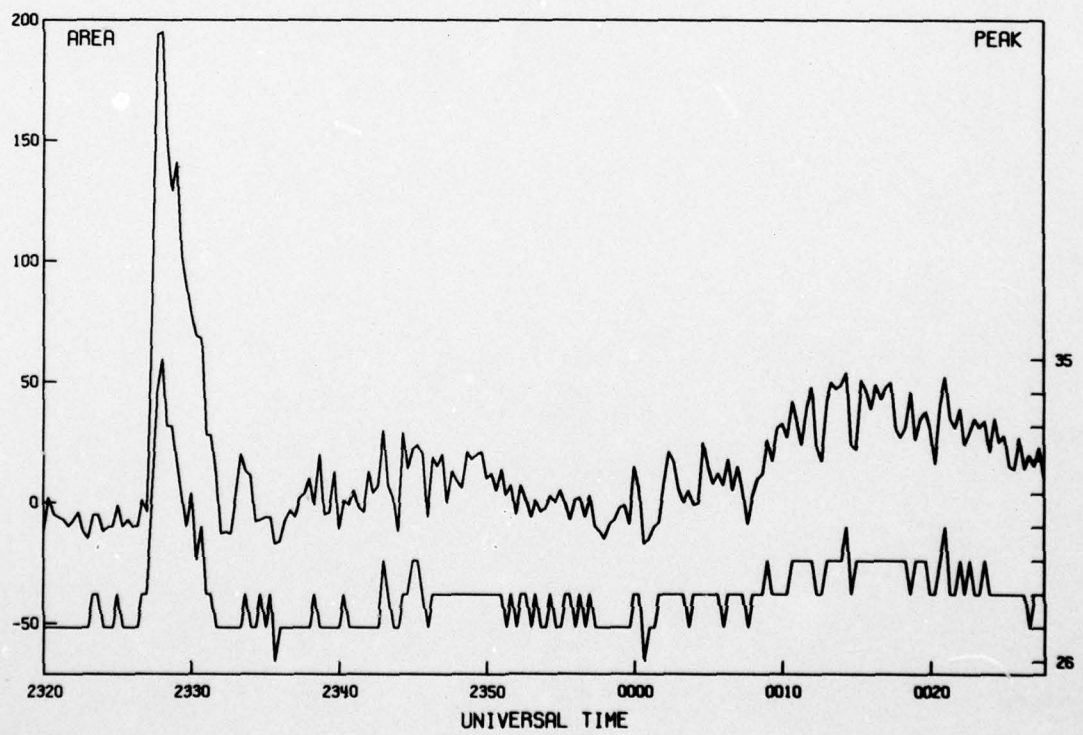
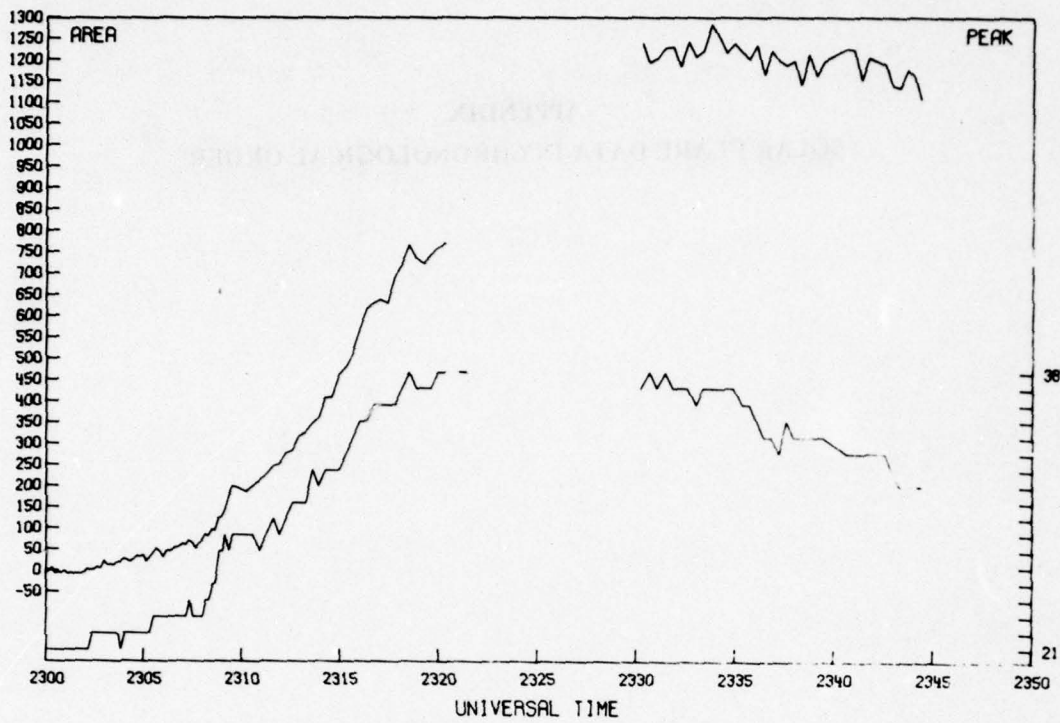


Figure 10d. La Posta, 25 October 1972; R460, 1B -N -N flares, bin 27.

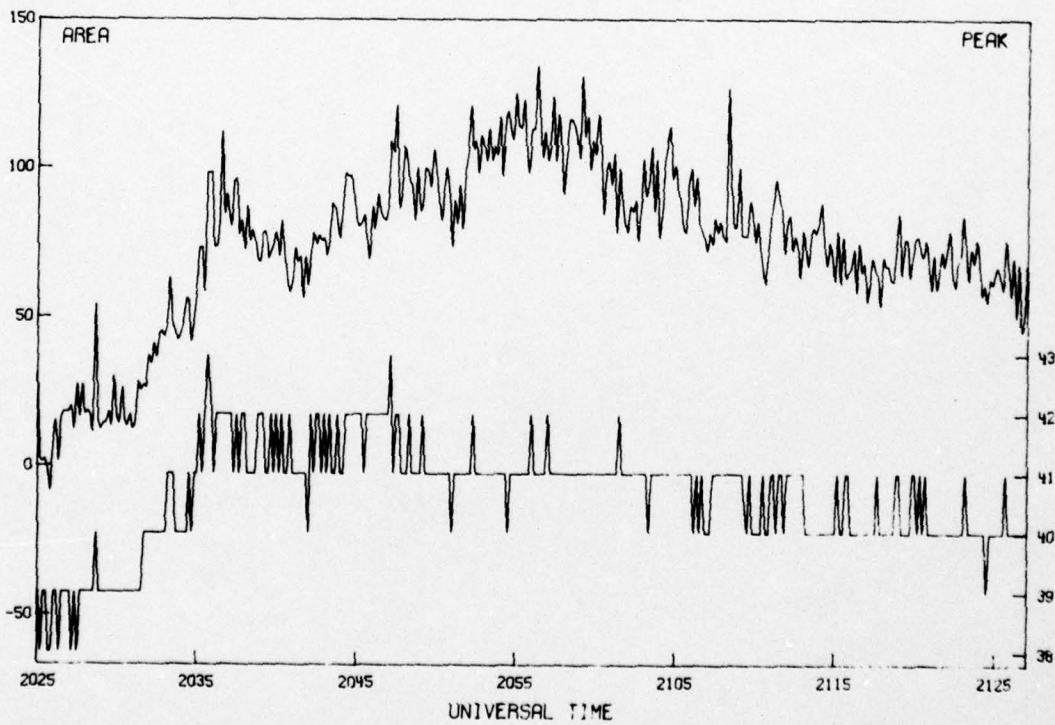
SUMMARY

The digital videometers were developed to test the concept of solar flare patrol standardization through use of semiautomated computer-video systems. The data collected during that development were intended for design evaluation, but it is believed that data are also useful from a scientific viewpoint. The following pages give H_{α} time histories of 150 flares in a form not presented to the solar community before. The authors hope that workers in other parts of the solar community will find these data valuable in evaluating their own experiments.

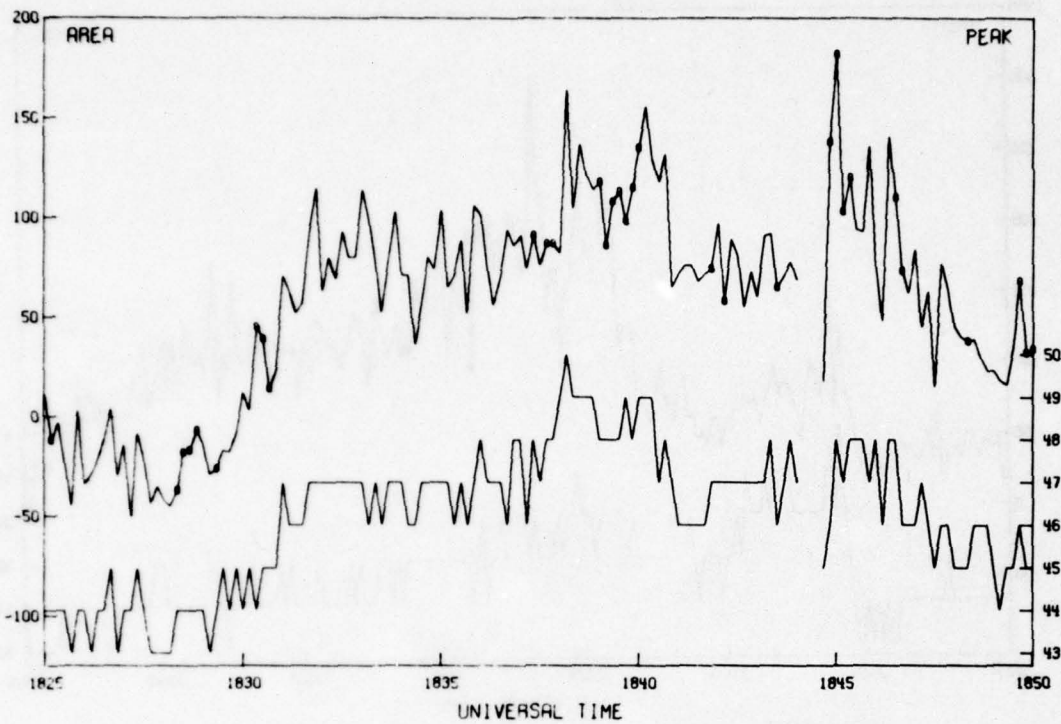
APPENDIX
SOLAR FLARE DATA IN CHRONOLOGICAL ORDER



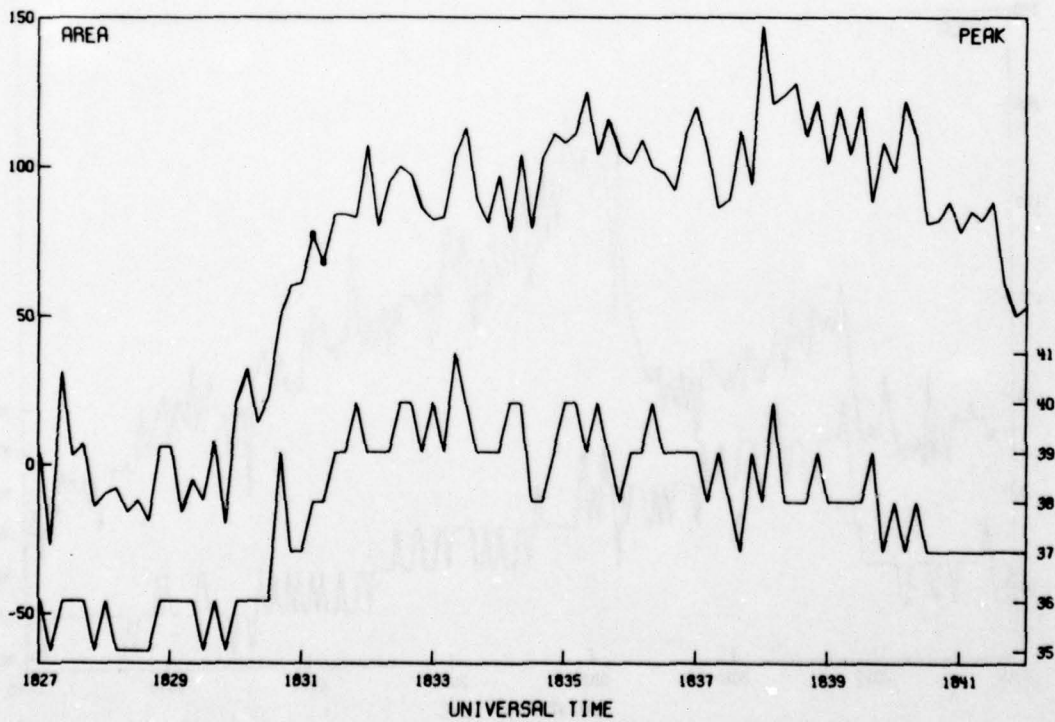
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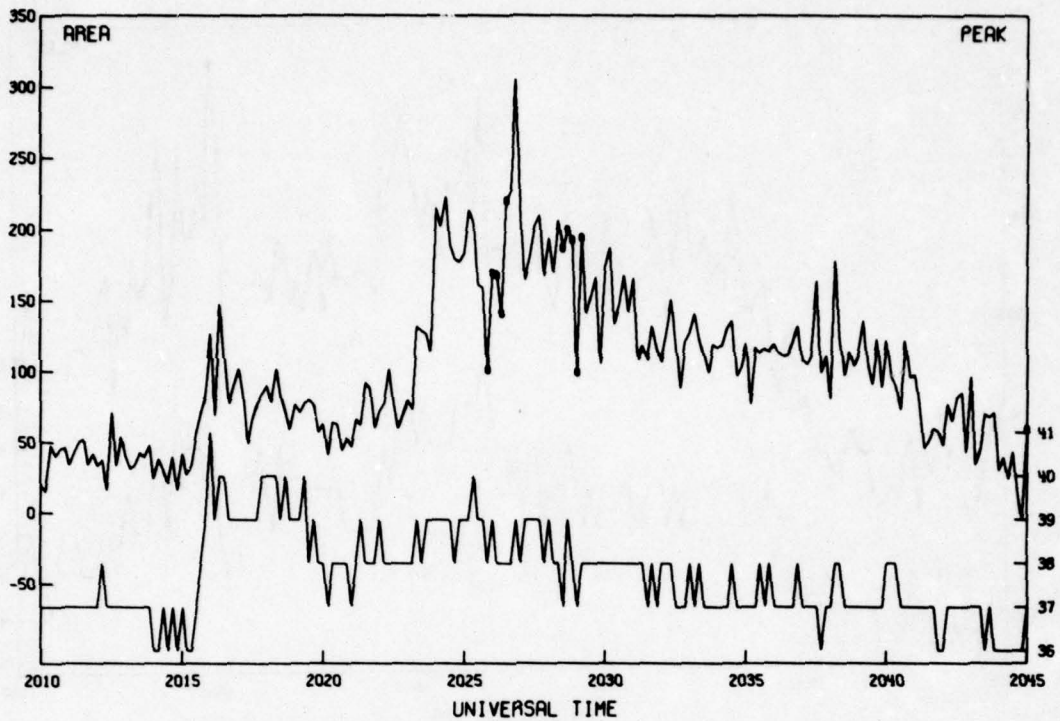
LA POSTA 24 JAN 71 1N -N FLARES BIN 38



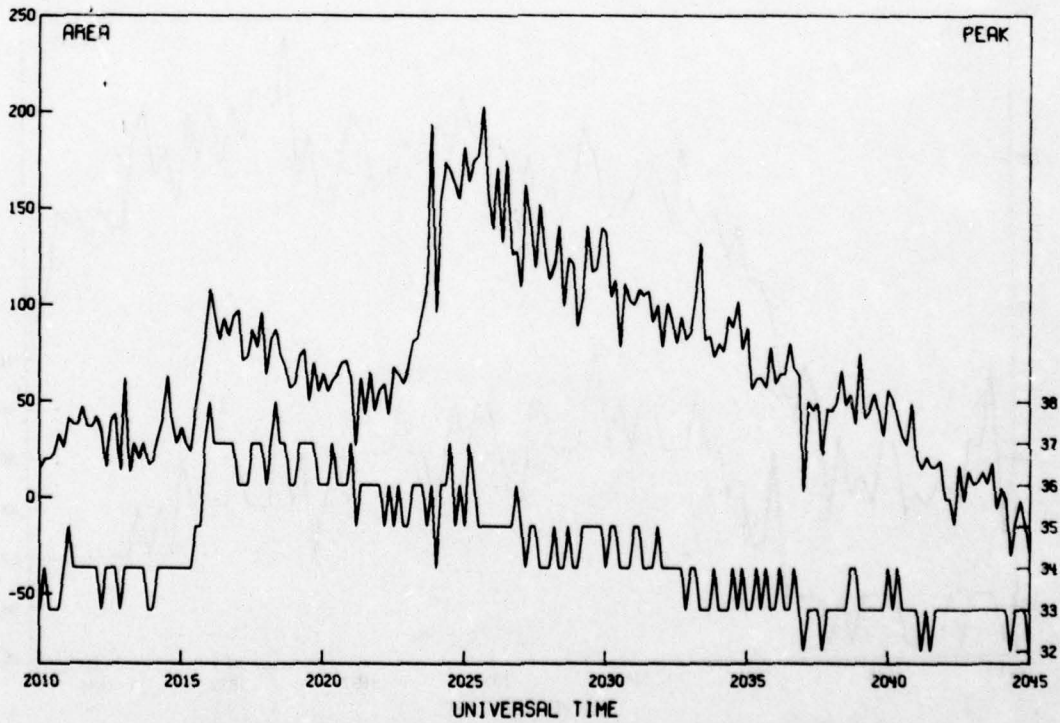
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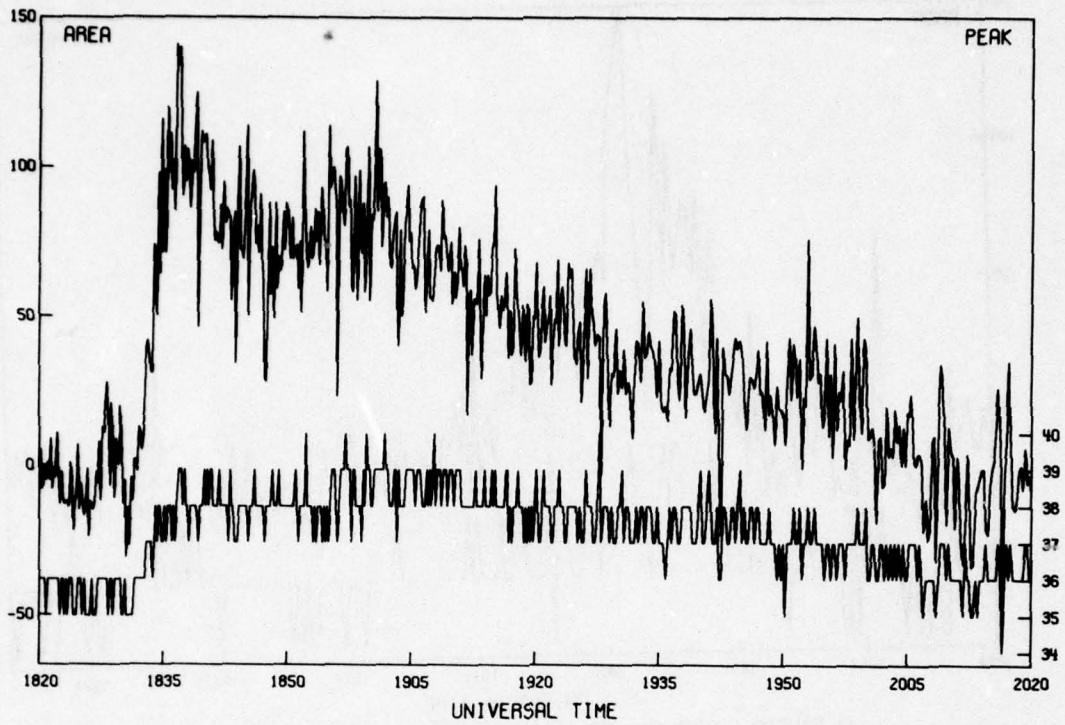
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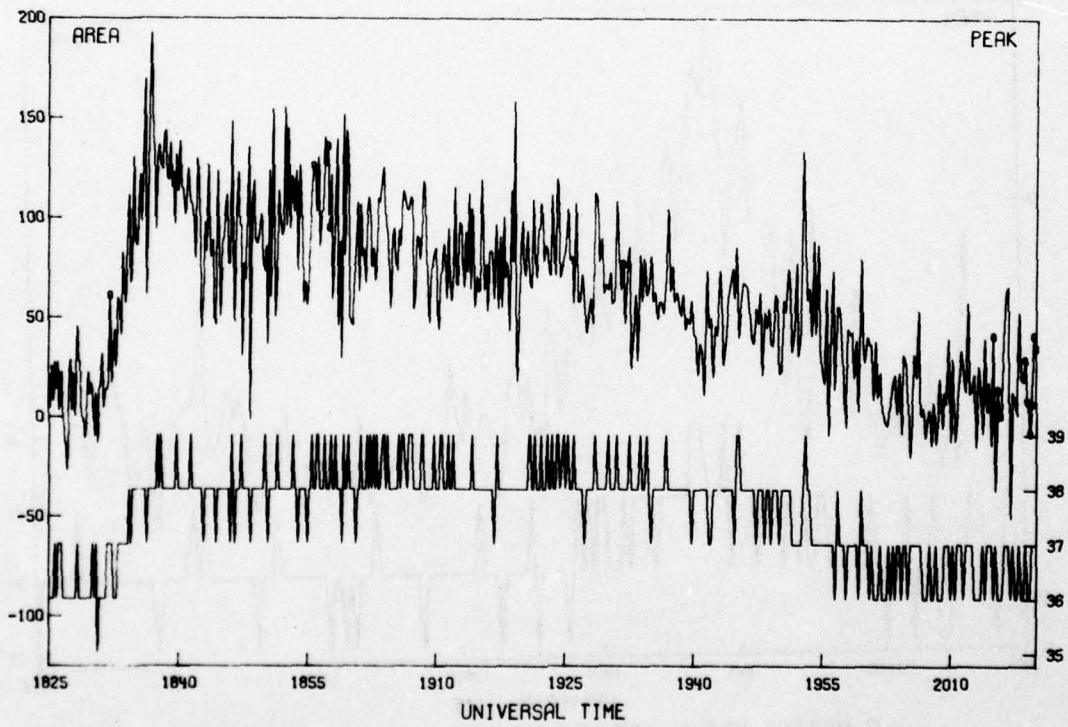
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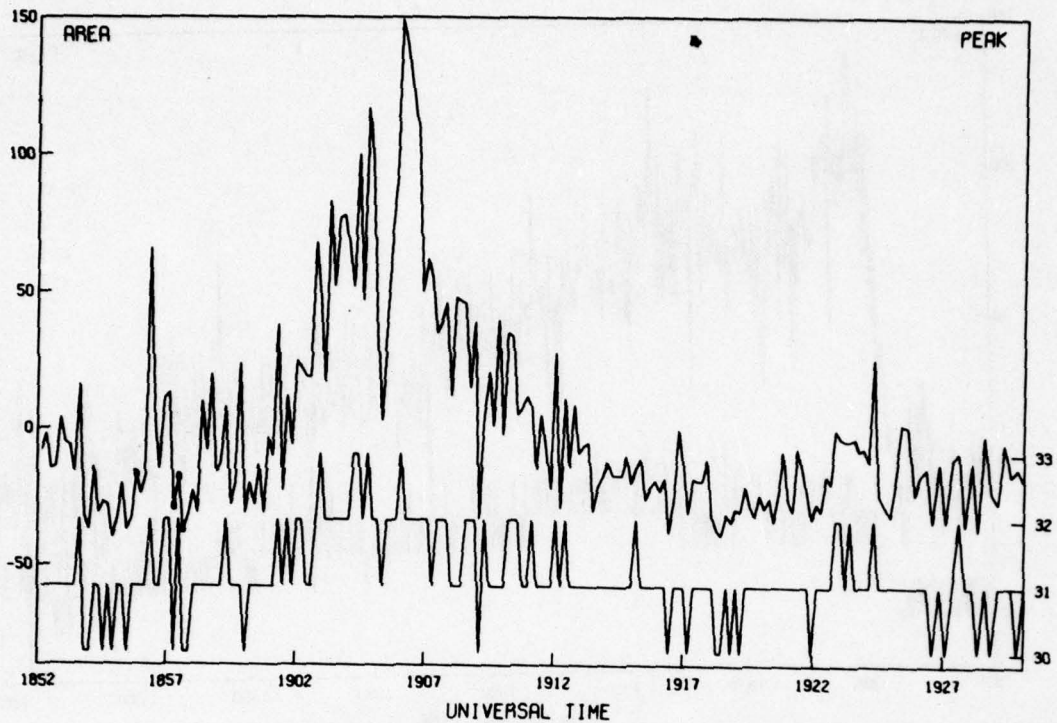
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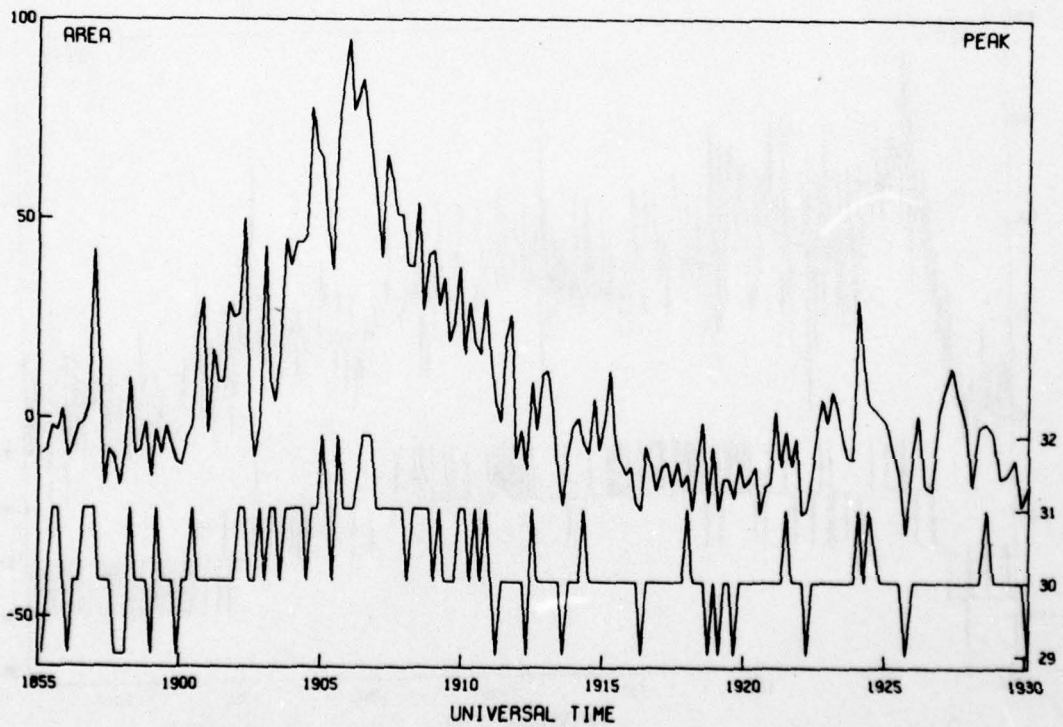
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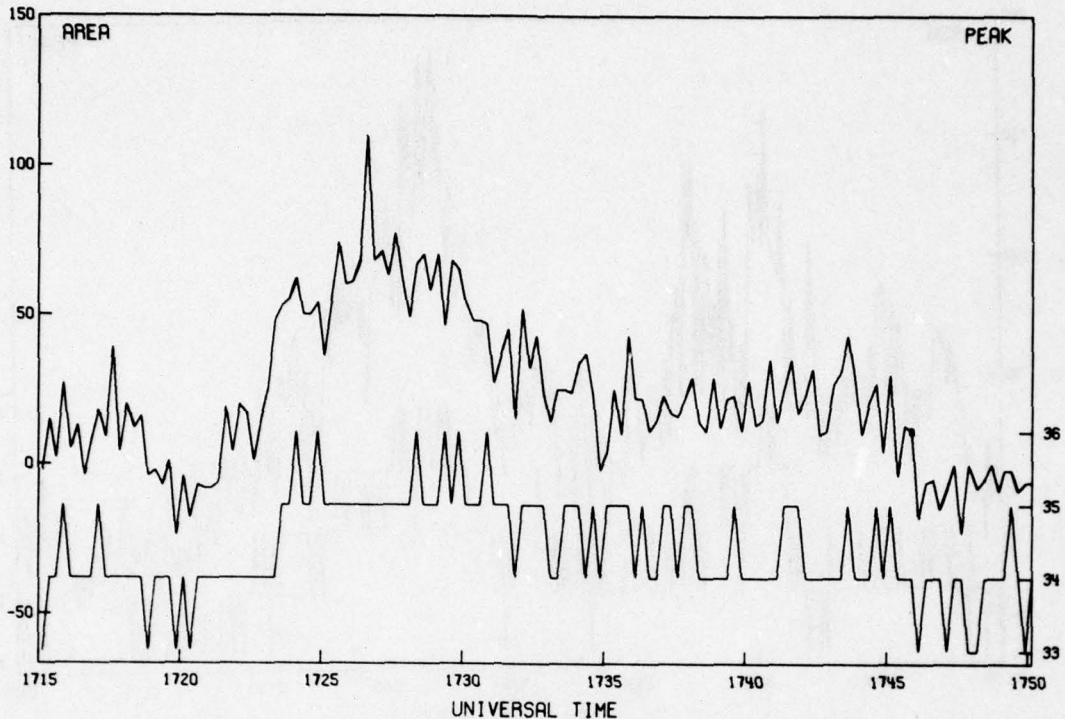
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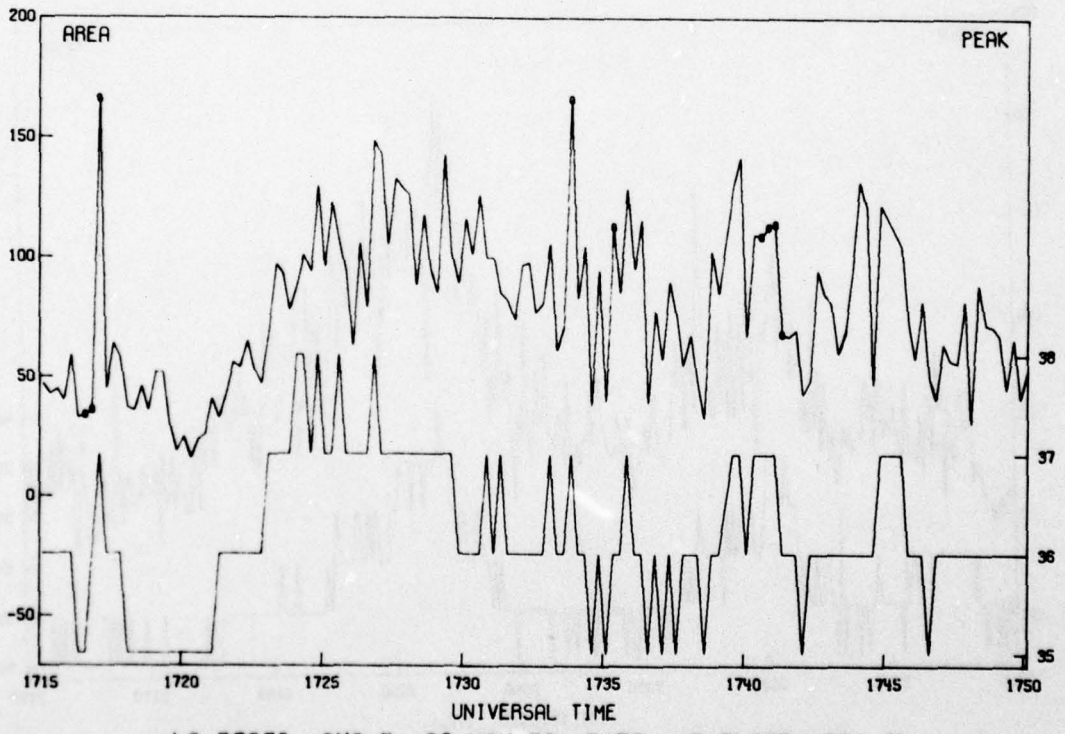
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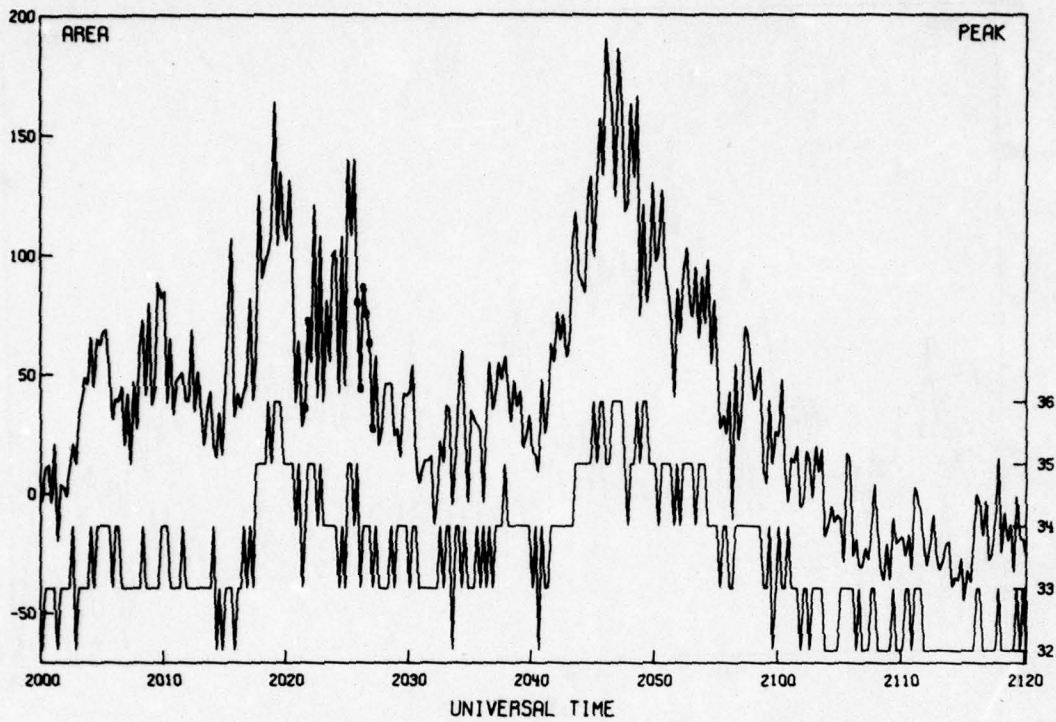
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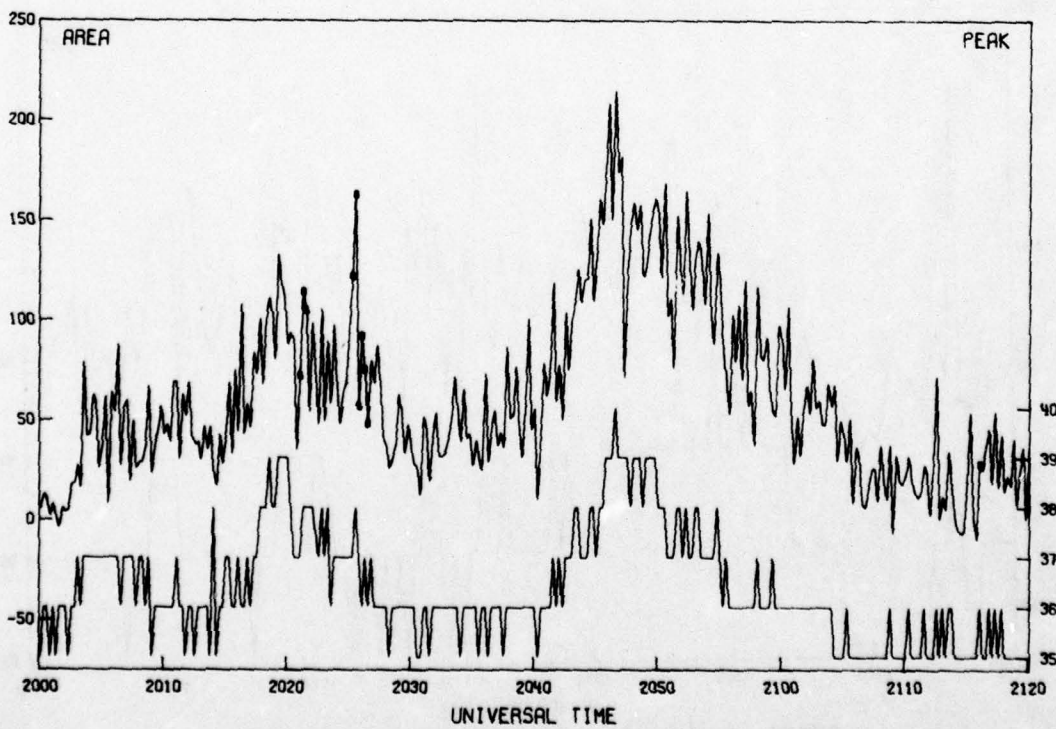
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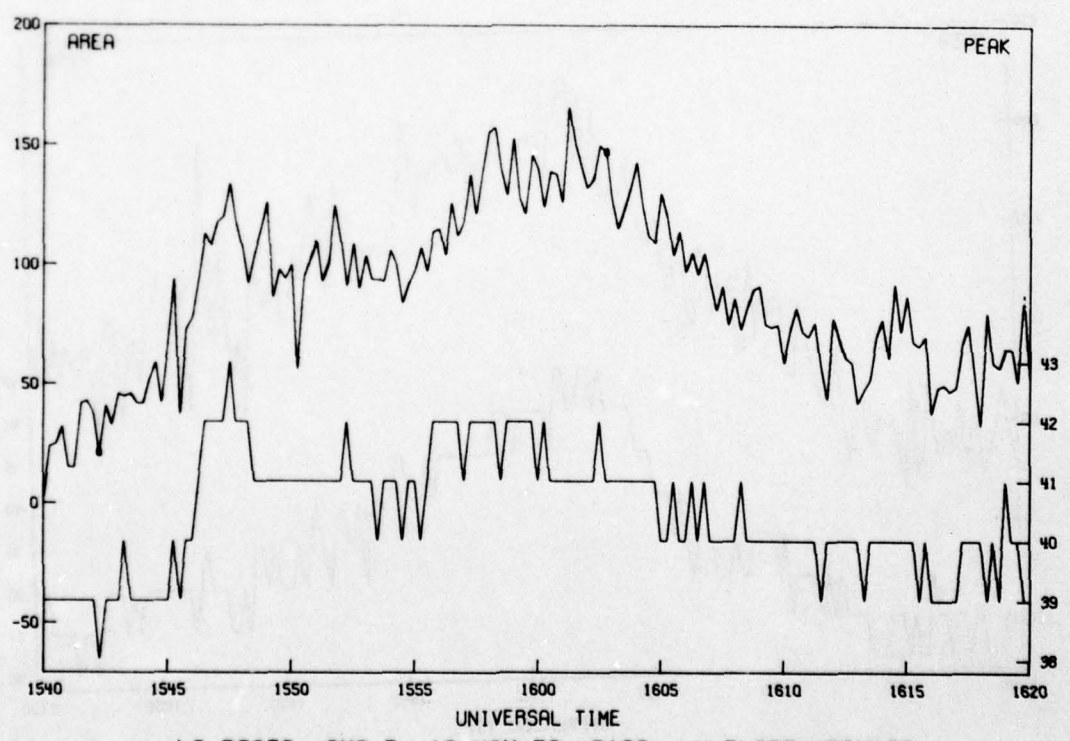
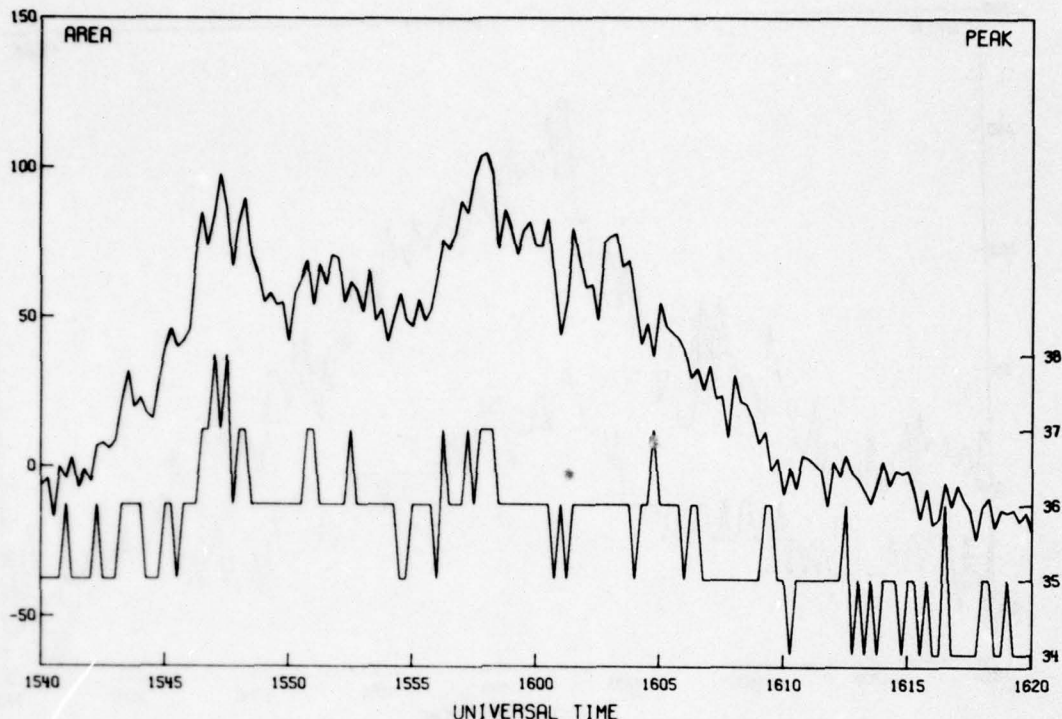
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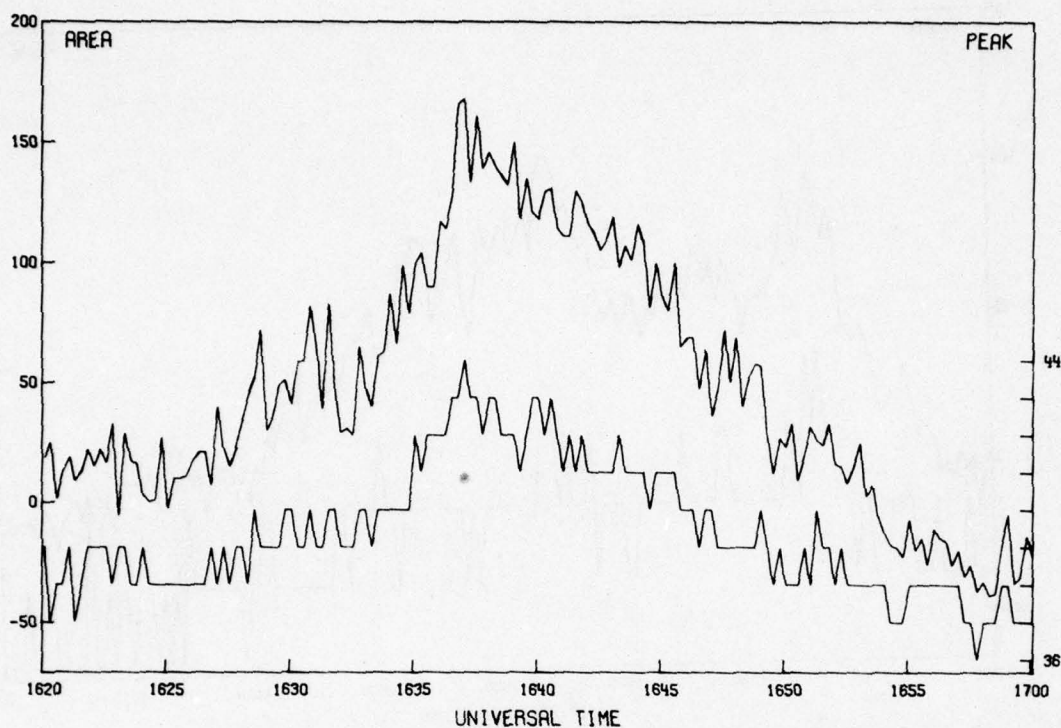


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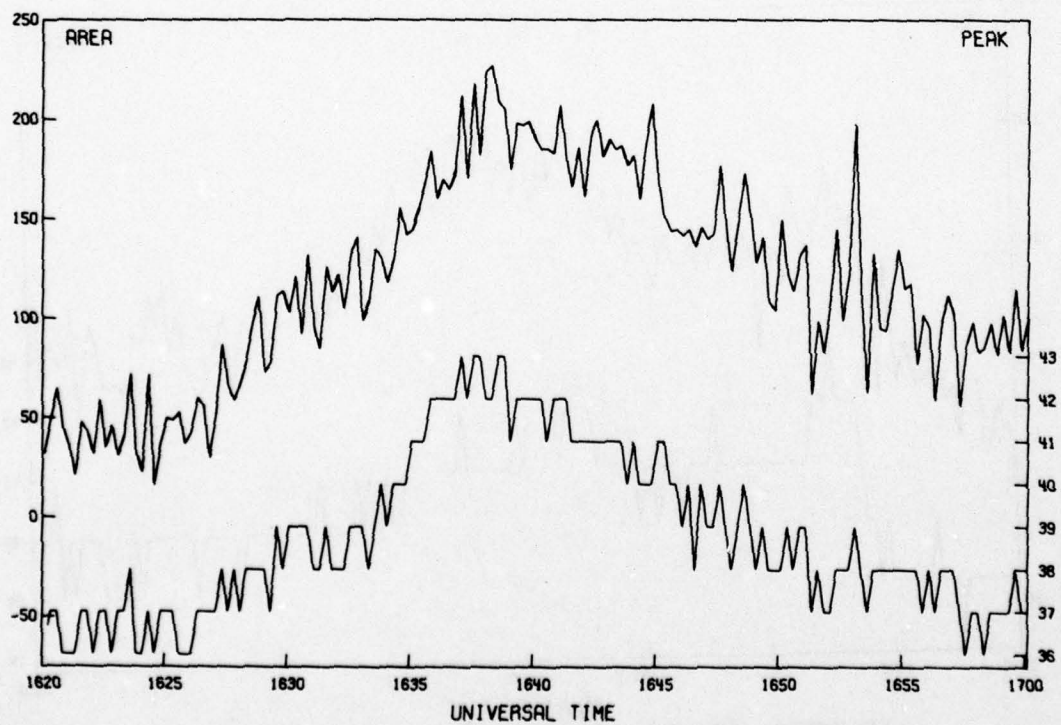


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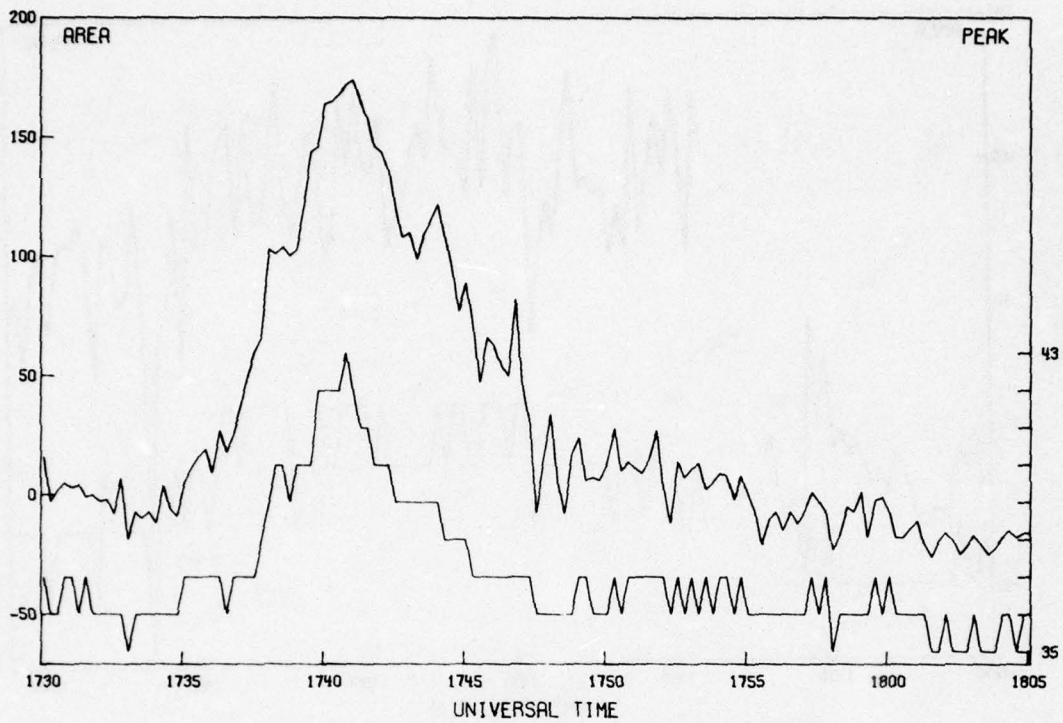




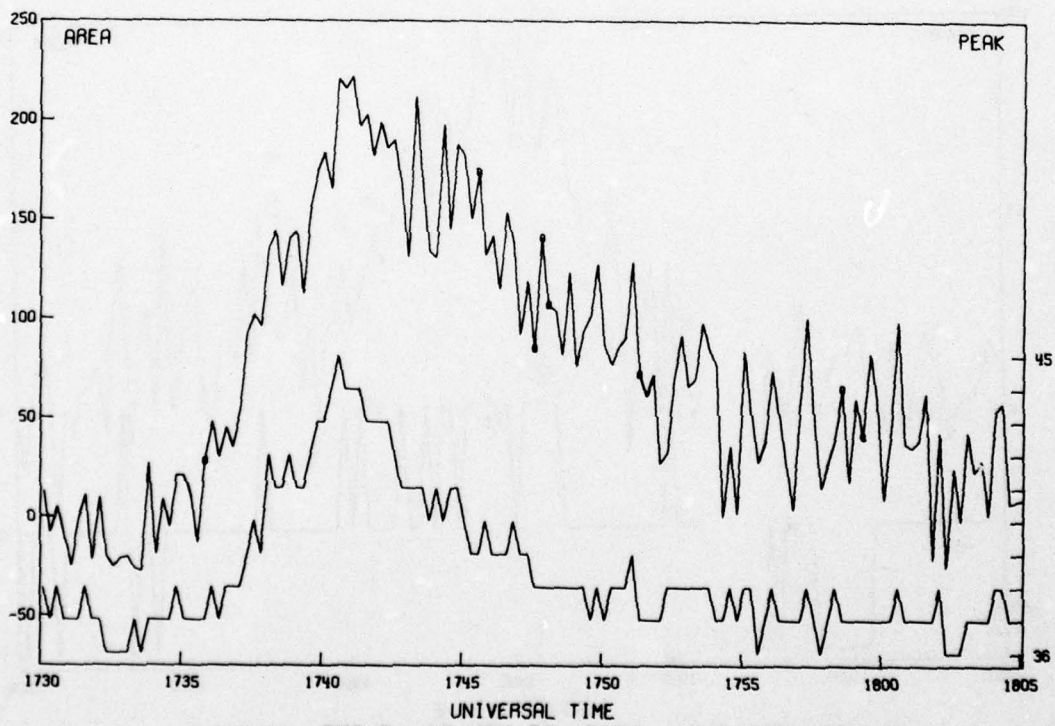
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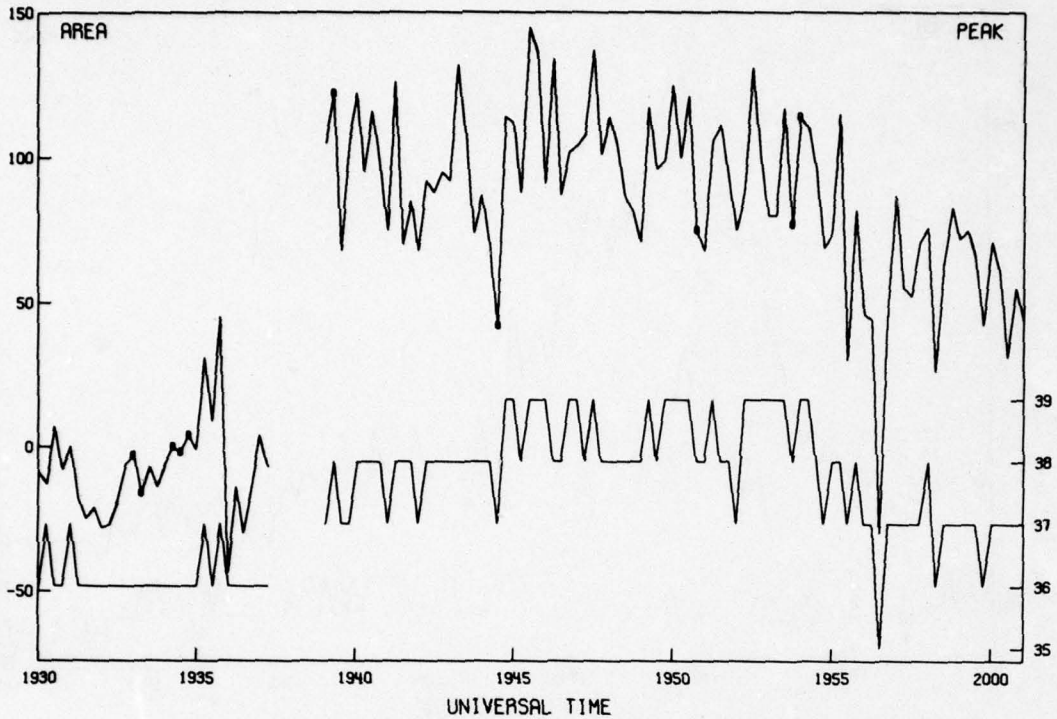
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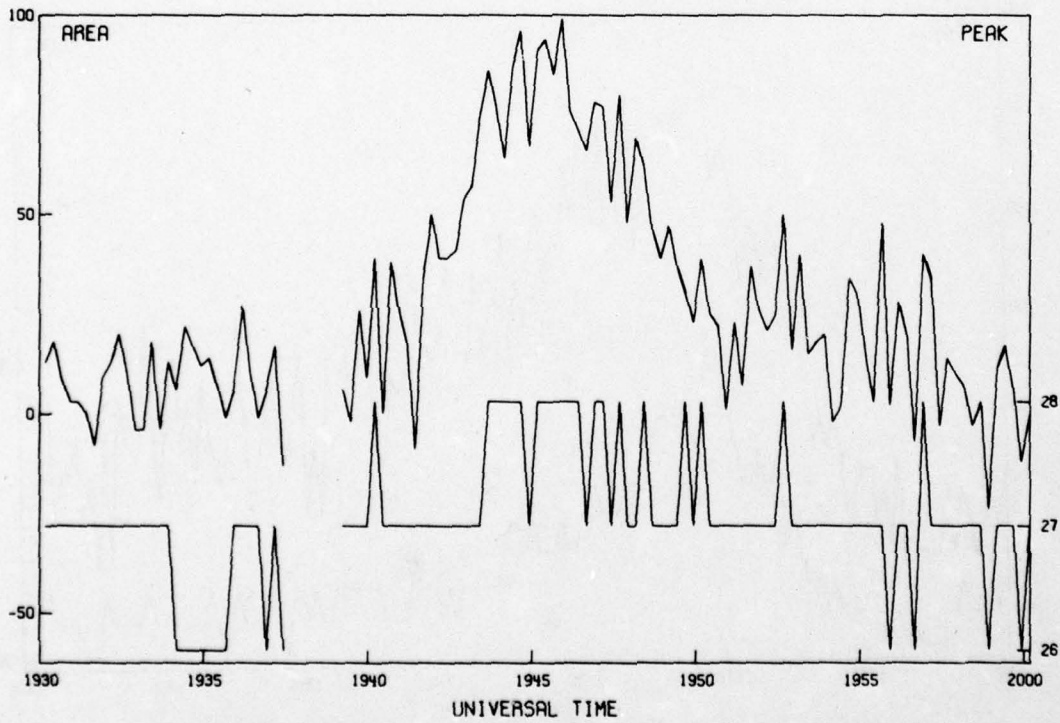
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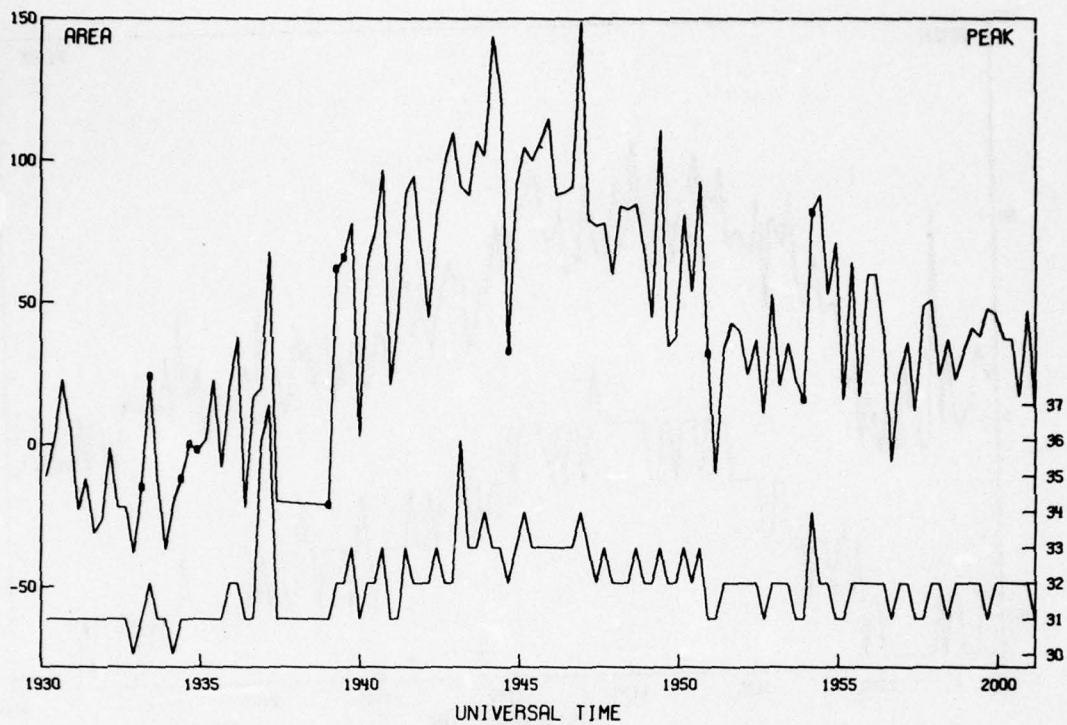
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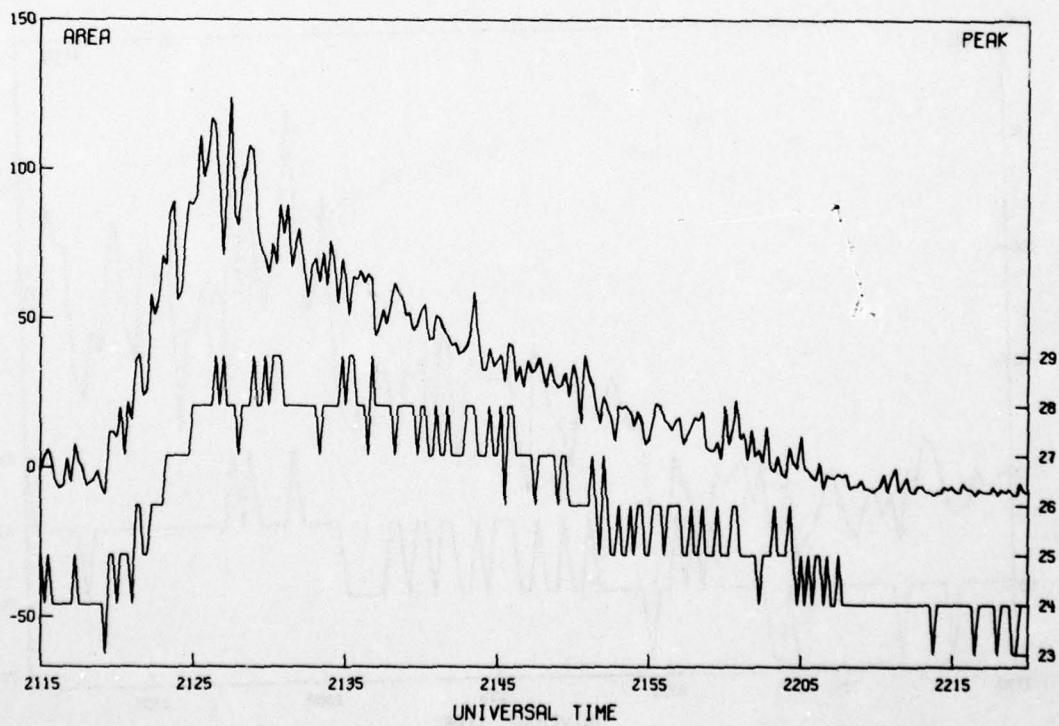
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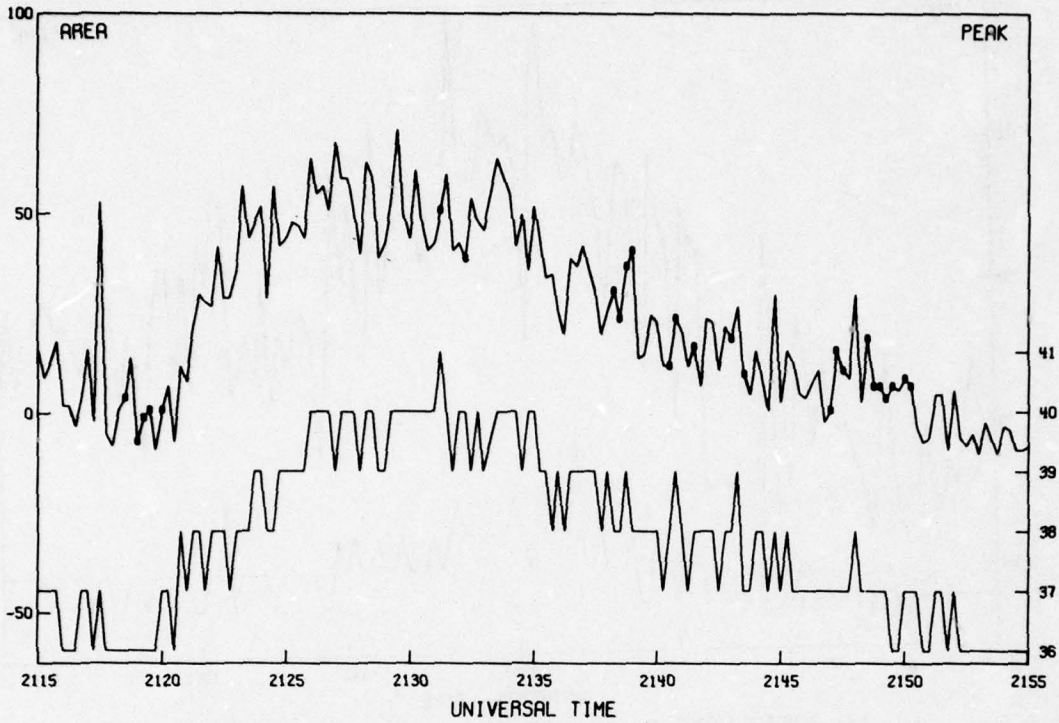
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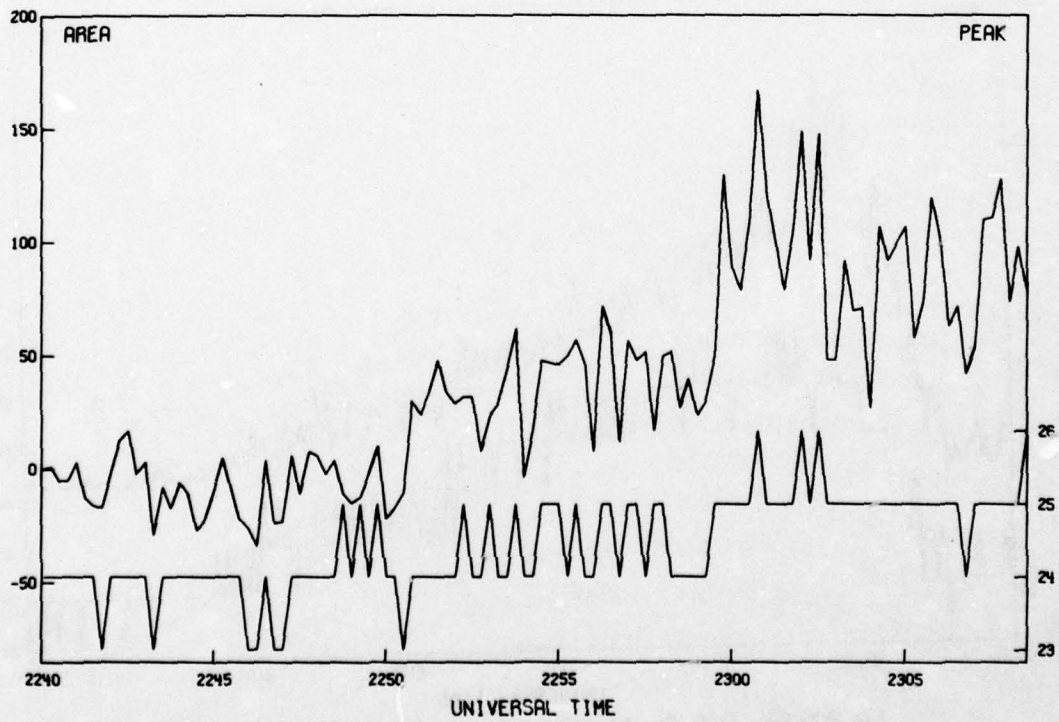
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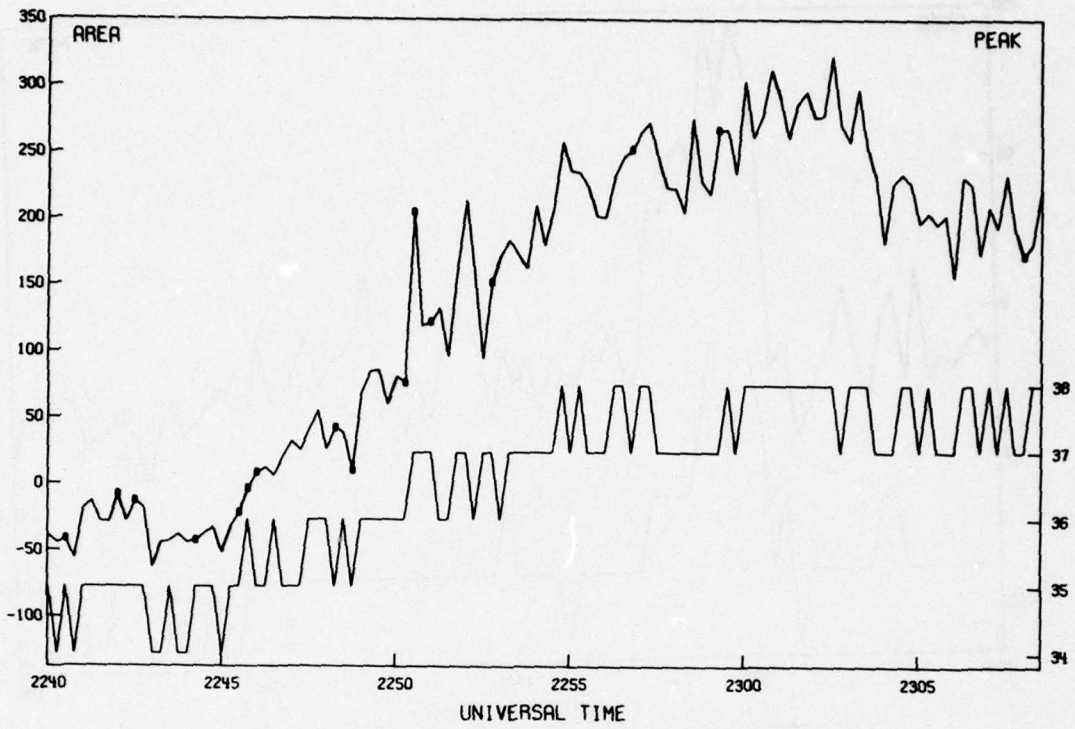
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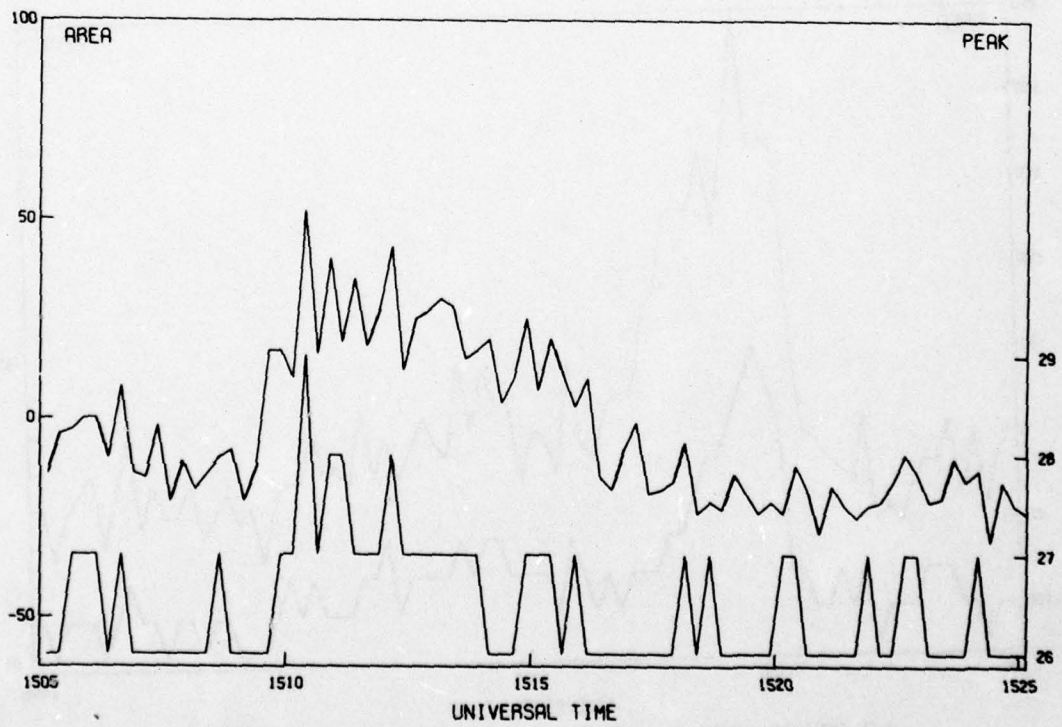
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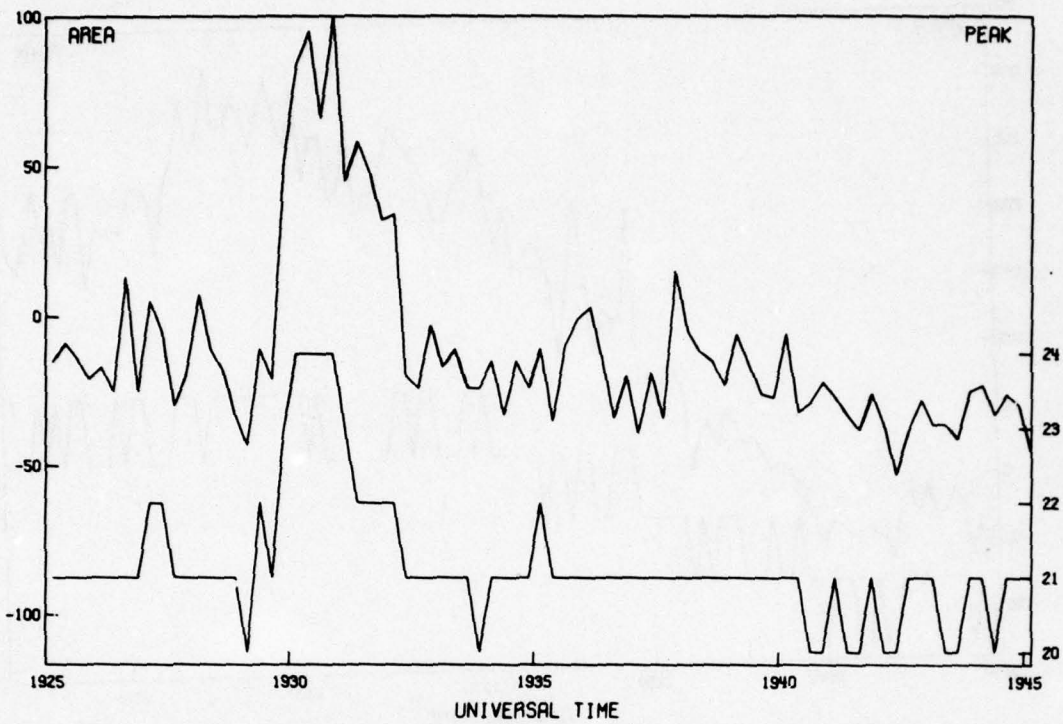
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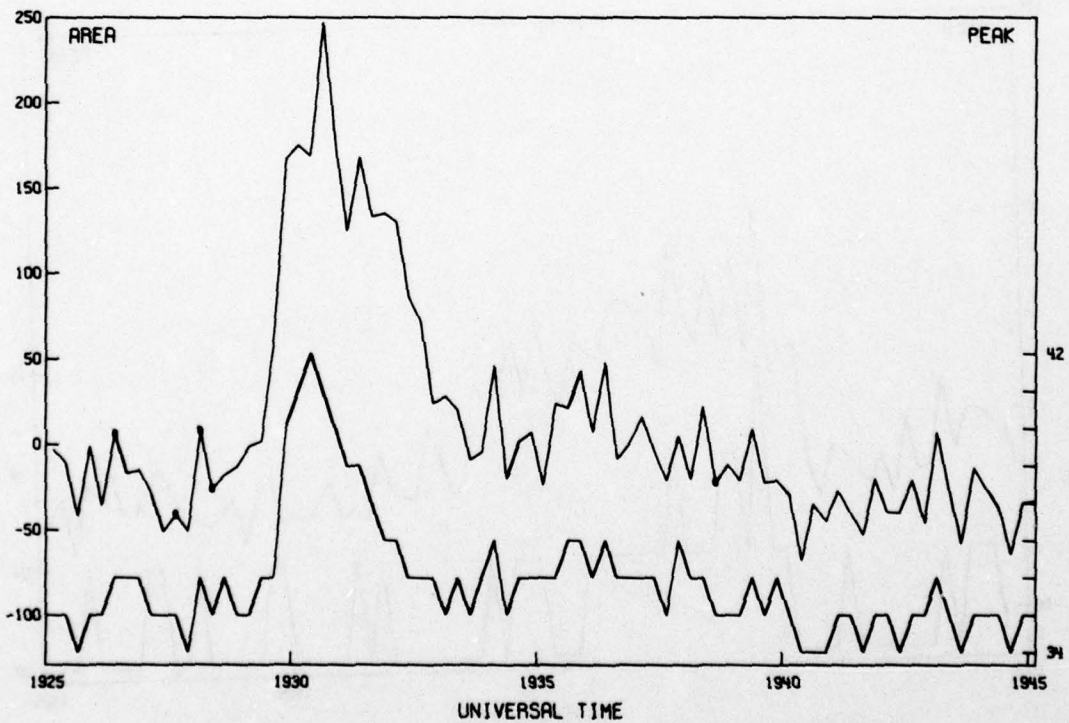
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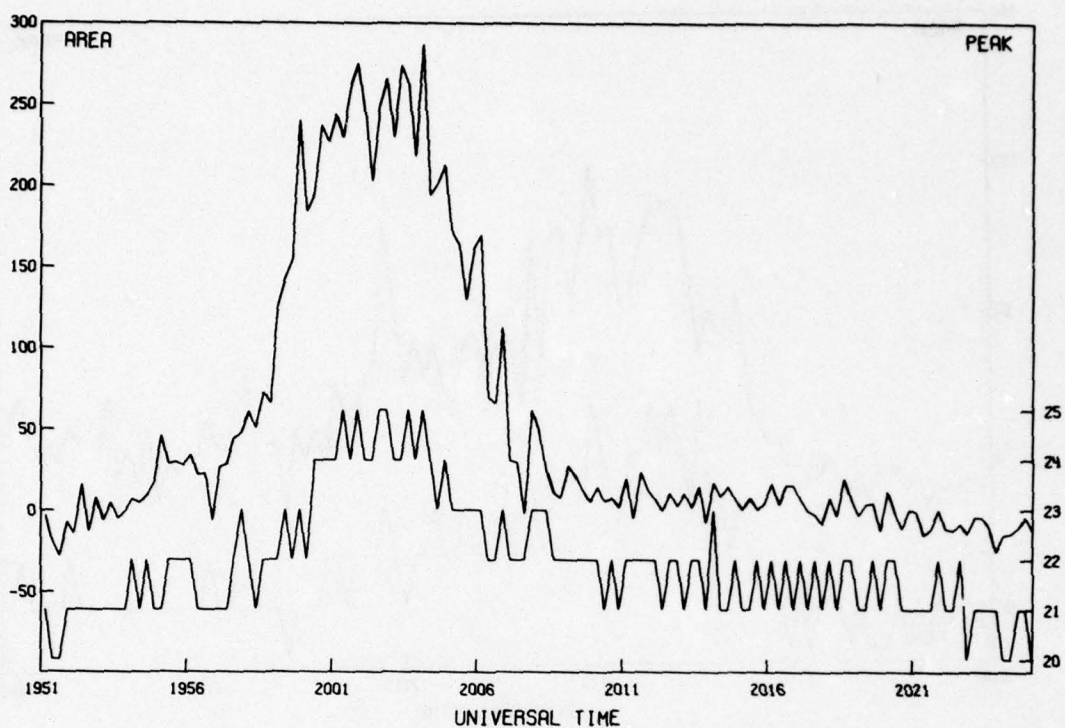
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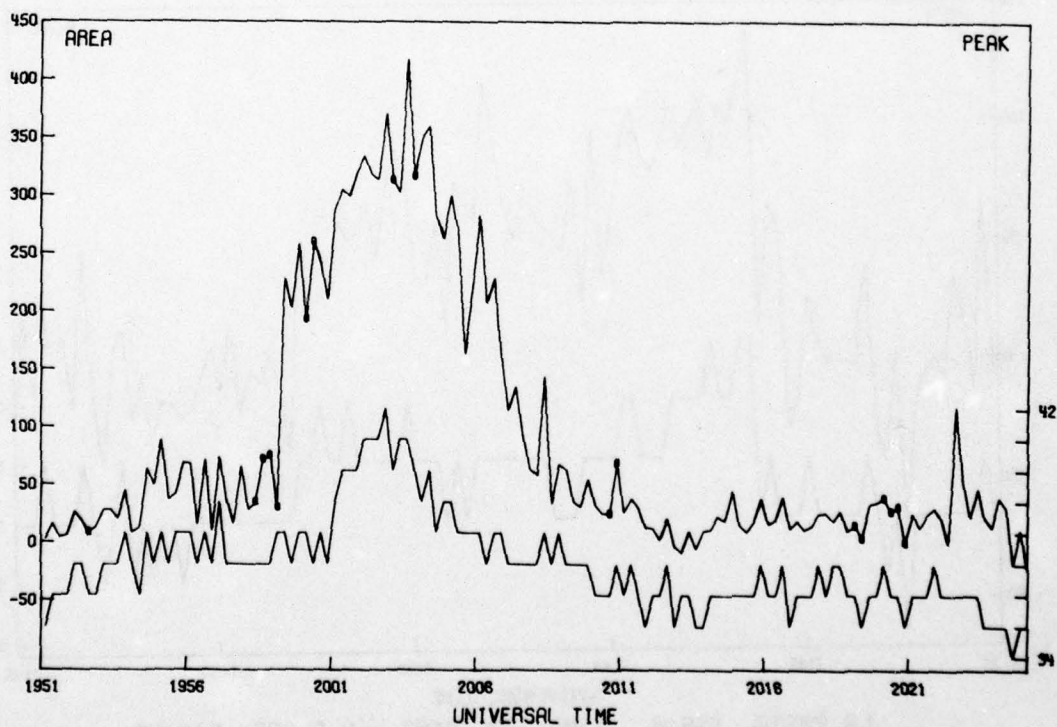
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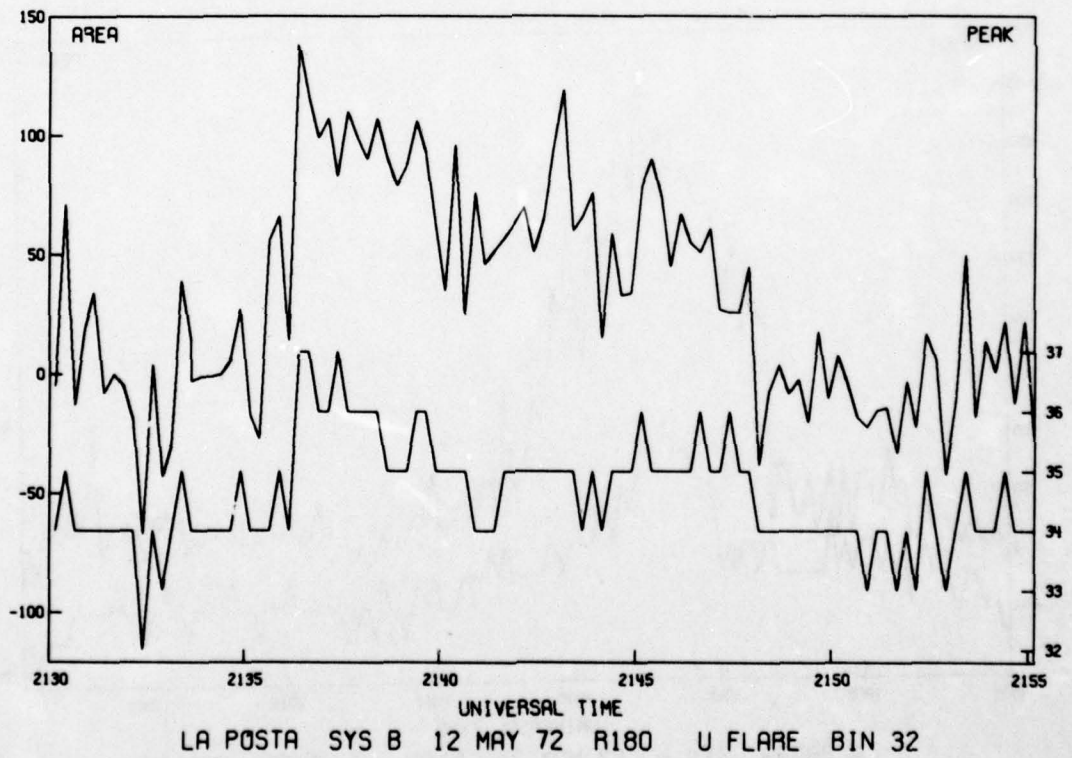
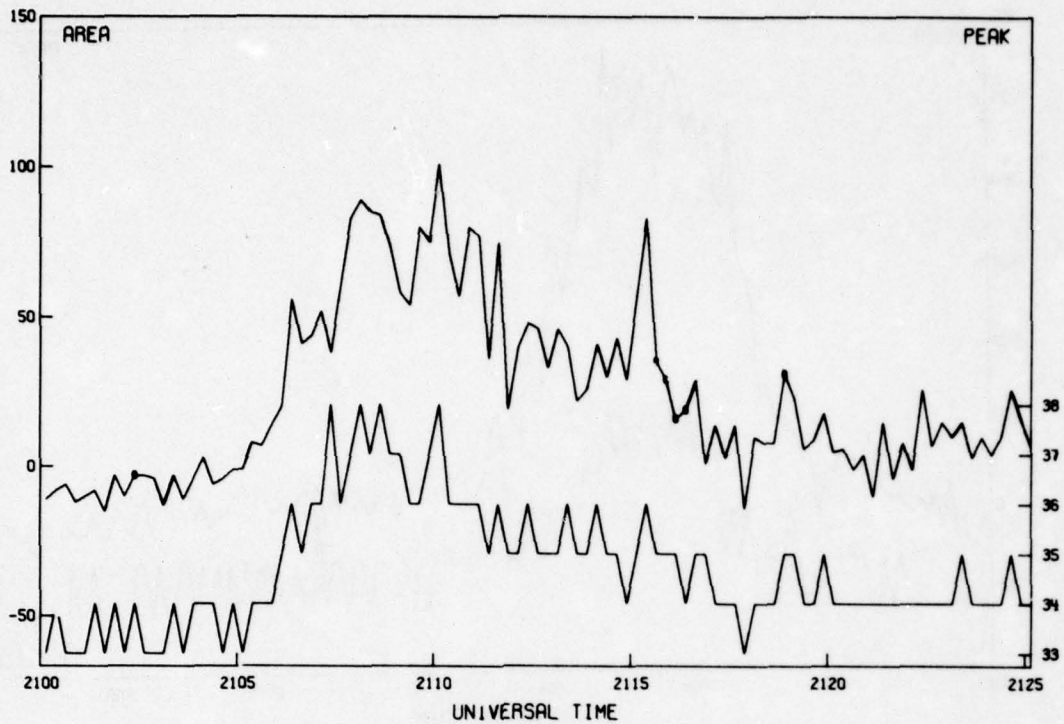
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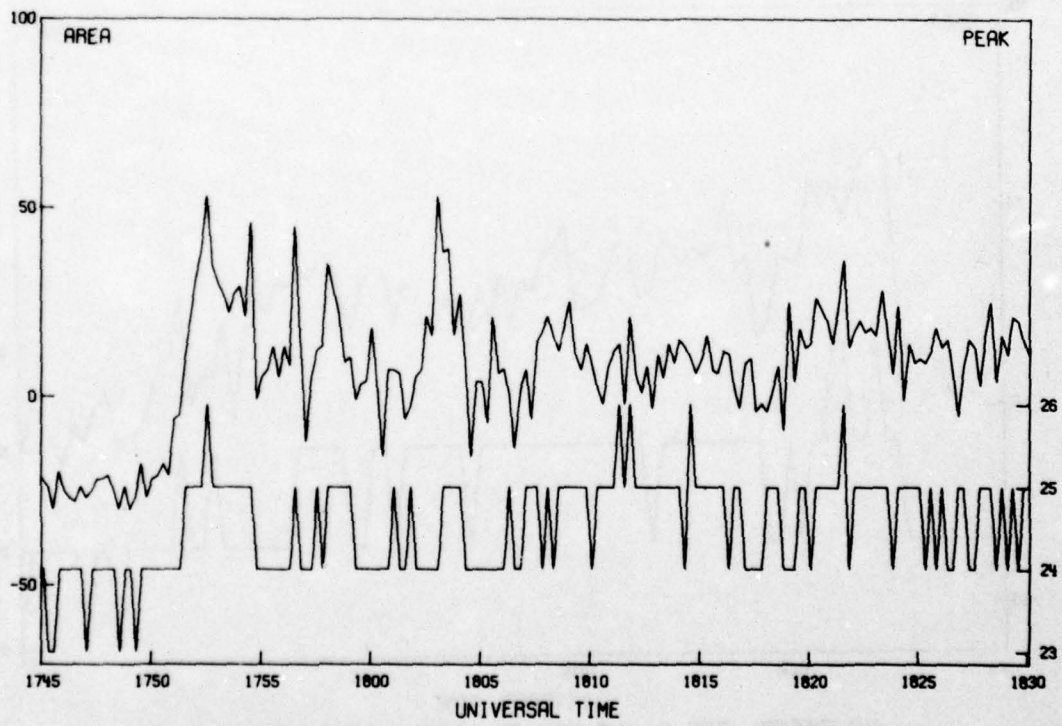
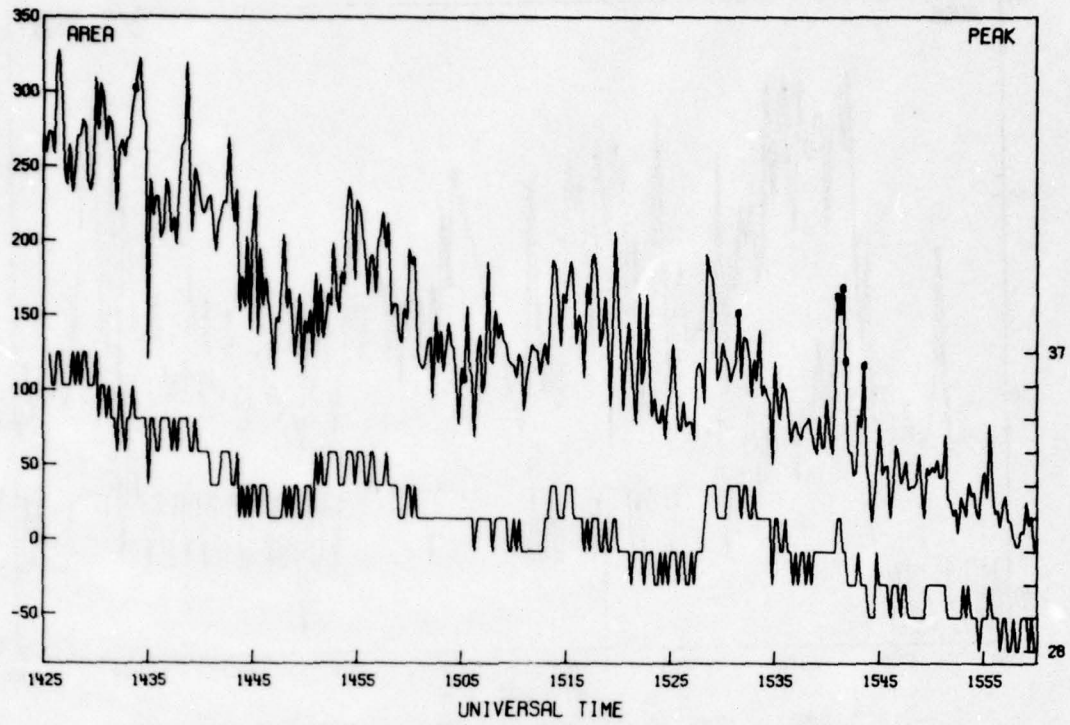


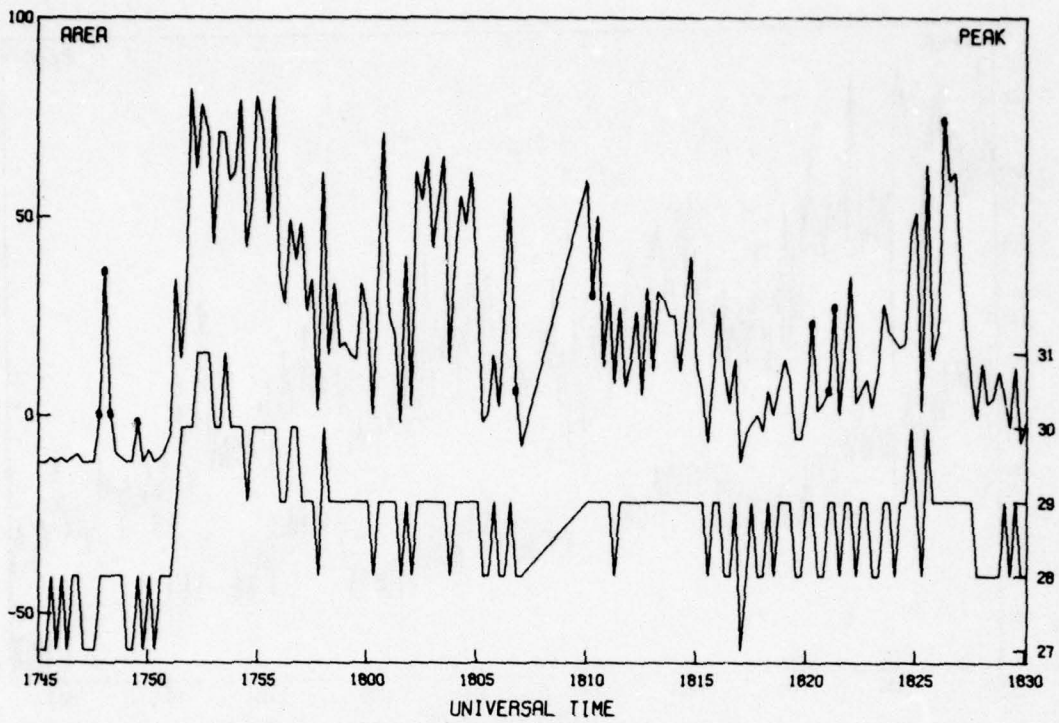
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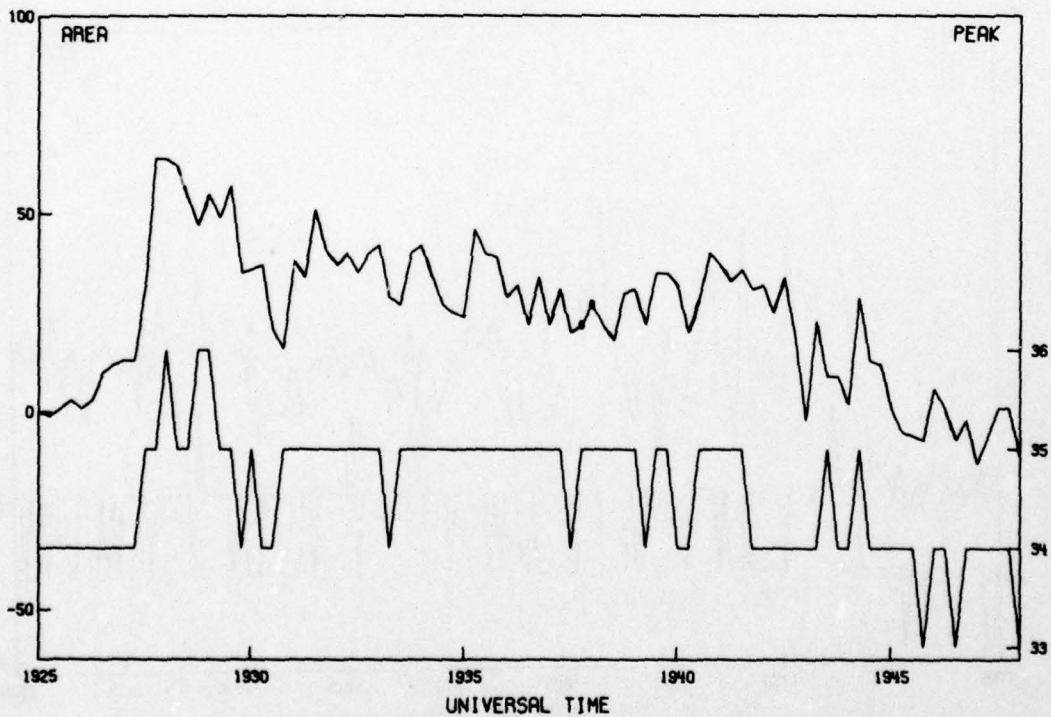
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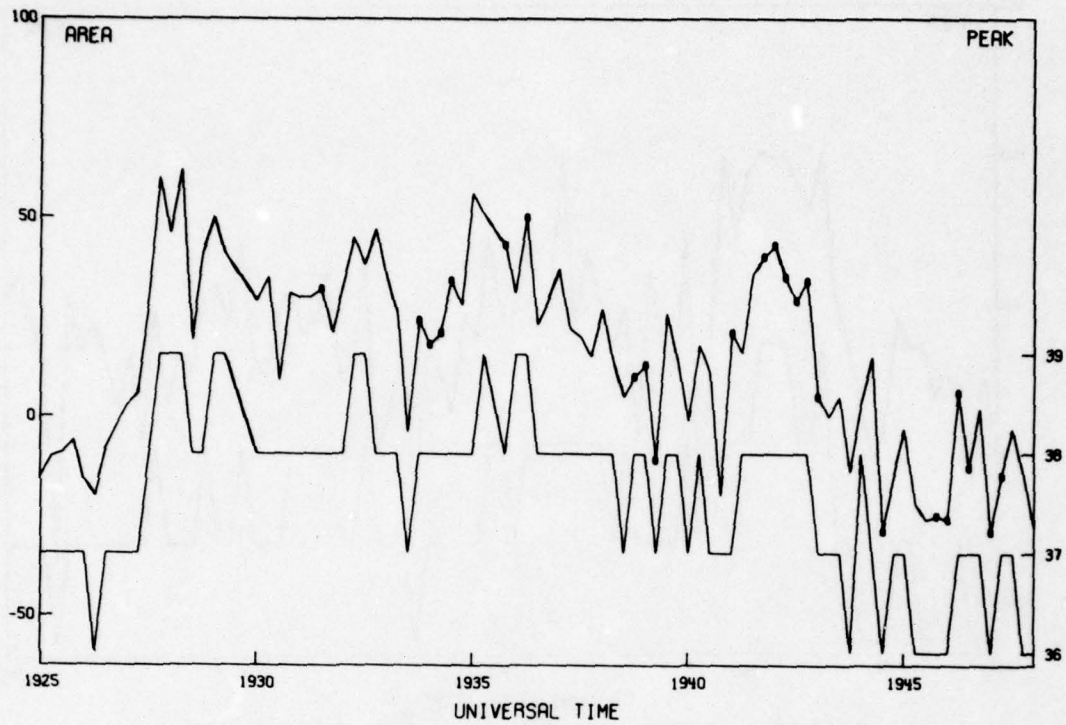




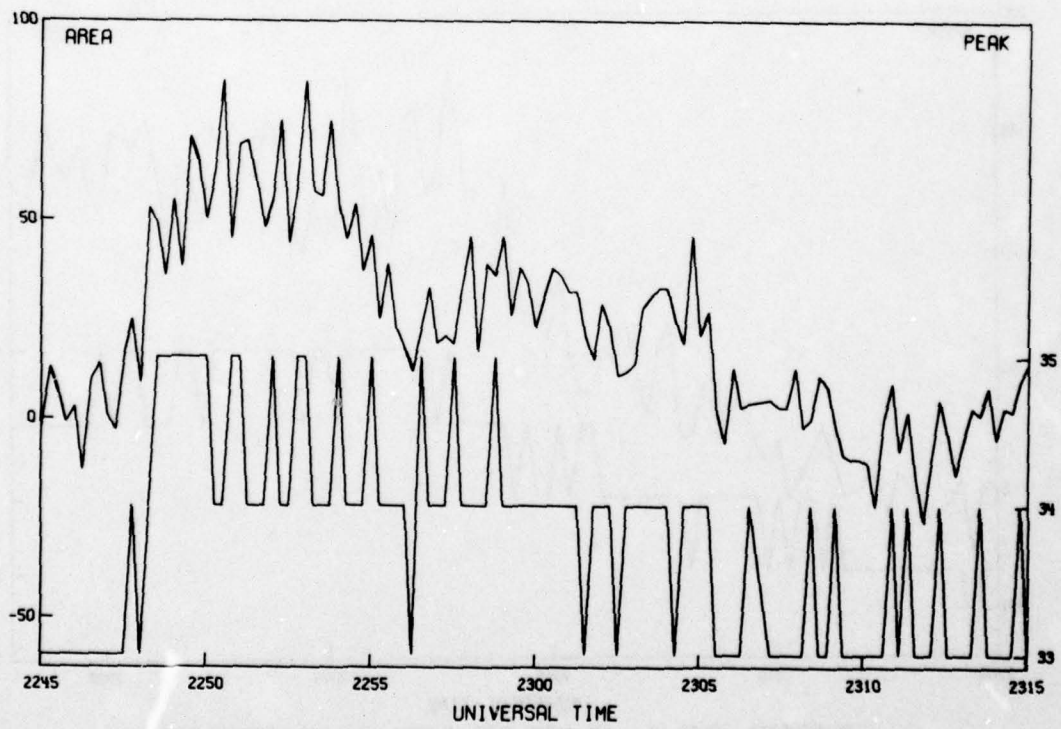
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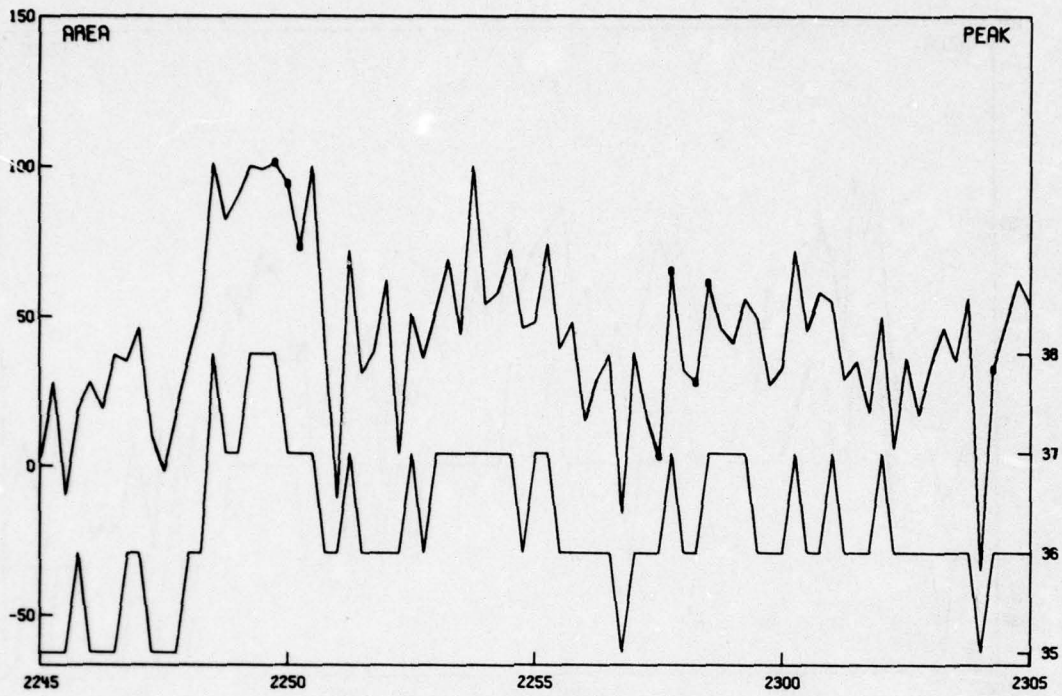
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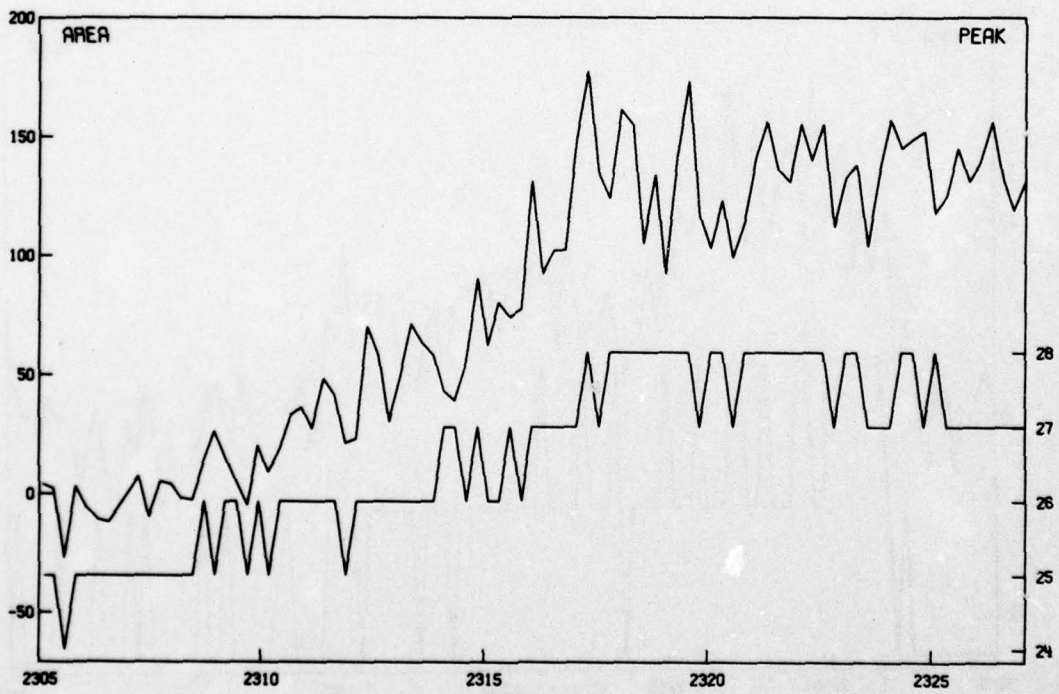
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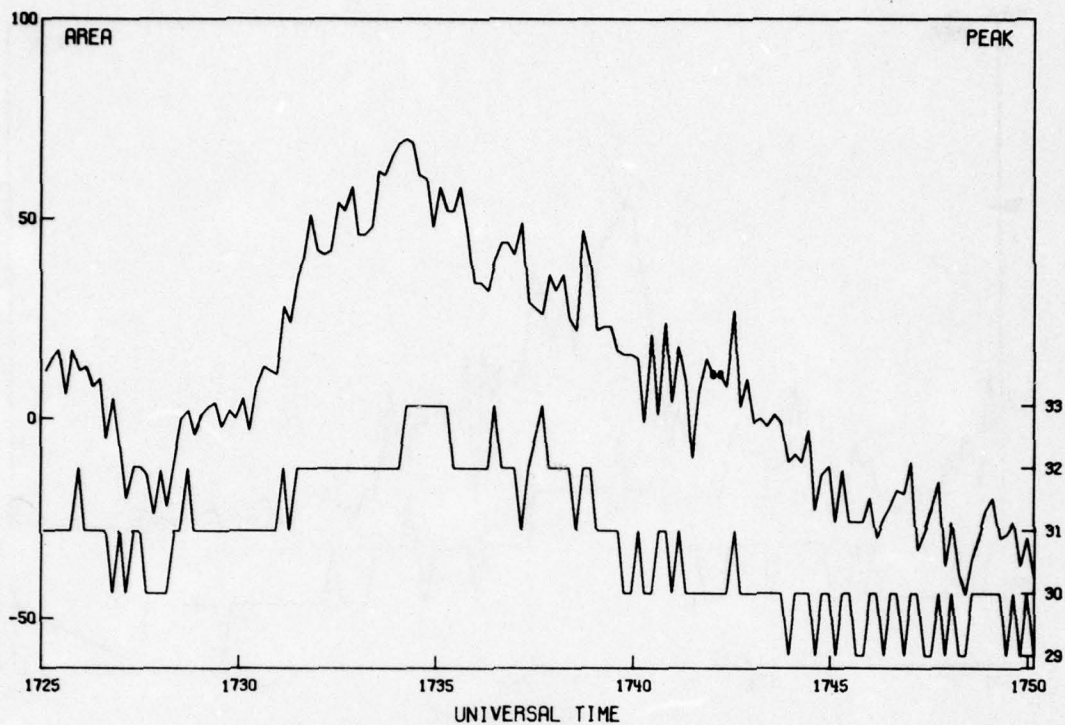
LA POSTA SYS A 13 MAY 72 R184 -F FLARE BIN 32



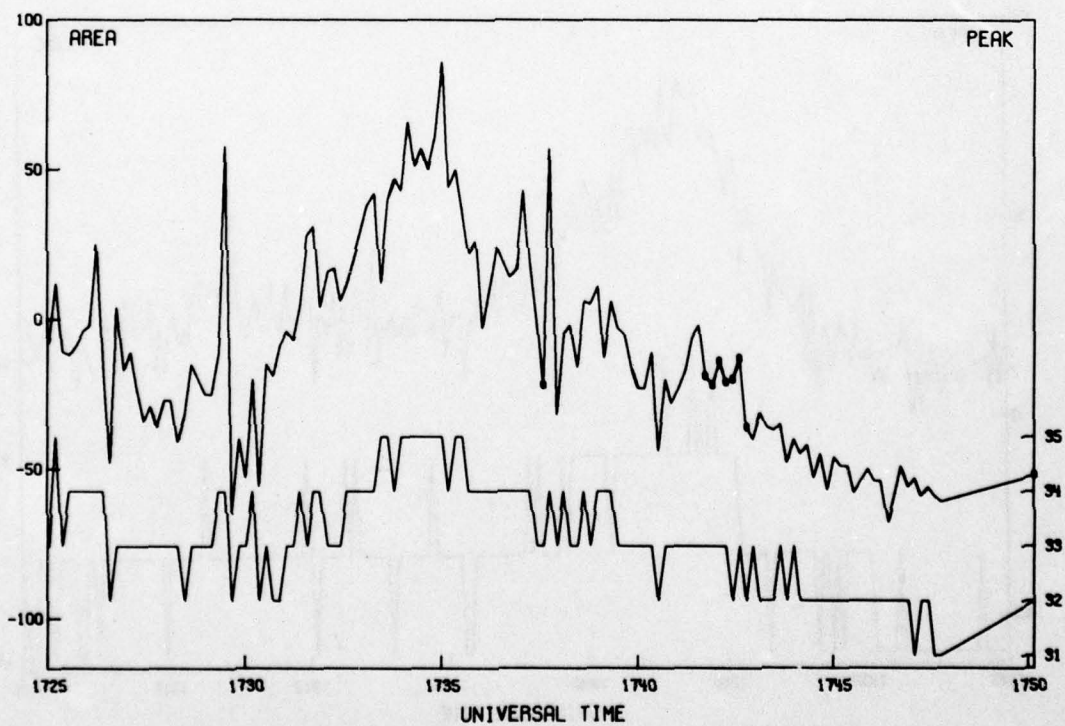
LA POSTA SYS B 13 MAY 72 R184 -F FLARE BIN 34



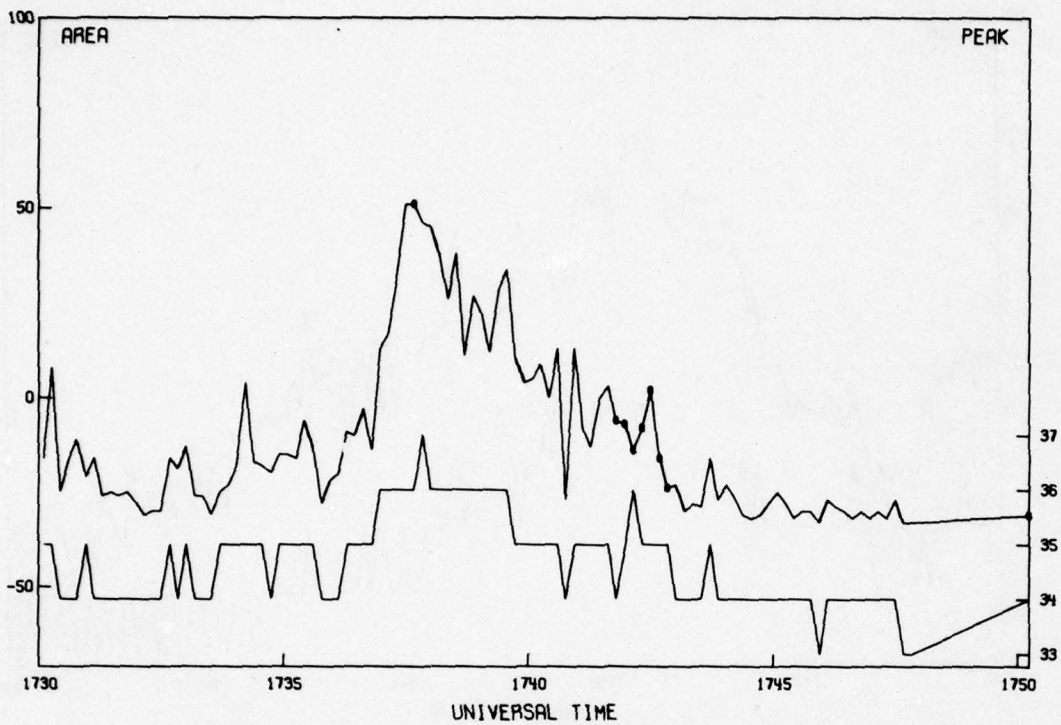
LA POSTA SYS A 13 MAY 72 R186 U FLARE BIN 24



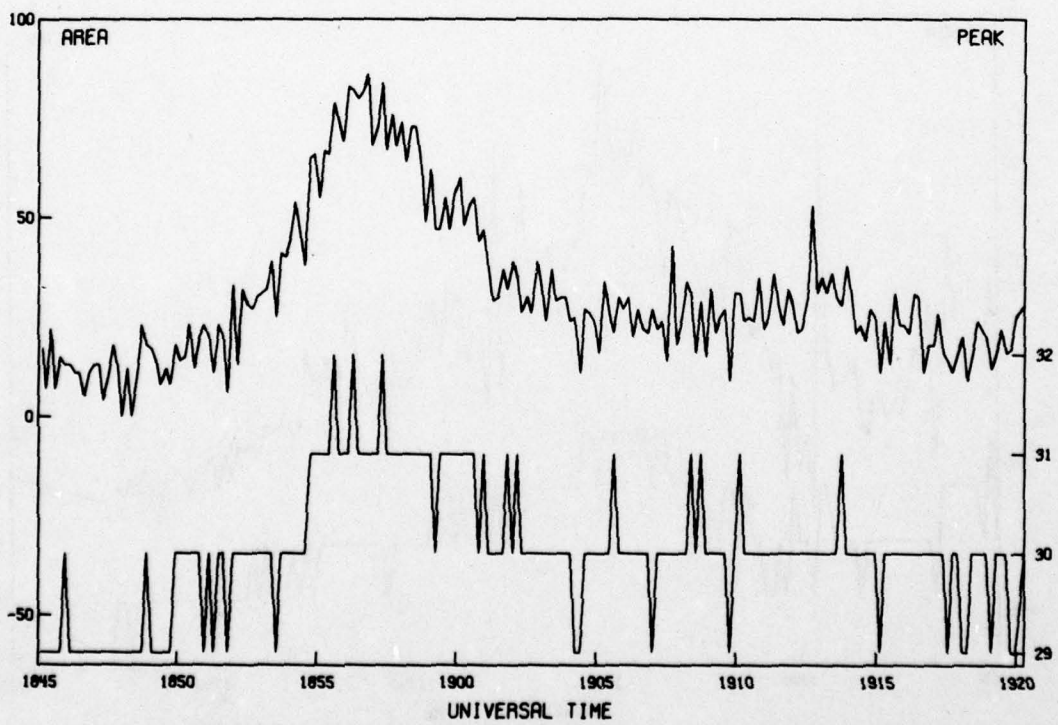
LA POSTA SYS A 14 MAY 72 R186 U FLARE BIN 28



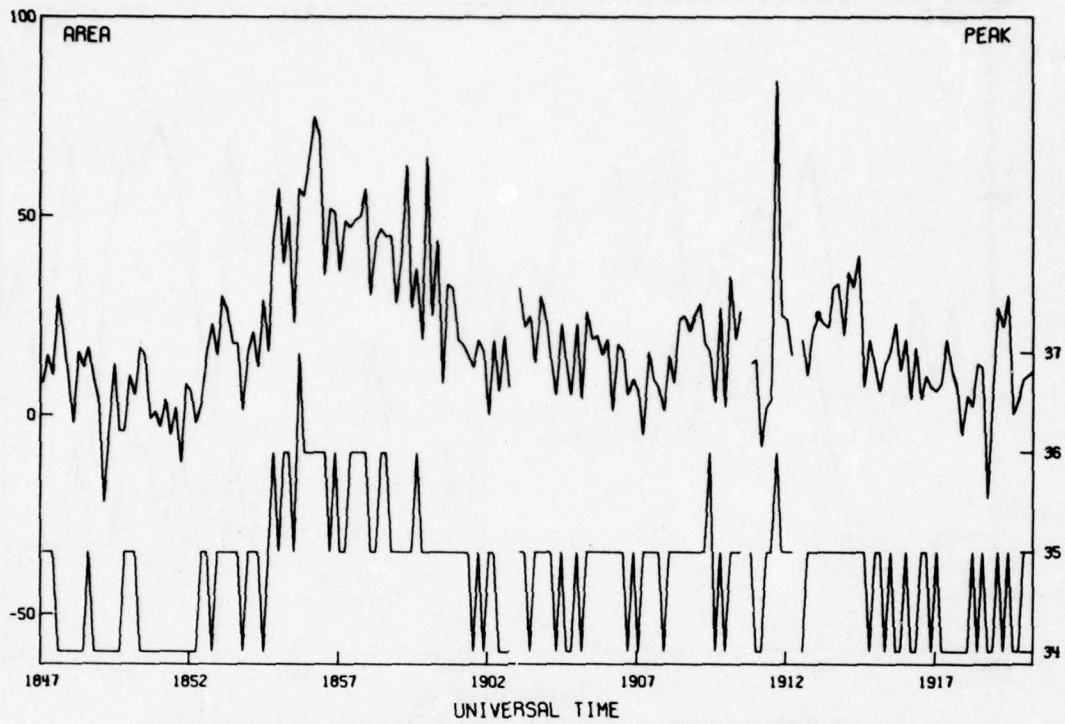
LA POSTA SYS B 14 MAY 72 R186 U FLARE BIN 31



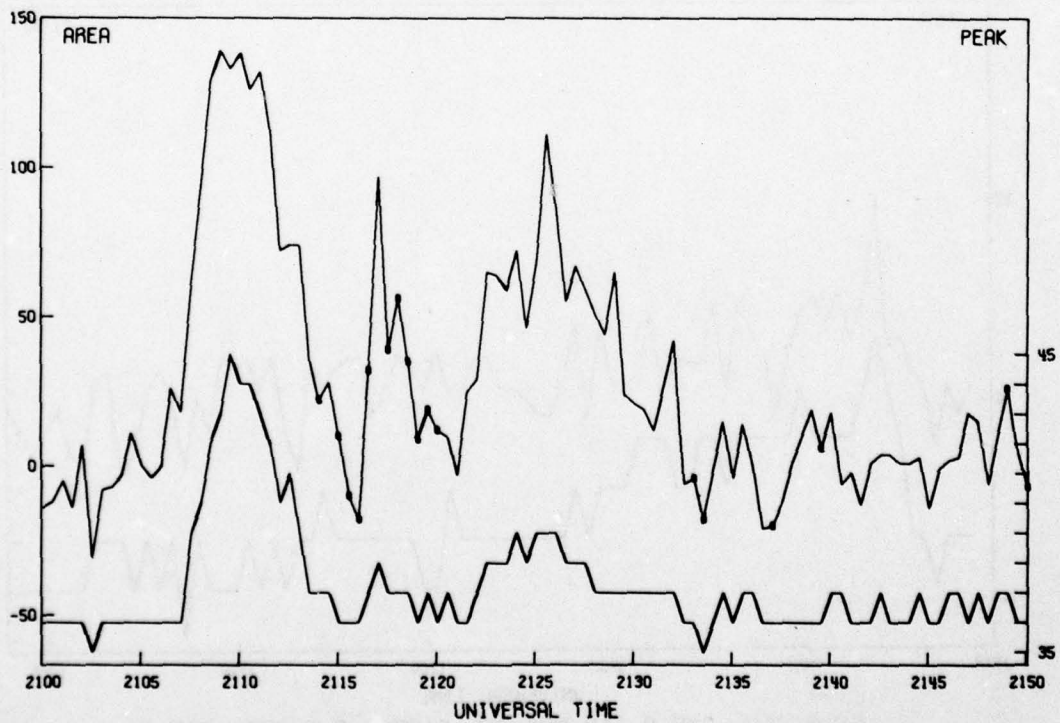
LA POSTA SYS B 14 MAY 72 R184 U FLARE BIN 34



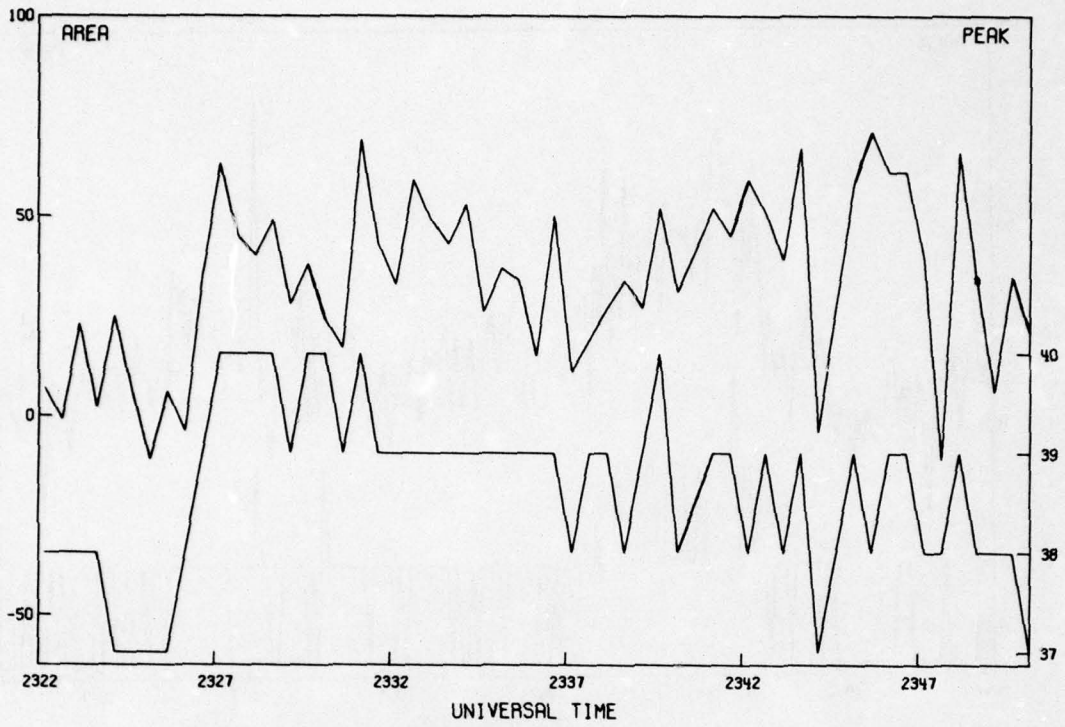
LA POSTA SYS A 14 MAY 72 R186 -F FLARE BIN 28



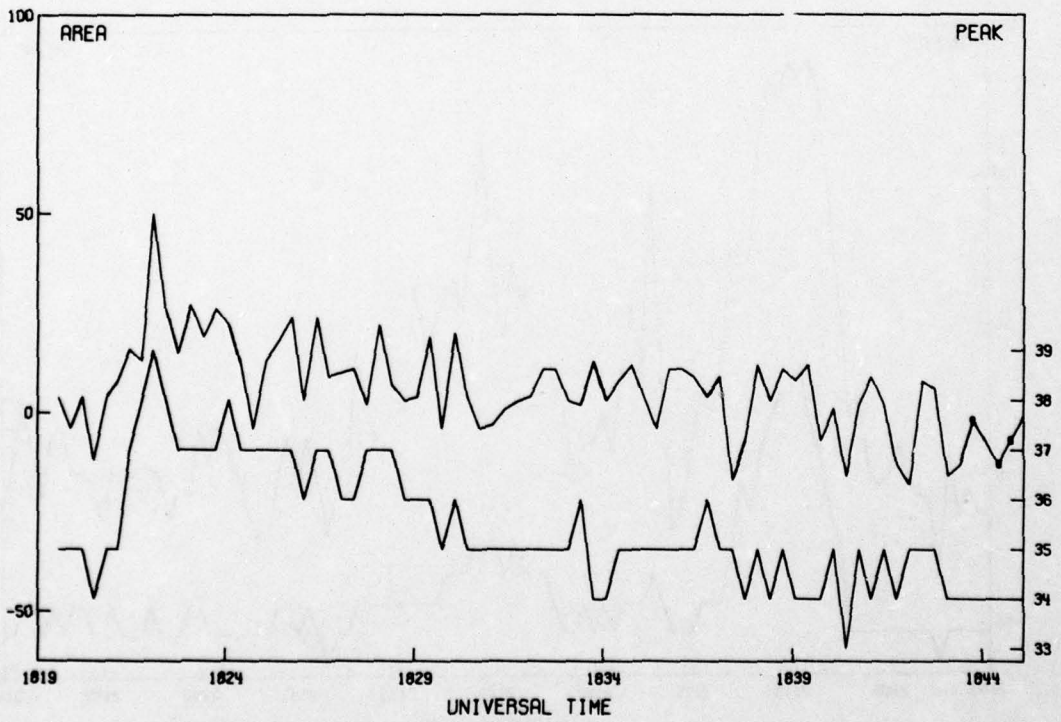
LA POSTA SYS B 14 MAY 72 R186 -F FLARE BIN 32



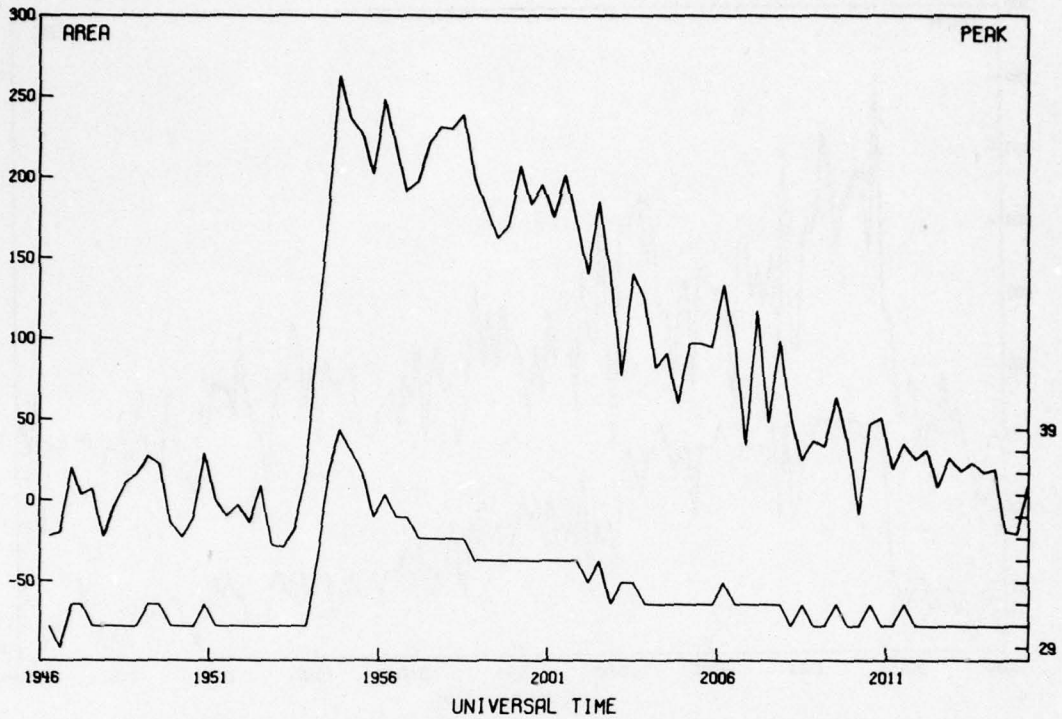
LA POSTA SYS B 17 MAY 72 R186 -F FLARE BIN 35



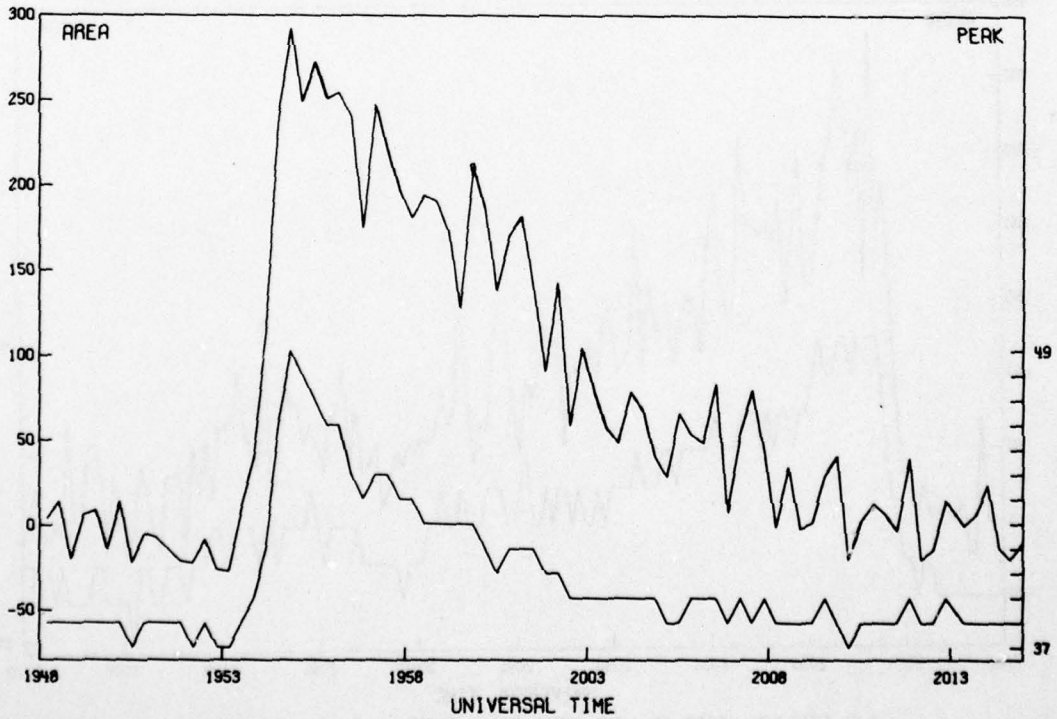
LA POSTA SYS B 17 MAY 72 R193 -F FLARE BIN 34



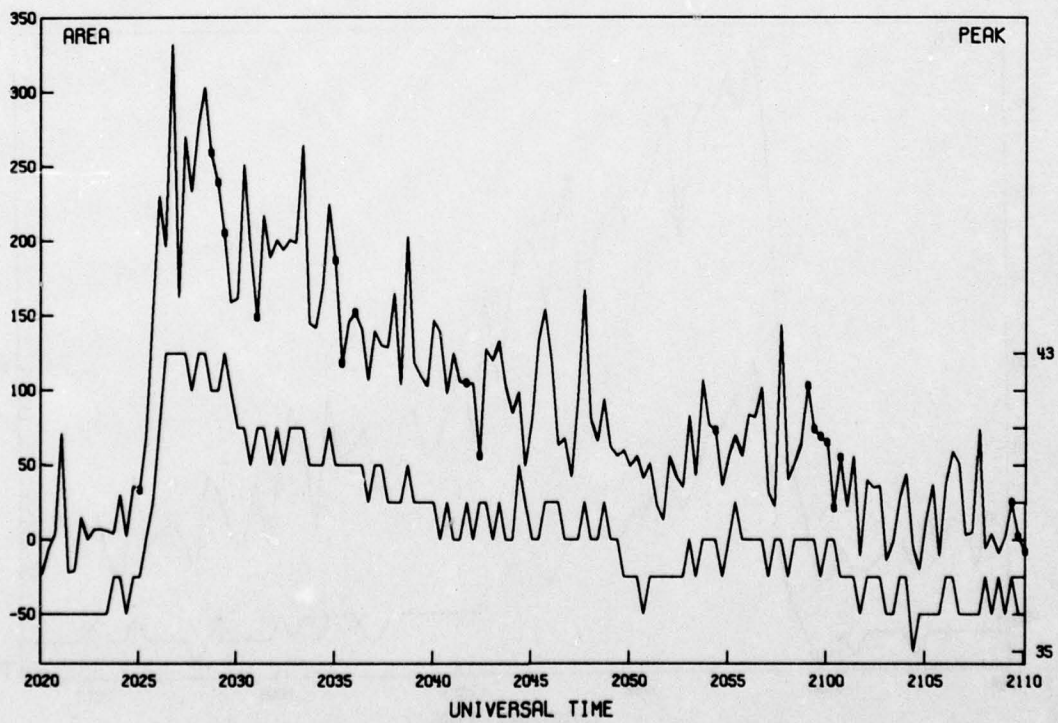
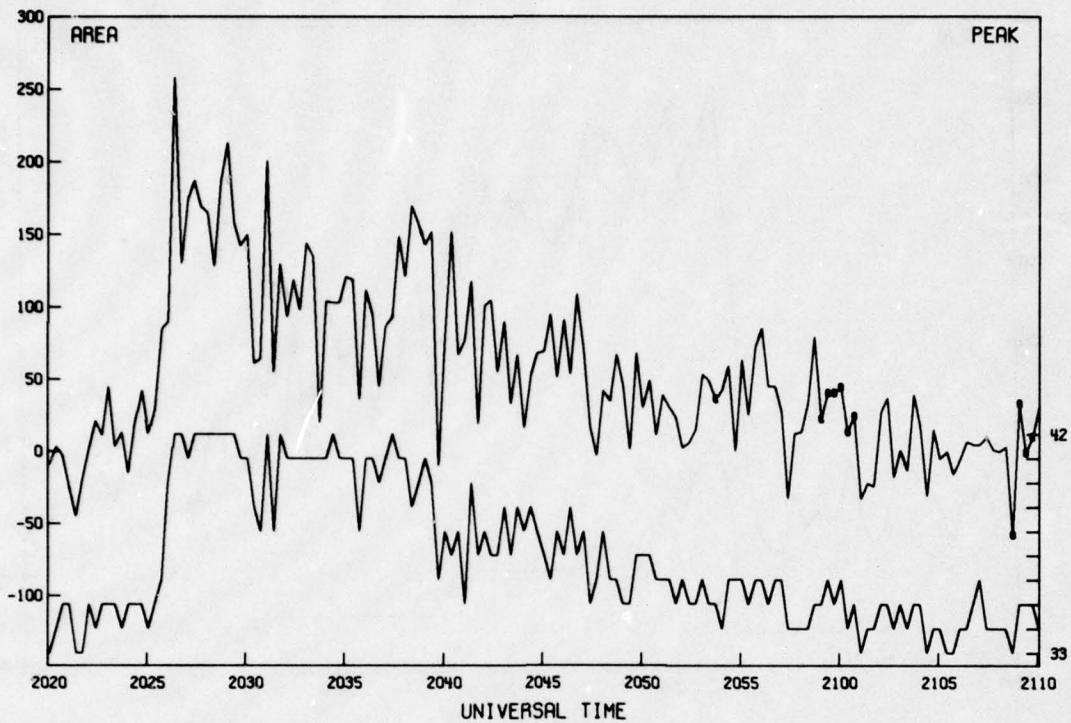
LA POSTA SYS A 18 MAY 72 R195 -F FLARE BIN 31

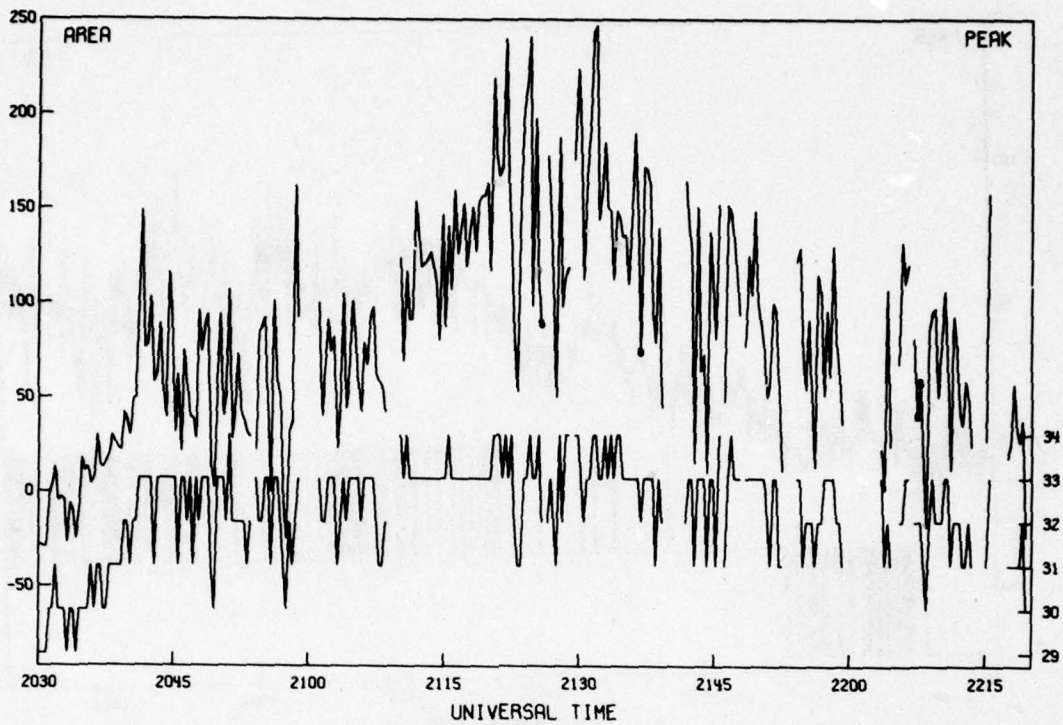


LA POSTA SYS A 18 MAY 72 R186 -N FLARE BIN 29

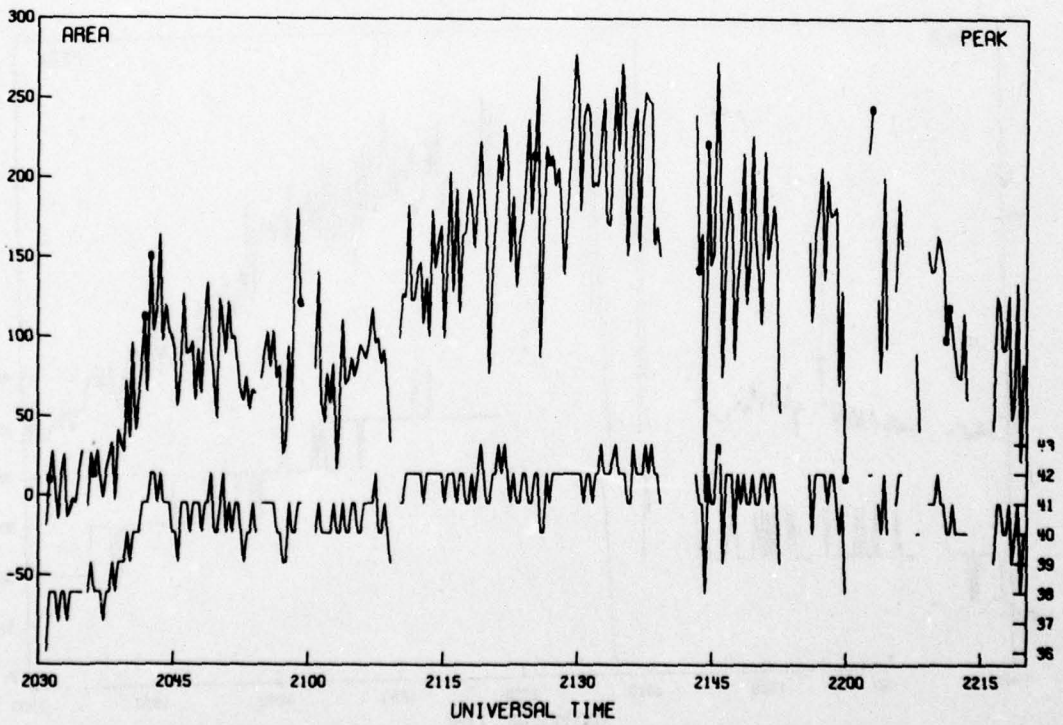


LA POSTA SYS B 18 MAY 72 R186 -N FLARE BIN 37

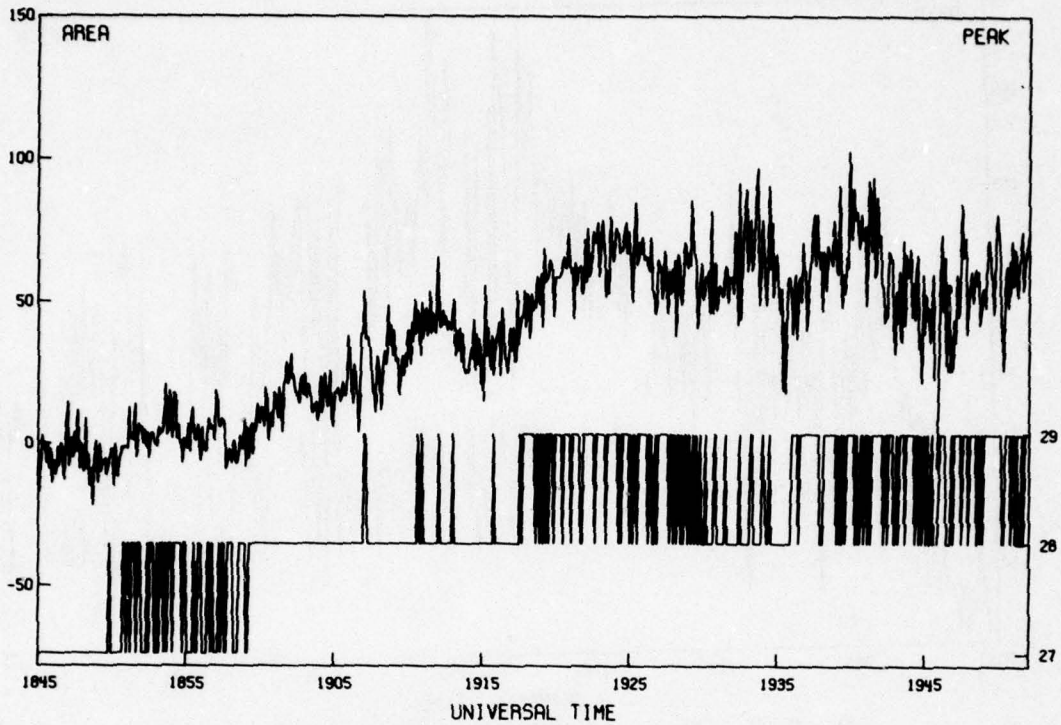




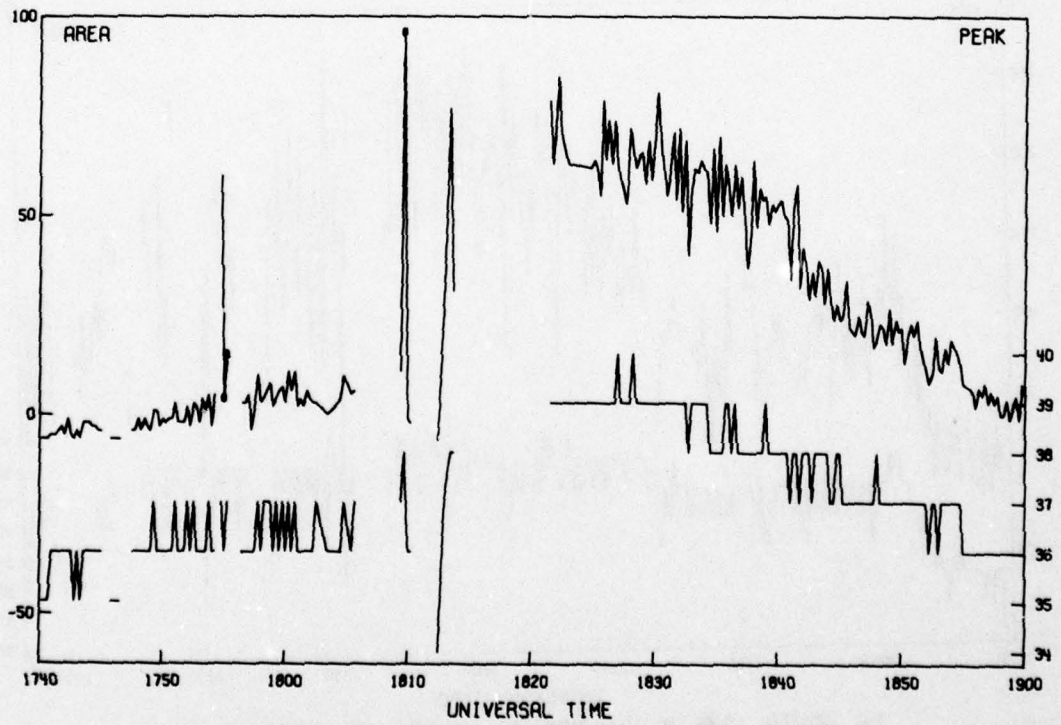
LA POSTA SYS A 18 MAY 72 R186 -F FLARE BIN 29



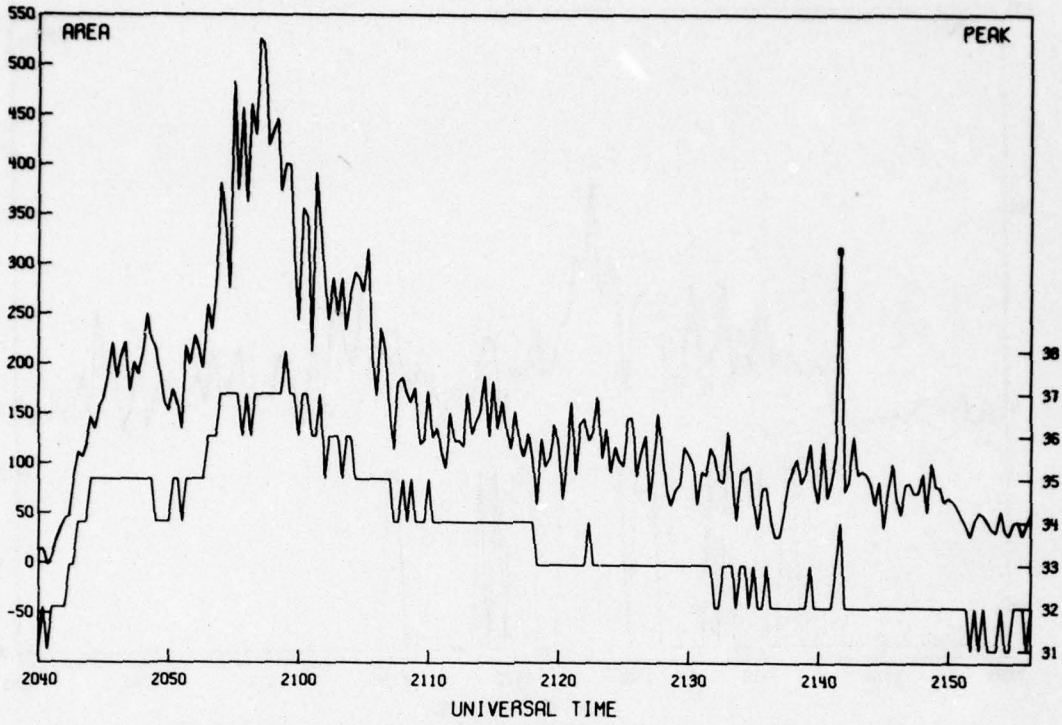
LA POSTA SYS B 18 MAY 72 R186 -F FLARE BIN 37



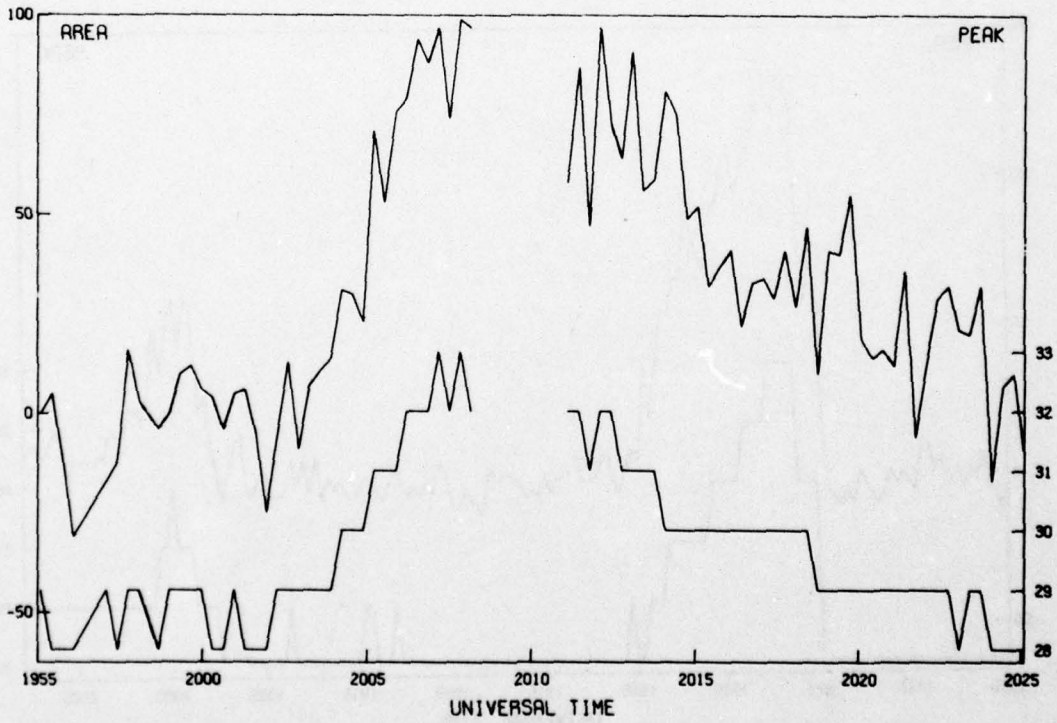
HAWAII 18 OCT 72 R448 -N FLARE BIN 26



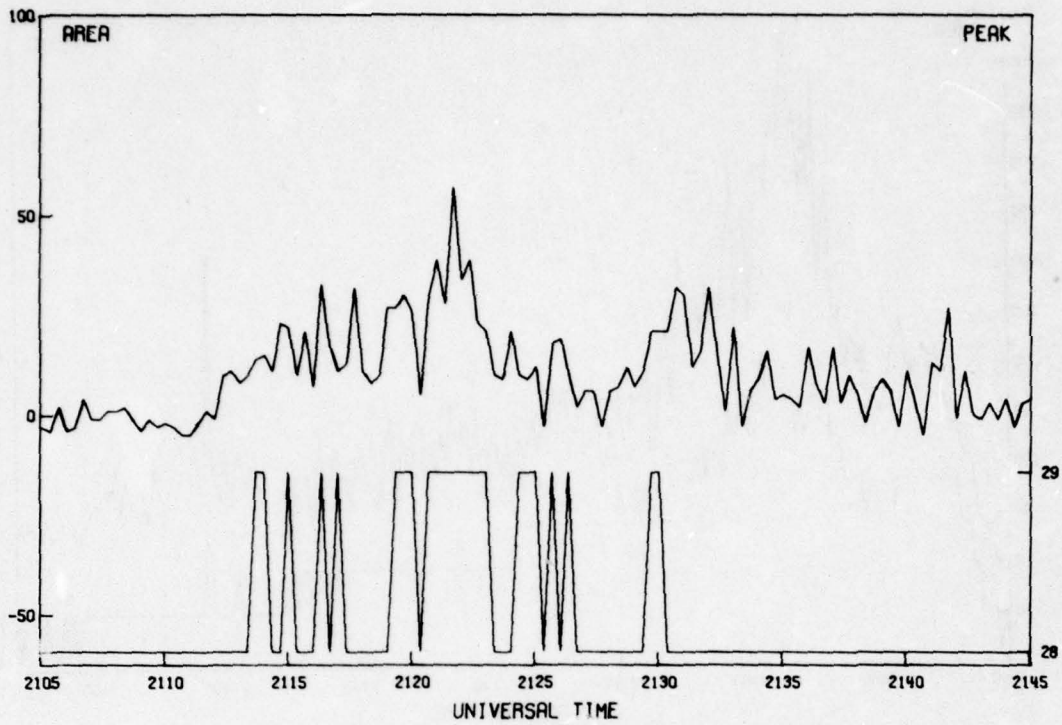
HAWAII 20 OCT 72 R453 -N FLARE BIN 36



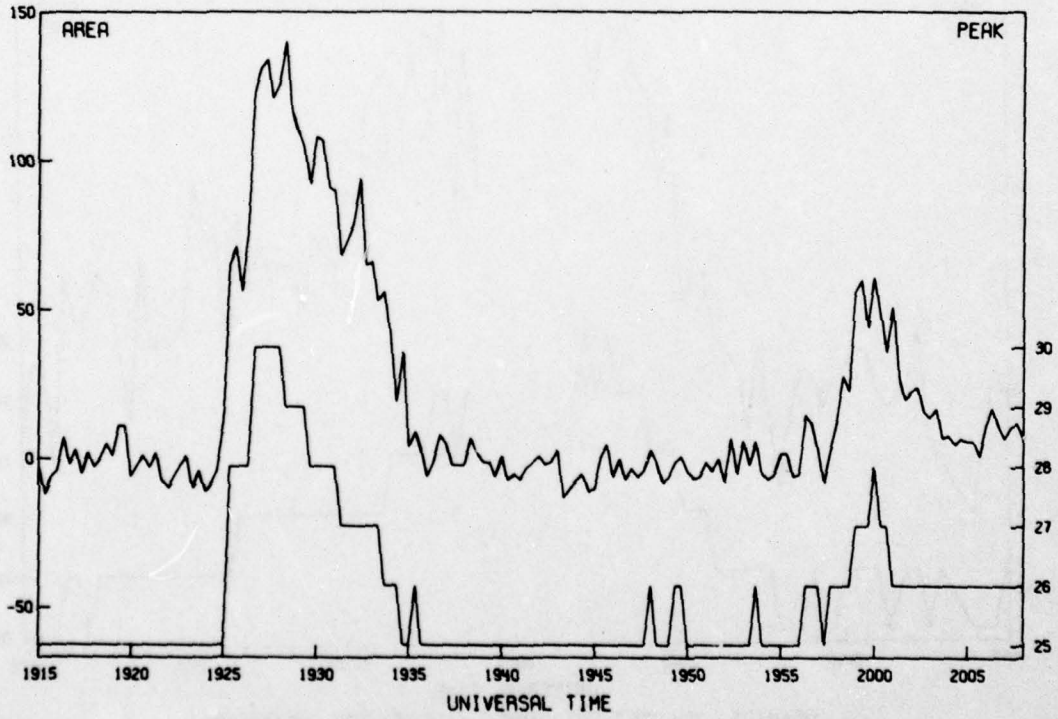
HAWAII 21 OCT 72 R448 -N FLARE BIN 31



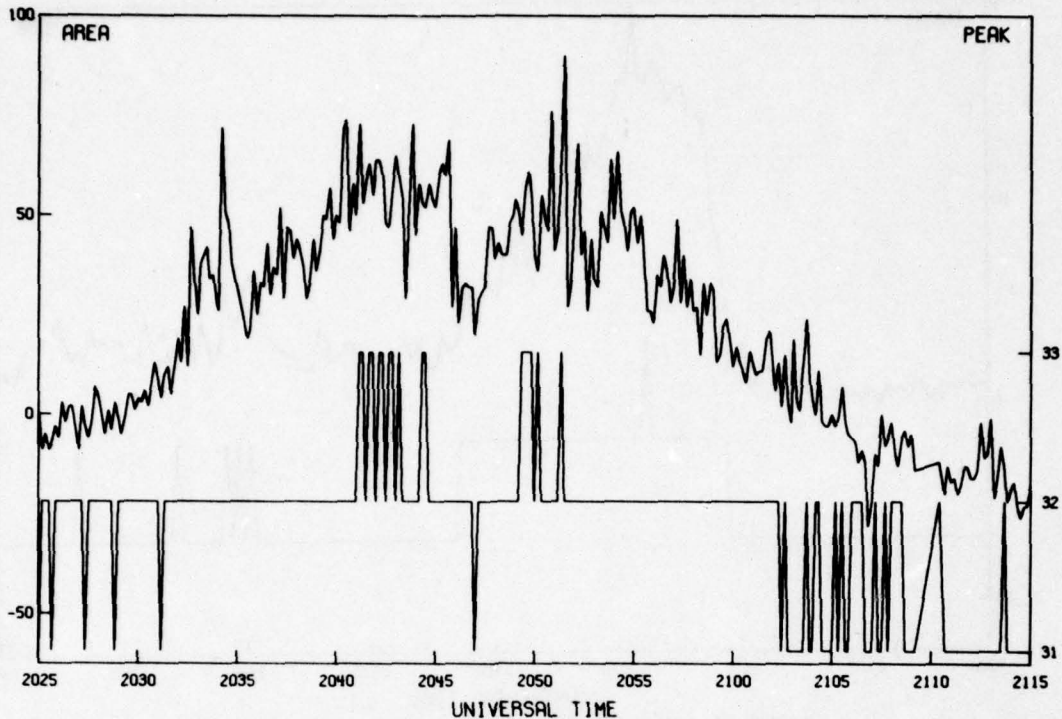
HAWAII 24 OCT 72 R453 -F FLARE BIN 28



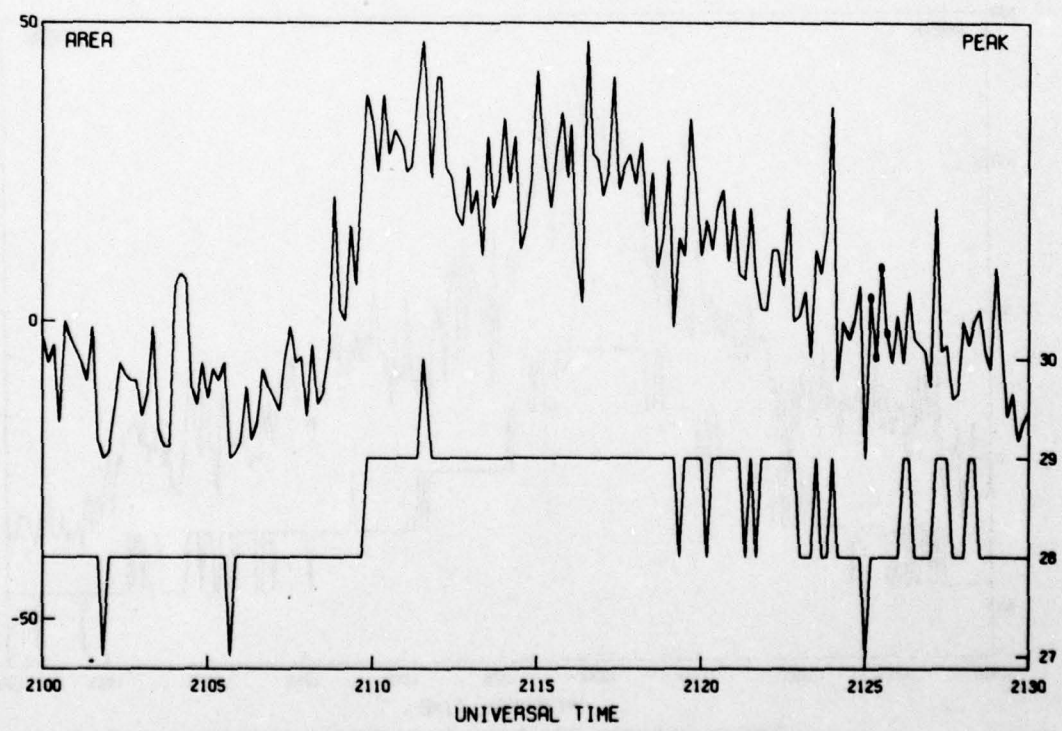
HAWAII 24 OCT 72 R453 -F FLARE BIN 28



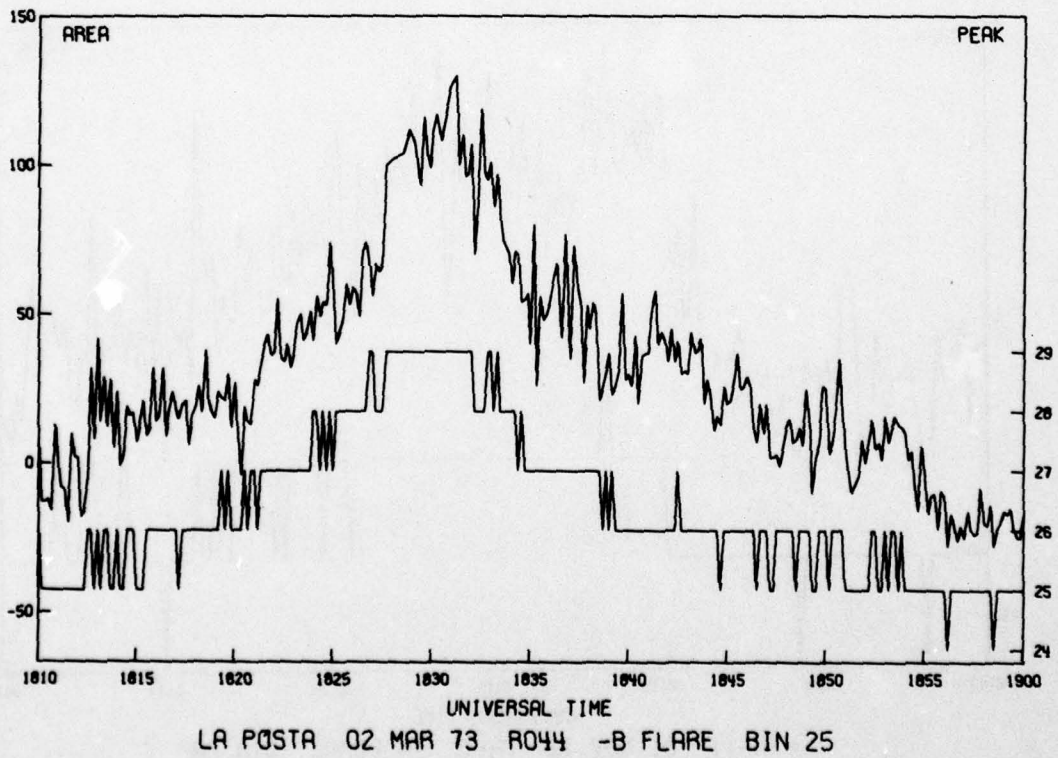
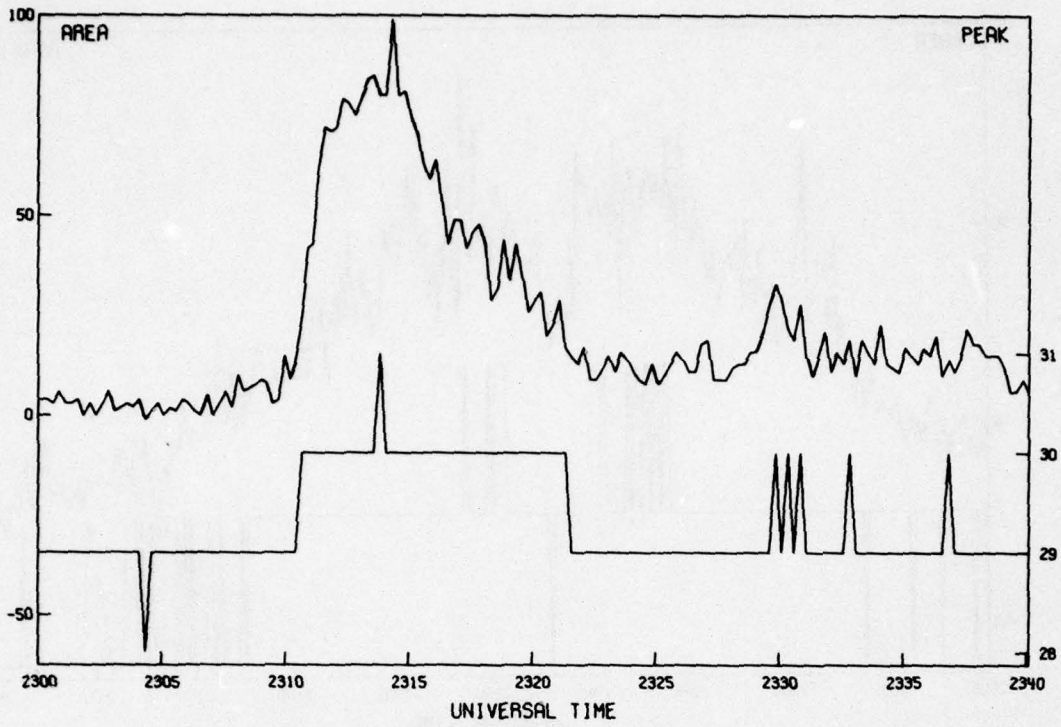
LA POSTA 25 OCT 72 R460 -B -N FLARES BIN 25

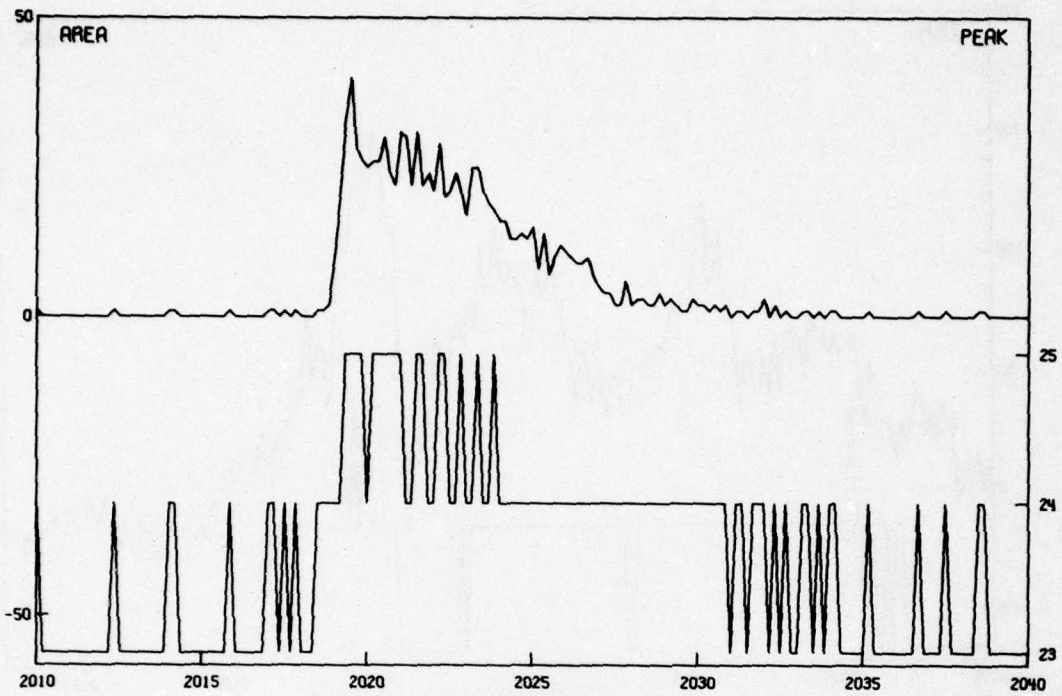


HAWAII 31 OCT 72 R460 -N FLARE BIN 31

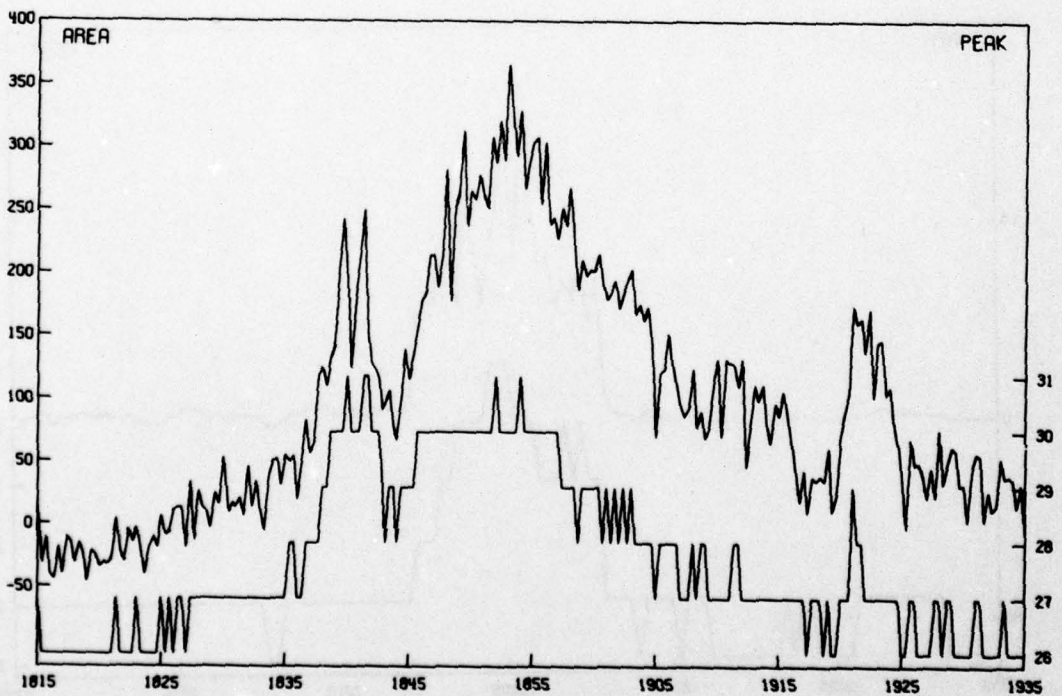


HAWAII 01 NOV 72 R460 -N FLARE BIN 28

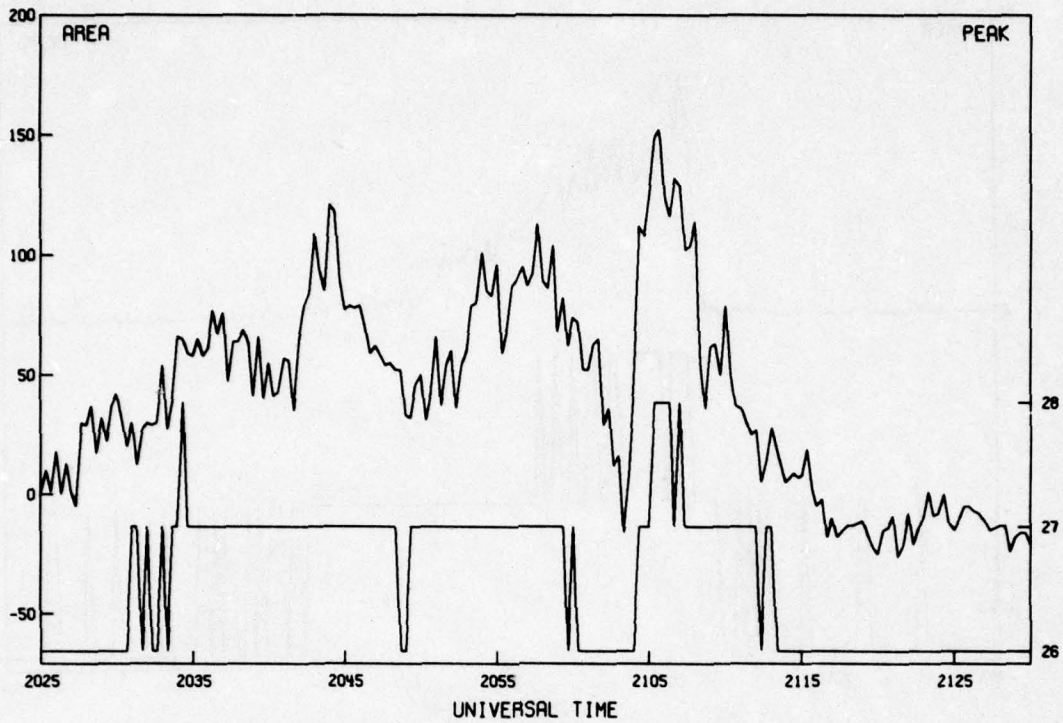




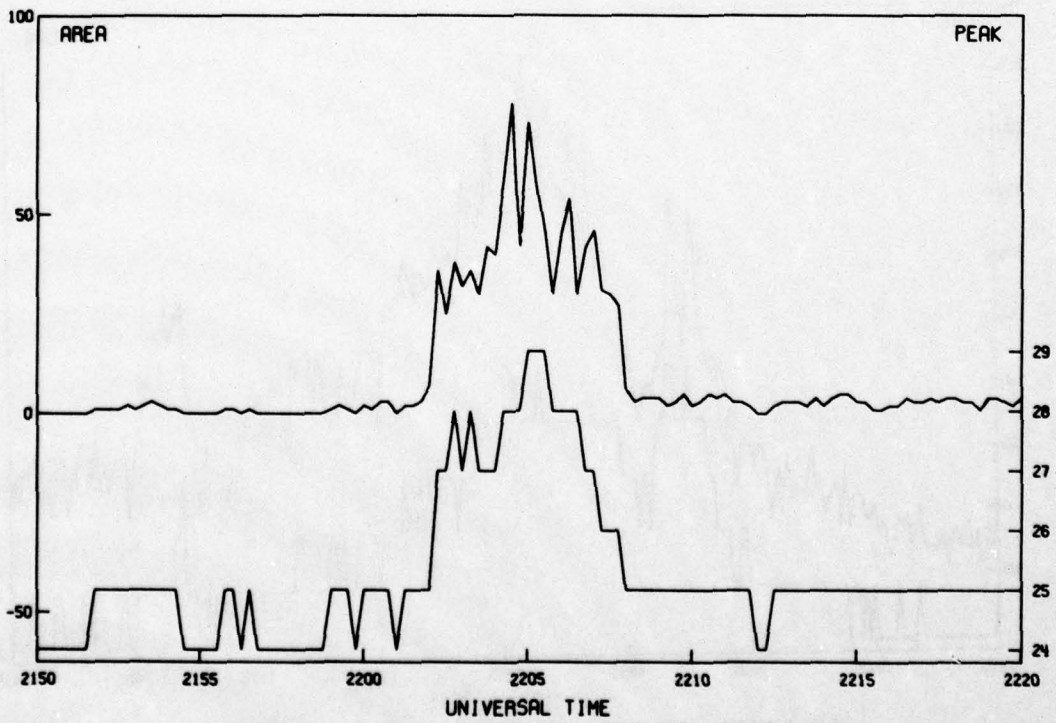
LA POSTA 03 MAR 73 R044 -F FLARE BIN 24



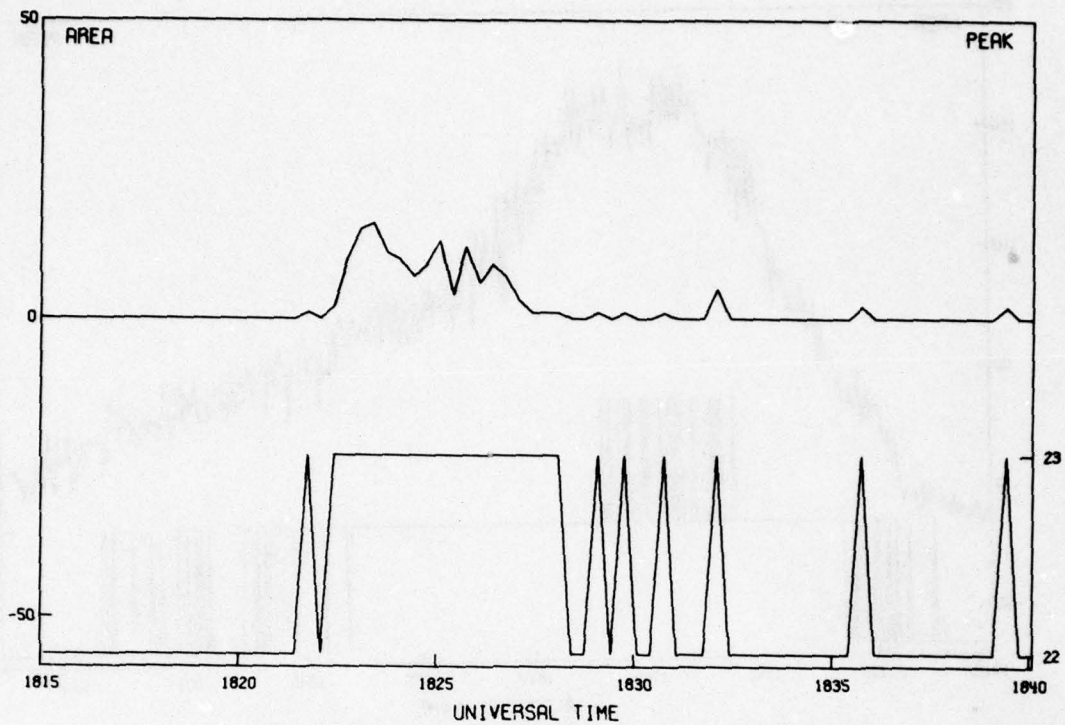
LA POSTA 03 APR 73 R064 IN FLARE BIN 26



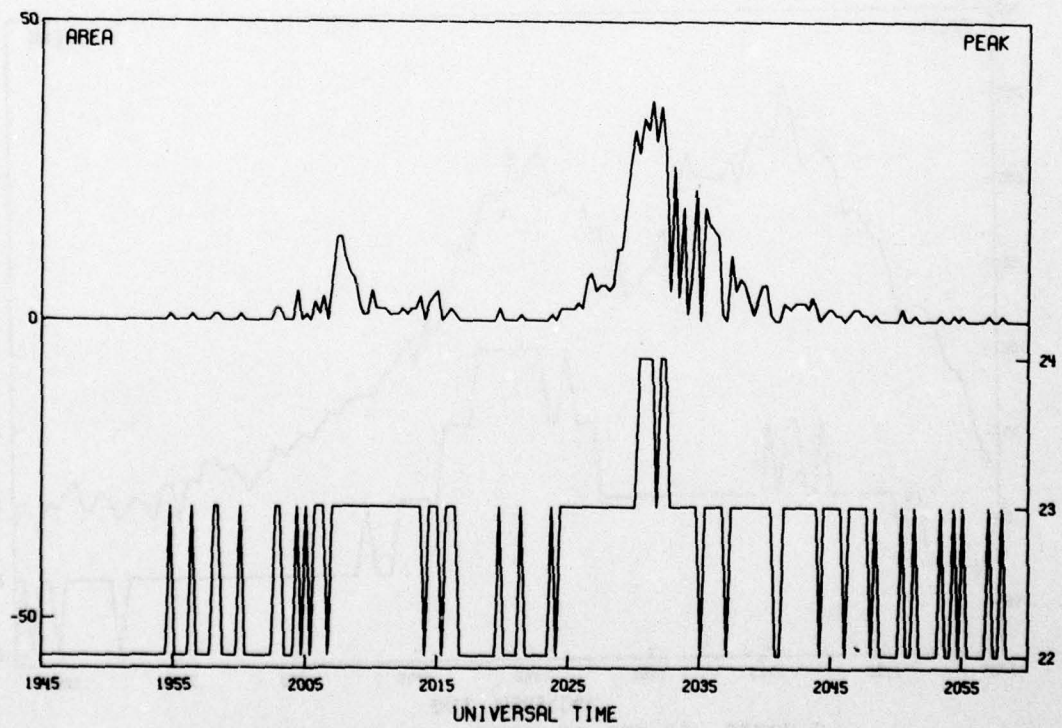
LA POSTA 03 APR 73 R064 U -N FLARES BIN 26



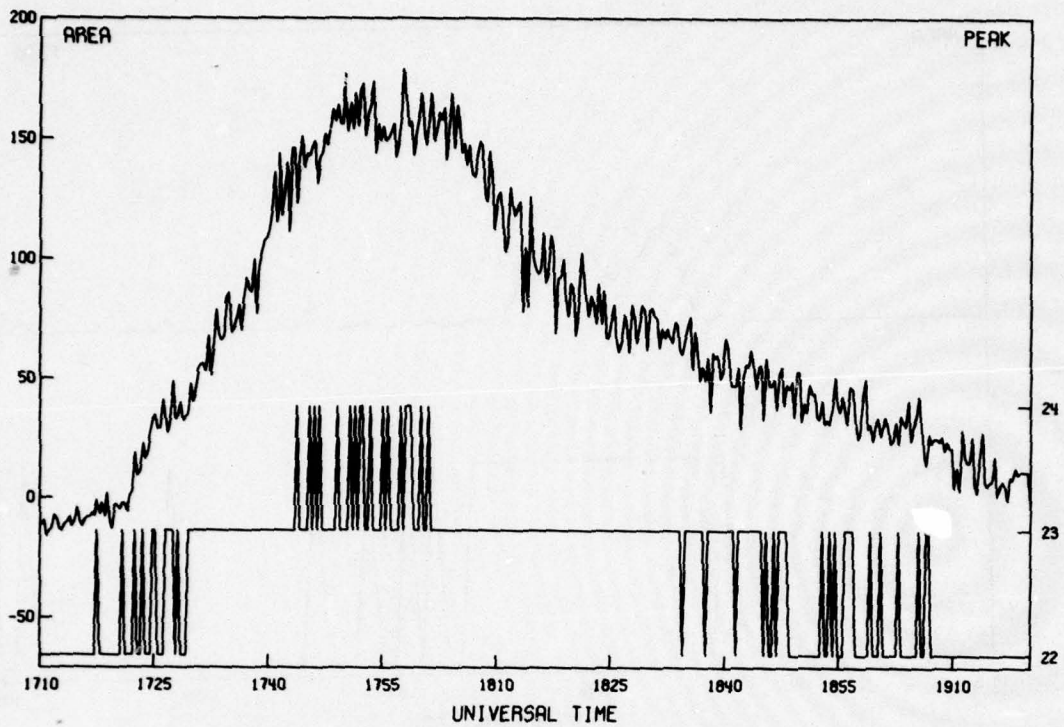
LA POSTA 04 APR 73 R064 -B FLARE BIN 25



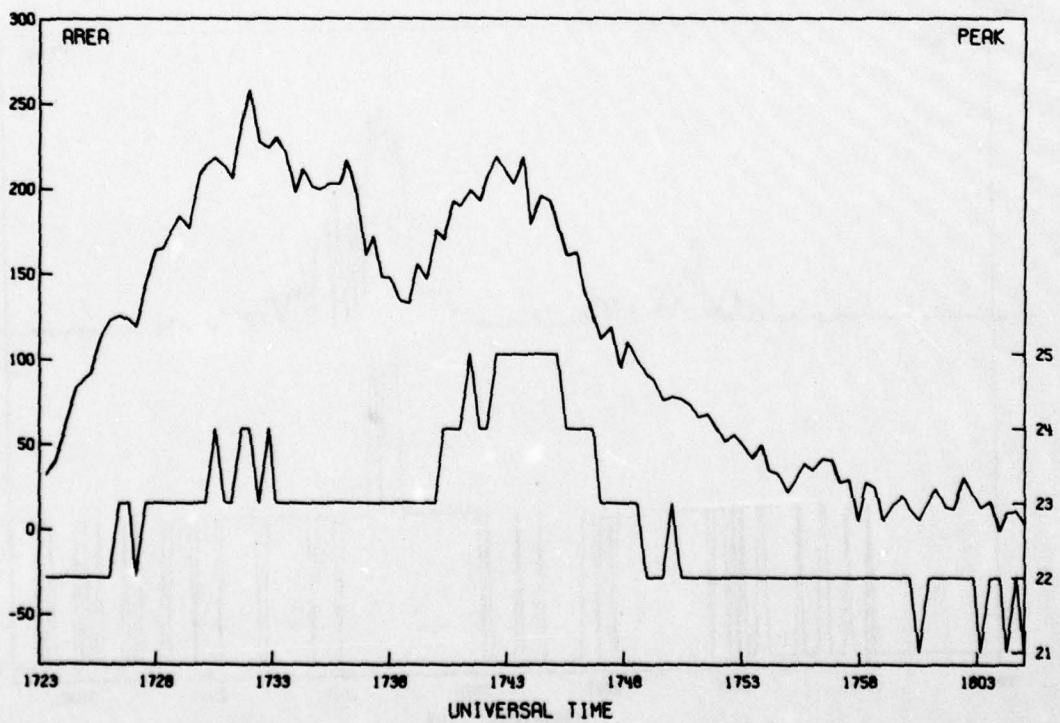
LA POSTA 05 APR 73 R067 -F FLARE BIN 23



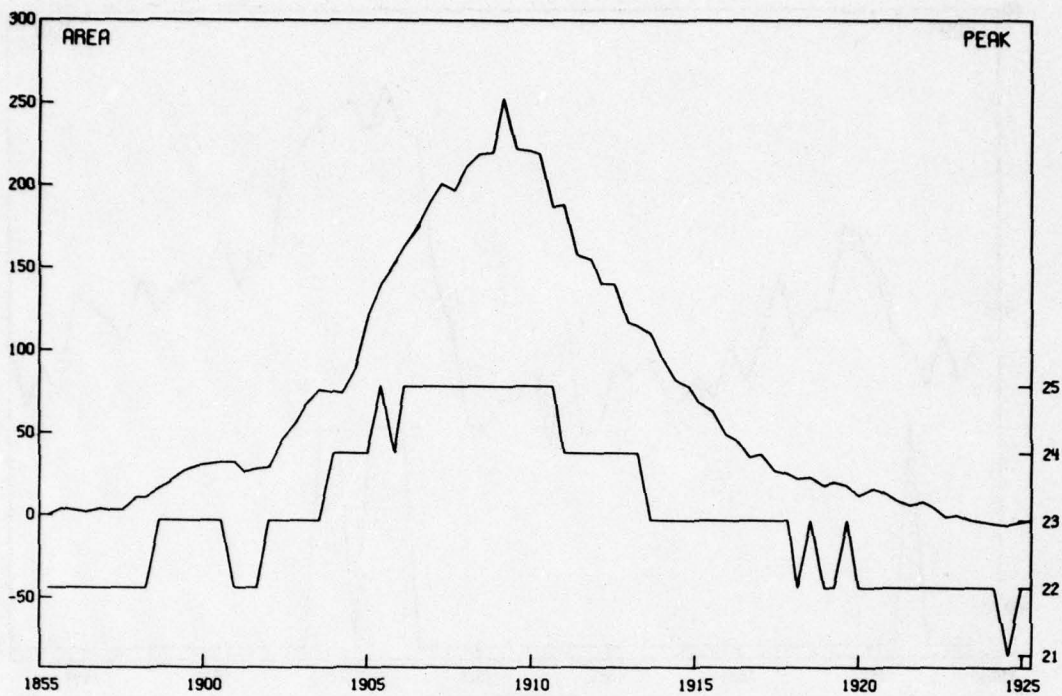
LA POSTA 05 APR 73 R067 -N FLARE BIN 23



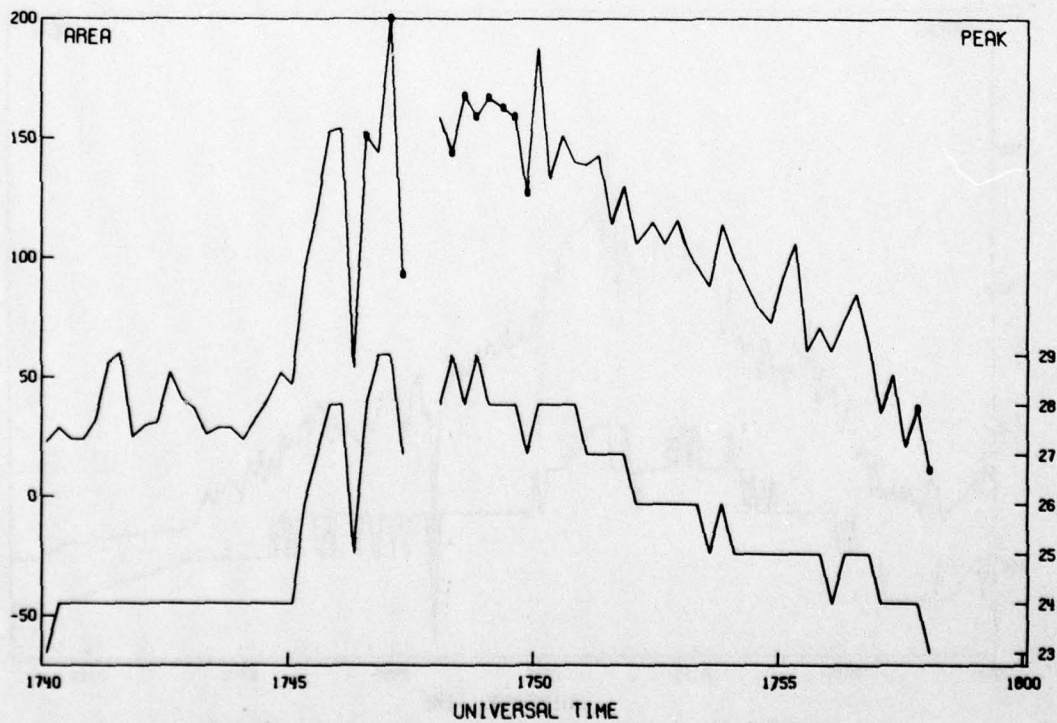
LA POSTA 06 APR 73 R071 -F FLARE BIN 22



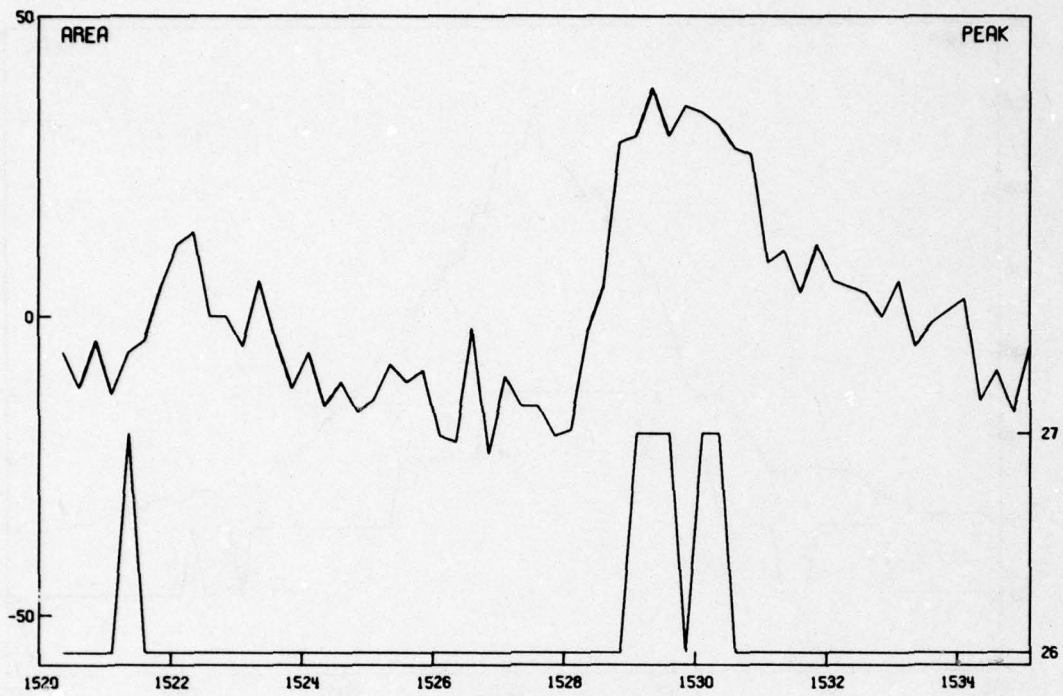
LA POSTA 07 APR 73 R078 -F -N FLARES BIN 21



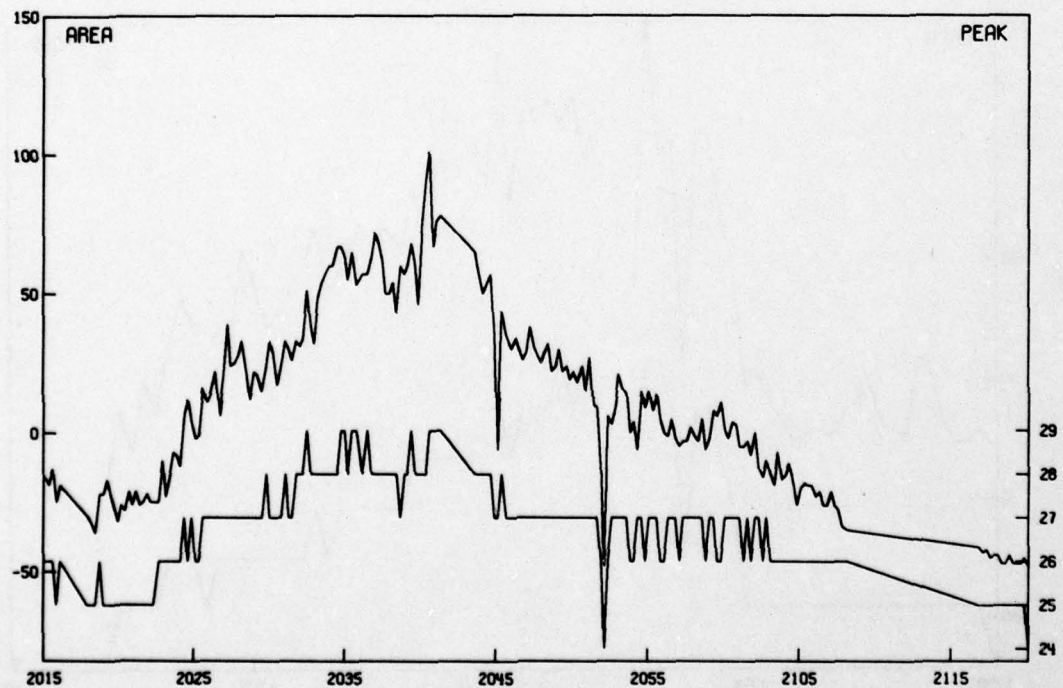
LA POSTA 07 APR 73 R078 -F FLARE BIN 22



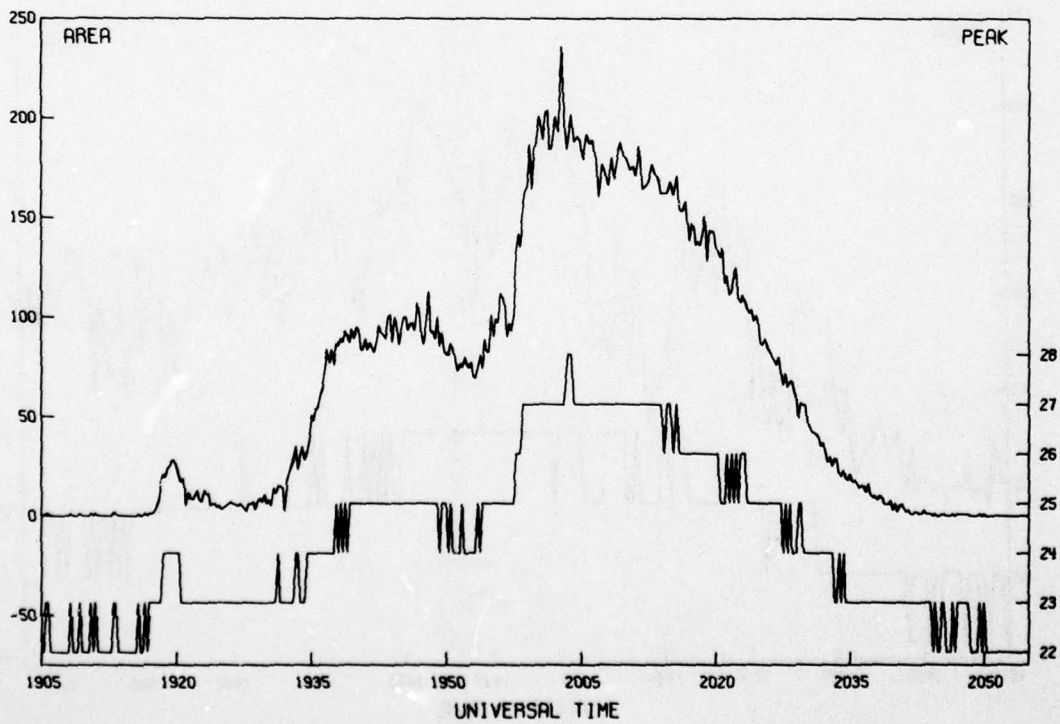
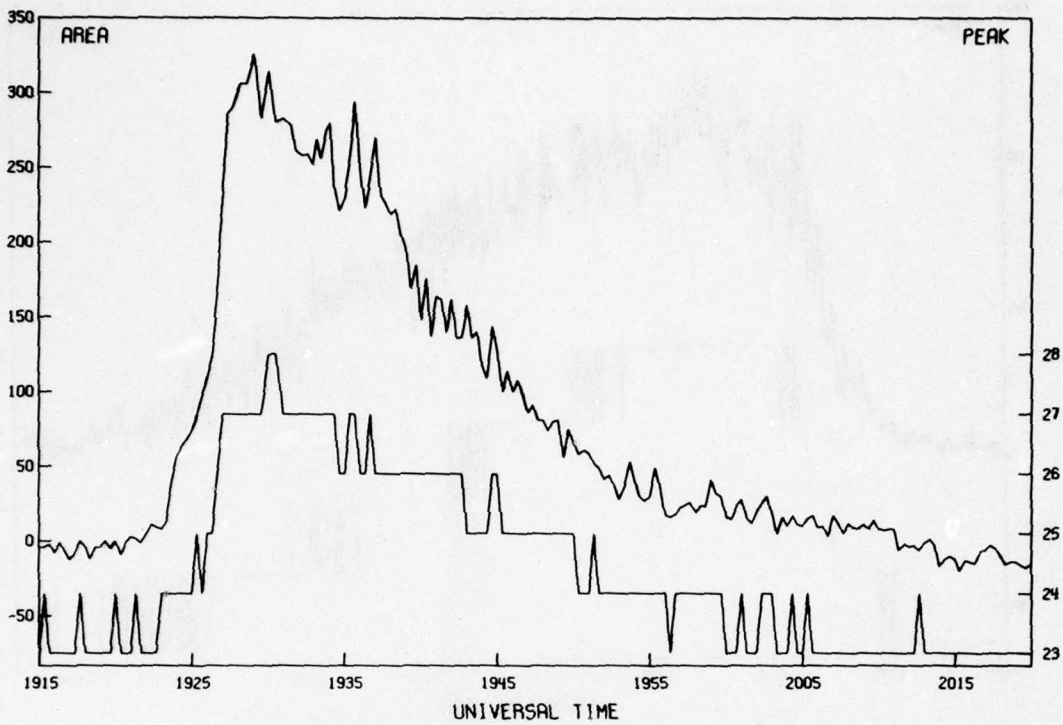
LA POSTA 09 APR 73 R077 -N FLARE BIN 23

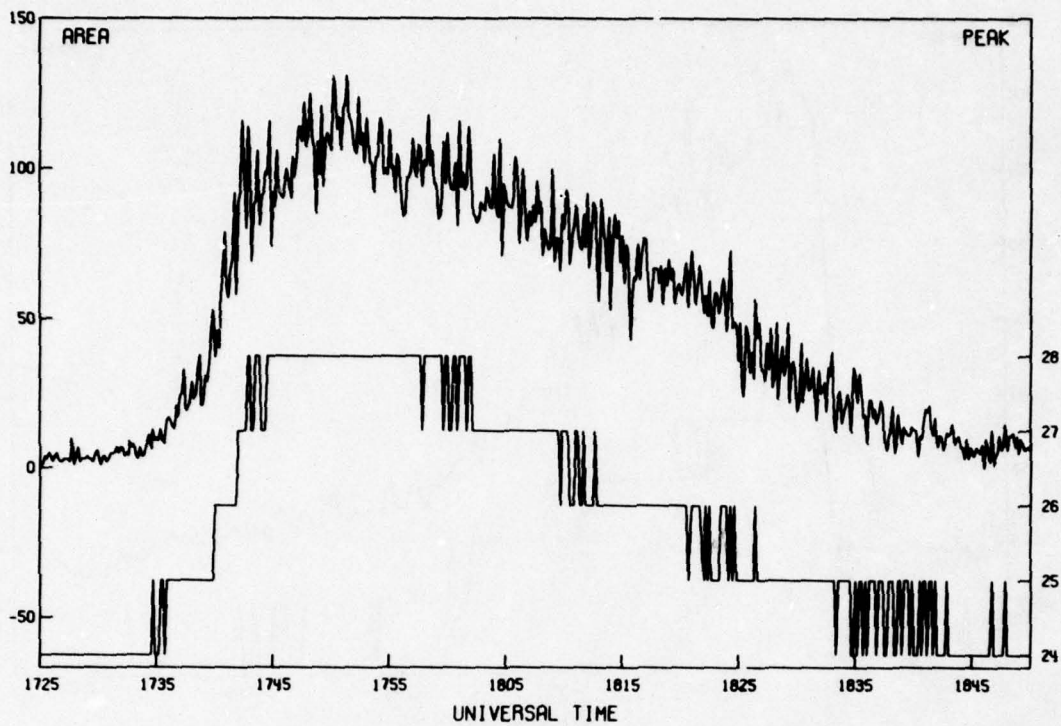


LA POSTA 11 APR 73 R077 -F FLARE BIN 25

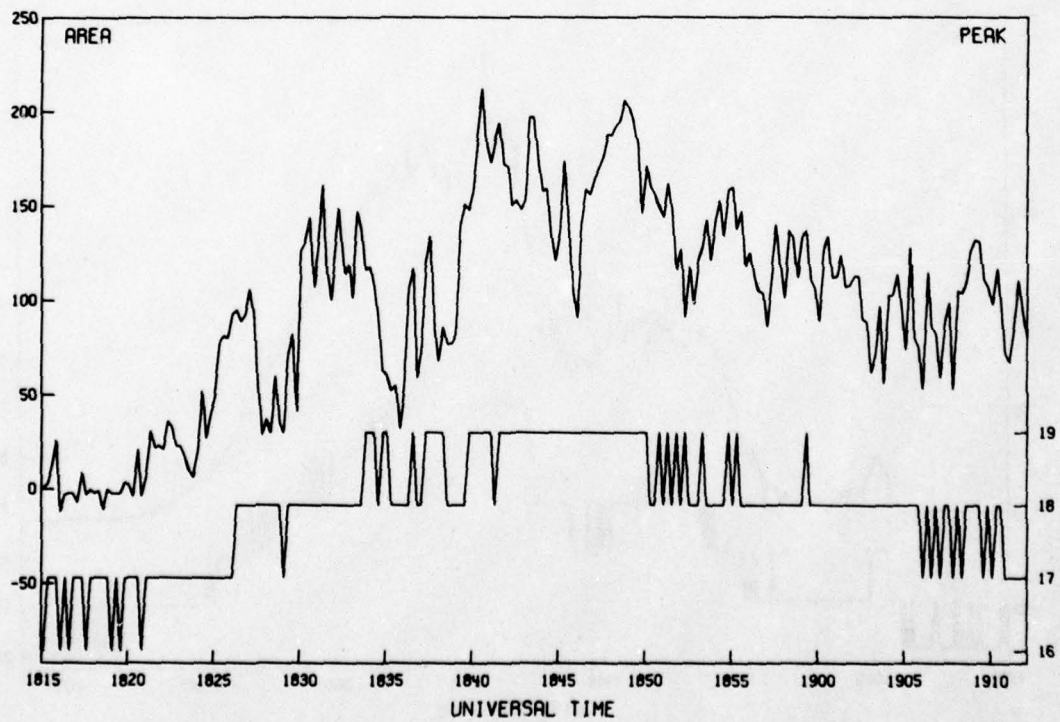


LA POSTA 11 APR 73 R077 1B FLARE BIN 25

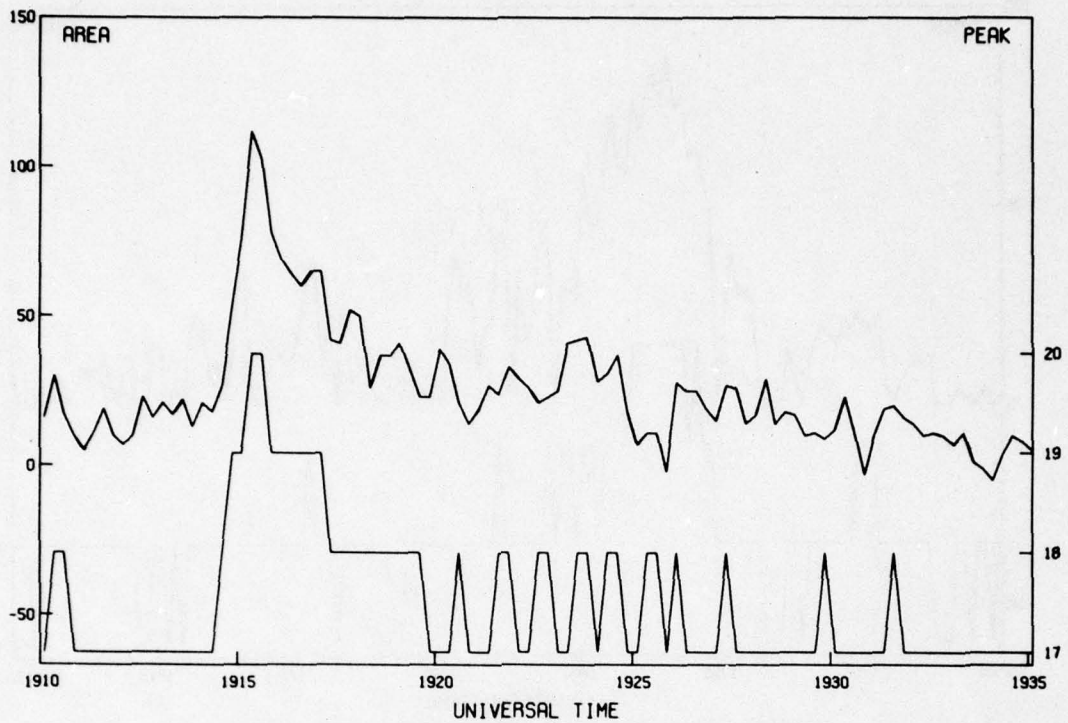




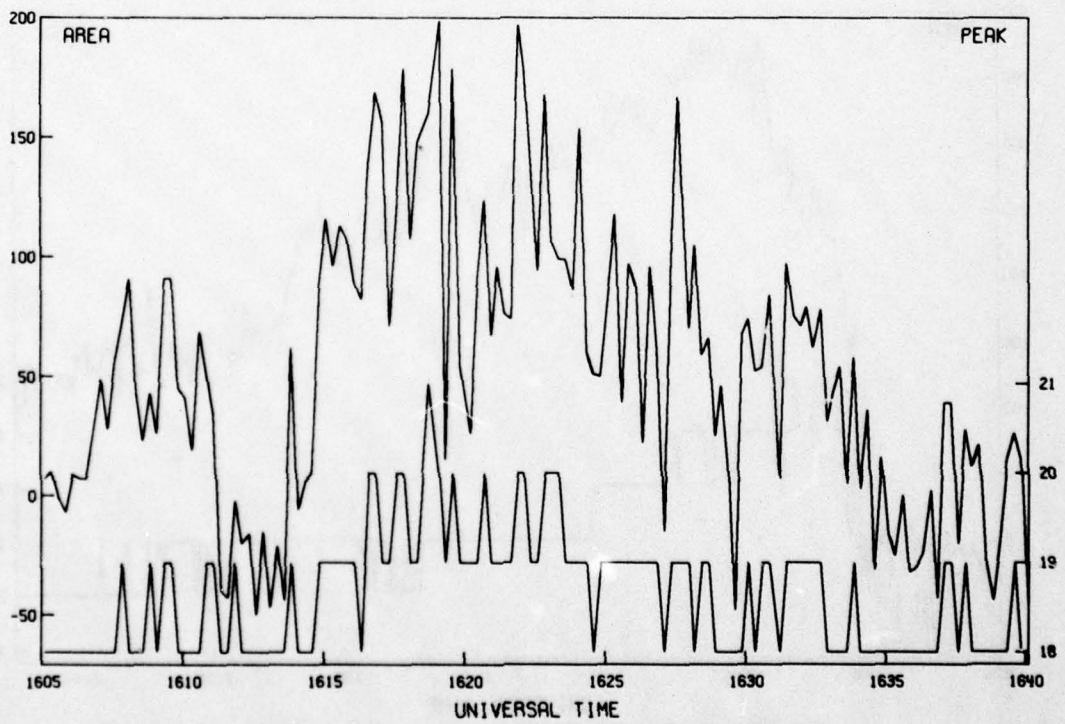
LA POSTA 28 APR 73 R085 -F FLARE BIN 24



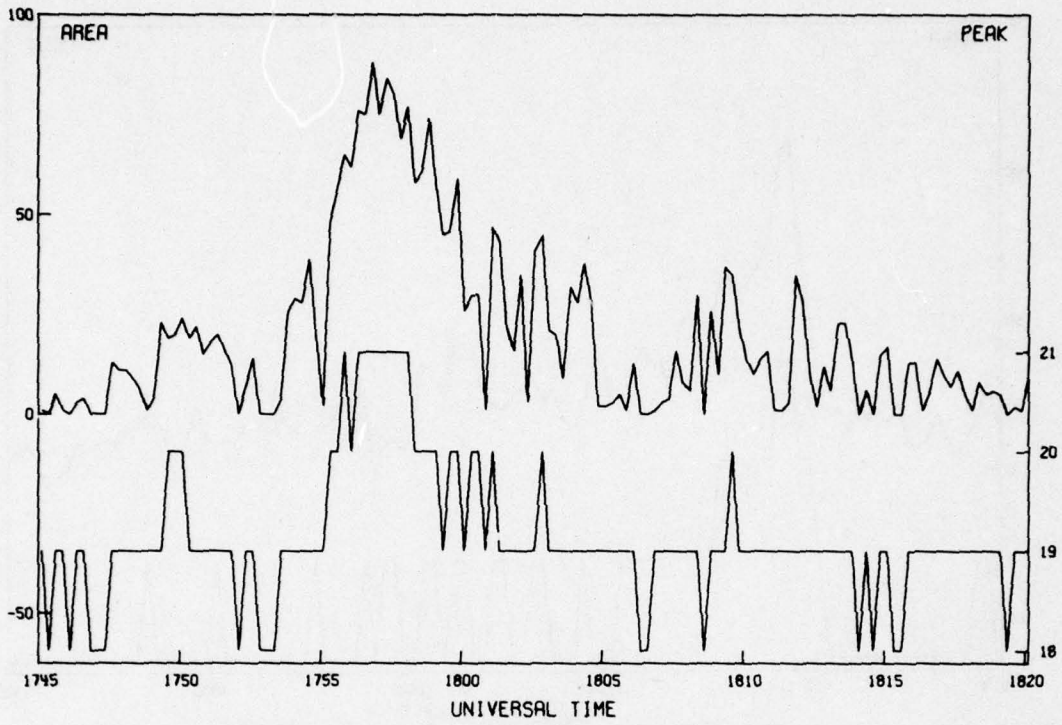
LA POSTA 01 MAY 73 R092 -F FLARE BIN 16



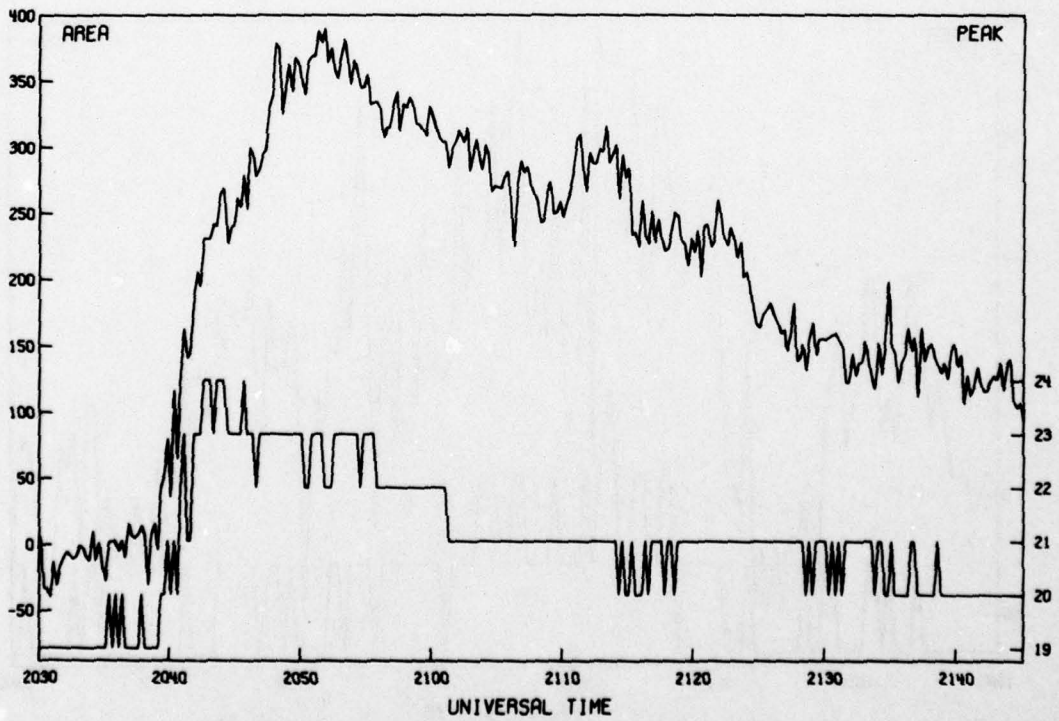
LA POSTA 01 MAY 73 R092 -F FLARE BIN 17



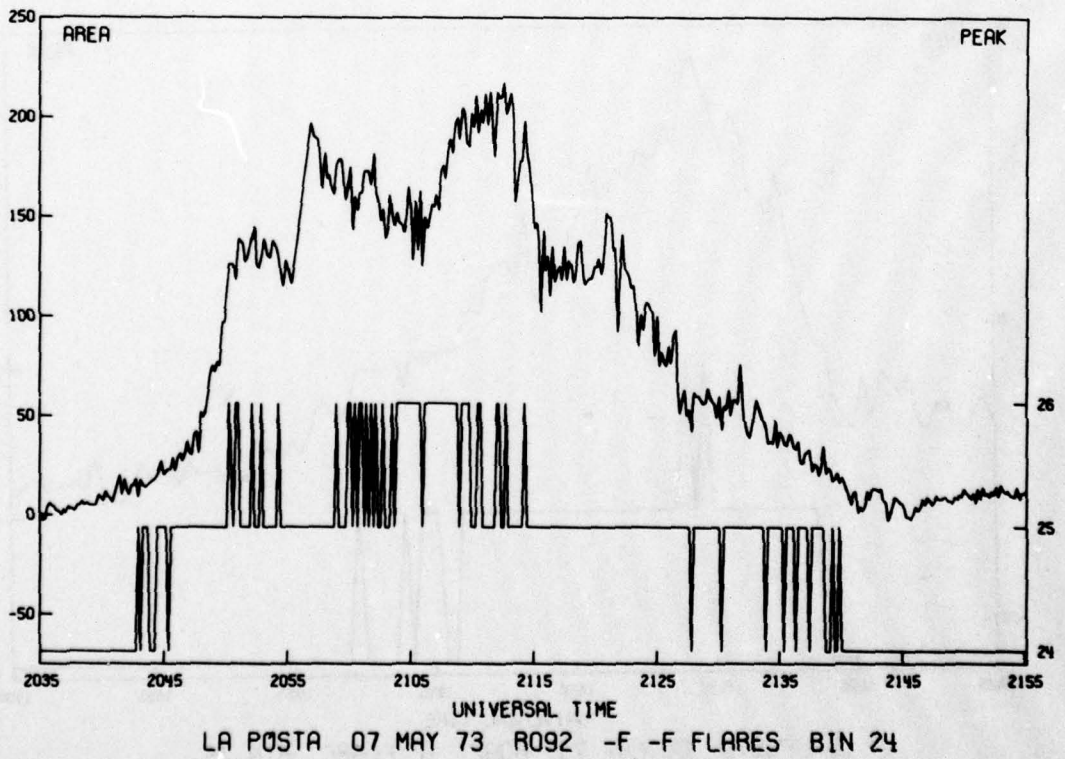
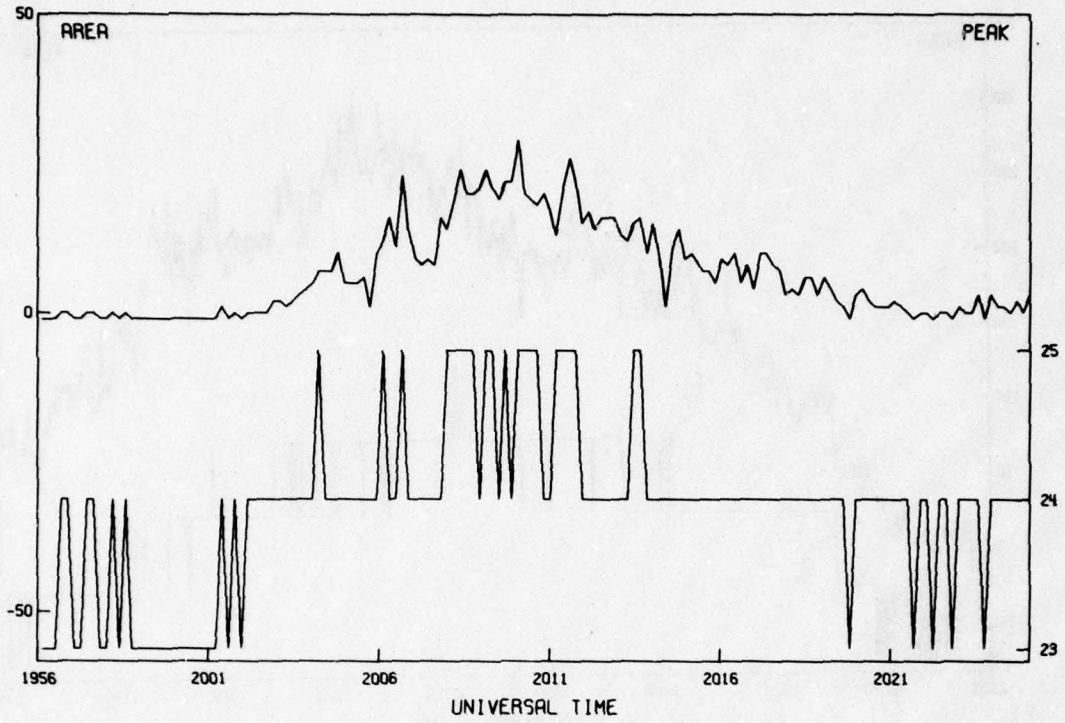
LA POSTA 02 MAY 73 R092 -F FLARE BIN 18

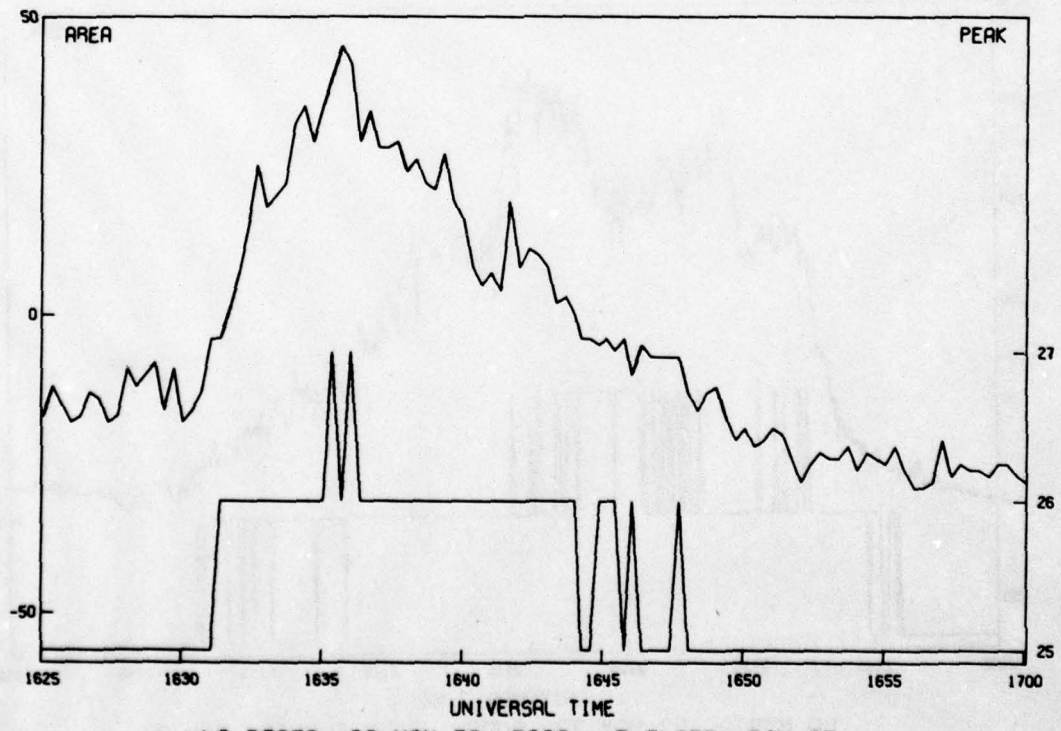
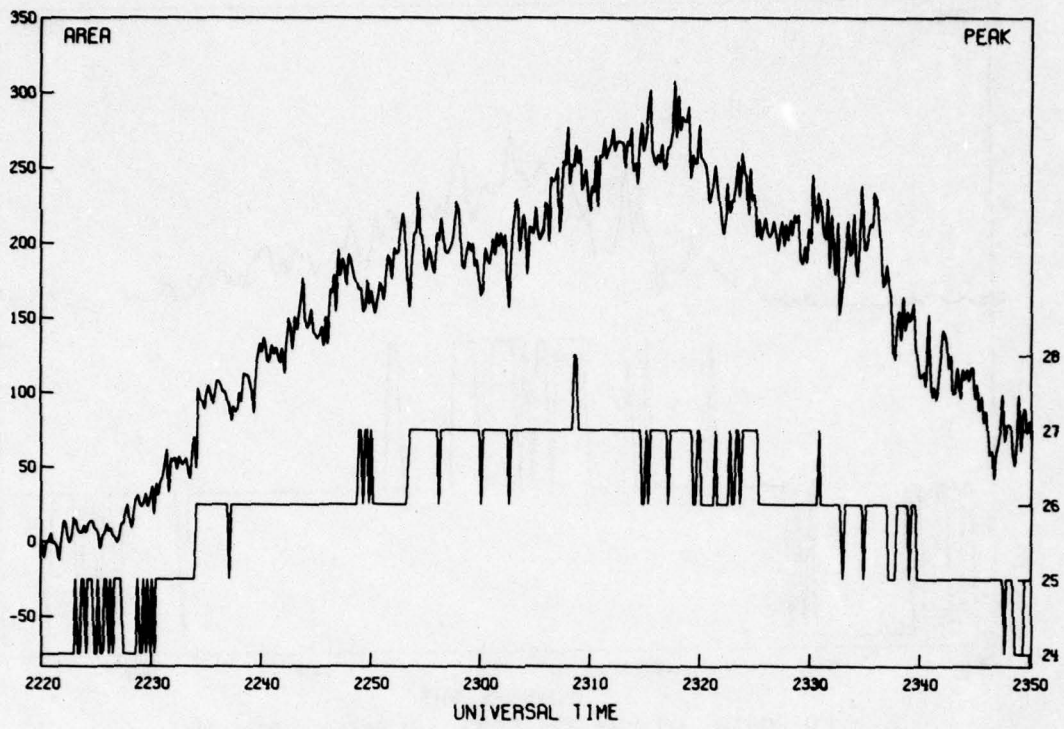


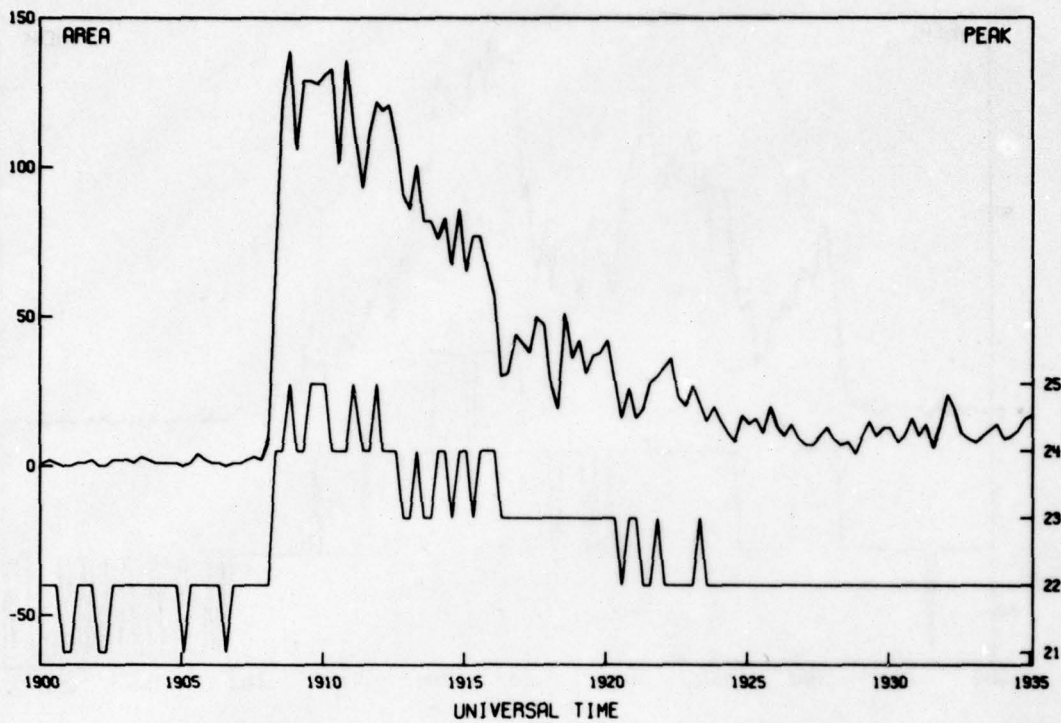
LA POSTA 02 MAY 73 R092 -N FLARE BIN 19



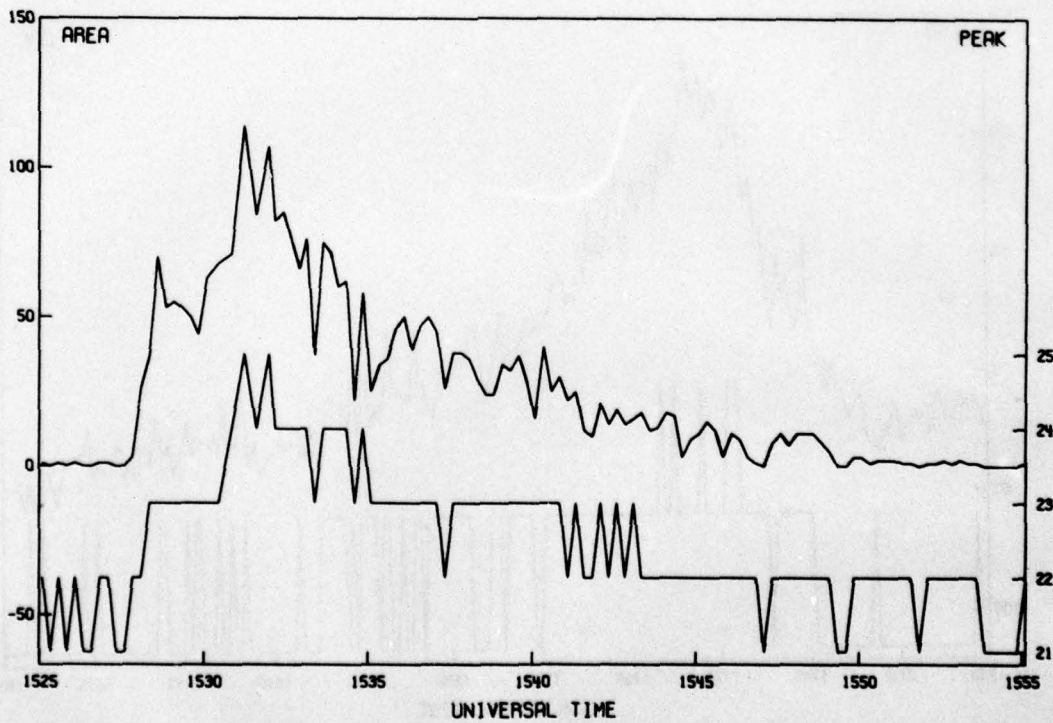
LA POSTA 02 MAY 73 R092 -B FLARE BIN 19



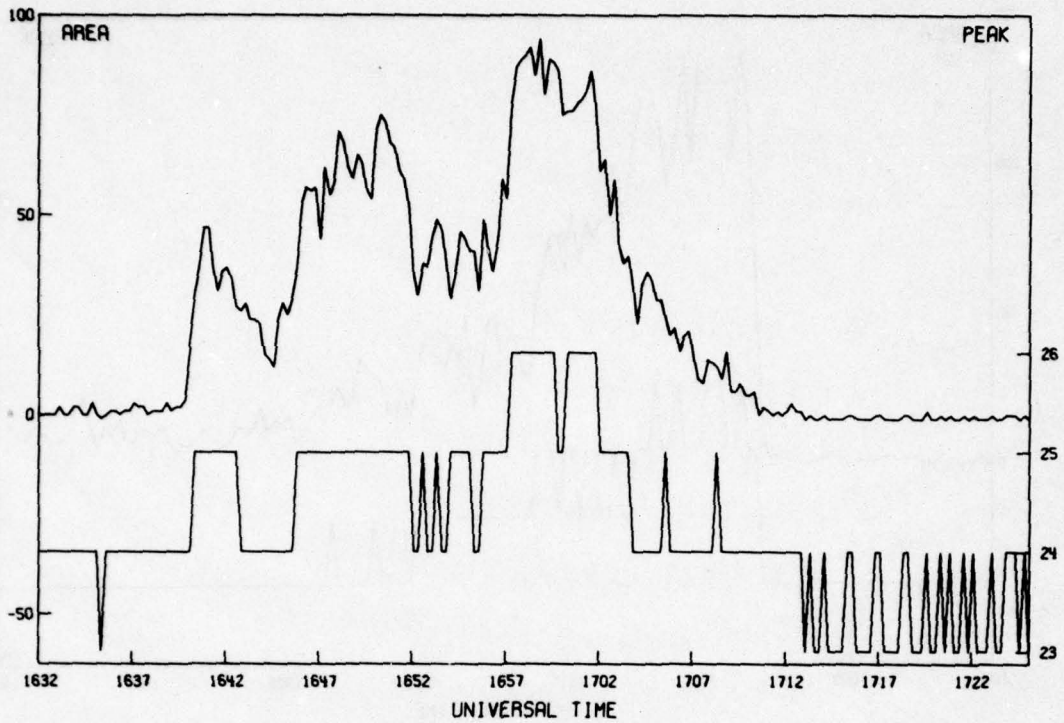




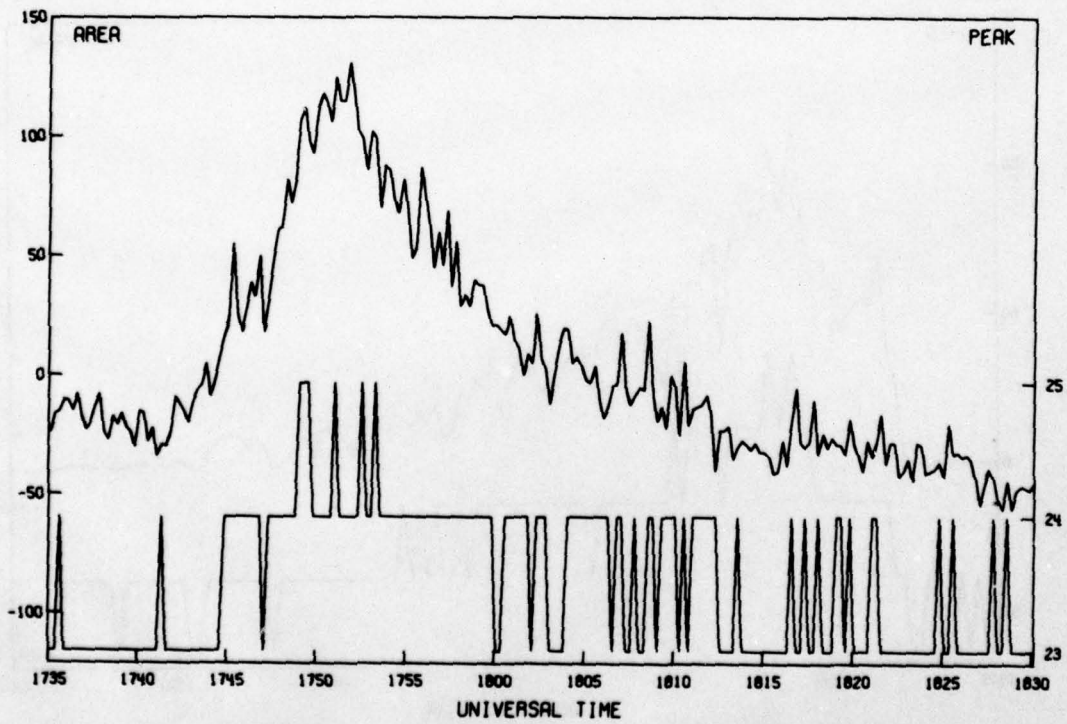
LA POSTA 17 MAY 73 R103 1B FLARE BIN 22



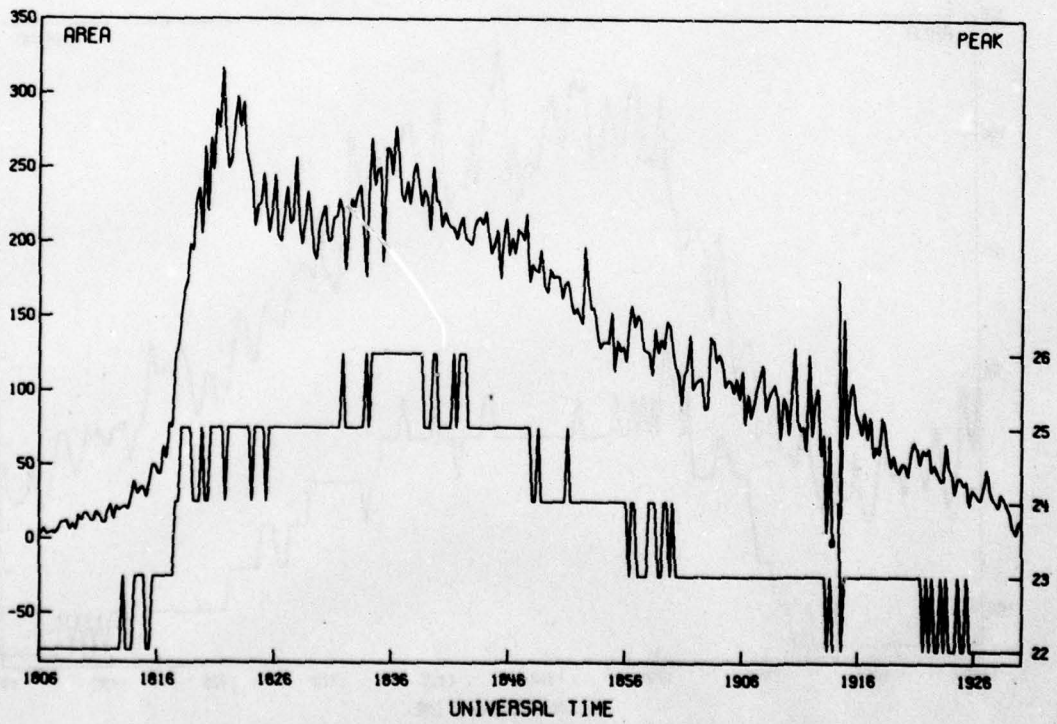
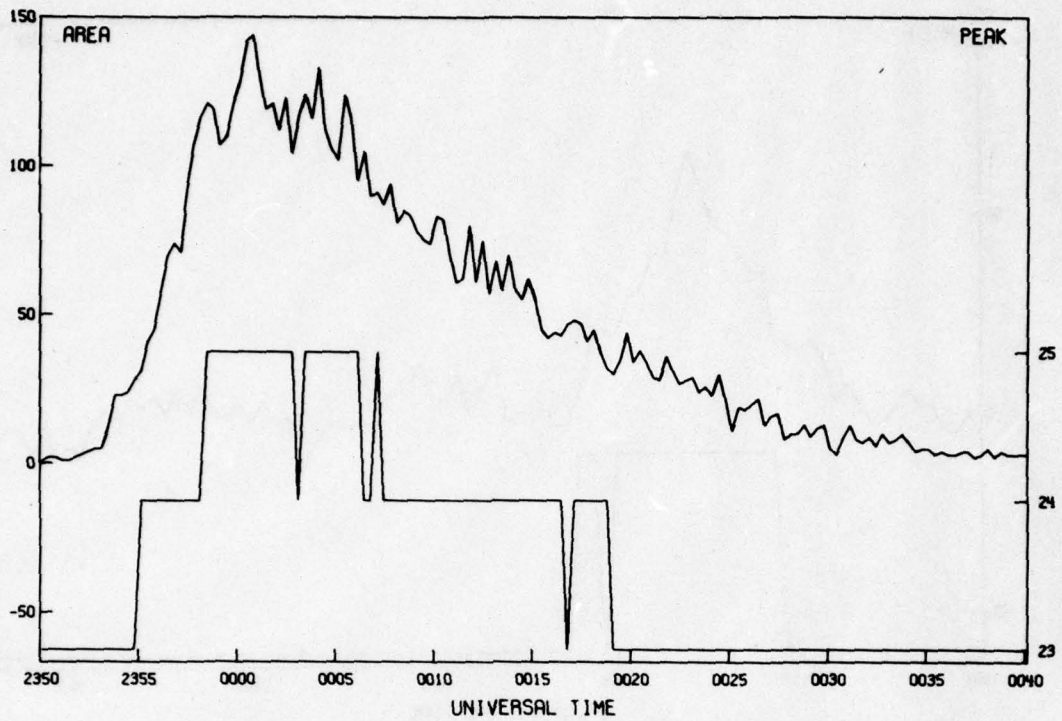
LA POSTA 18 MAY 73 R103 1B FLARE BIN 22

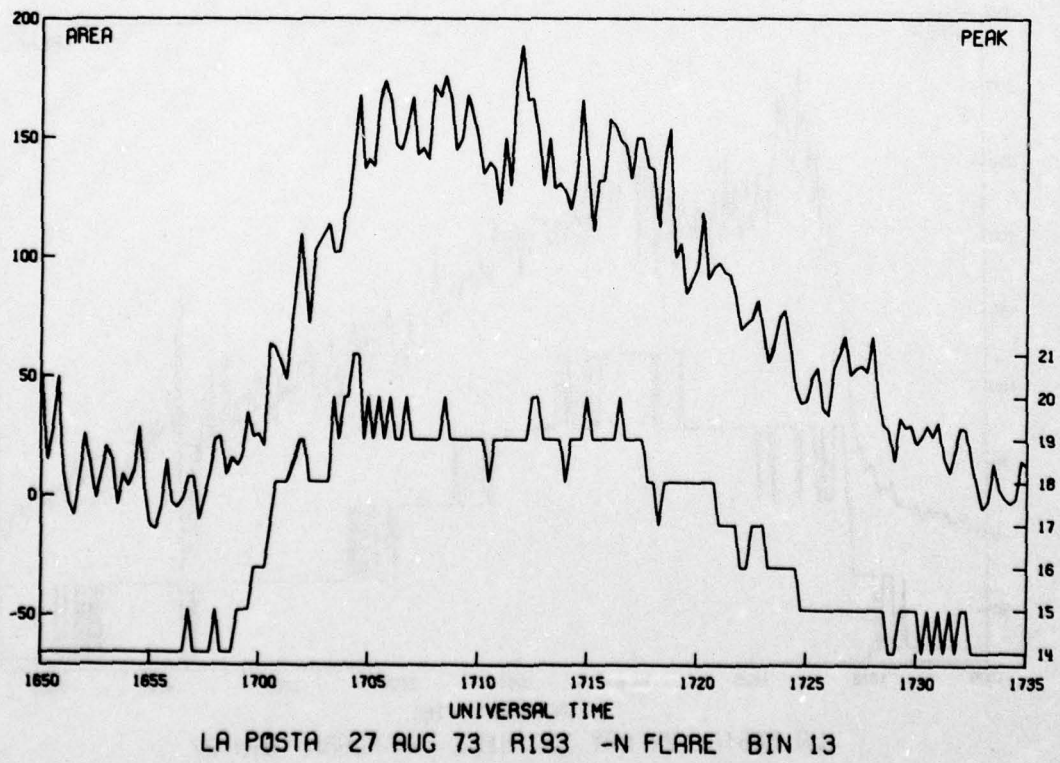
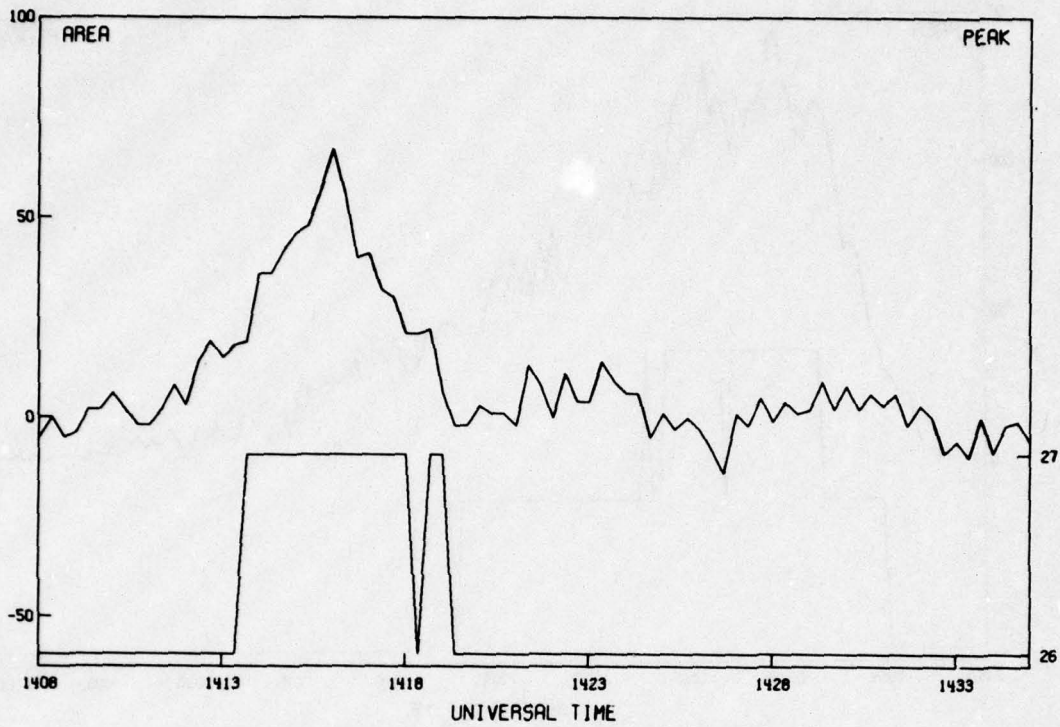


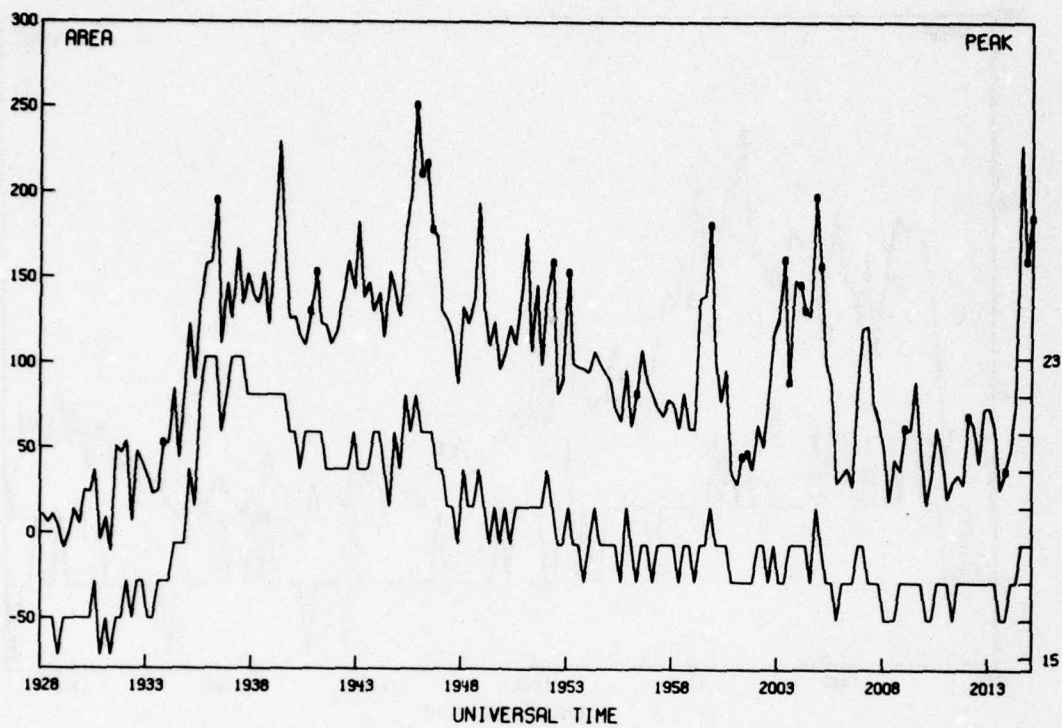
LA POSTA 21 MAY 73 R103 -N FLARE BIN 24



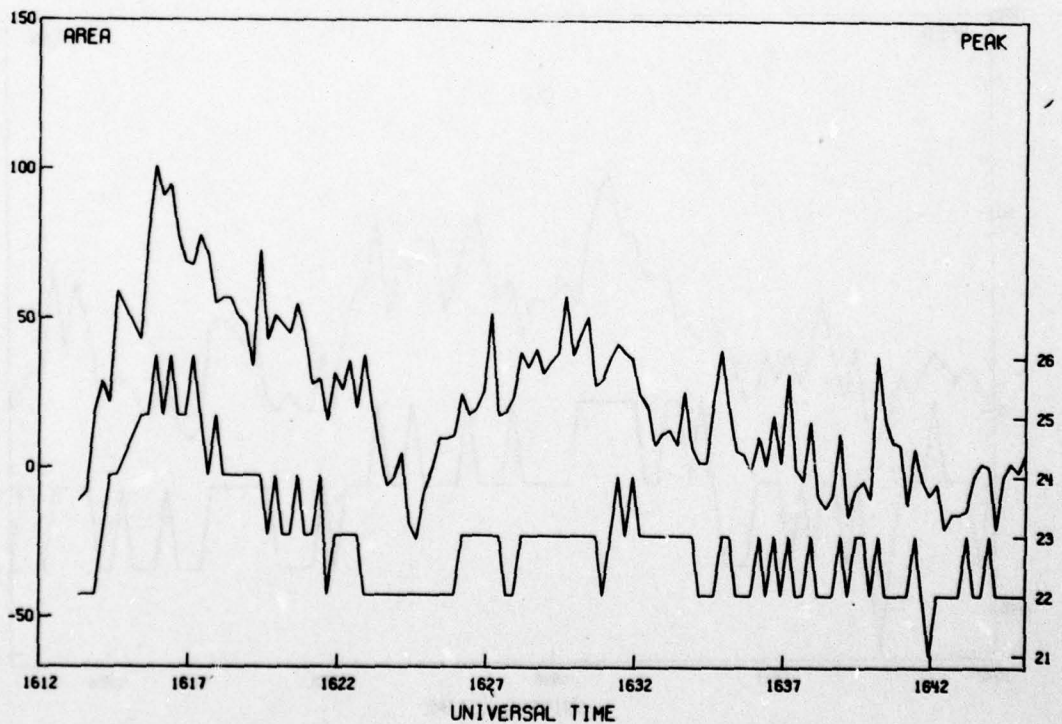
LA POSTA 21 MAY 73 R103 -F FLARE BIN 23



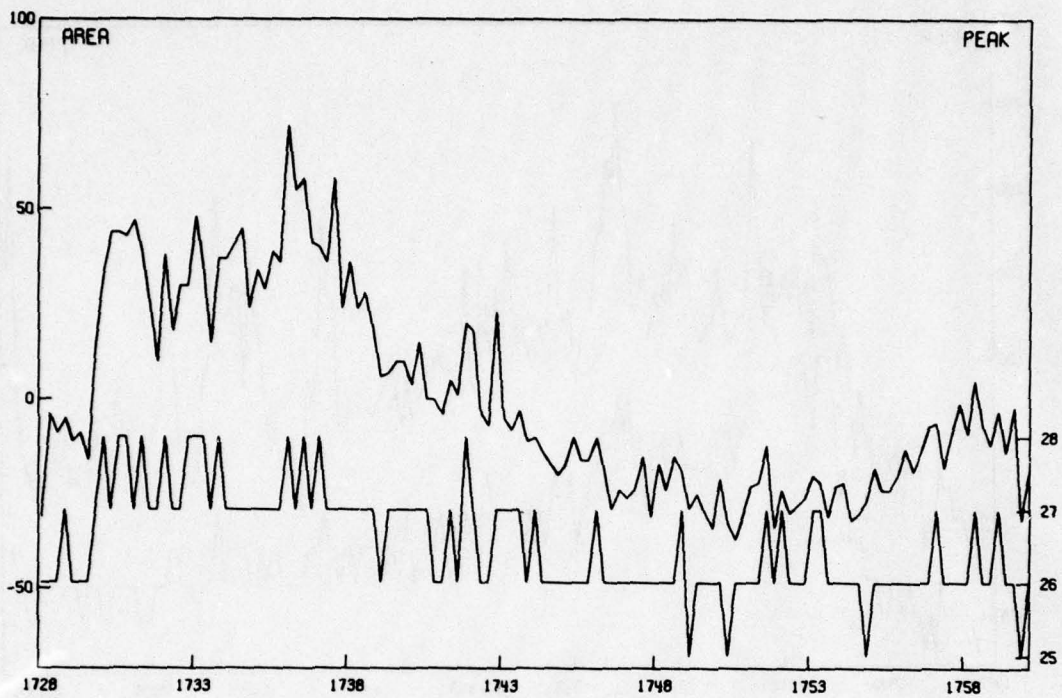




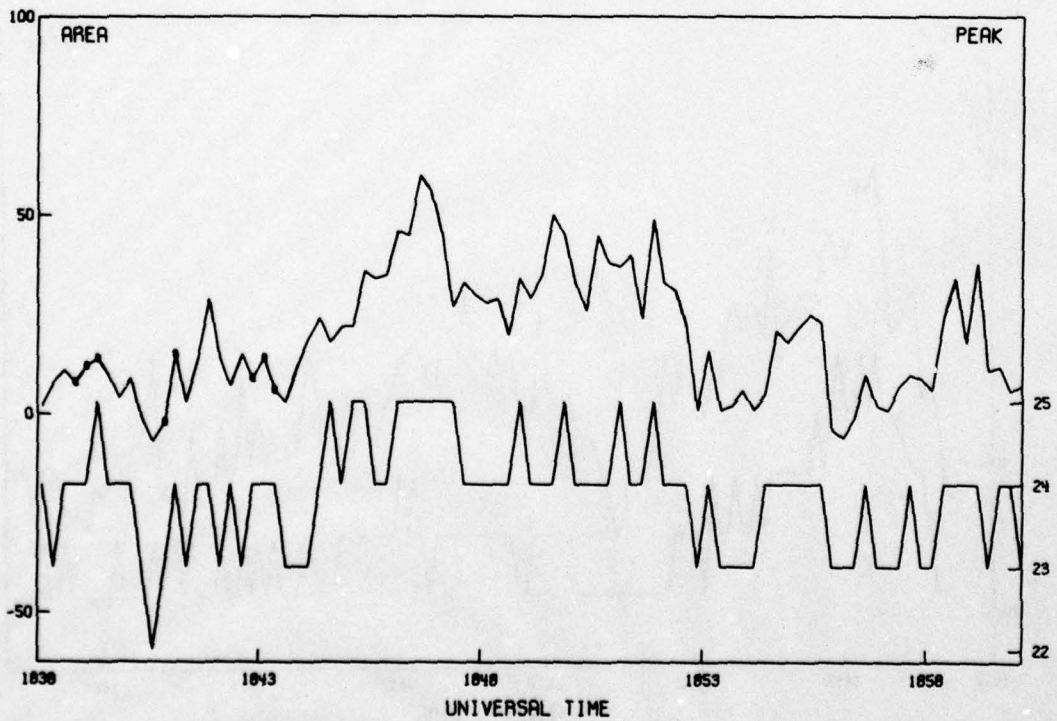
LA POSTA 30 AUG 73 R209 -N FLARE BIN 14



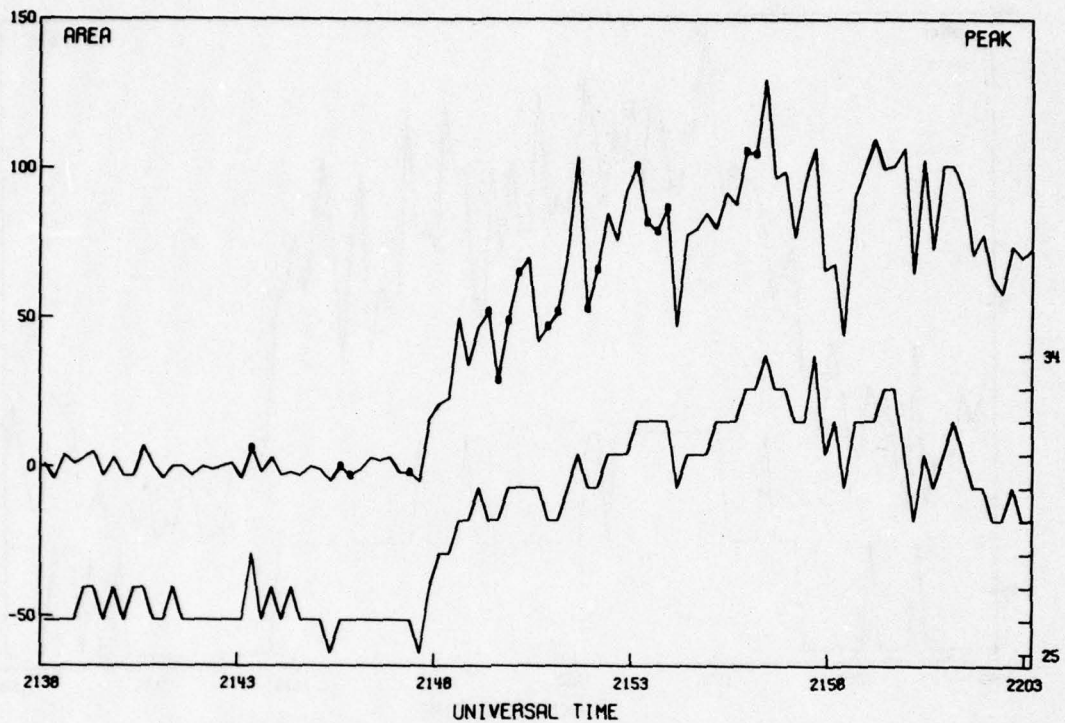
LA POSTA 31 AUG 73 R209 -F FLARE BIN 21



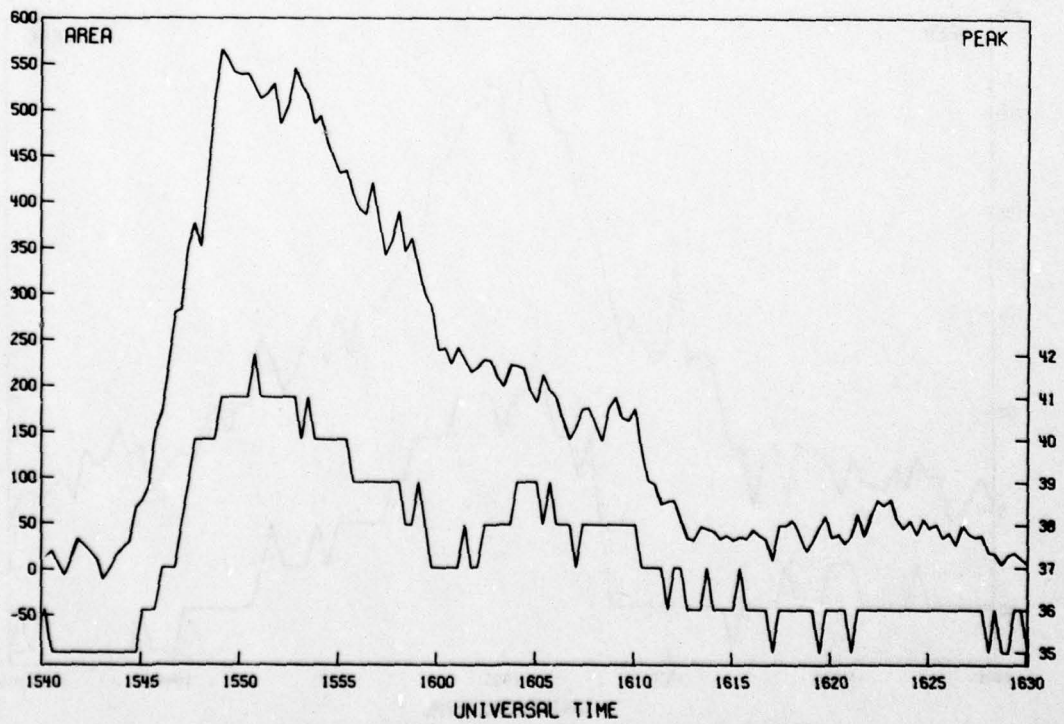
LA POSTA 31 AUG 73 R203 -F FLARE BIN 25



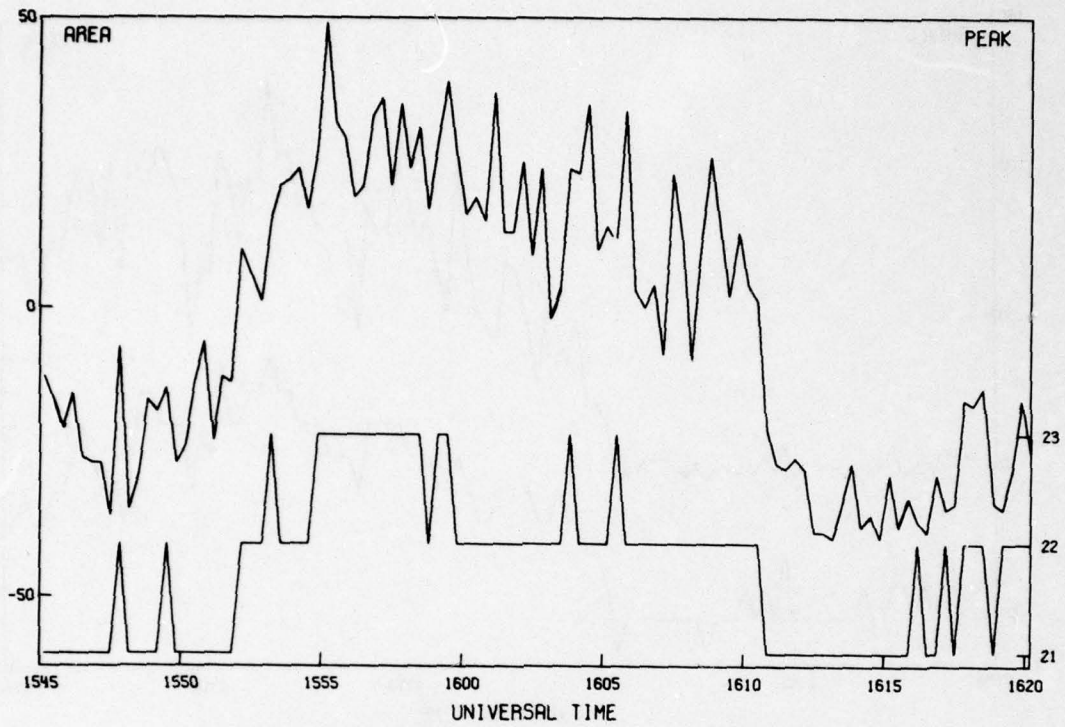
LA POSTA 31 AUG 73 R208 U FLARE BIN 22



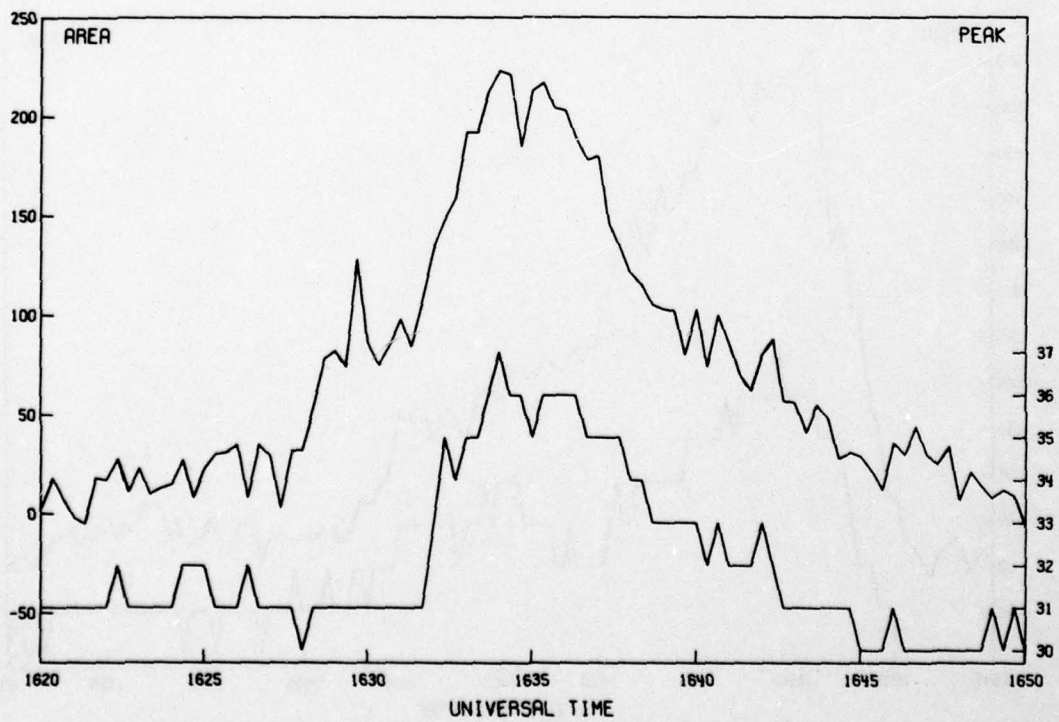
LA POSTA 31 AUG 73 R203 -F FLARE BIN 26



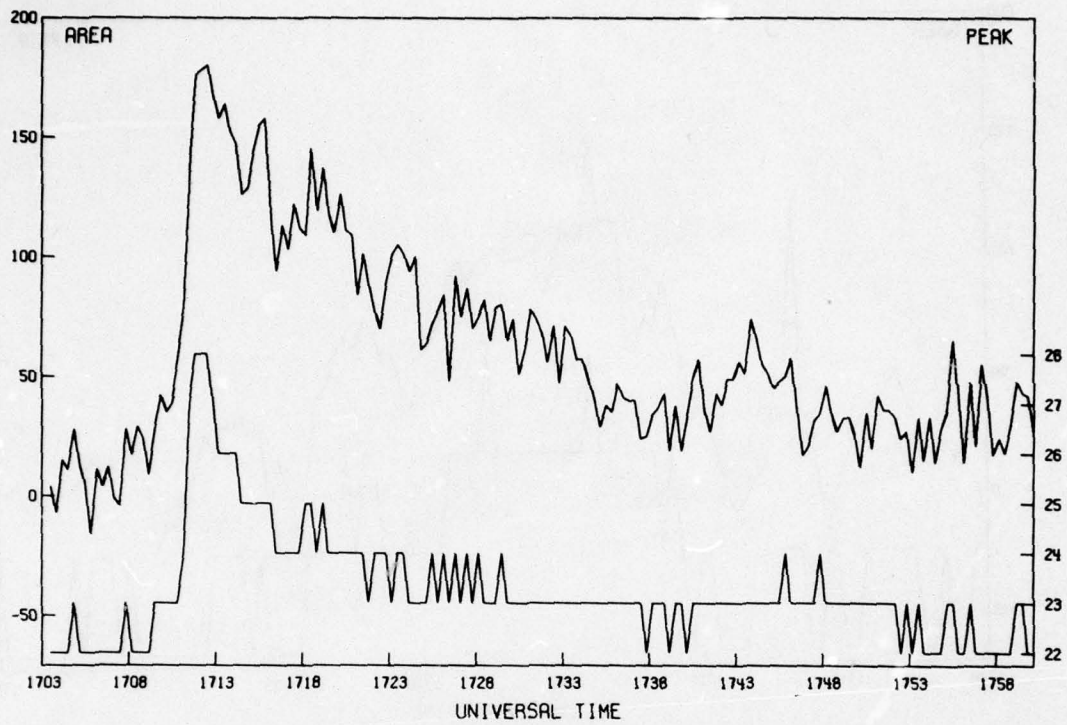
LA POSTA 04 SEP 73 R209 -N FLARE BIN 33



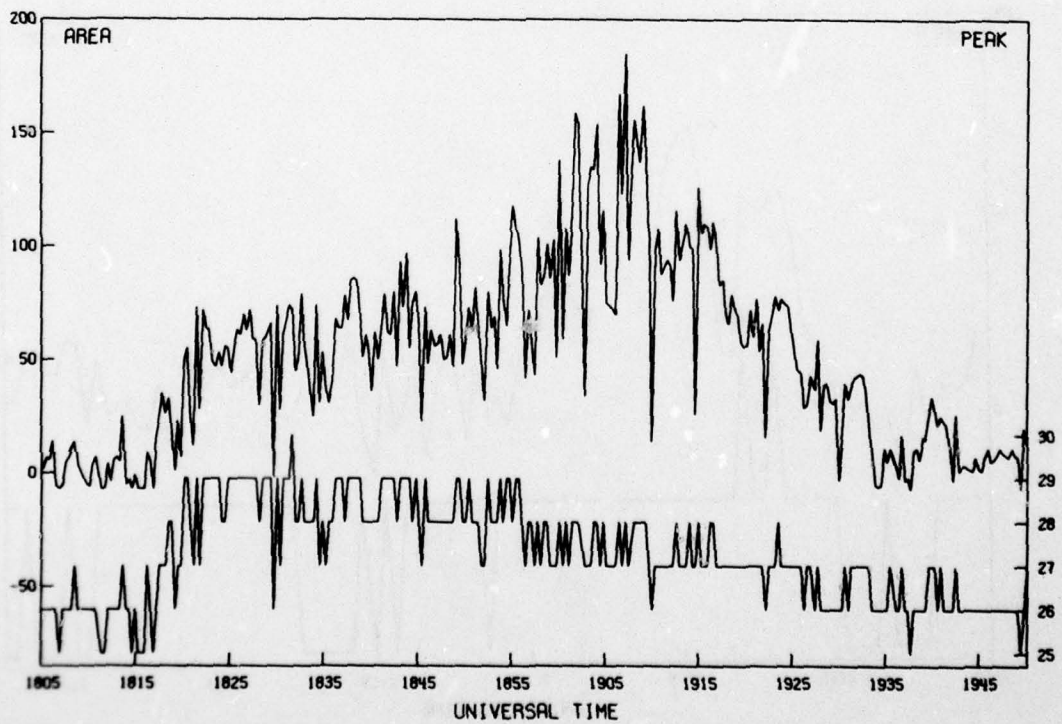
LA POSTA 04 SEP 73 R219 U FLARE BIN 20



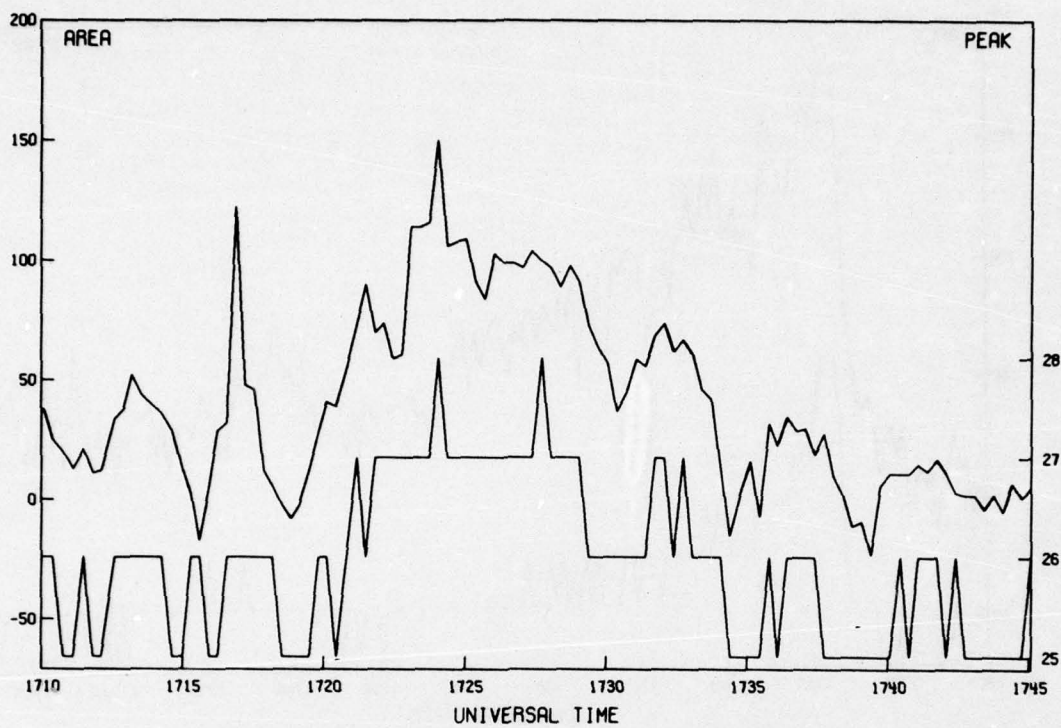
LA POSTA 04 SEP 73 R212 -N FLARE BIN 26



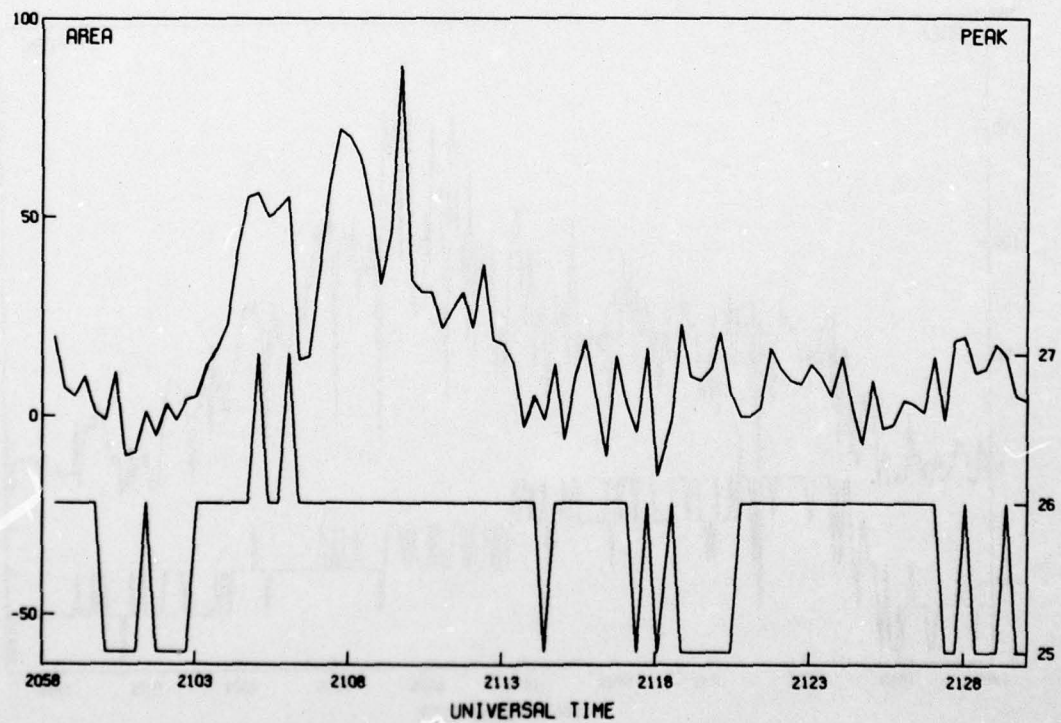
LA POSTA 04 SEP 73 R219 -F FLARE BIN 20



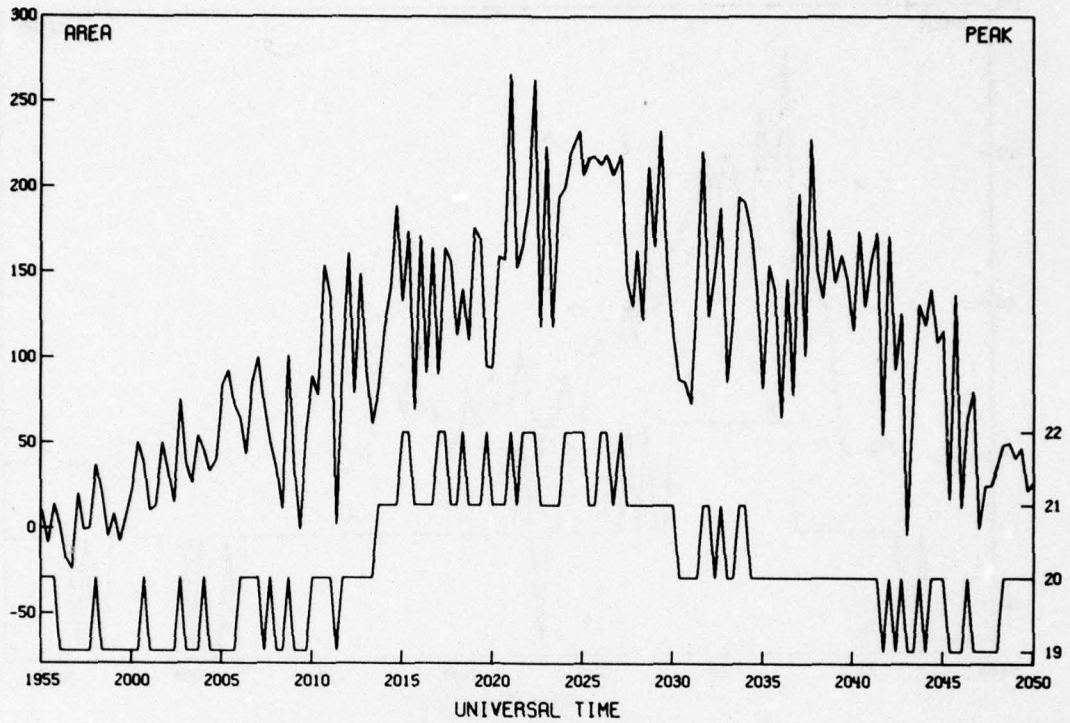
LA POSTA 06 SEP 73 R215 -B FLARE BIN 26



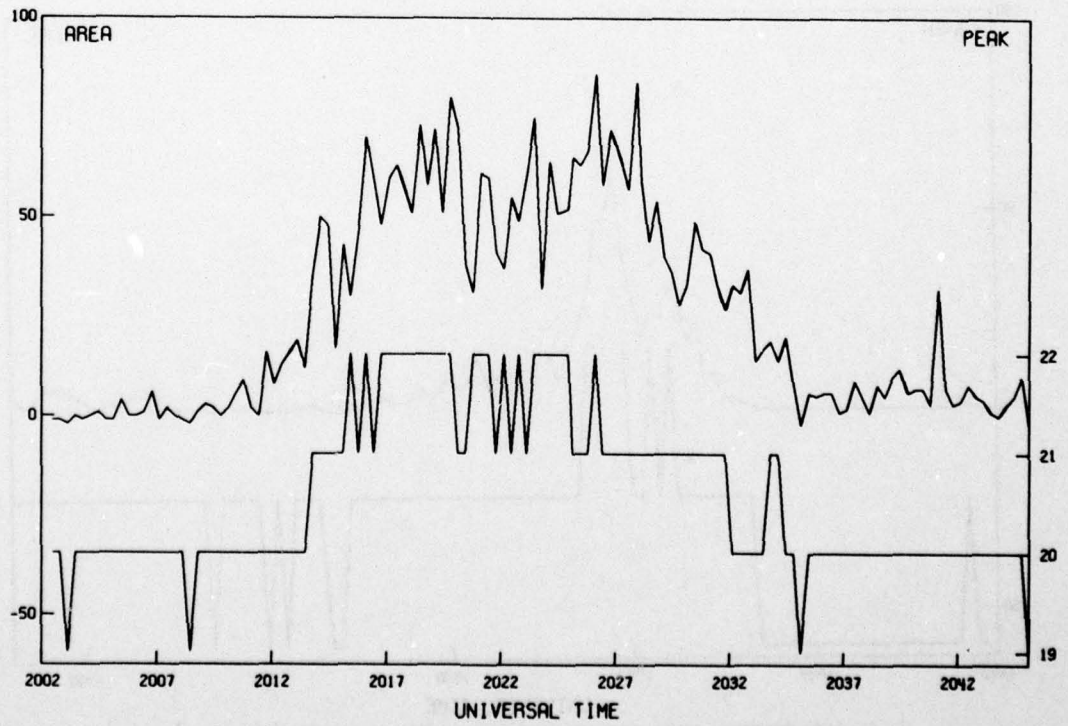
LA POSTA 07 SEP 73 R219 -F FLARE BIN 25



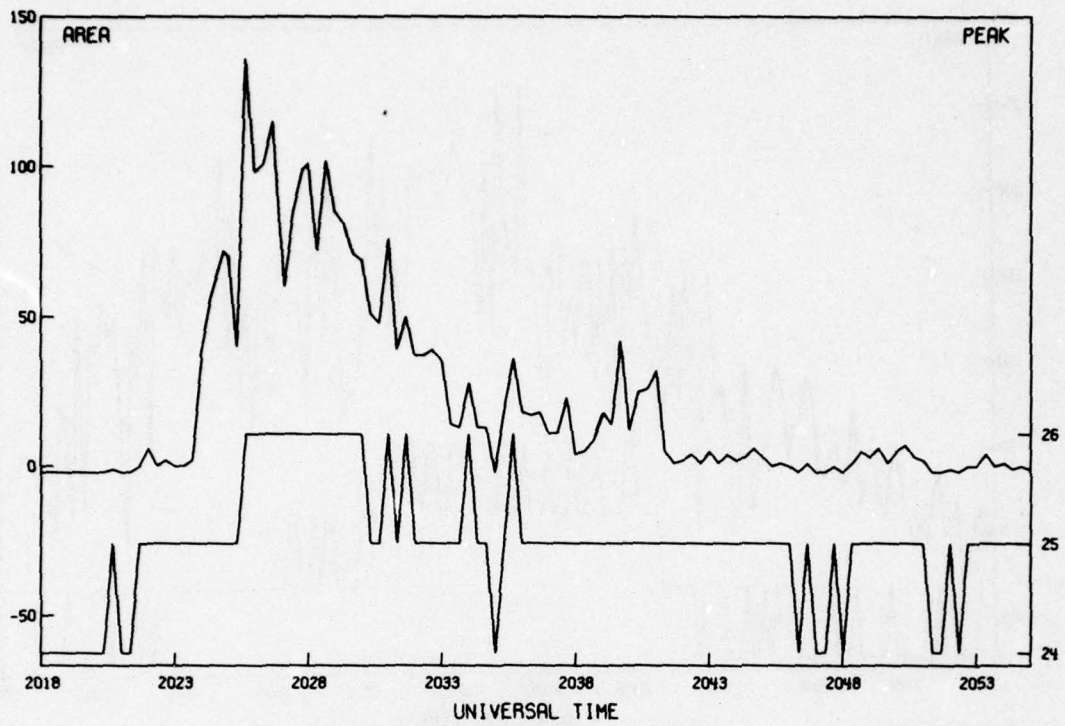
LA POSTA 07 SEP 73 R219 -F FLARE BIN 25



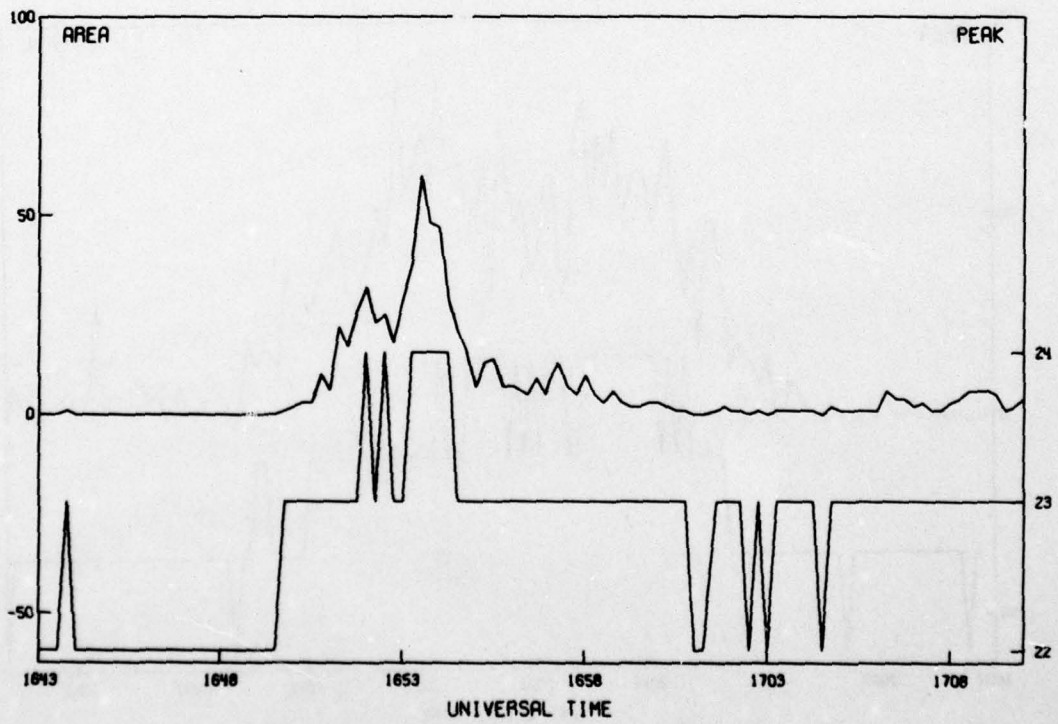
LA POSTA 10 SEP 73 R224 -F FLARE BIN 19



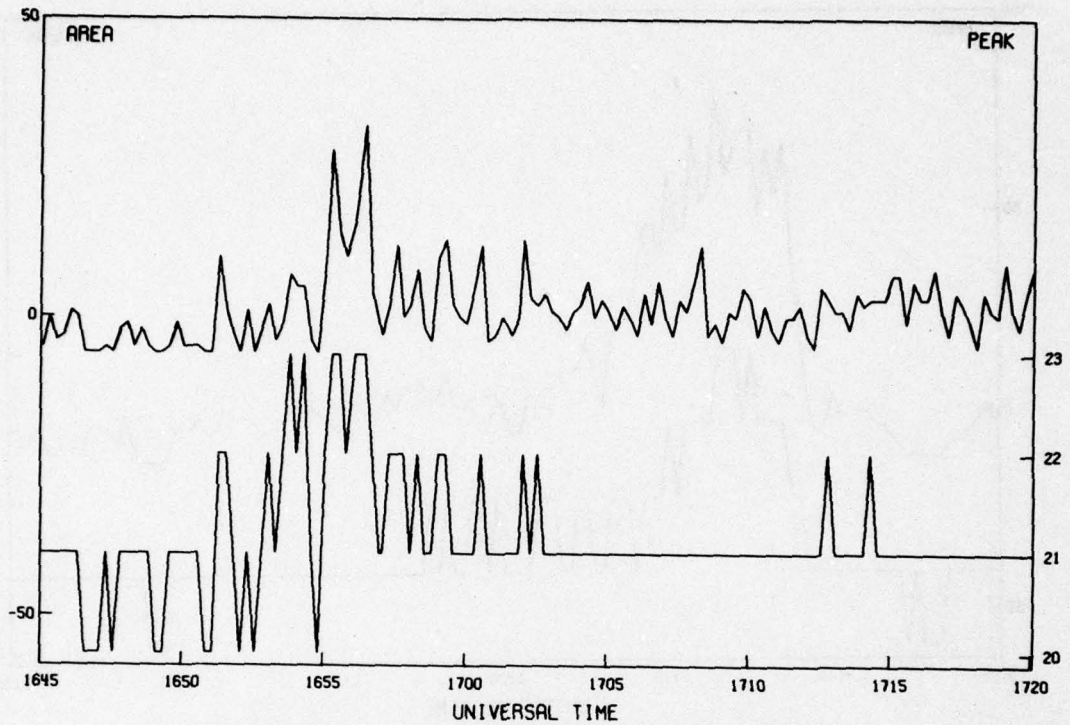
LA POSTA 10 SEP 73 R215 U FLARE BIN 20



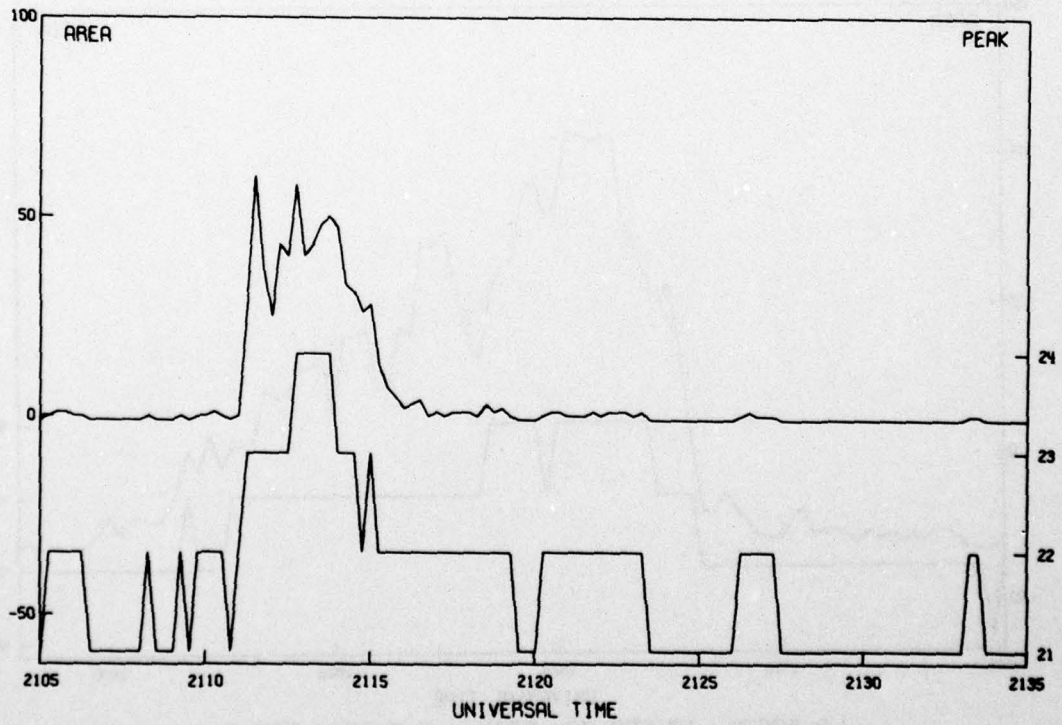
LA POSTA 10 SEP 73 R219 -F FLARE BIN 25



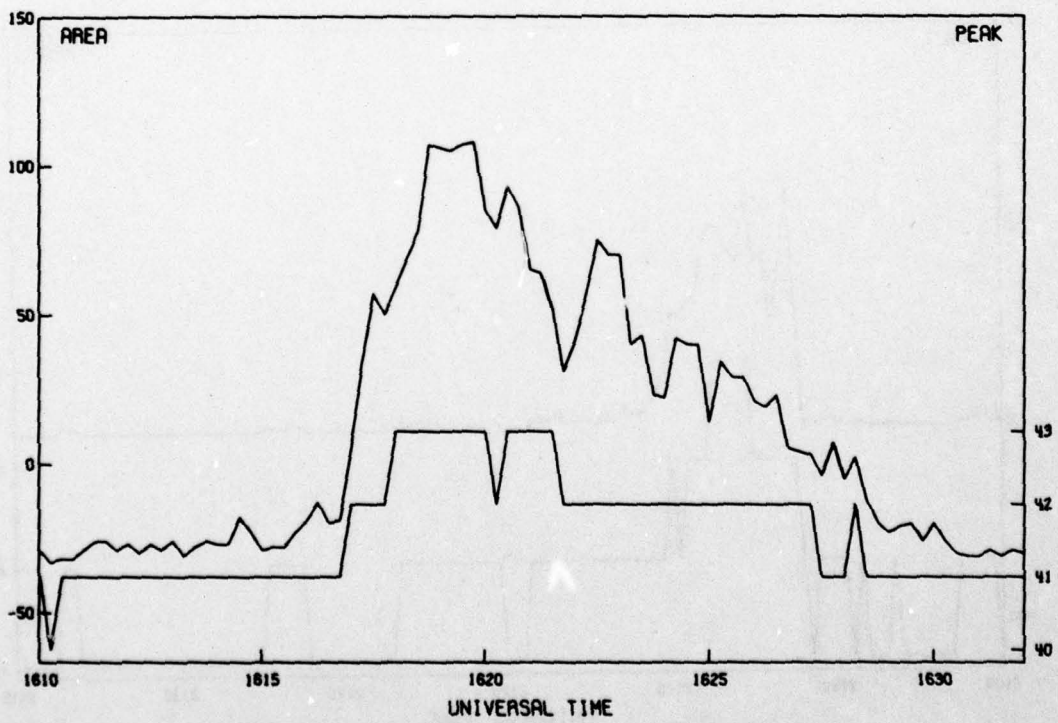
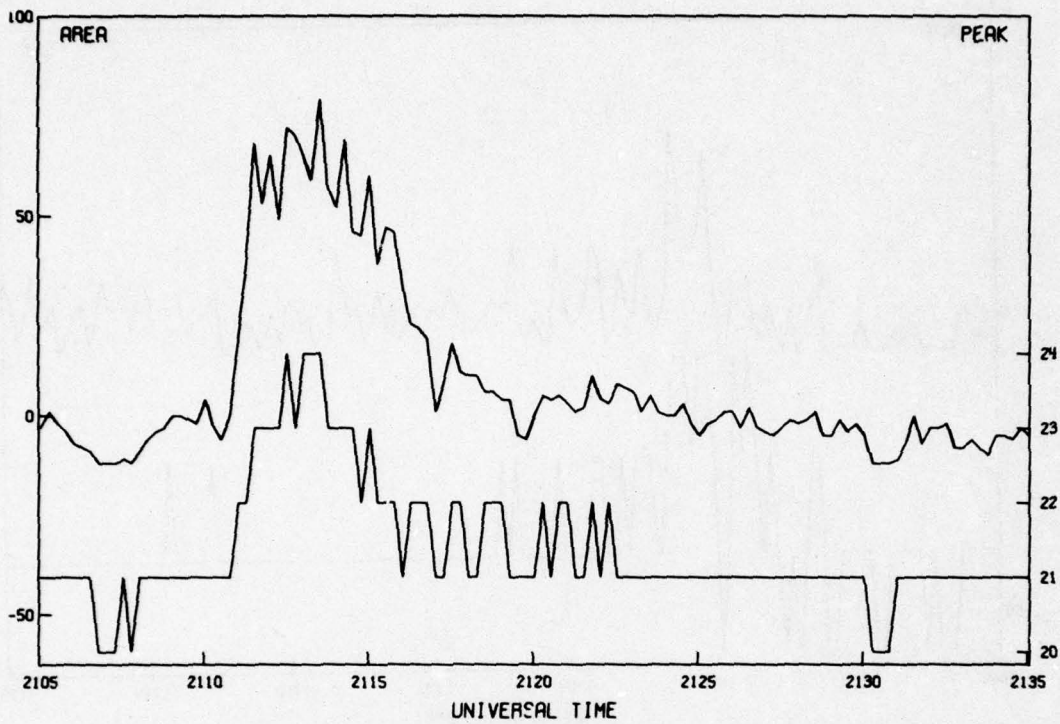
LA POSTA 11 SEP 73 R224 U FLARE BIN 23

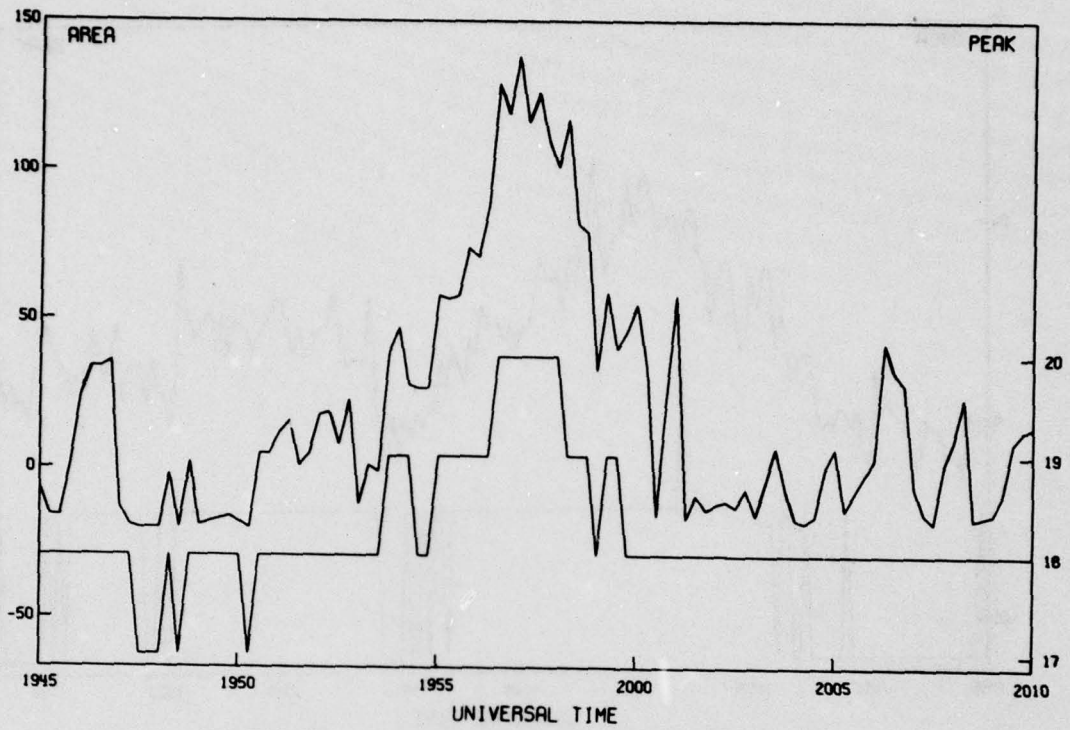


LA POSTA 11 SEP 73 R219 -F FLARE BIN 21

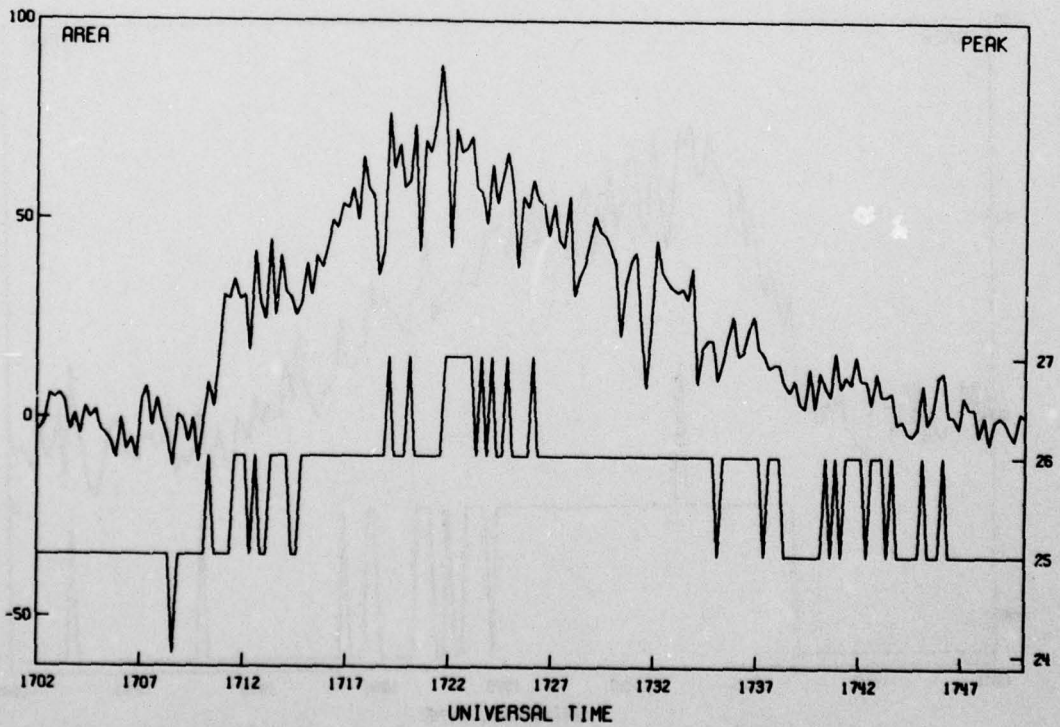


LA POSTA 11 SEP 73 R224 U FLARE BIN 22

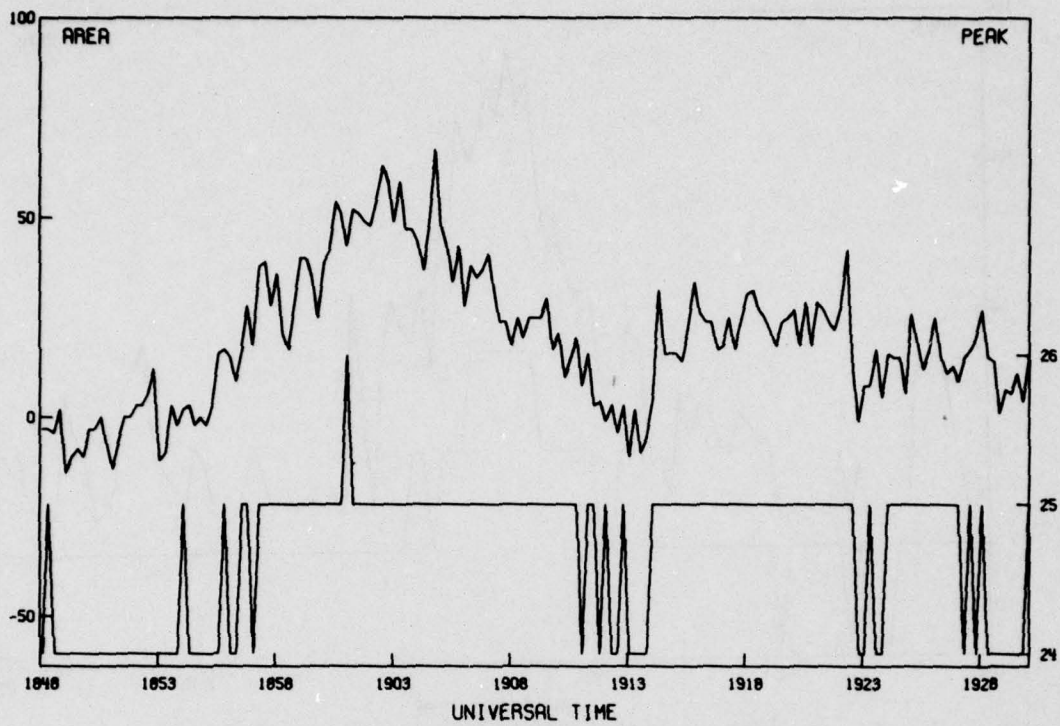




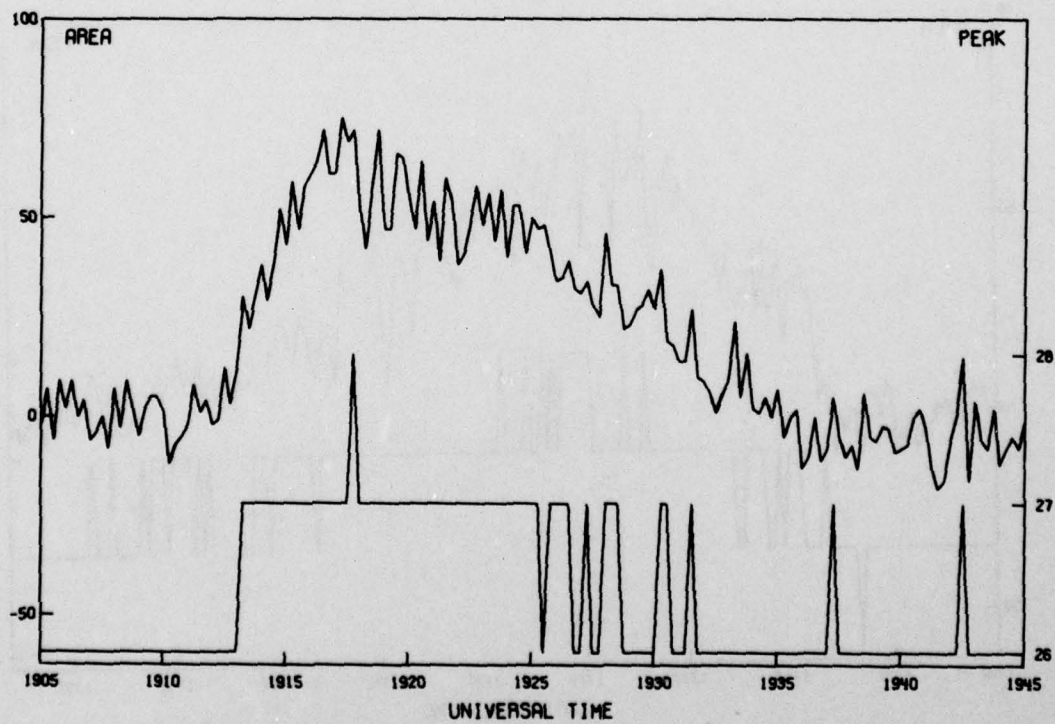
LA POSTA 12 SEP 73 R224 U FLARE BIN 18



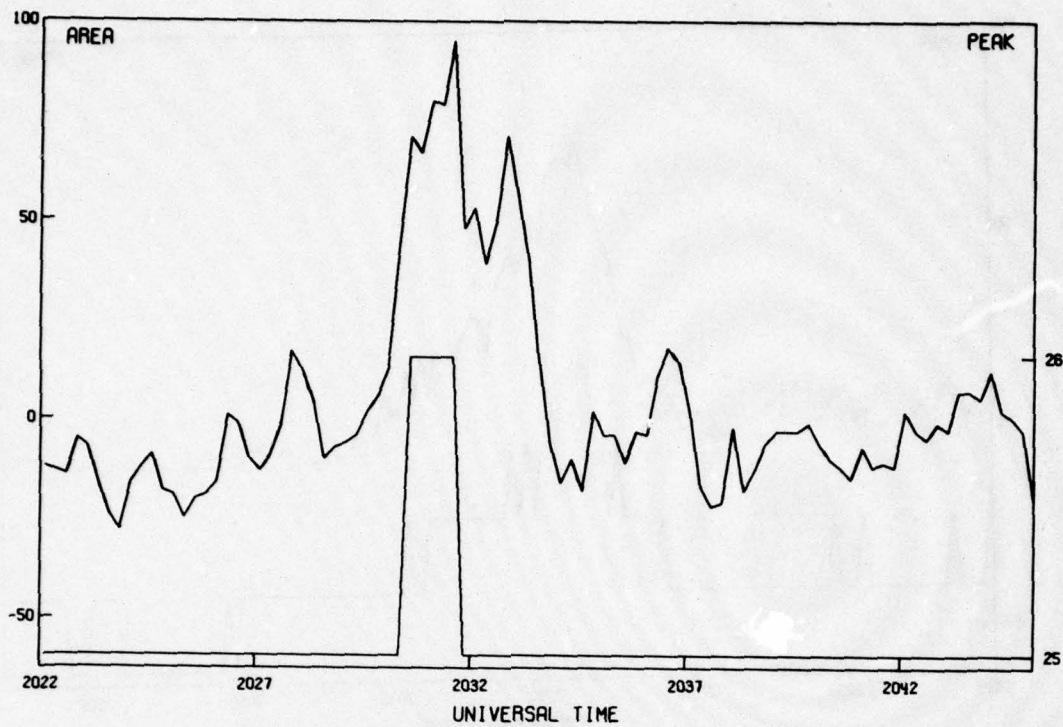
LA POSTA 25 SEP 73 R227 -F FLARE BIN 25



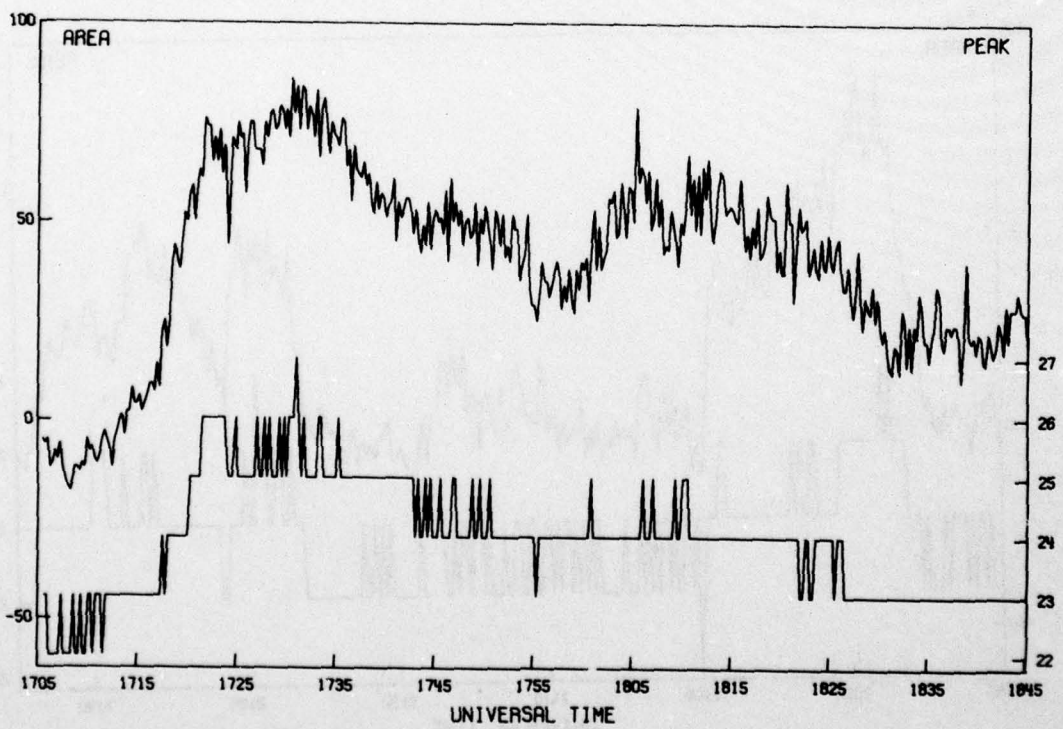
LA POSTA 25 SEP 73 R227 -F FLARE BIN 24



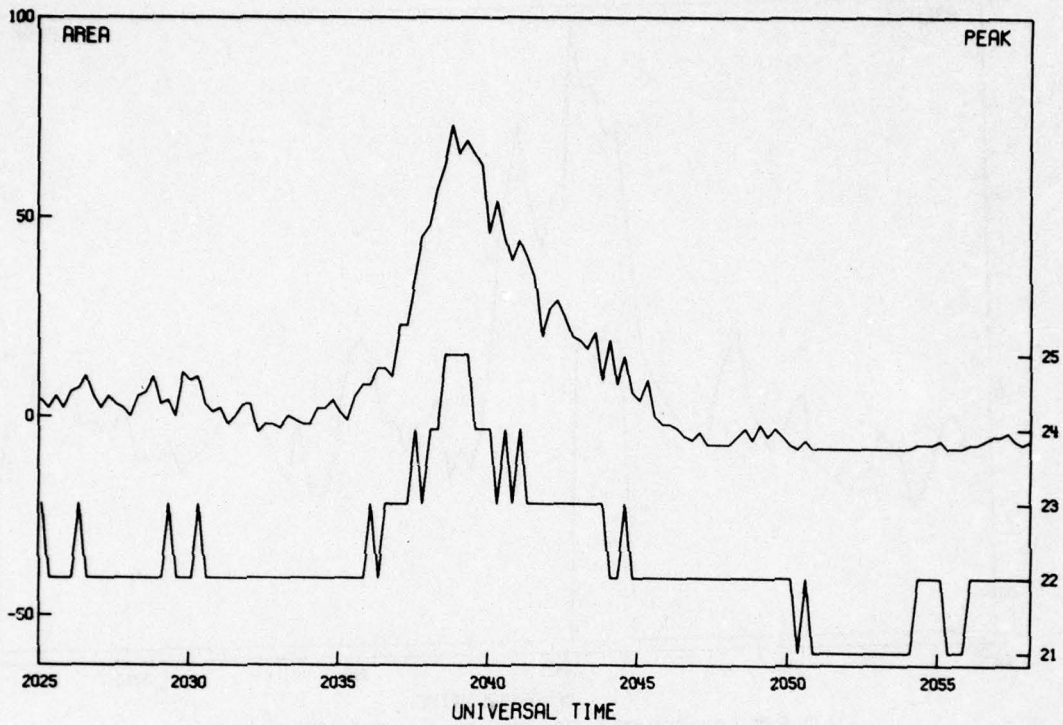
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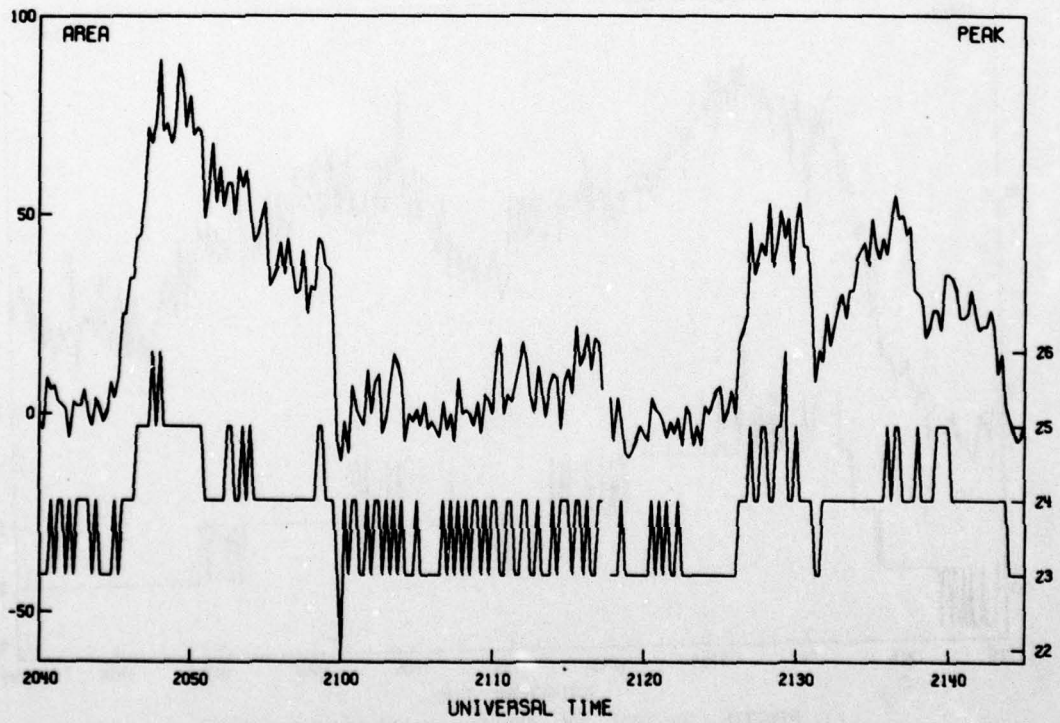
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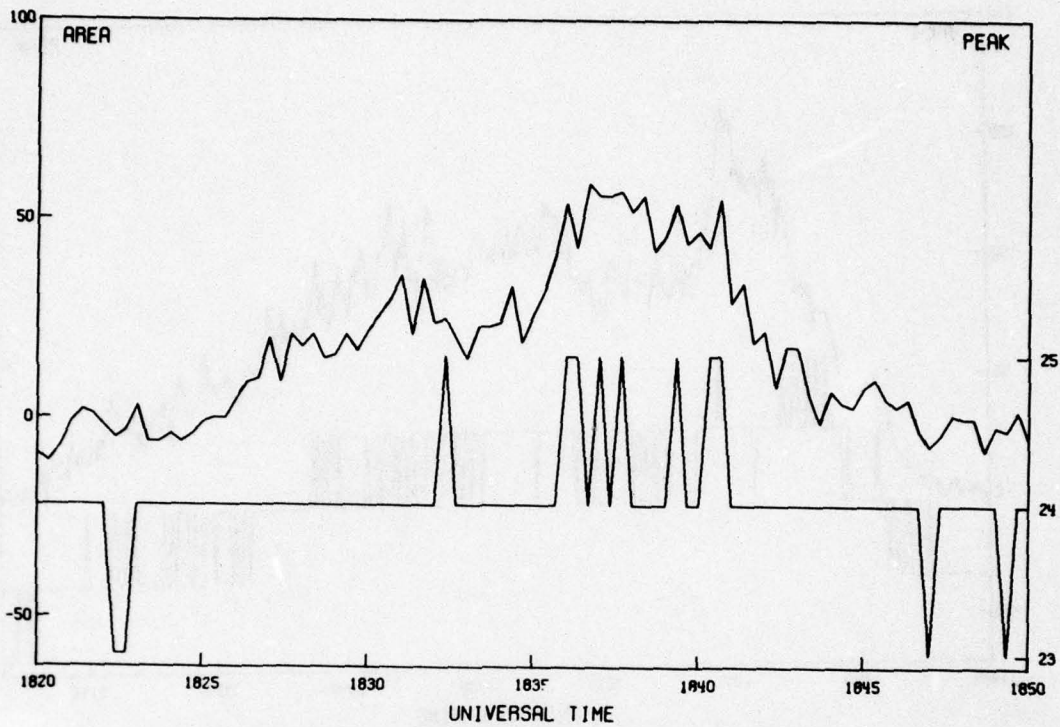
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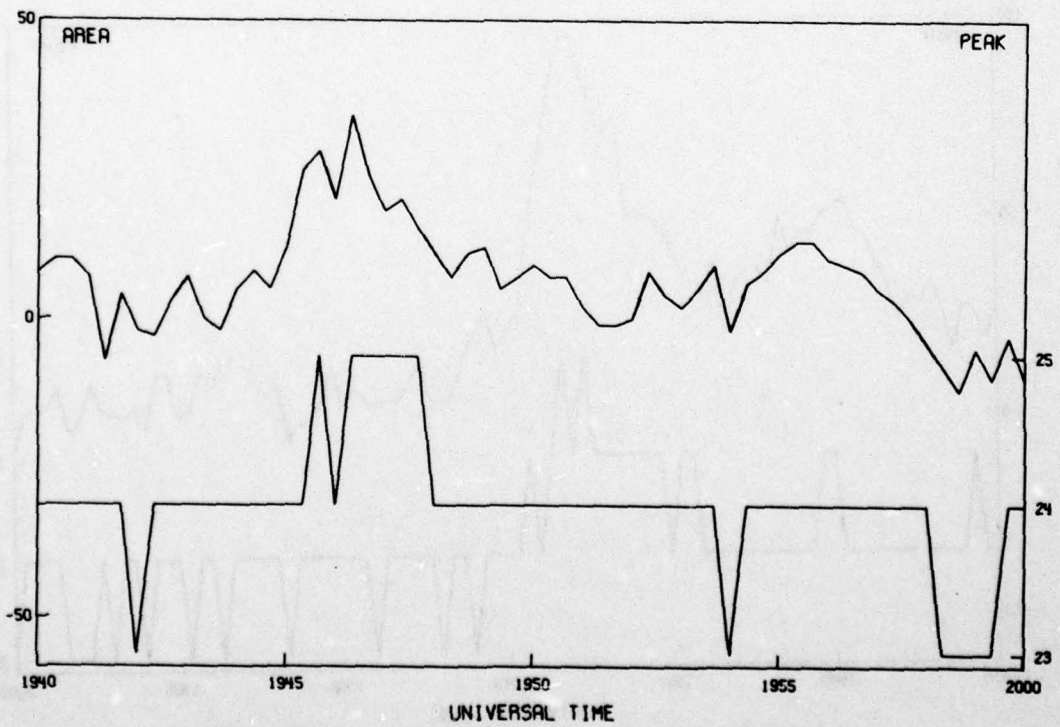
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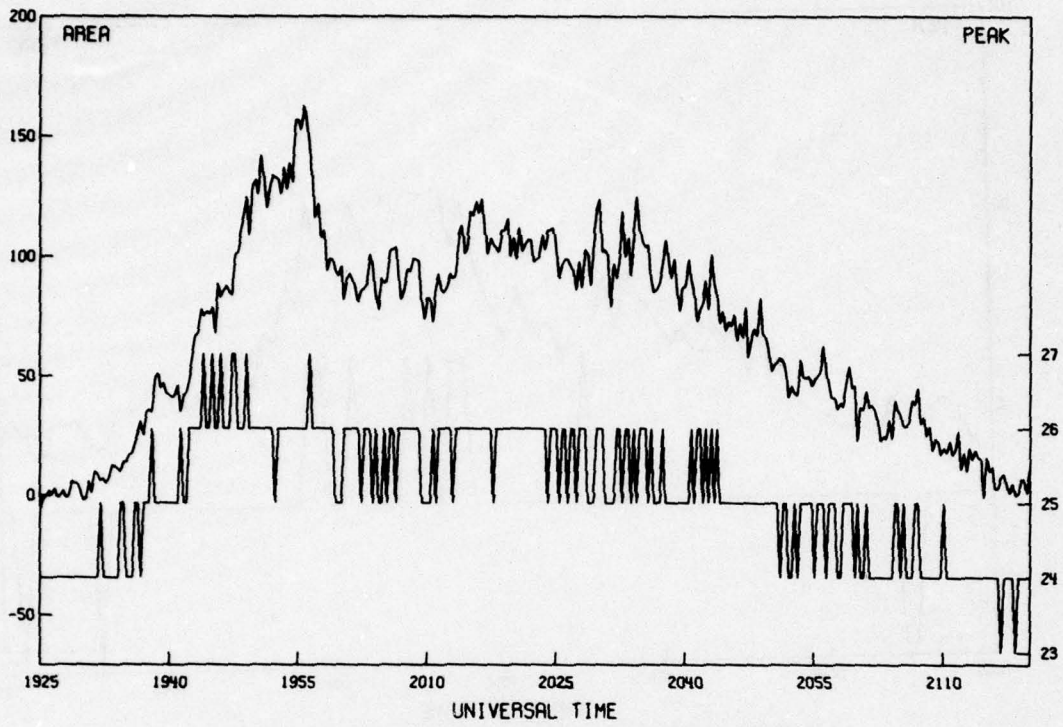
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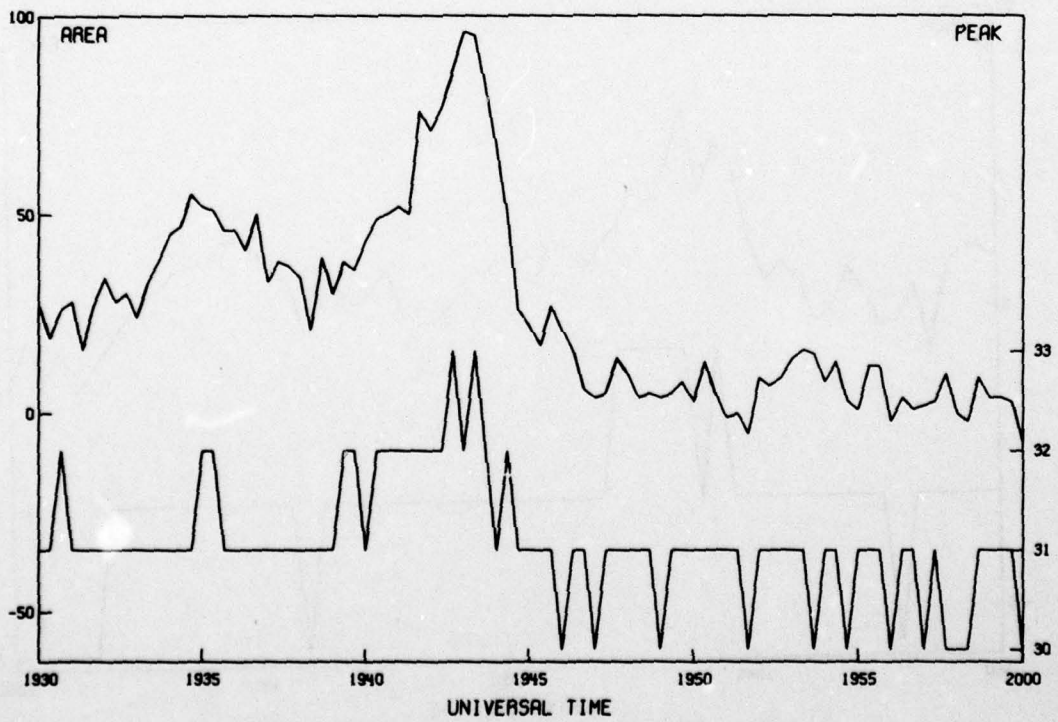
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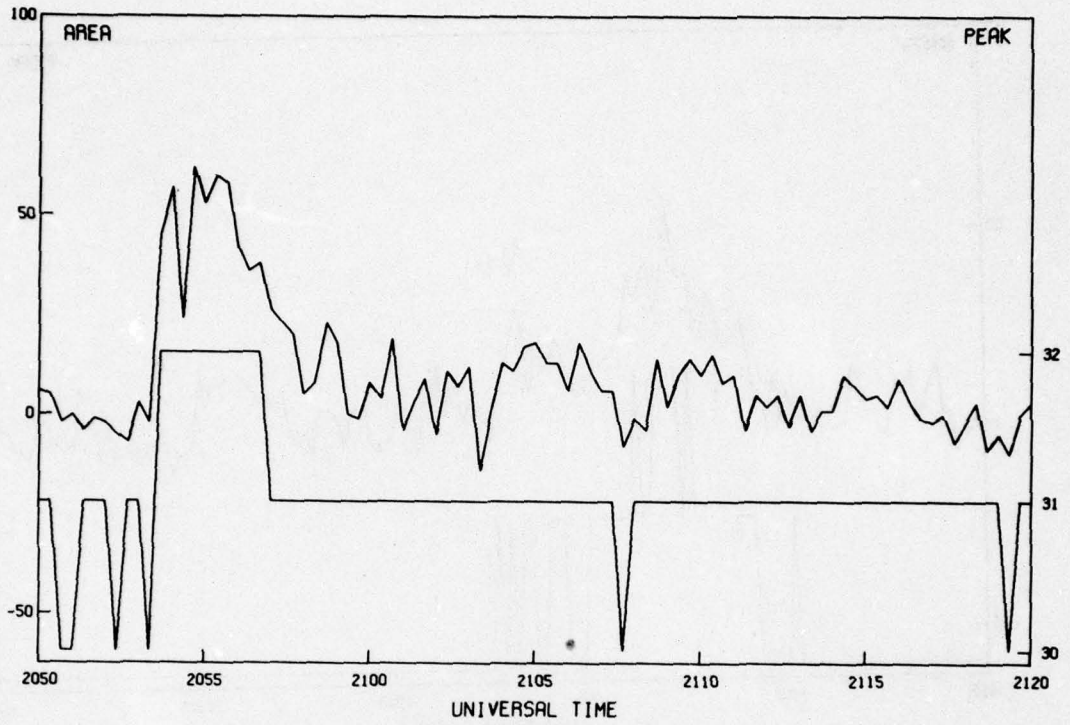
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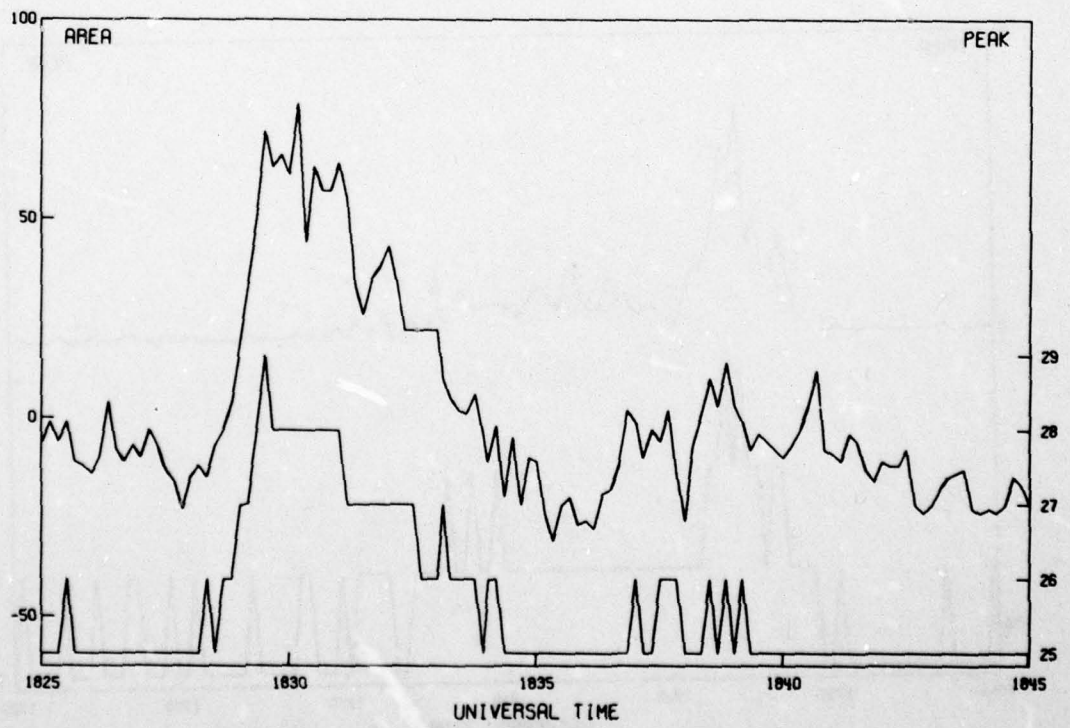
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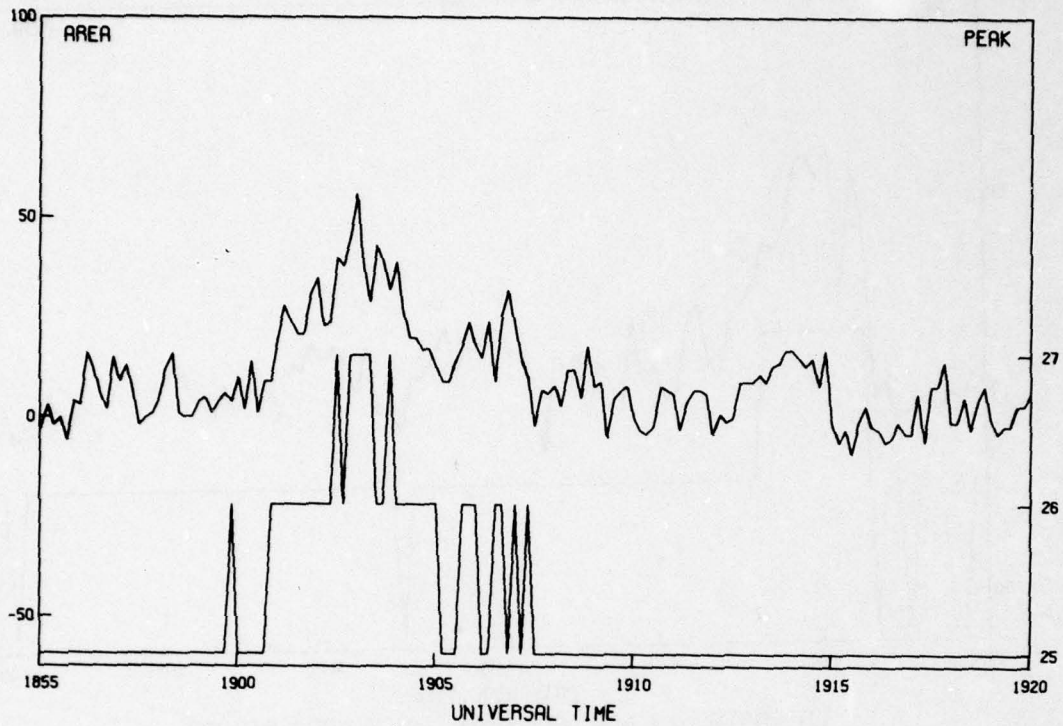
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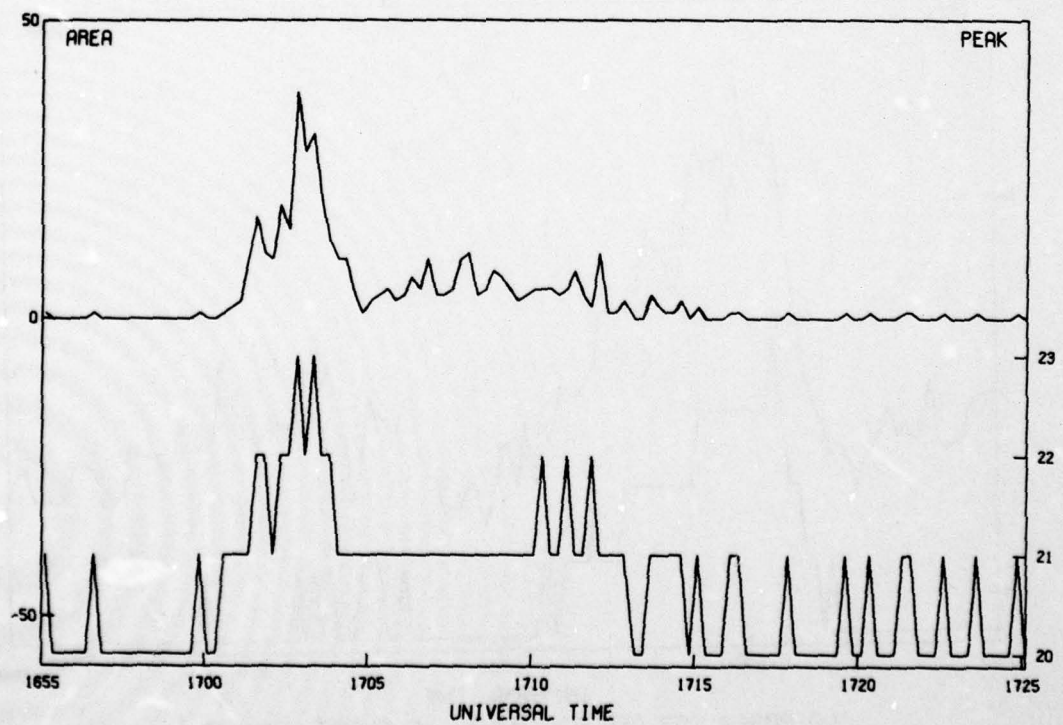
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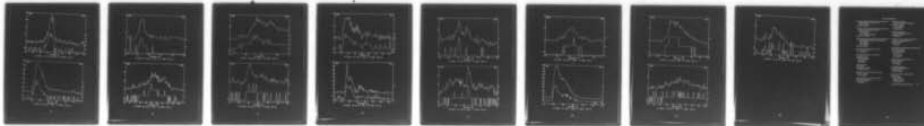
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NOSC/TD-140

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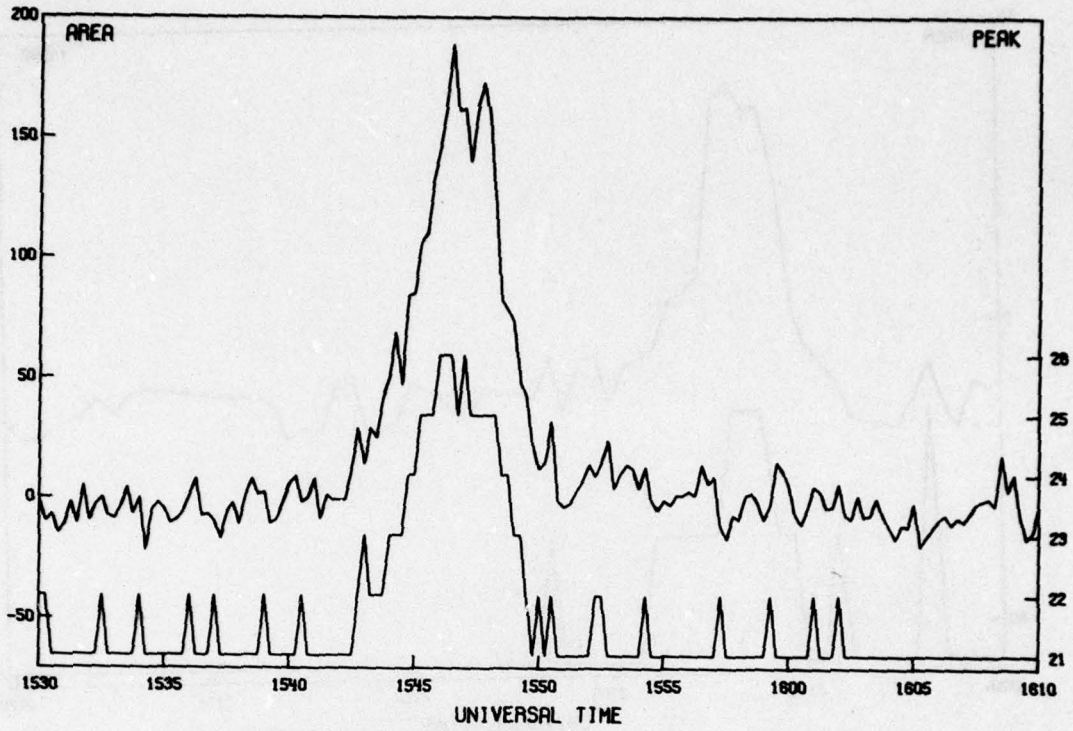
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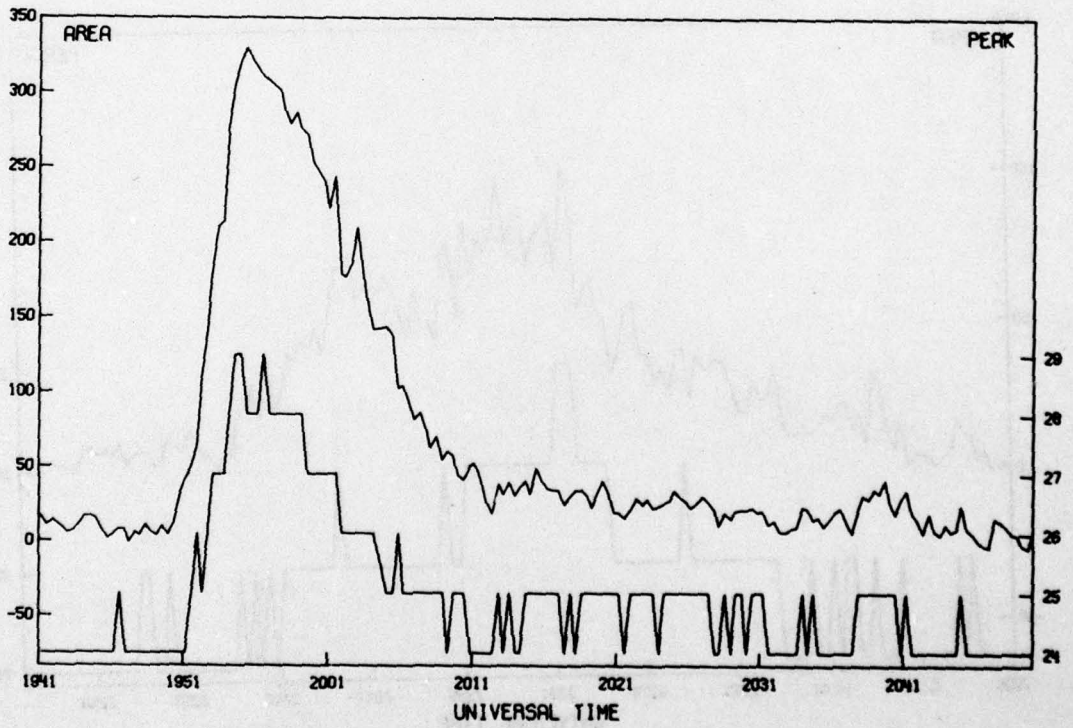
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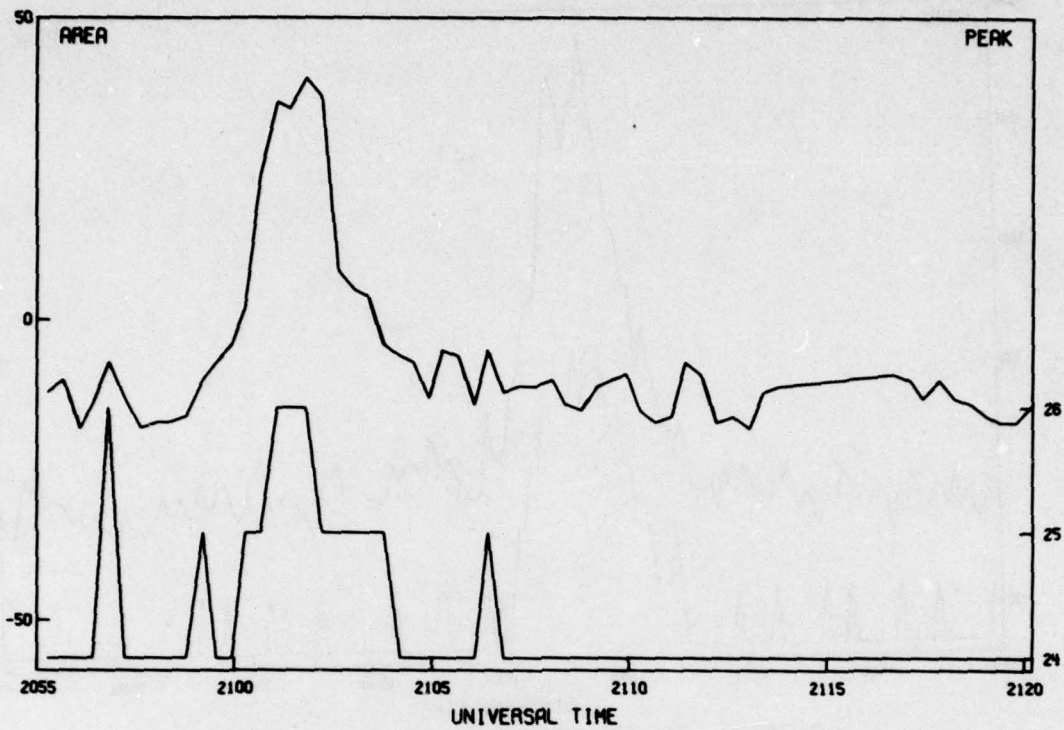
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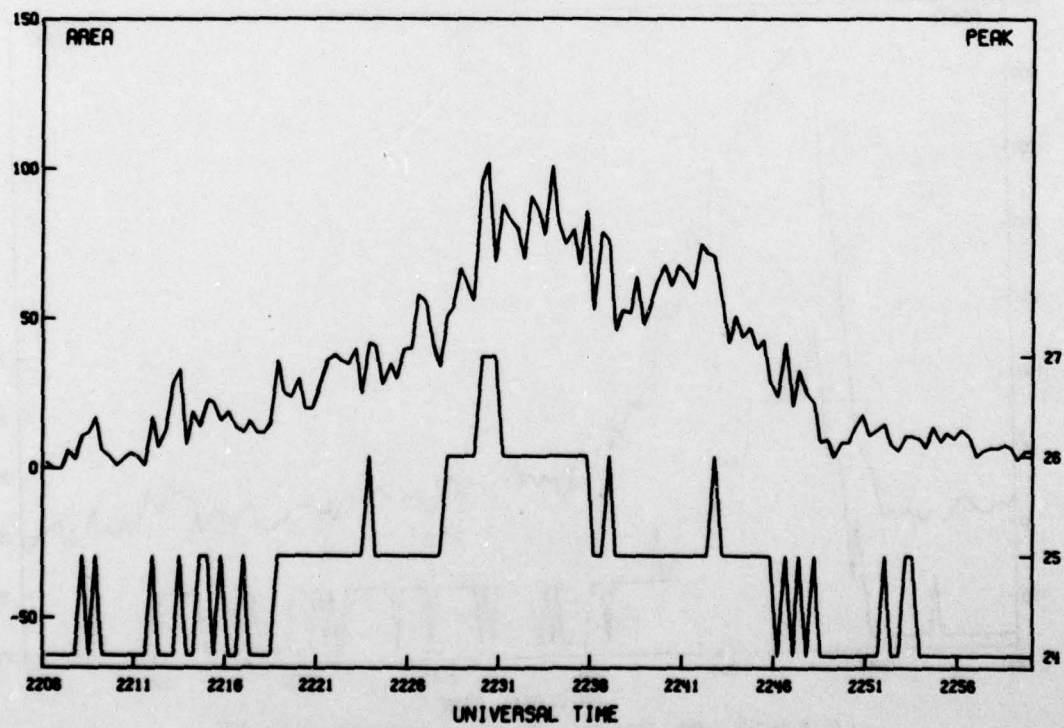
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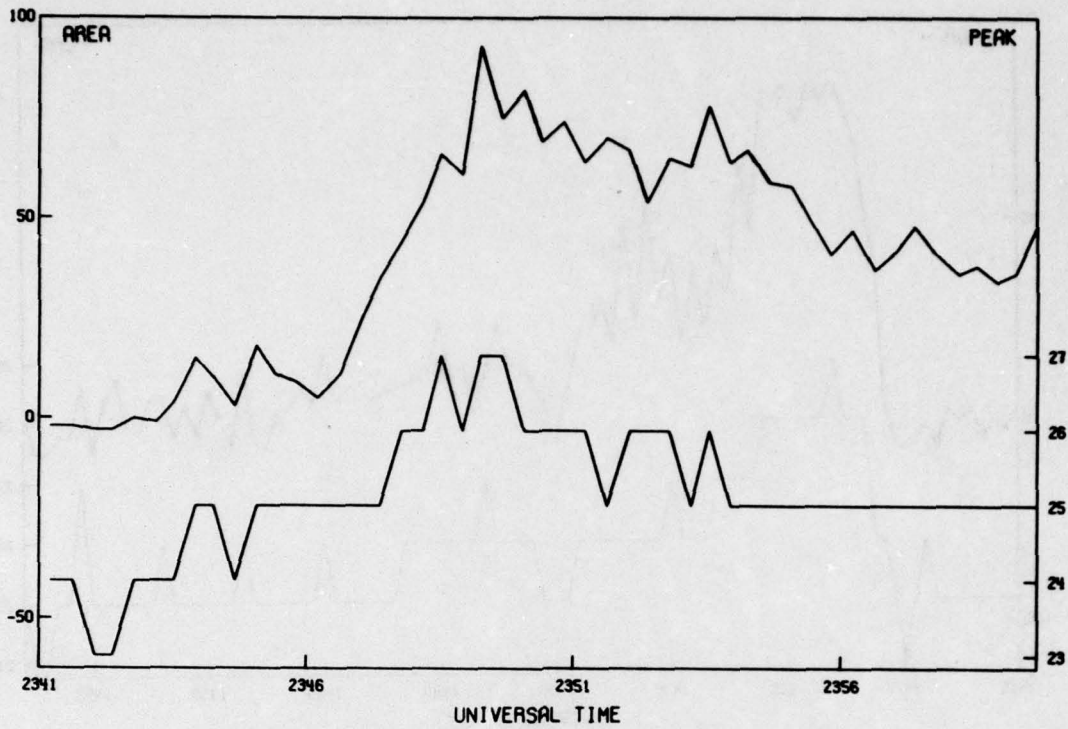
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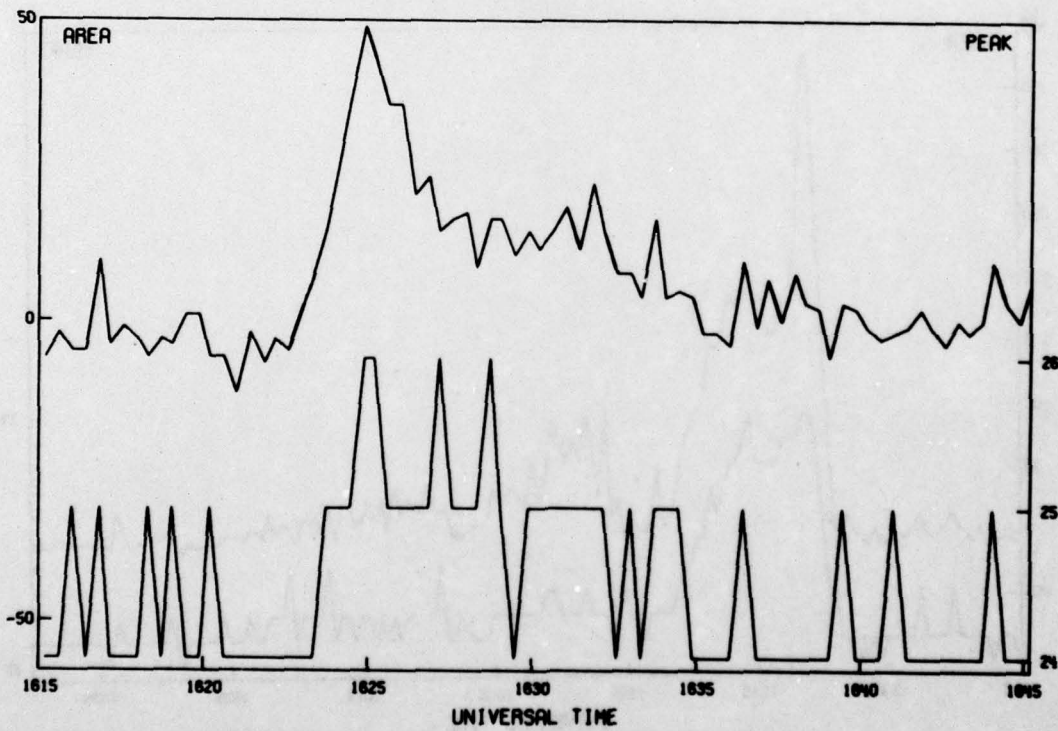
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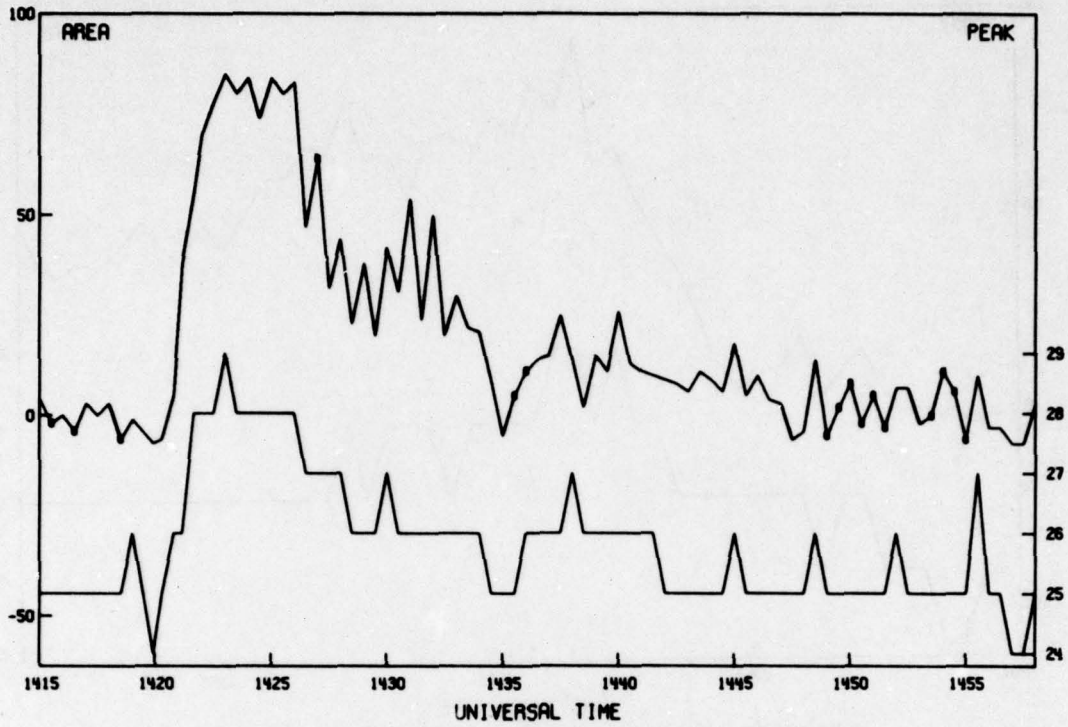
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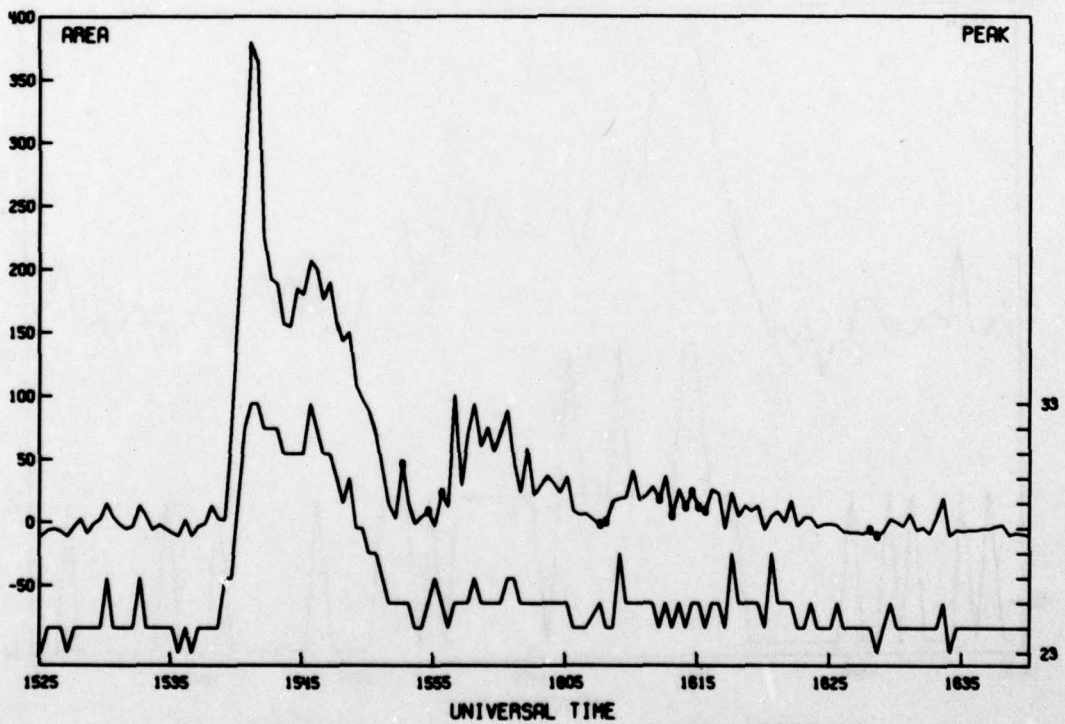
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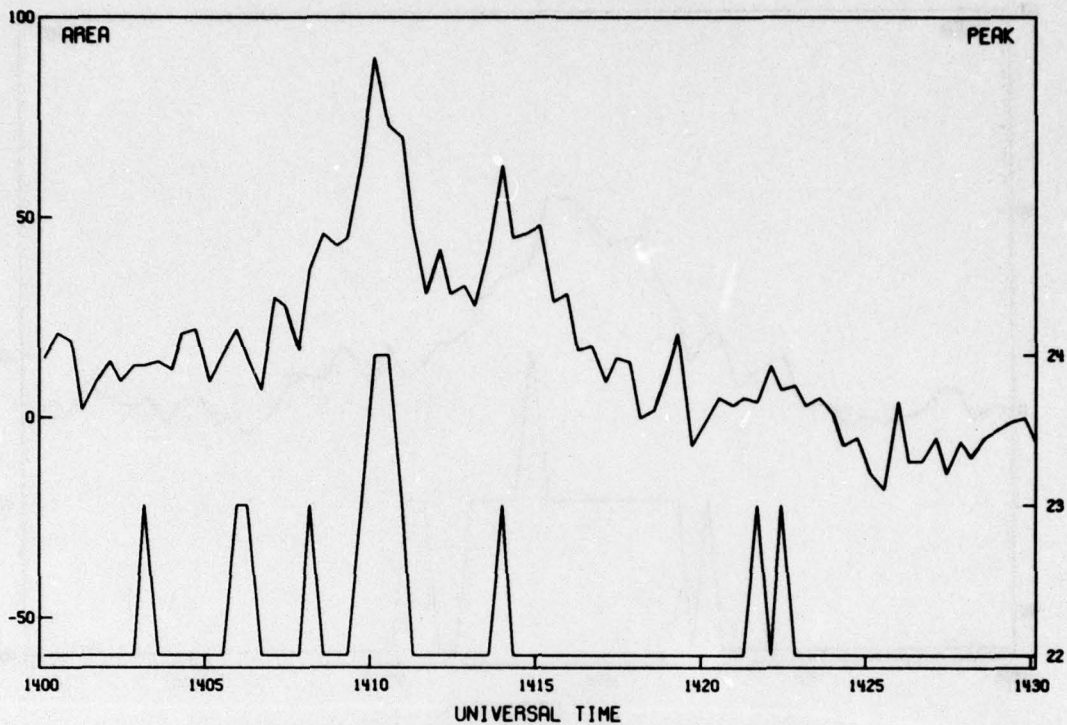
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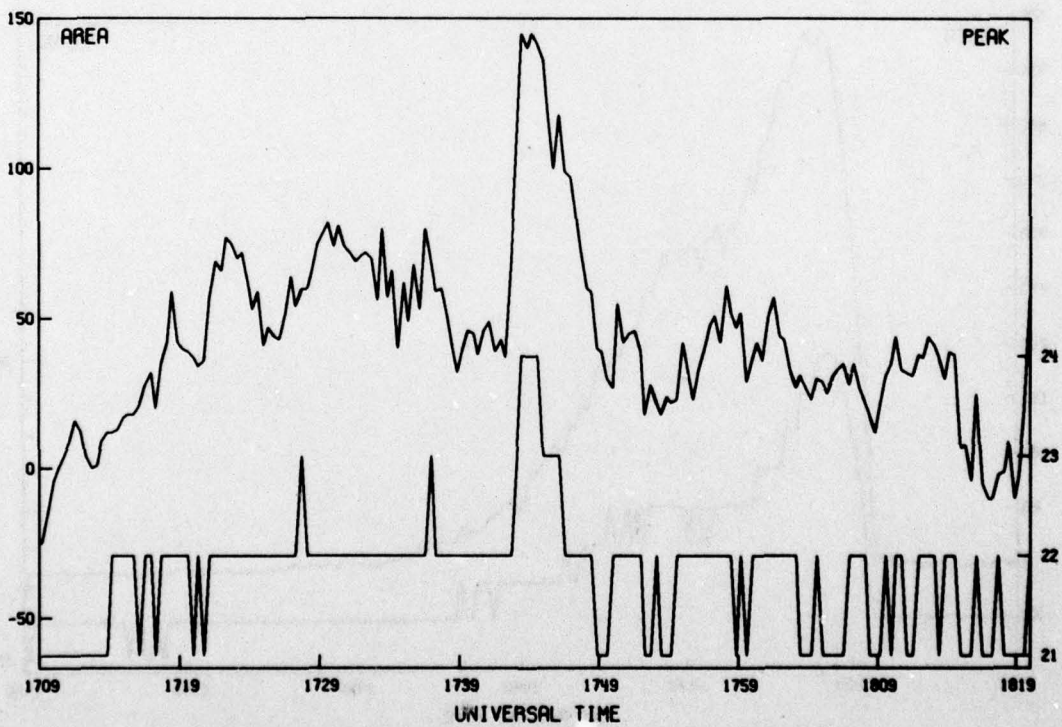
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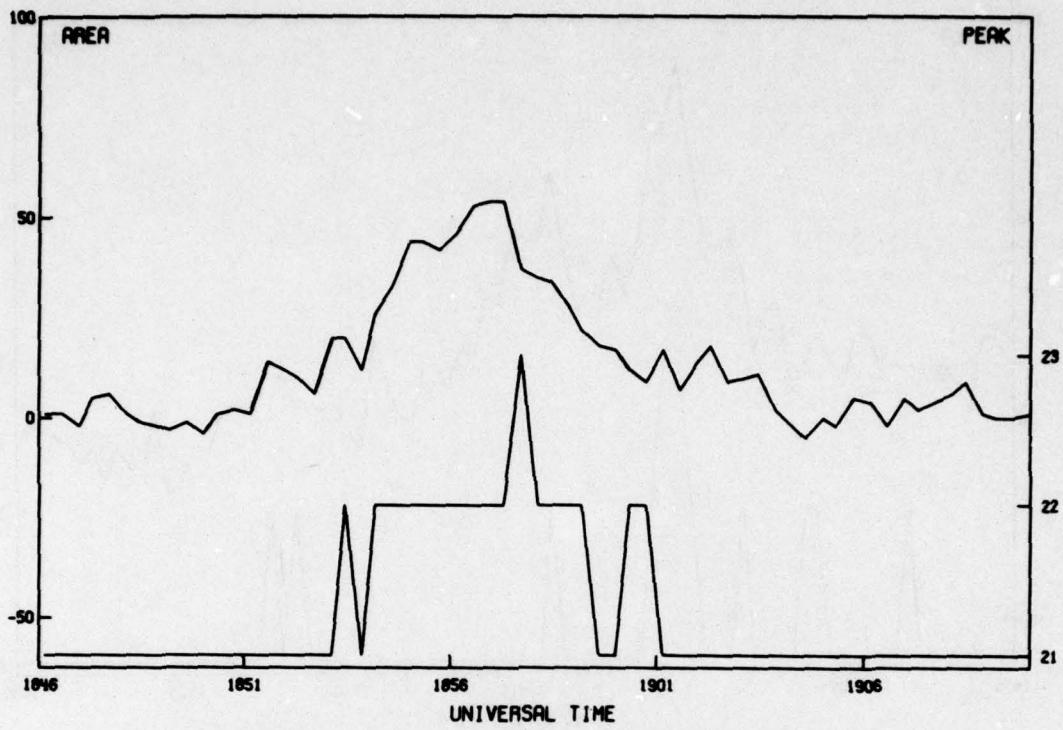
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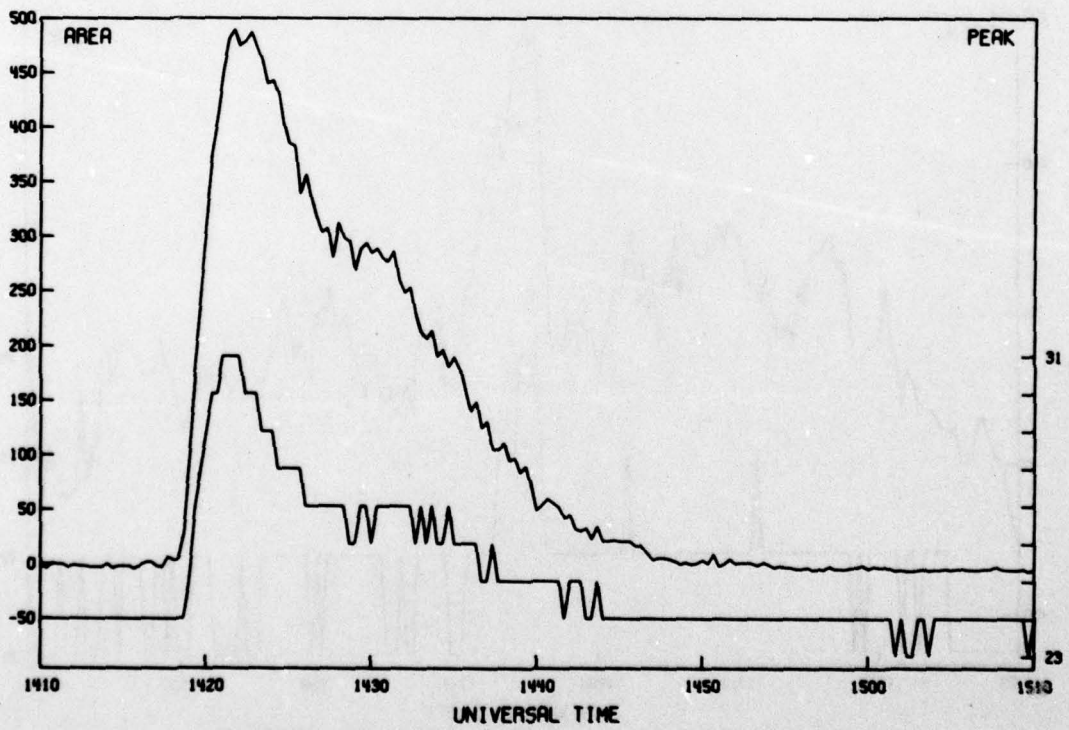
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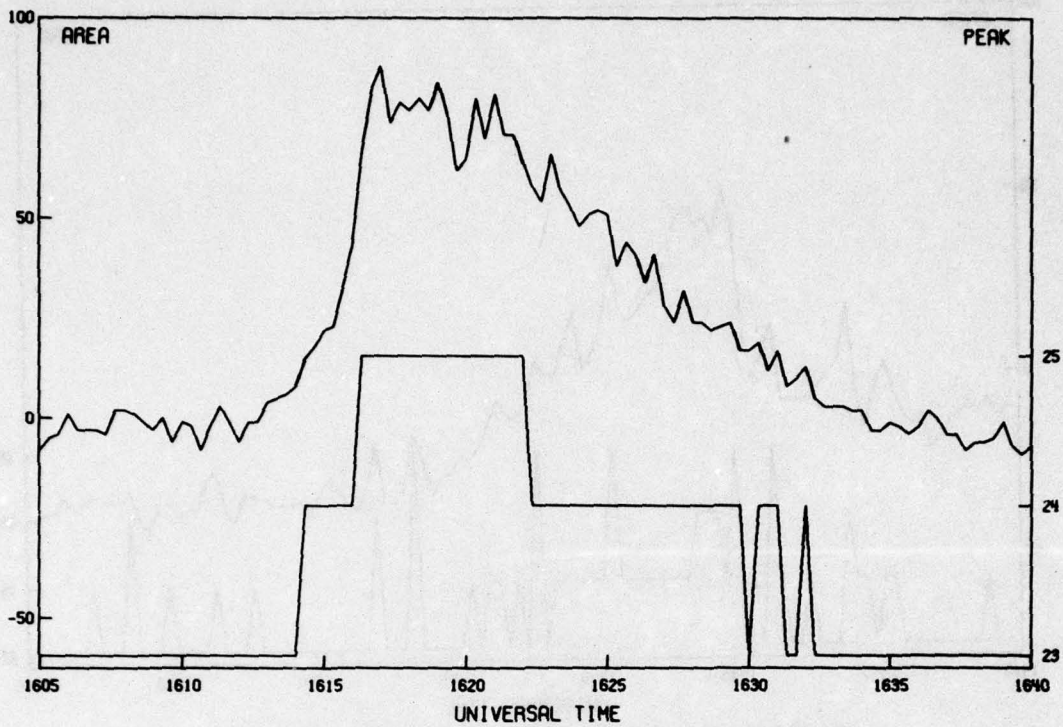
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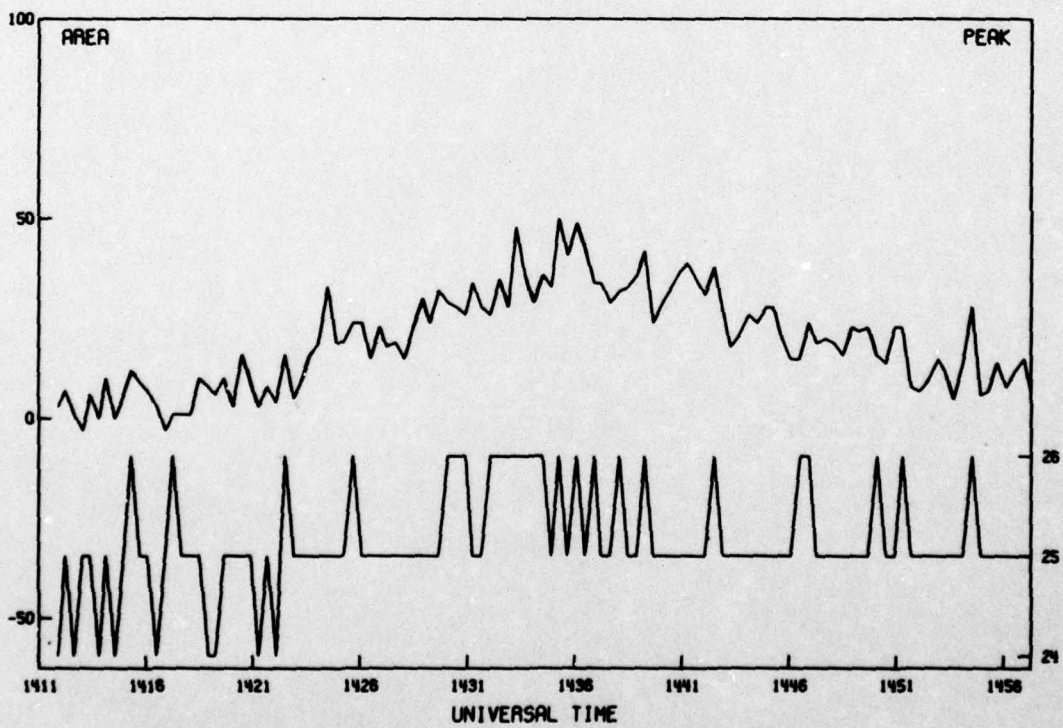
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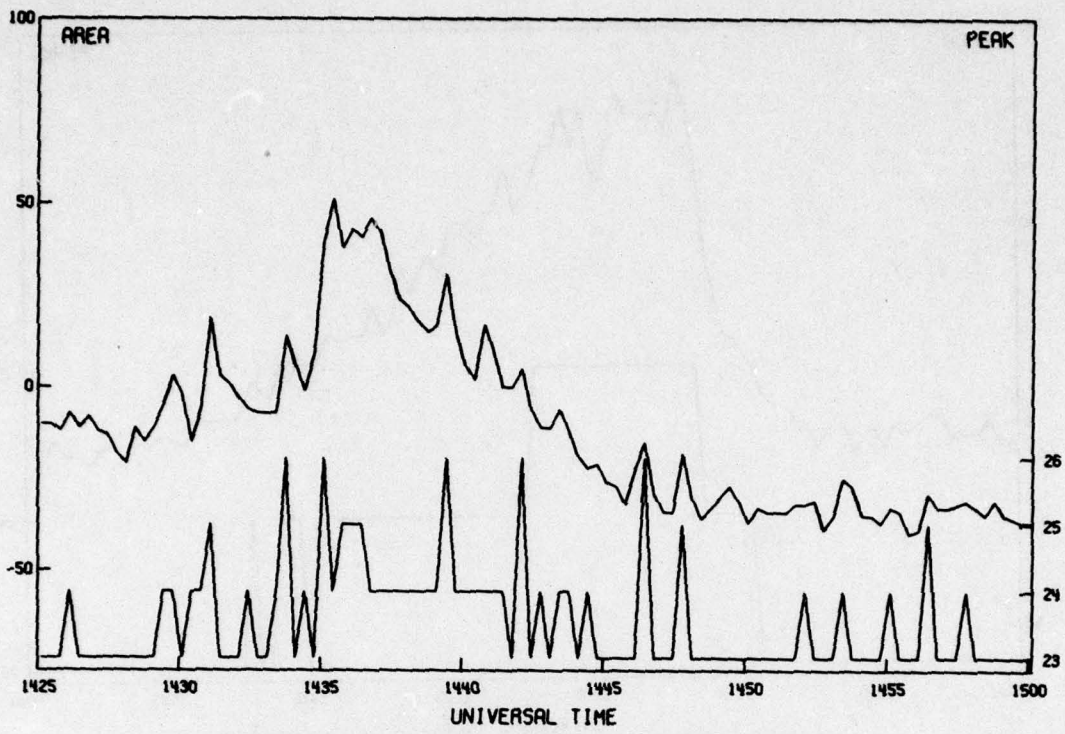
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LA POSTA 14 JUN 74 R426 -N FLARE BIN 23



LA POSTA 19 JUN 74 R428 U FLARE BIN 24



LA POSTA 21 JUN 74 R428 IN FLARE BIN 23

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