Naval Command,
Control and Ocean
Surveillance Center RDT&E Division

San Diego, CA
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Technical Document 2449
February 1993

Auroral-E Observations: The First Year's Data

R. B. Rose
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ADMINISTRATIVE INFORMATION

This work was a cooperative effort by members of the Ionospheric Branch, Code 542, at the Naval Command, Control and Ocean Surveillance Center, RDT&E Division, San Diego, California 92152-5001, and RP Consultants, Fairbanks, Alaska 99709. The work was performed between 1 August 1991 and 31 August 1992 for the Naval Security Group Command (GX), Washington, DC, under the Classic Prophecy (SY35) and Project PENEX (MP91). This document was written by R. B. Rose of NCCOSC RDT&E Division Code 542 and R. D. Hunsucker of RP Consultants.

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INTRODUCTION

In 1989, the Disturbance Impact Assessment System (DIAS) was developed to make qualitative assessments of the impact of solar flares on high-latitude, high-frequency (HF) propagation (Rose, 1993). The system employed new techniques in "expert system" technology to describe some of the vaguer aspects in high-latitude disturbance phenomenology. While developing the rule sets for the different high-latitude disturbances, it became obvious that there was some confusion regarding the occurrence characteristics of sporadic-E, auroral sporadic-E, and plain auroral-E. It was difficult to determine the type of sporadic ionization being described in different studies.

To gain better insight on the characteristics of auroral-E so an accurate rule set for DIAS could be developed, it was decided to conduct a year-long measurement campaign.

This report describes the results of the first year of measurements, presents theories on the generation of sporadic ionization at E-region ionospheric heights, and attempts to correlate the observations to the theories.

EXPERIMENTAL DESCRIPTION

In July 1991, a 960-km experimental circuit was established between the Arctic Submarine Laboratory at Cape Prince of Wales, Alaska (65.6 N, 168 W), and a facility at RP Consultants in Fairbanks, Alaska (64.8 N, 147.8 W). In order to sense anomalous or sporadic patches of ionization drifting at E-region height, a frequency of 25.545 megahertz (MHz) was chosen for a continuously transmitting beacon at Cape Wales. Whenever the E-region critical frequency rose above 5 MHz at the E-region midpoint of 64.6 N and 107 W, the signal could be heard in Fairbanks, indicating that sporadic ionization was present (Hunsucker, 1991).

A block diagram of the experiment is shown in figure 1. The transmitter was a Yaesu FT-757 providing 100 watts to a half-wave dipole antenna. The signal was a slow Morse "R." Transmissions were continuous, 24 hours a day. Except for two periods when high winds broke the antenna, data collection was continuous between 15 August 1991 and 16 August 1992.

The receiver, an Icom R9000, was located in Fairbanks and continuously monitored the 25.545 MHz signal. The automatic gain control (AGC) output from the R9000 measured relative signal amplitude and was recorded on a Primeline Chart Recorder as a function of time. Approximately 6 days of monitoring could be recorded on a single pack of chart paper.

To supplement the auroral-E information that was recorded, a Telluric-current sensor with electronics oriented north–south was installed to measure the current induced in the ground from the auroral electrojet. This was done in an attempt to correlate variations in the auroral electrojet and the occurrence of auroral-E.

Figure 2, an example of a strip of data recorded in Fairbanks, shows what this simple experimental set-up produced. The lower trace is relative signal amplitude. The upper trace shows variations in the electrojet as measured by the Telluric-current

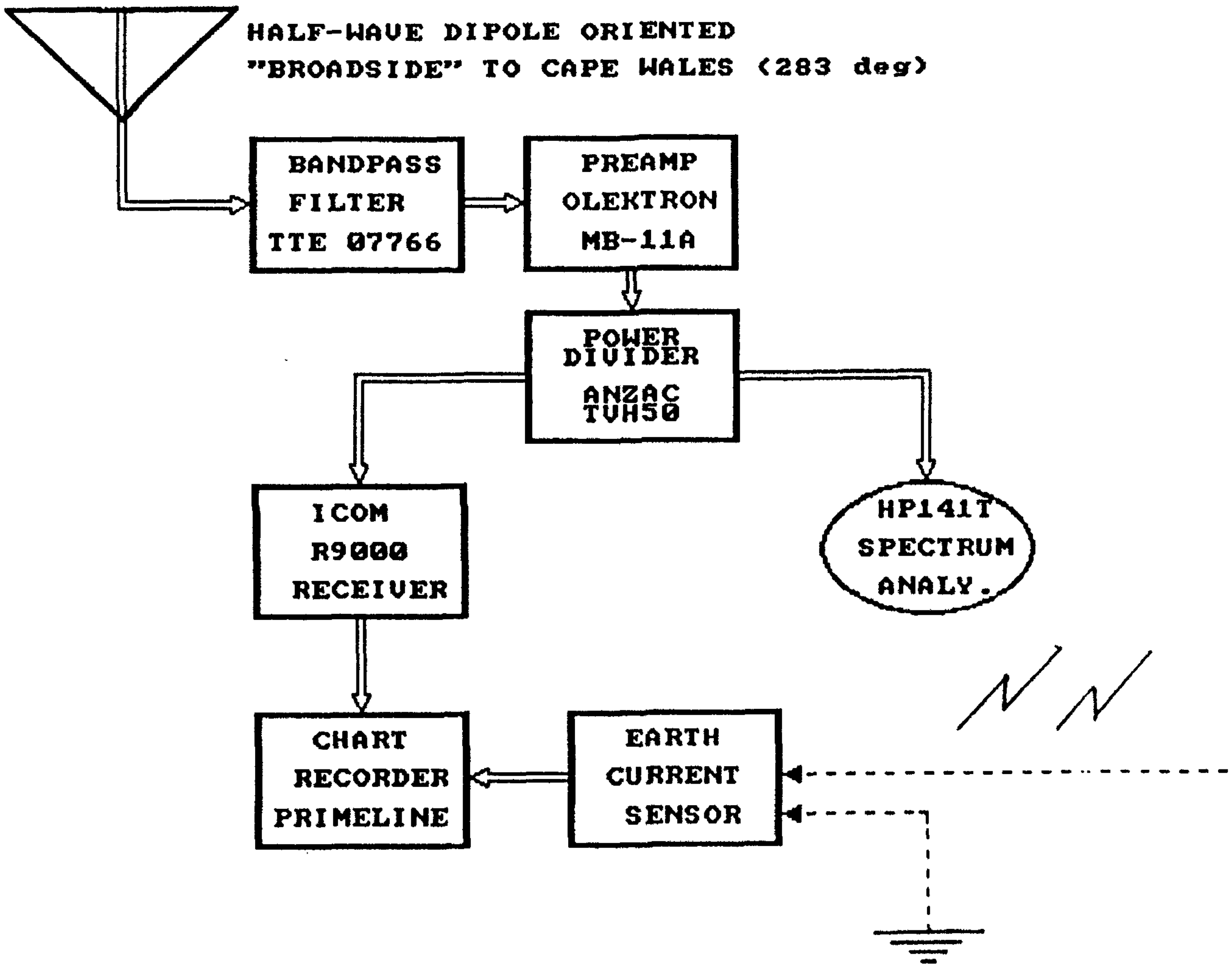
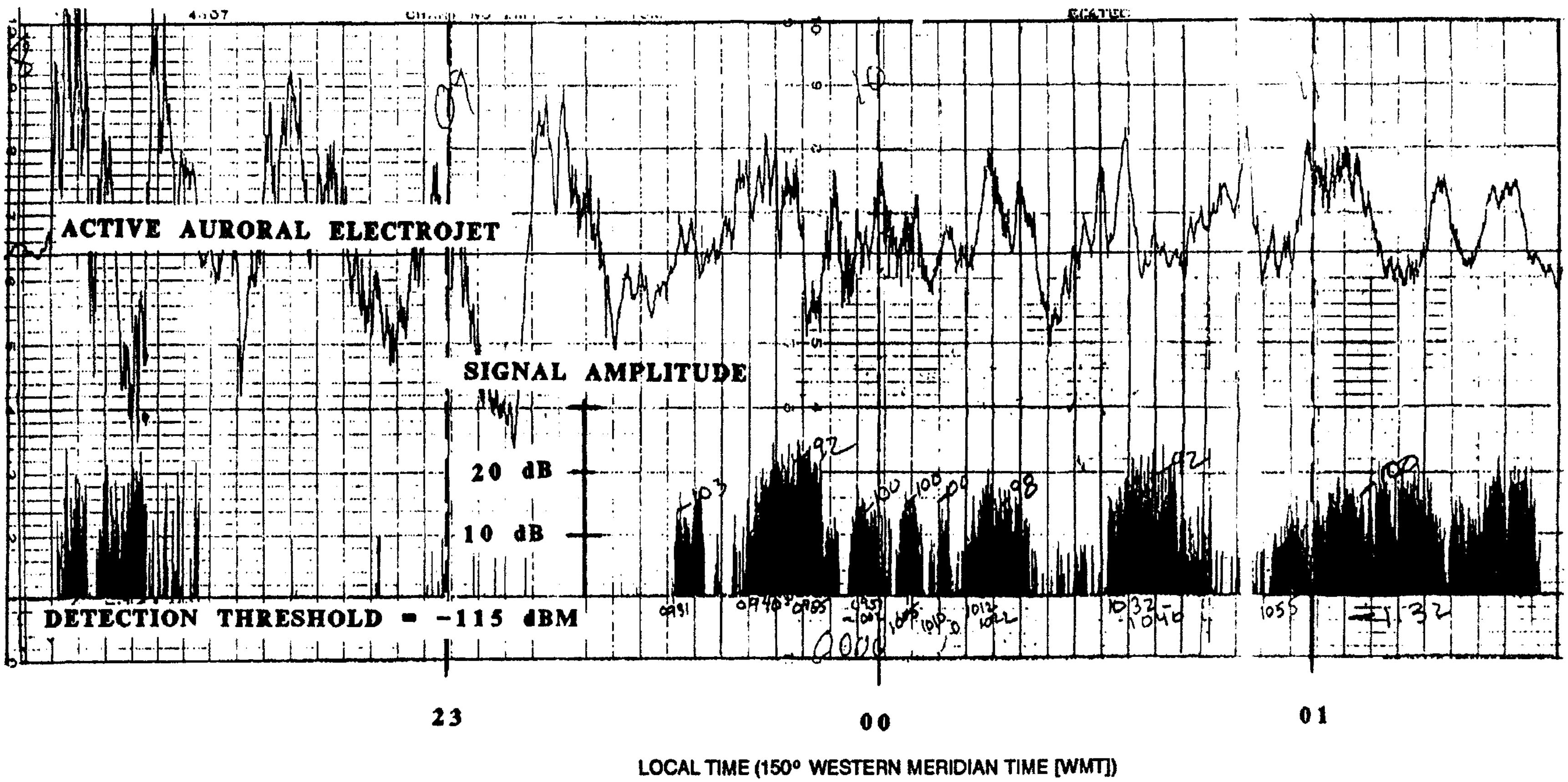


Figure 1. Auroral-E receiver configuration.



* Kp AND Ap ARE MAGNETIC INDICES

Figure 2. Multiple auroral-E events, 23 November 1991: Kp = 4, Ap = 24.*

sensor. In this example, there are 14 discrete sporadic ionization events centered around local midnight.

As seen in figure 3, a magnetic index (Kp) of 3 or greater is required for the equatorward edge of the auroral oval to pass over and south of the experimental HF path. The majority of measurements gathered for this report were taken during significant magnetic substorms.

THEORIES ON AURORAL-E AND THE AURORAL ELECTROJET

The purpose of this experiment was to measure and define, either qualitatively or quantitatively, the characteristics of the sporadic ionization that occurs at auroral latitudes. This ionization is sporadic but very dense, supporting oblique, sky-wave propagation up through low very-high frequencies (LoVHF). Since its occurrence appears to be contained within the auroral region, it is called auroral-E.

Recent studies have started to clarify the mechanisms that may generate auroral-E. It now appears that auroral-E is formed as a result of perturbations in the auroral electrojet. In addition, it is suspected that two, and maybe three, types of ionization may be lumped into the category of auroral-E.

The "auroral electrojet" describes a complex, high-latitude current system. Figure 4 shows a generalization of the current system and the resultant formation of the electrojet. The electrojet has two components: one flowing counter-clockwise to the east—the eastward electrojet—and one flowing clockwise to the west—the westward electrojet. The two electrojets meet and merge near the midnight sector. The merged electrojets are called the Harang Discontinuity. Anomalous E is also formed and observed in the midnight sector. Figure 5 shows an example of the change in earth current as the Harang Discontinuity passes over the experimental path.

Two major groups of sporadic-E have been identified from vertical-incidence-sounding (VIS) ionograms. One group, generally called auroral-E, includes nighttime E (particle E) of the k type and E of the r type (Esr), which produces group retardation at HF. The second group is sporadic-E of the a tvpe (Esa). Auroral-E is characterized by a homogenous structure both in time and space and is known to be caused by diffuse precipitation. The a type of E is characterized by a strong inhomogeneity in space and drastic variations in time, and it is associated with visual aurora produced by the pre cipitation (called discrete precipitation) responsible for discrete auroral arcs (Besprozvannaya et al., 1991). The latitudinal distribution of sporadic ionization types tends to be within 1 to 2 degrees of the electrojet maximum.

According to Besprozvannaya, the eastward and westward electrojets generate different types of sporadic ionization. The occurrence of sporadic ionization is correlated with increases in geomagnetic activity and the duration of the storm. There are also considerable differences between the ionospheric structure in the regions of the eastward and westward electrojets.

For the eastward electrojet in a nonstorm condition, the Esr type of sporadic ionization is the ionization associated with diffuse precipitation—the true auroral-E. These

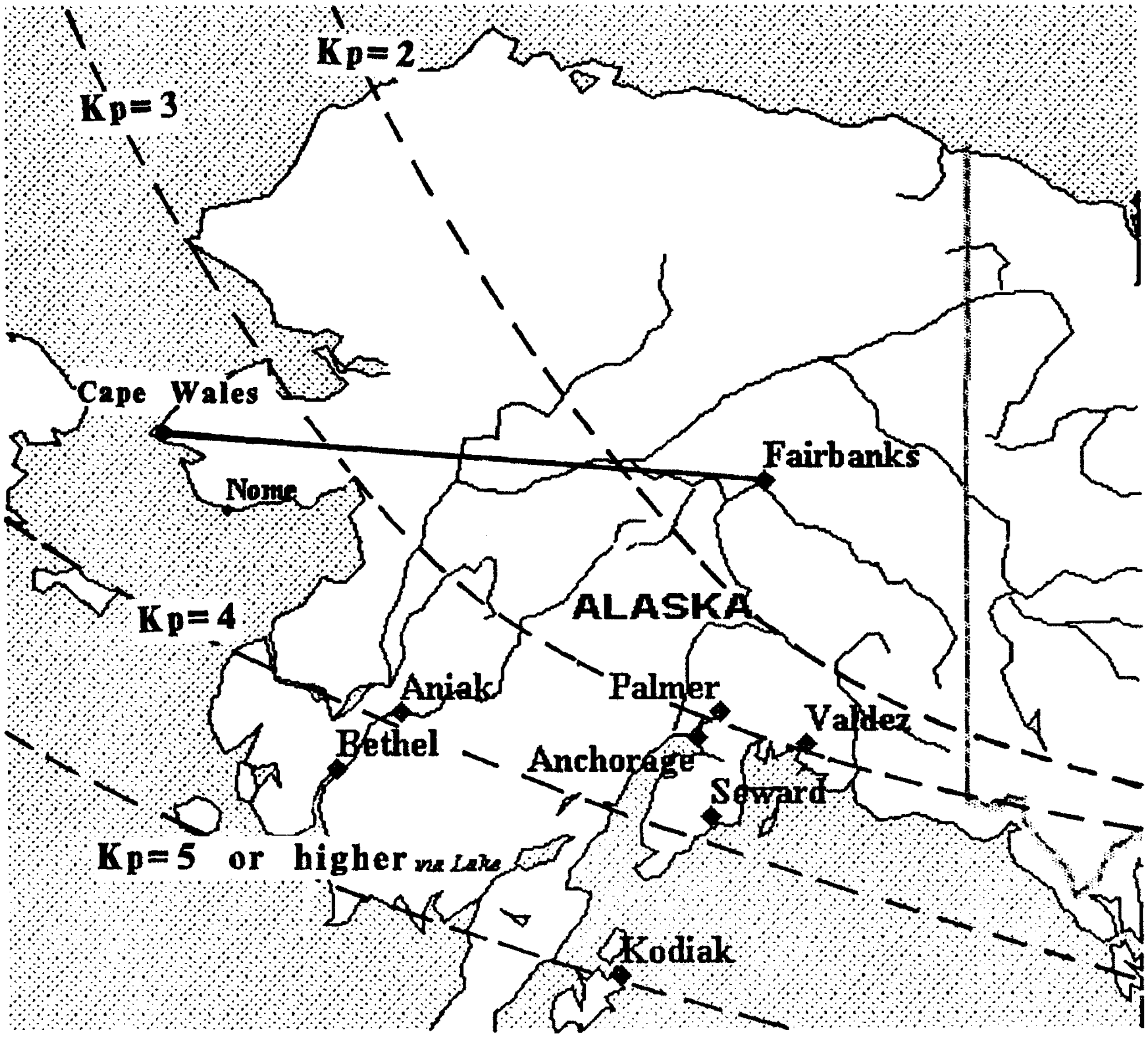
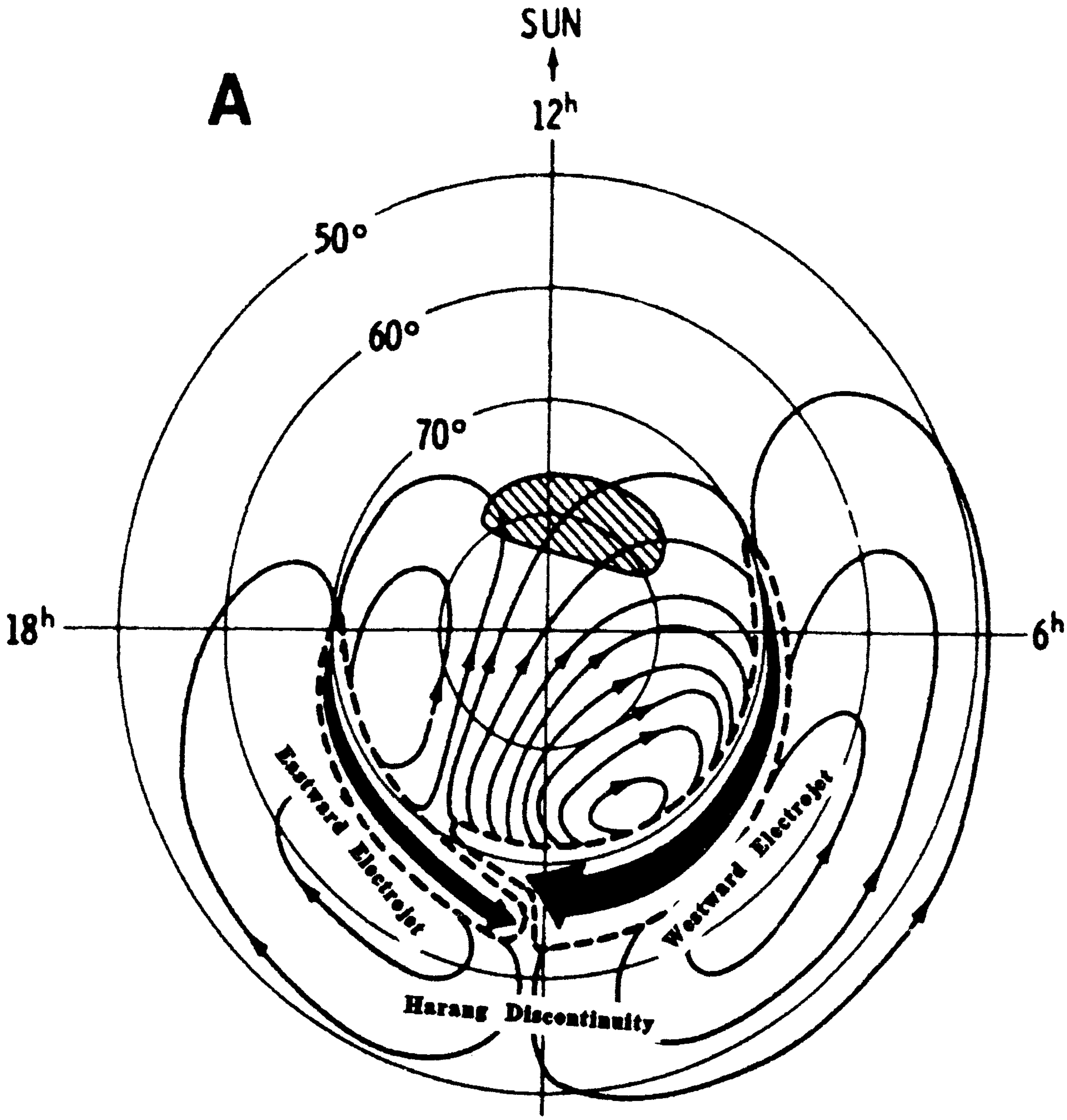


Figure 3. Equatorward edge of the auroral oval over the experimental path as a function of Kp.



* THIS FIGURE IS TAKEN FROM AN ARTICLE BY SUGIURA AND HEPPNER (1965).

Figure 4. The eastward and westward electrojets in the auroral oval.

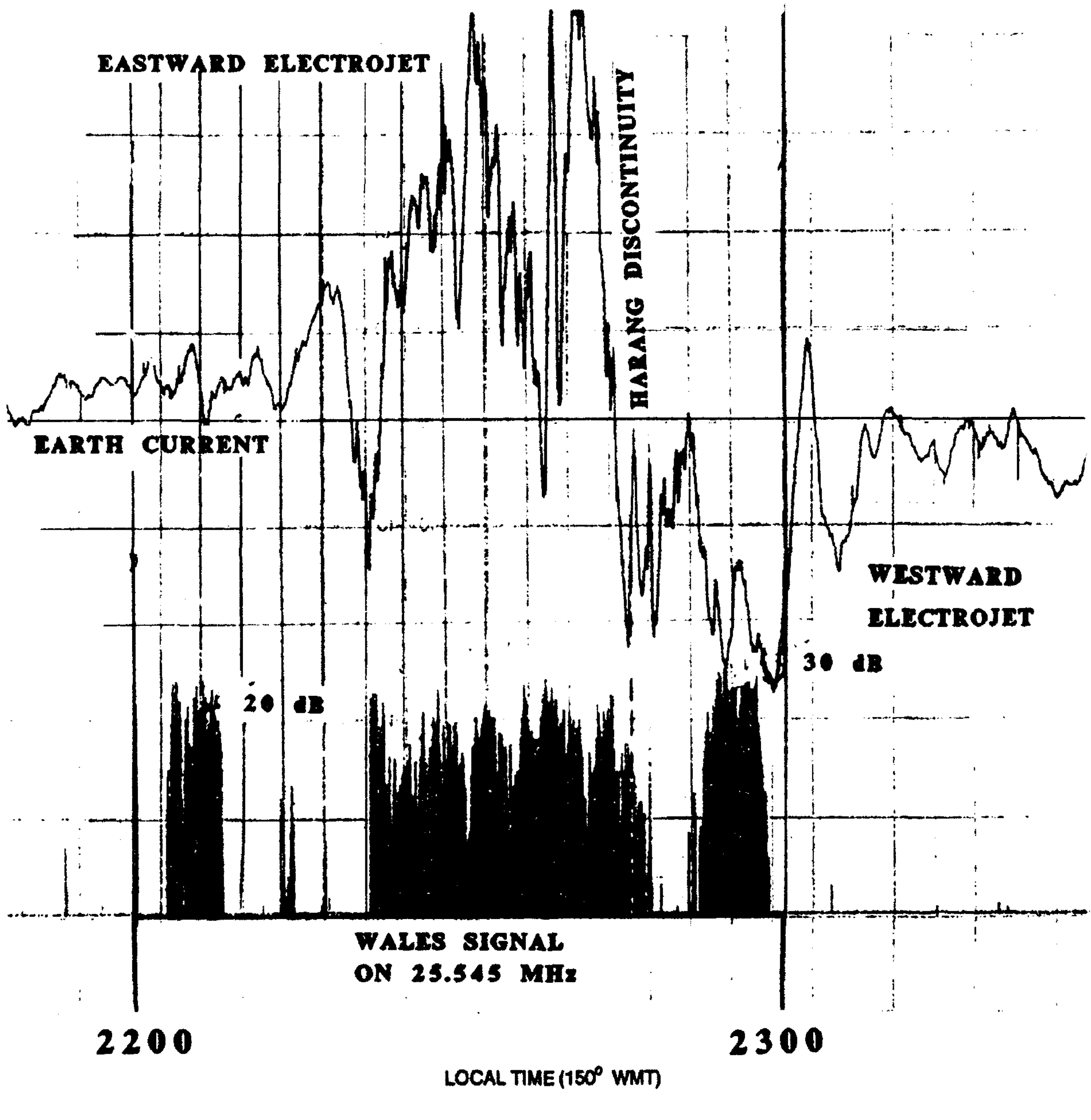


Figure 5. Passage of the Harang Discontinuity, 9 October 1991.

occurrences take place between 1600 and 2200 local time. The eastward electrojet appears between 60 and 70 degrees corrected geomagnetic latitude and the height of the E layer is approximately 120 km (Kamide and Brekke, 1977).

The westward electrojet is dominant between 2200 and 0400 local time. The observed Esa ionization is related to discrete precipitation and nighttime auroral absorption at ionospheric heights of 100 km. Some auroral-E is also observed in the westward electrojet.

When the auroral region is in prolonged substorm conditions, both the eastward and westward electrojets widen. The occurrences of auroral-E increase in the eastward electrojet, while a harder spectrum of precipitation causes increased auroral absorption in the westward electrojet. The incidence of auroral-E also increases in the westward electrojet under these conditions, especially in the 2200 to 0200 local time sectors.

Since nearly all the observed sporadic ionization events reported in this document occurred with Kp equal to or greater than 3, prolonged substorm conditions dominate these data.

DATA PREPARATION

When the strip chart data were received from the field, a template was created from the calibration strip that had been made at the test site. The purpose of the template was to scale the duration and the relative signal amplitude of the auroral-E event. The magnetic indices, Kp and Ap, were annotated on the chart near the event. This analysis used simple hand-scaling techniques on these data for several reasons:

(1) The data were analog. Hand-scaling allowed the analysts to "read between the lines" and identify smaller, more obscure events. With experience, the analyst could see auroral-E in the presence of noise and interference.

(2) With periodic recalibration, the signal amplitude accuracy was approximately ±5 dB.

When auroral-E events were observed, the strip chart was annotated with the following parameters:

(1) Start time of event (UT)

(2) Event duration

(3) Signal amplitude

(4) Earth current deviation and magnitude

After scaling and analyzing a given block of data, those portions of the overall chart that contained auroral-E events and calibration data were copied. Figure 6 shows an example of annotated, raw strip chart data.

The last step in the data preparation was to enter the parametric data into a LOTUS 123 spreadsheet data base. The purpose of this was to facilitate comparisons

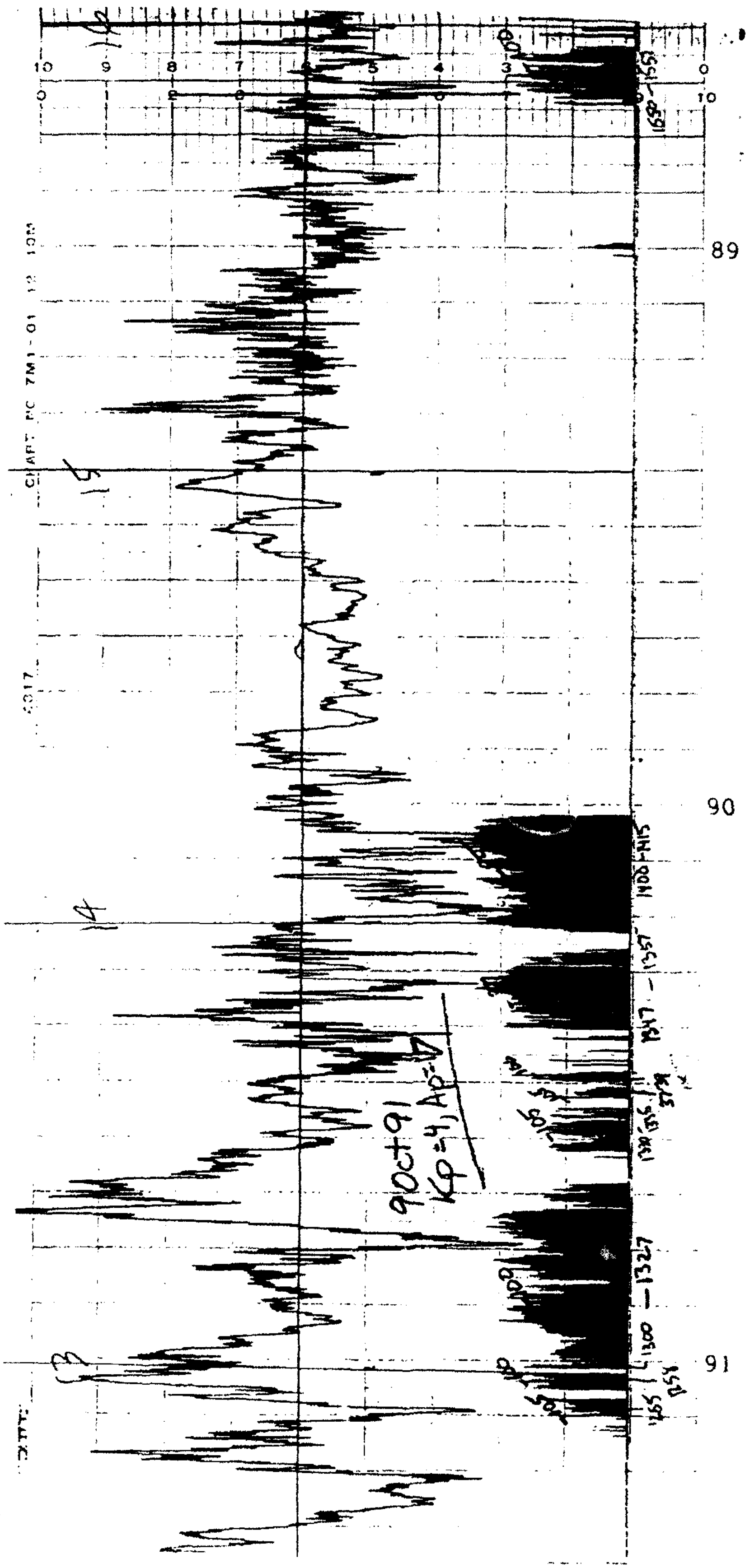


Figure 6. Example of raw data chart.

between different blocks of data. Furthermore, these spreadsheets are separated by season. The appendix contains a complete set of the first year's spreadsheet. The data recorded for each event were the following:

(1) Month

(2) Day

(3) Year

(4) Event start time (UT)

(5) Event duration (minutes)

(6) Signal amplitude (dB above the −115 decibel-above-a-microvolt (dBm) detection threshold)

(7) Magnitude and direction of earth current fluctuations

(8) Magnetic index—Ap

(9) Magnetic index—Kp

Figure 7 shows an example of the resulting spreadsheet. When the spreadsheet was completed, the data set contained the following:

(1) Original strip chart

(2) Hardcopy of annotated strip chart for all events

(3) Hardcopy of data in spreadsheet form

(4) Data in spreadsheet form on floppy disk

PRESENTATION OF THE DATA

Between 15 August 1991 and 15 August 1992, sporadic ionization was observed 1446 times. Due to the nature of the experiment, we can say that the E-region critical frequency rose above 5 MHz, allowing the 25.545 MHz signal from Cape Wales to be monitored in Fairbanks. While it is suspected that the majority of observations were auroral-E—either the diffused type occurring prior to local midnight or the discrete type occurring after local midnight—the existence of sporadic-E, like the type observed at midlatitudes, cannot be ruled out. As will be shown, diurnal characteristics may be useful in separating the two.

Table 1. Seasonal characteristics.

Season	Average Duration (min)	Average Amplitude (dB)	Number of Events Exceeding 60 min.	Longest Duration (min)	Number of Observations (events)
Autumn Aug, Sept, Oct 1991	9.9	17.4	7	120	403
Winter Nov, Dec 1991, Jan 1992	8.3	19.0	2	84	383
Spring Feb, Mar, Apr 1992	8.6	18.4	1	65	272
Summer May, Jun, Jul 1992	21.0	19.2	21	192	388

AURORAL-E EXPERIMENTAL DATA CAPE WALES TO FAIRBANKS ALASKA
NOVEMBER 1991, DECEMBER 1991, JANUARY 1992 - WINTER

MONTH	DAY	YEAR	startUTC	190 WMT	Dur(min)	Sig(db)	E/C(+/-)	Ap	Kp
1	1	92	1320	320	3	20	-2	11	2
1	1	92	1055	55	5	15	0	11	2
1	1	92	1422	422	3	15	-5	11	2
1	1	92	1316	316	2	13	0	11	2
1	1	92	1325	325	2	20	0	11	2
1	1	92	1312	312	2	15	0	11	2
1	1	92	1327	327	2	20	0	11	2
1	1	92	1134	134	12	30	-5	11	2
1	1	92	1043	43	4	15	10	11	2
1	1	92	1418	418	4	20	5	11	2
1	2	92	1030	30	2	10	-20	18	4
1	2	92	937	2337	8	23	-5	18	4
1	2	92	1105	105	3	11	5	18	4
1	3	92	1300	300	2	25	0	13	4
1	3	92	1140	140	2	15	0	13	4
1	3	92	1427	427	7	15	0	13	4
1	3	92	1153	153	2	10	0	13	4
1	3	92	1310	310	4	25	0	13	4
1	3	92	1317	317	3	25	0	13	4
1	3	92	1307	307	2	25	0	13	4
1	3	92	1245	245	9	30	0	13	4
1	8	92	1308	308	16	15	0	12	3
1	8	92	1055	55	13	13	7	12	3
1	8	92	1352	352	8	13	0	12	3
1	8	92	1140	140	3	10	10	12	3
1	8	92	1013	13	2	17	0	12	3
1	8	92	1122	122	4	10	0	12	3
1	8	92	818	2218	7	20	0	12	3
1	8	92	1328	328	6	13	0	12	3
1	8	92	812	2212	2	20	0	12	3
1	8	92	1550	550	2	10	0	12	3
1	8	92	745	2145	20	25	0	12	3
1	8	92	1028	28	19	20	0	12	3
1	8	92	1445	445	28	18	0	12	3
1	8	92	809	2209	2	15	0	12	3
1	8	92	1433	433	10	20	0	12	3
1	8	92	1632	632	3	18	0	12	3
1	8	92	1530	530	6	20	0	12	3
1	8	92	1607	607	22	28	0	12	3
1	8	92	1047	47	5	18	5	12	3
1	8	92	915	2315	10	25	0	12	3
1	10	92	422	1822	10	30	0	11	2
1	10	92	1140	140	10	20	-20	11	3
1	10	92	1252	252	3	15	0	11	3
1	10	92	817	2217	2	18	-10	11	3
1	10	92	1302	302	2	15	0	11	3

Figure 7. Auroral-E data spreadsheet.

MAGNETIC AND DIURNAL DEPENDENCIES

Three areas were investigated to determine what dependencies existed in the data. The areas were (1) occurrences versus local time, (2) occurrences versus magnetic index, and (3) amplitude and duration versus magnetic index.

We will discuss the last two areas first. There were no strong correlations between the signal amplitude and the duration of observed auroral-E and the Kp. Once the Kp reached a value of 3, the signal amplitude and duration varied irrespective of the Kp. A long duration event was just as likely at a Kp of 3 as at a Kp of 7. It appears that a dependency on Kp is somewhat binary. Once the Kp crosses a threshold of 3, the likelihood of auroral-E occurrence is relatively uniform.

Figures 8, 9, 10, and 11 show the distribution of occurrence as a function of the local time of day. These plots show that the probability of occurrence has a high dependency on the local time of day. Figure 8 shows the diurnal variation in the occurrence for fall 1991. It shows a strong dependency centered on local midnight. During the fall equinox, there is about an equal amount of daylight and night. During daylight hours between 0700 and 1700 local time, only a small number of events were observed. Another feature in this plot is a small subpeak just prior to sunrise at 0600 local time.

Figure 9 shows the diurnal characteristics for the winter solstice. The distribution seems to be shifting to the postmidnight period, indicating a strong dominance by the westward electrojet. The probability of occurrence is still centered on the 2300 to 0100 local time period.

The spring equinox, shown in figure 10, still shows a peak probability around local midnight, although the peak broadens to include the 2200 to 0200 local time period. A secondary peak is also noted just prior to sunrise at 0500 local time.

During the summer solstice in June, the path is in daylight between 0130 and 2300. As is seen in figure 11, the probability of occurrence now shifts to between 0100 and 0400 with the distribution curve starting to build as early as 1800 local time. Due to the number of events that occurred during the postsunrise and presunset periods, we expect that sporadic-E was present much of the time. As mentioned earlier, there is no way to separate the two.

Except during the summer solstice, the probability of the occurrence of auroral-E was centered around local midnight. Since the majority of events occurred after 2200 local time, activity in the westward electrojet caused most of the observed sporadic propagation. During highly disturbed periods, the observed auroral-E was a combination of E modes created by both diffuse and discrete precipitation.

Figure 12 shows the number of events by month. October and November 1991 were the most productive months with 371 events. During the rest of the year, there were approximately 100 events per month.

Figure 13 presents the number of days per month that auroral-E events were observed on. Noting that August 1991 and August 1992 had only 15 days of

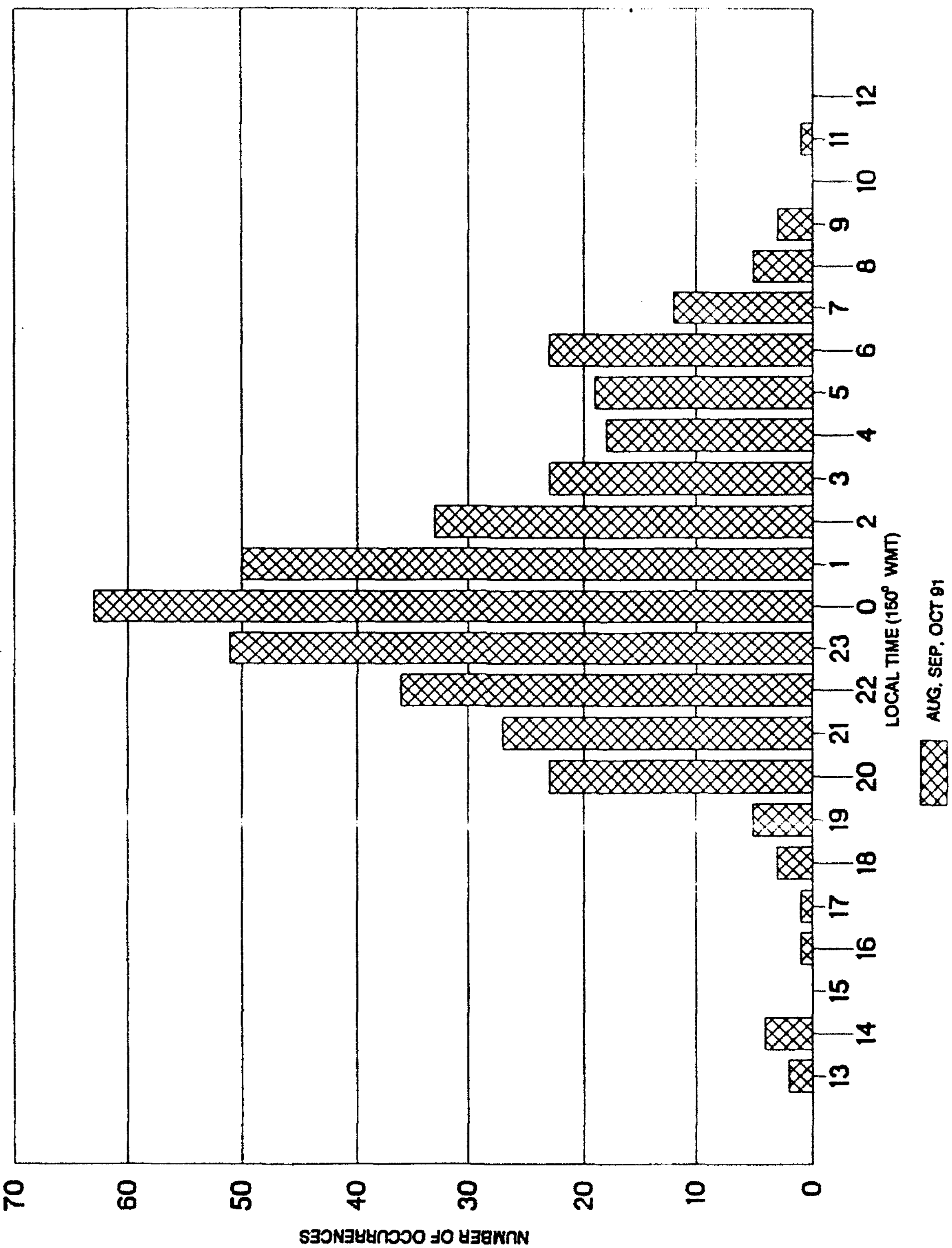


Figure 8. Auroral-E experiment: occurrence vs. local time (fall 1991).

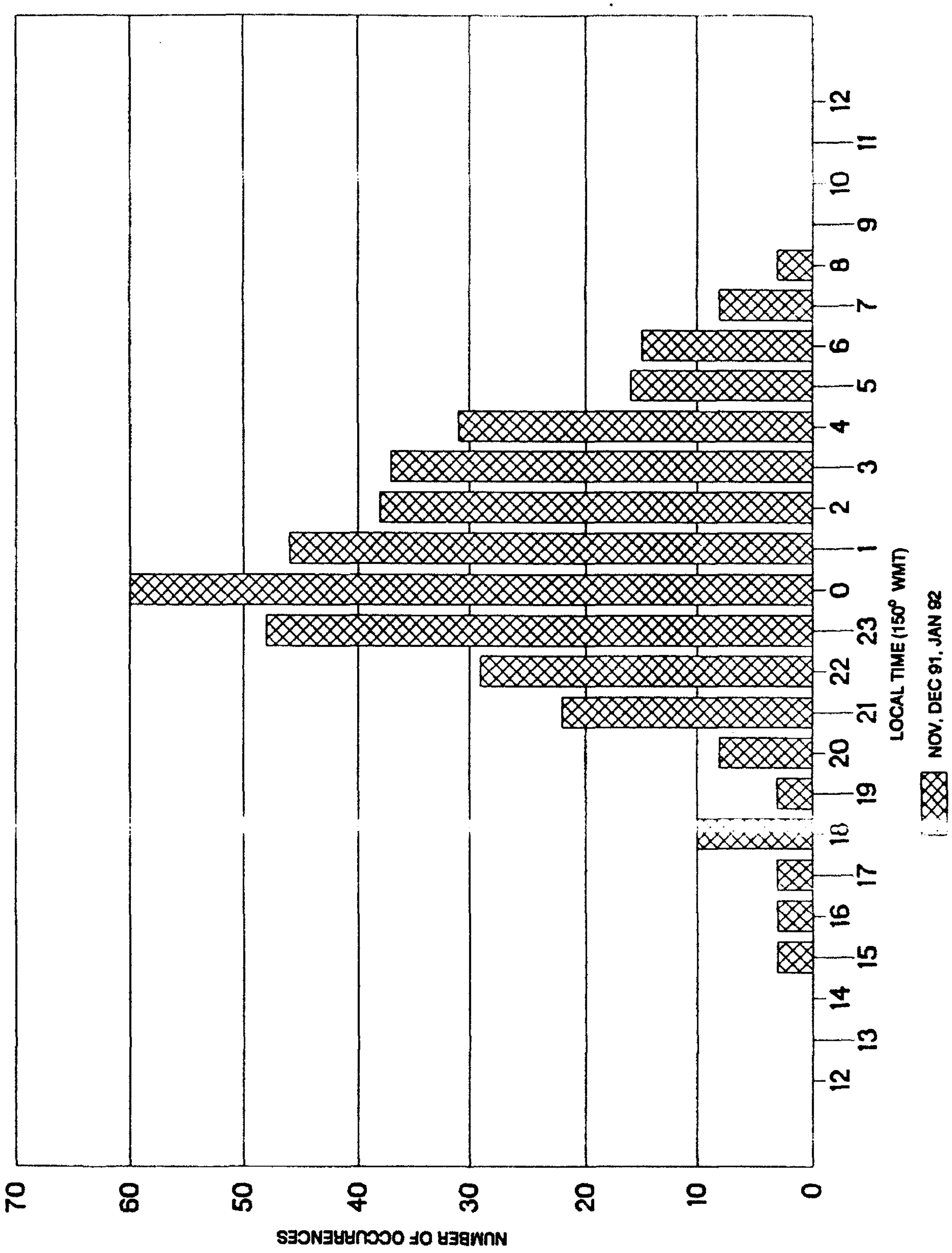


Figure 9. Auroral-E experiment: occurrence vs. local time (winter 1991–1992).

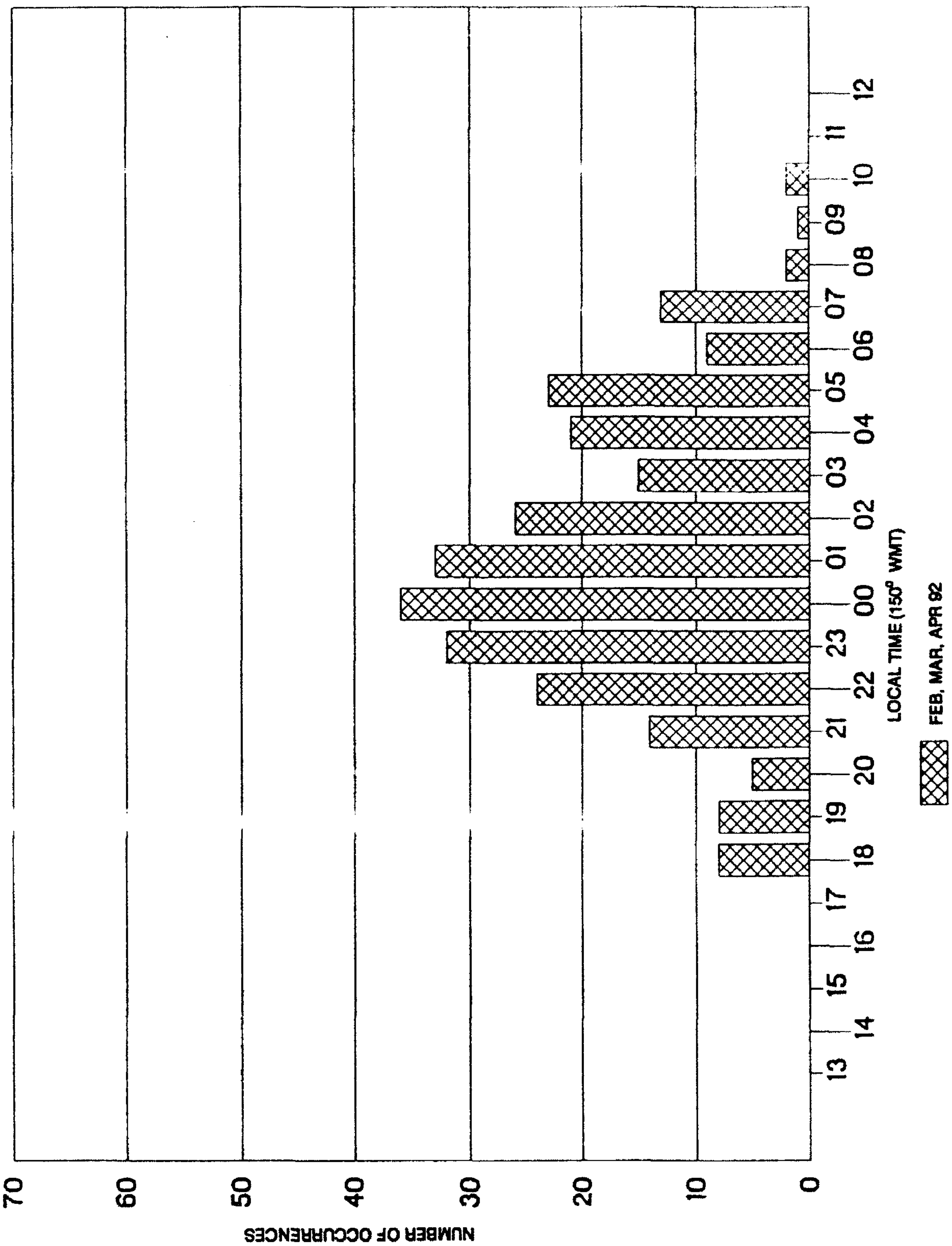


Figure 10. Auroral-E experiment: occurrence vs. local time (spring 1992).

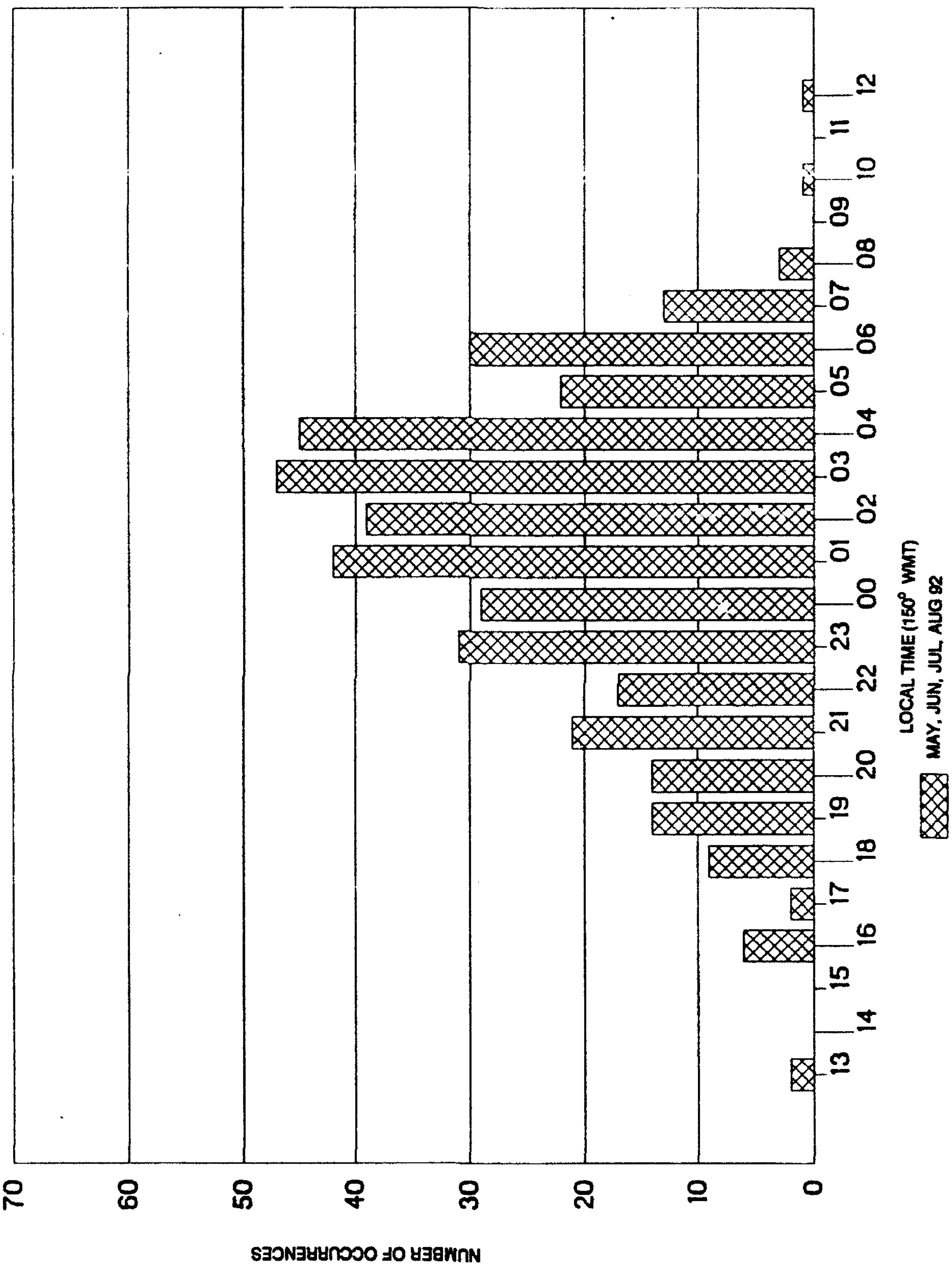


Figure 11. Auroral-E experiment: occurrence vs. local time (summer 1992).

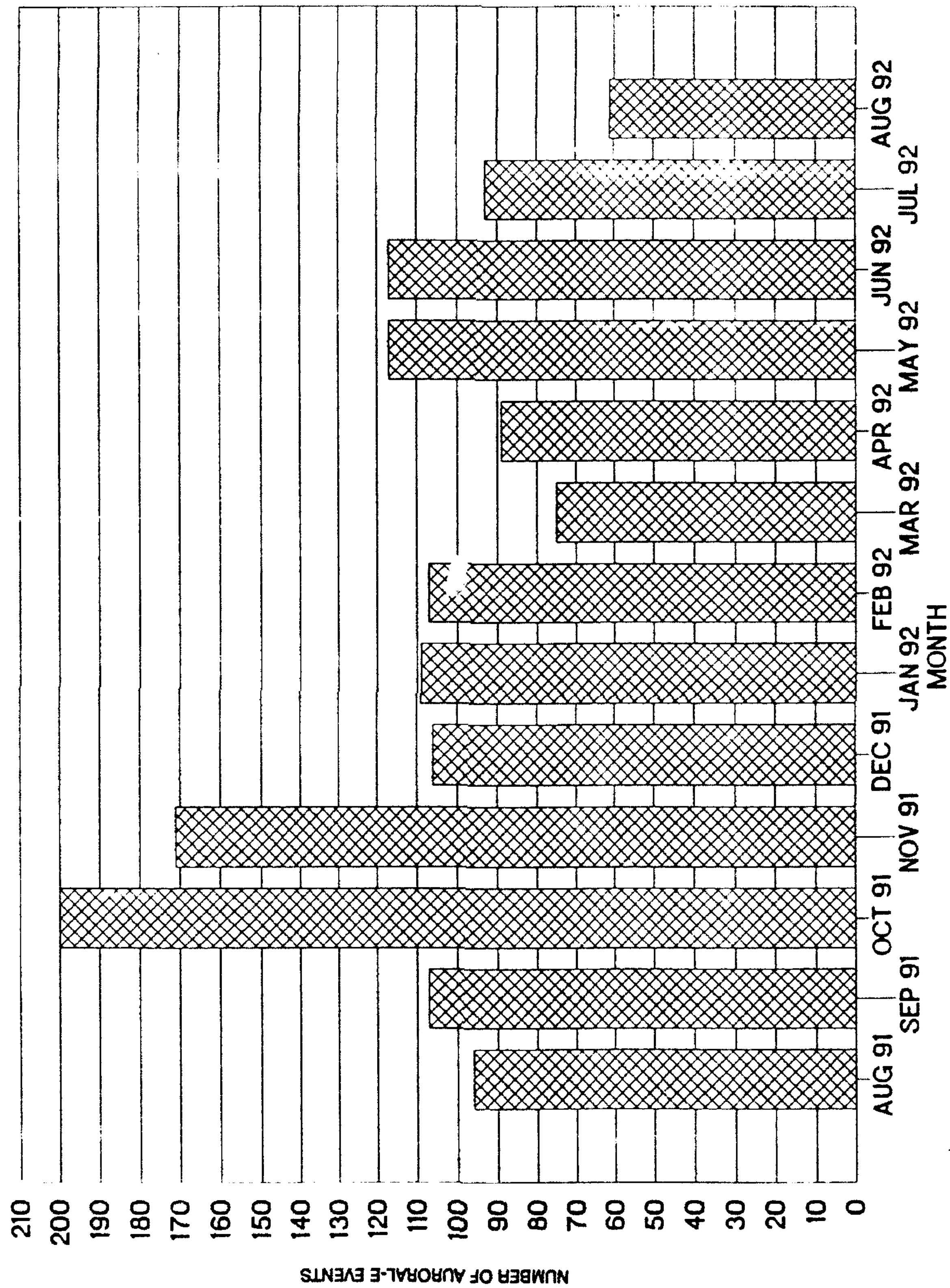


Figure 12. Auroral-E experiment: number of events by month.

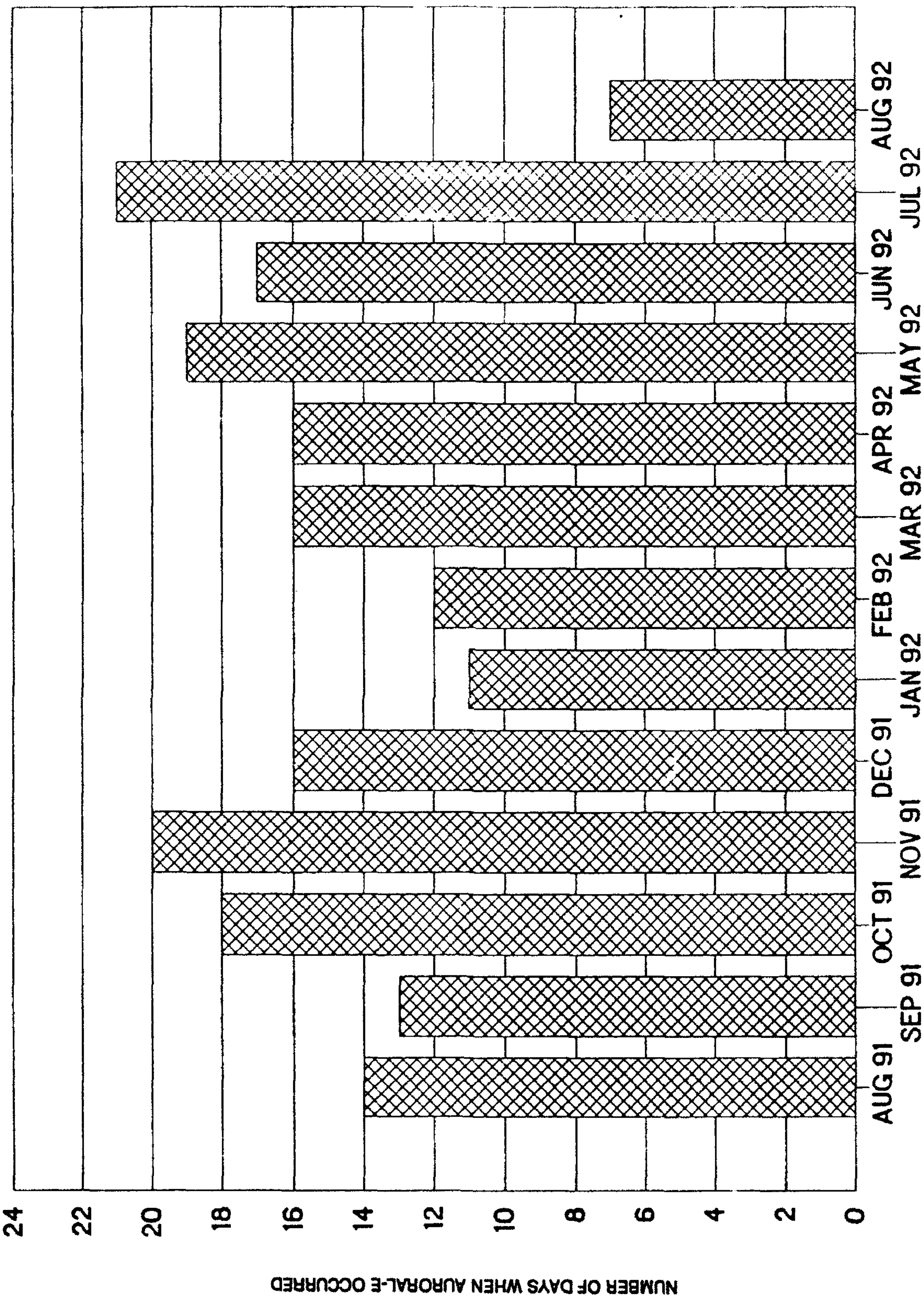


Figure 13. Auroral-E experiment: number of days when auroral-E occurred.

observation, August 1991 was nearly 100% productive while August 1992 was 50% productive. This chart indicates that auroral-E occurred on 16 days during the average month, which is a little over 50% of the time.

Figure 14 shows what percentage of days per month auroral-E occurred on. This figure indicates that the occurrence of auroral-E peaked during the fall equinox, slowed down during the winter solstice, and started to peak again throughout summer and fall 1992. During the summer and fall, monthly sunspot numbers declined from 150 to 70 as the cycle moved toward solar minimum.

Auroral-E tended to occur in clusters or "swarms" during periods of increased geomagnetic activity. Figures 15a, 15b, and 15c show the nightly return of auroral-E events during a large geomagnetic storm over the three-day period between 27 October and 29 October 1991. On the first day, shown in figure 15a, when the Kp rose to 5, the electrojet activity started prior to local midnight. Short duration events of 5 to 15 minutes occurred through the remaining night hours. On the second night, the Kp rose to 7. The auroral electrojet was extremely active just after local midnight. However, figure 15b shows a surprising lack of E propagation. Then in the predawn hours, E events increased. On the third night, seen in figure 15c, the passage of the Harang Discontinuity at about 2000 local time decreased the level of activity in the westward electrojet. The magnetic indices rose to a Kp of 8. During the remaining night hours until just past midnight, a swarm of 25 auroral-E events took place. After about 0145 local time, the electrojet was quiet and the E events ceased.

The E propagation characteristics seen over this three-day period are representative of observations made during geomagnetic storms throughout the year. Signal amplitudes were typically 25 to 30 dB above the detection threshold. Event durations varied between 2 minutes and 40 minutes. This presents a picture of plasma consisting of patches of electron density that vary widely in size being driven along the auroral electrojet. This size variation caused the variation in event duration.

The relative consistency in the maximum signal amplitude indicates that the electron density of each patch also reaches a maximum value. In most cases, either the signal is or is not there. There is no consistent "graceful degradation." This is most likely because the peak electron density of the auroral-E region occurs at a narrowly bounded height between 90 and 120 km. Therefore, we would expect that electron densities being formed by the same ionization source (auroral precipitation) would be about the same.

Early in the experiment, it was attempted to correlate electrojet activity as evidenced by the earth current meter to the occurrence of auroral-E. It was observed that the existence of electrojet activity, and not its magnitude, correlated to the occurrence of auroral-E. This is consistent with the theory, discussed earlier, which states that an increase in the auroral electrojet activity triggers the particle precipitation that causes auroral-E. It should also be mentioned that the earth current meter was installed at the receiving site. It is likely that there would had been a better correlation between electrojet variations and received signal variations if the earth current sensor were located under the E-region reflection point at midpath.

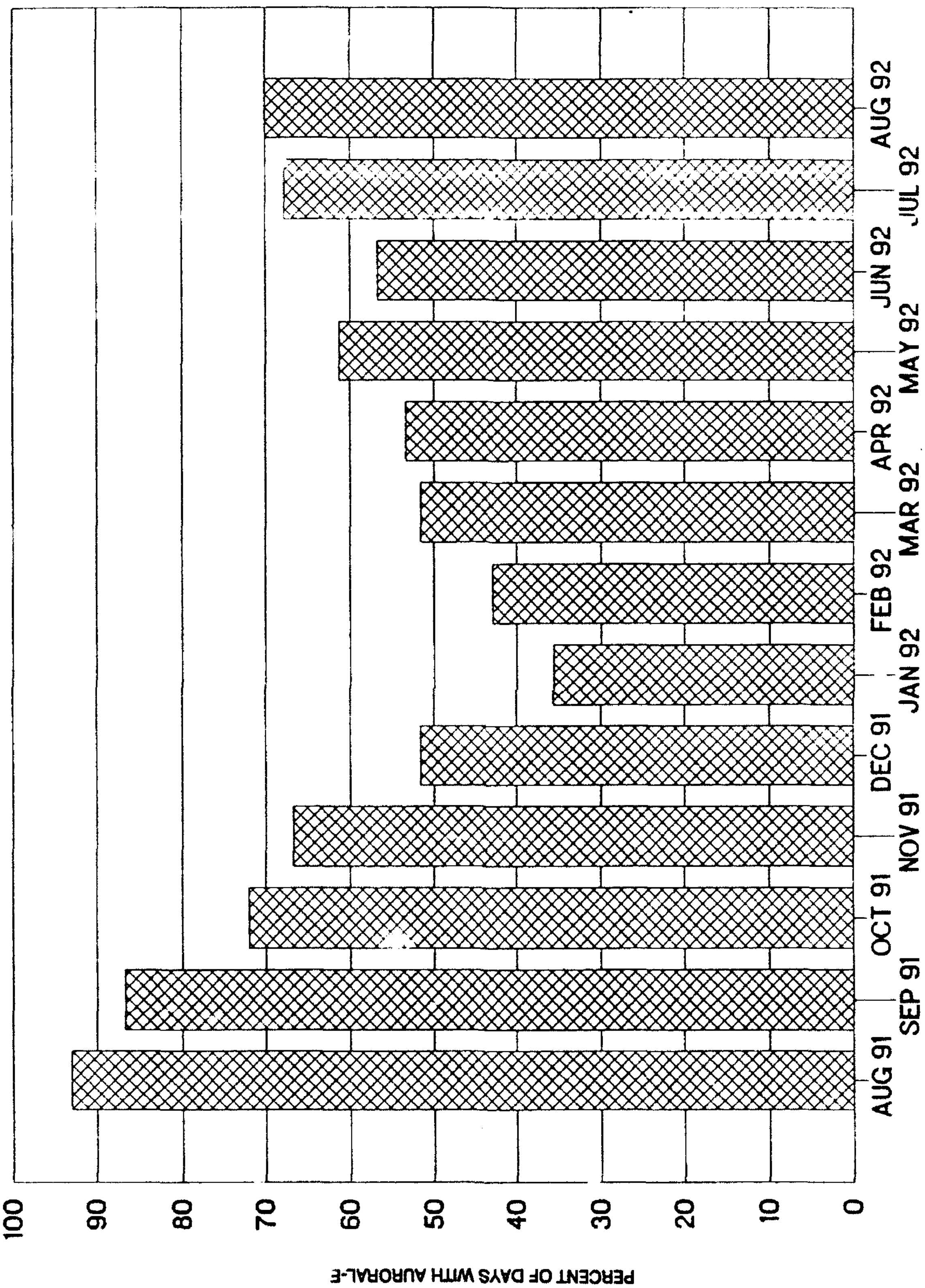
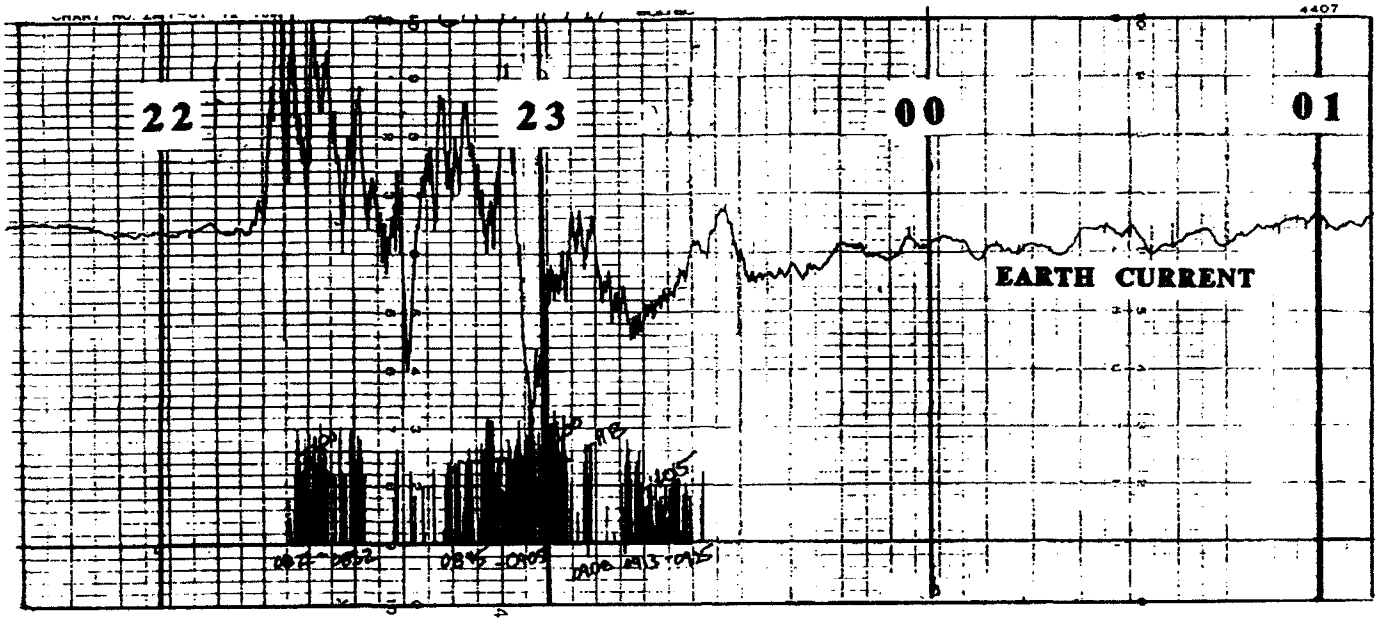
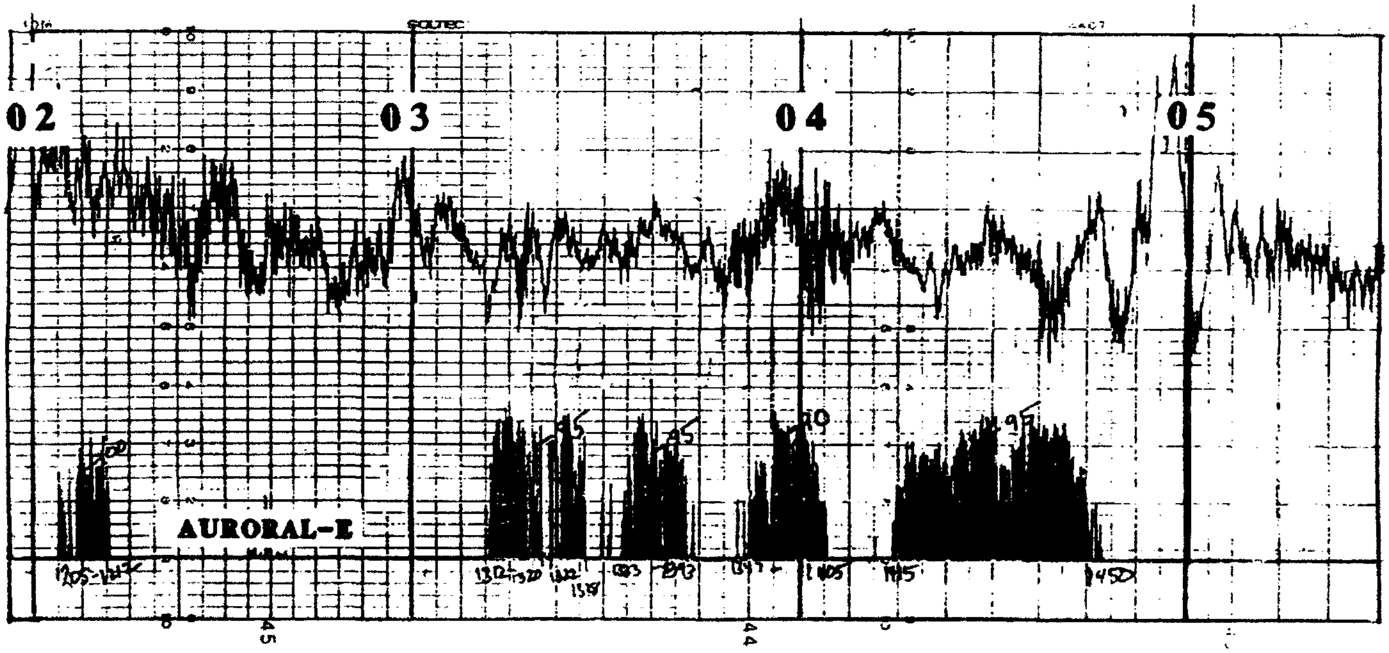


Figure 14. Auroral-E experiment: percentage of days with auroral-E.

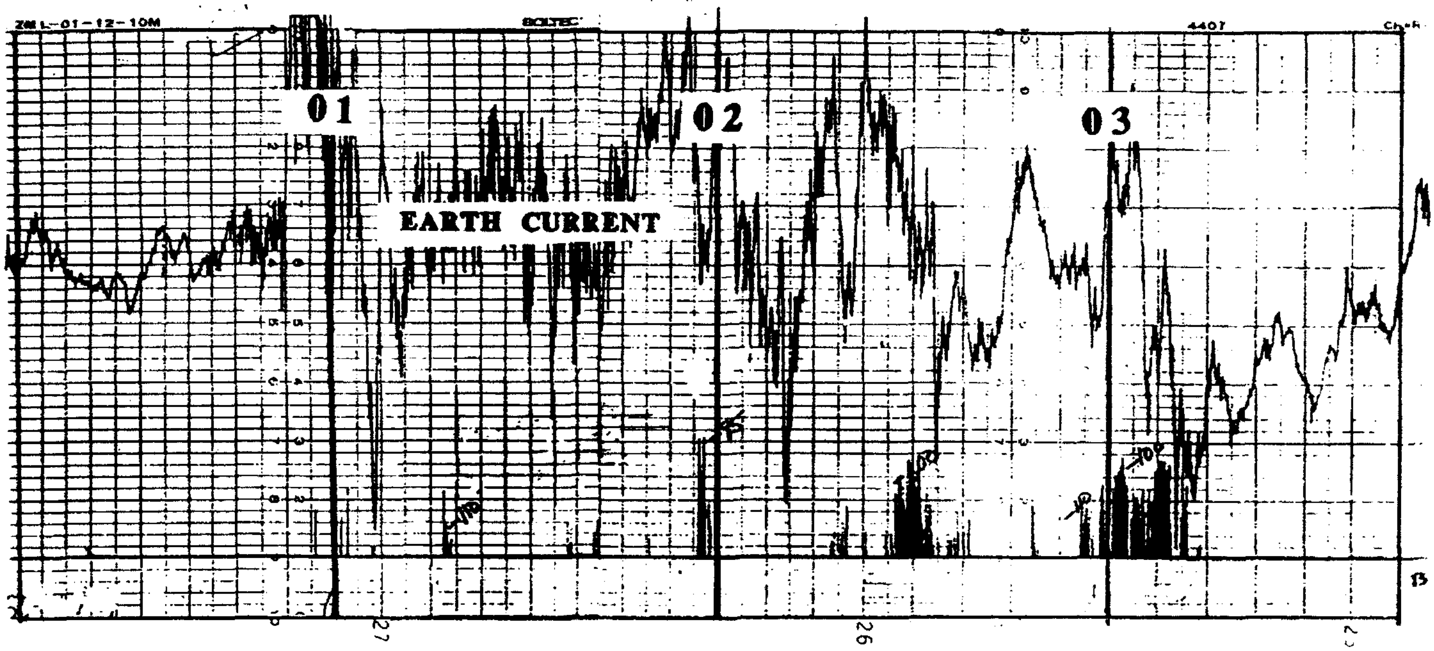


LOCAL TIME (150° WMT)

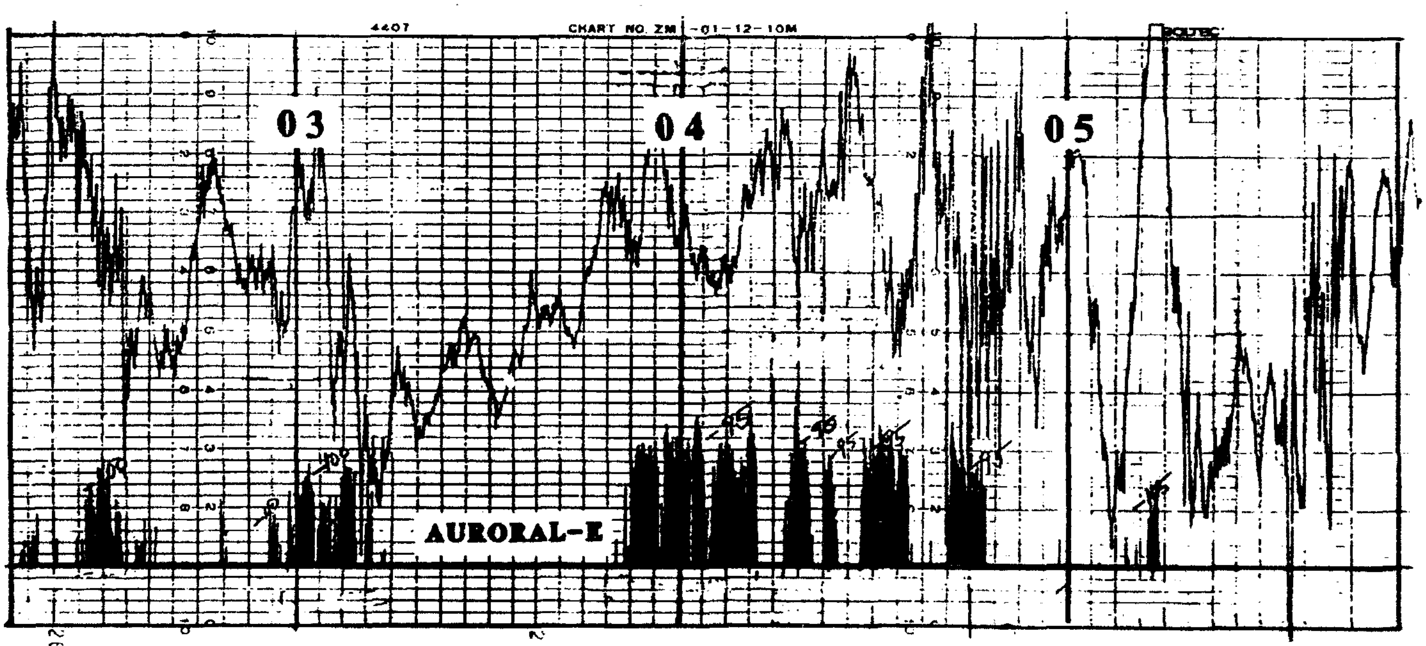


Ap = 33, Kp = 5

Figure 15a. Major magnetic storm, first day, 27 October 1991.

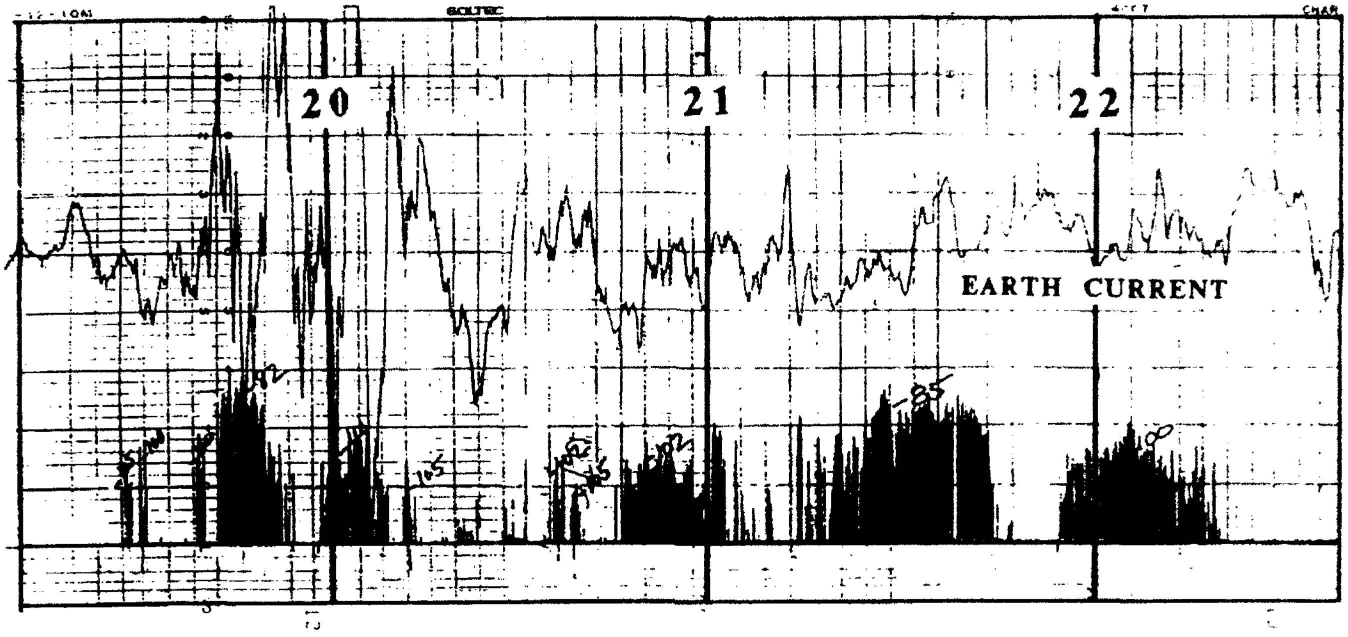


LOCAL TIME (150° WMT)

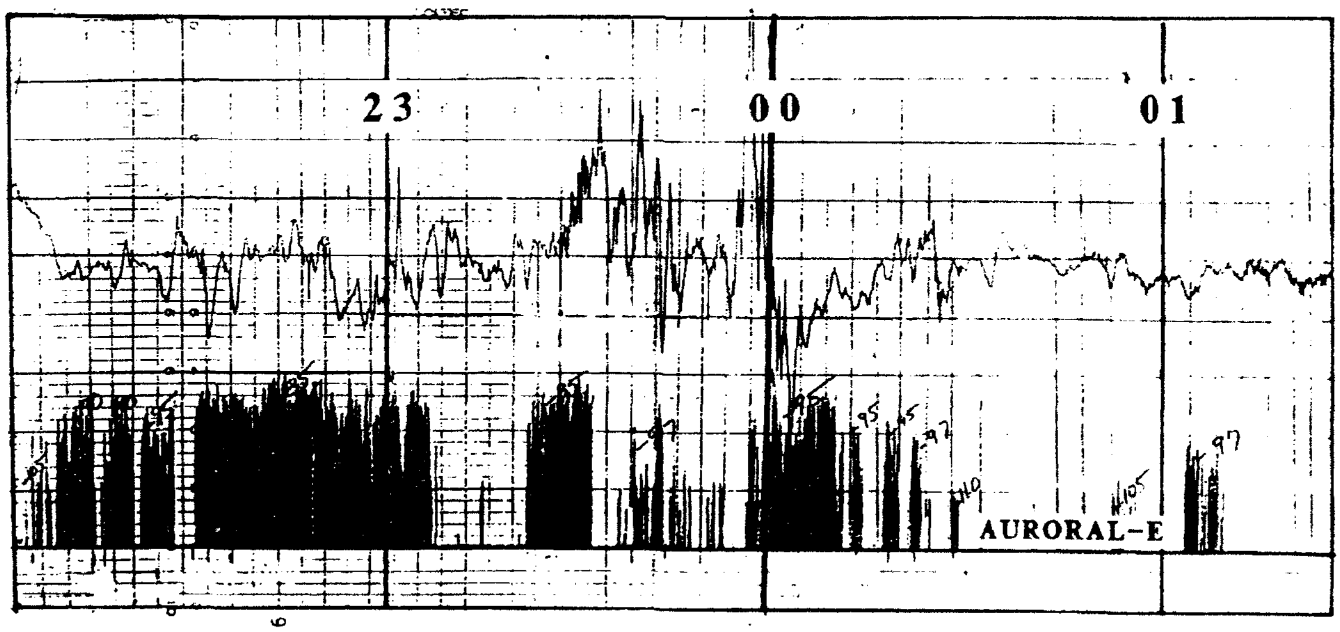


Ap = 50, Kp = 7

Figure 15b. Major magnetic storm, second day, 28 October 1991.



LOCAL TIME (150° WMT)



Ap = 90, Kp = 8

Figure 15c. Major magnetic storm, third day, 29 October 1991.

Longer duration events that exceeded 60 minutes were seen on occasion. According to the previous discussion on the formation of auroral-E, a long duration event requires a large sheet of ionization. Figure 16 shows two examples of long duration events, one lasting 50 minutes and another 80 minutes. Both produced relatively consistent signal amplitudes of 30 dB. Also note the relative lack of activity. This example is almost certainly auroral-E because it occurred many hours prior to sunrise, which was about 0930 local time, with a Kp of 3 in the postmidnight sector.

As mentioned previously, modelers who must typify the auroral ionospheric environment face three types of E-region ionization. These types are the following:

(1) Sporadic-E (E)

(2) Auroral-E—diffuse precipitation

(3) Auroral-E—discrete precipitation

However, it is virtually impossible to separate the three types in an oblique sensing experiment such as this one. About the only way to separate the types is to use diurnal and seasonal characteristics to guess which type is present. Figure 17 illustrates this problem. It shows two long duration events that are probably typical midlatitude-type sporadic-E events. They occur in daylight, 4 hours after sunrise, and the Kp is 2, meaning the auroral zone is north of the Wales to Fairbanks path. Finally, the earth current sensor shows almost no activity. Other than these reasons, the data are similar to the even data shown in figure 16, which are "auroral-E."

SUMMARY

The objective of this experiment was to sufficiently characterize auroral-E so that an expert system rule set could be derived for DIAS. This objective was obtained. From the analysis of the data the following observations were made:

(1) Auroral-E is predominantly a nighttime phenomenon. Its occurrence centers around local midnight and several hours after local midnight. In the hours between 2200 and 0300 local time, when the K index is sufficiently high to place the auroral oval and the electrojet is over the transmission path, the likelihood of auroral-E occurrence is 50%.

(2) Auroral-E is a short-lived, intense phenomenon. Its onset and demise are abrupt in nature. Out of 1445 observations, 981 (68%) had durations equal to or less than 10 minutes, 234 (16%) had durations between 11 and 20 minutes, and 90 (6%) had durations between 21 and 30 minutes. 90% of the observations occurred between 1 and 30 minutes. Eleven events had durations greater than 90 minutes. One of these events occurred in the fall and the rest occurred in the spring; 7 events in the spring had durations longer than 120 minutes. In the summer months, the 2-hour-long night and the long daylight hours caused auroral-E and sporadic-E events to run together.

(3) Auroral-E occurs on 75% of the days during months containing equinoxes, about 60% of the time during the summer, and only 36% of the time during the winter.

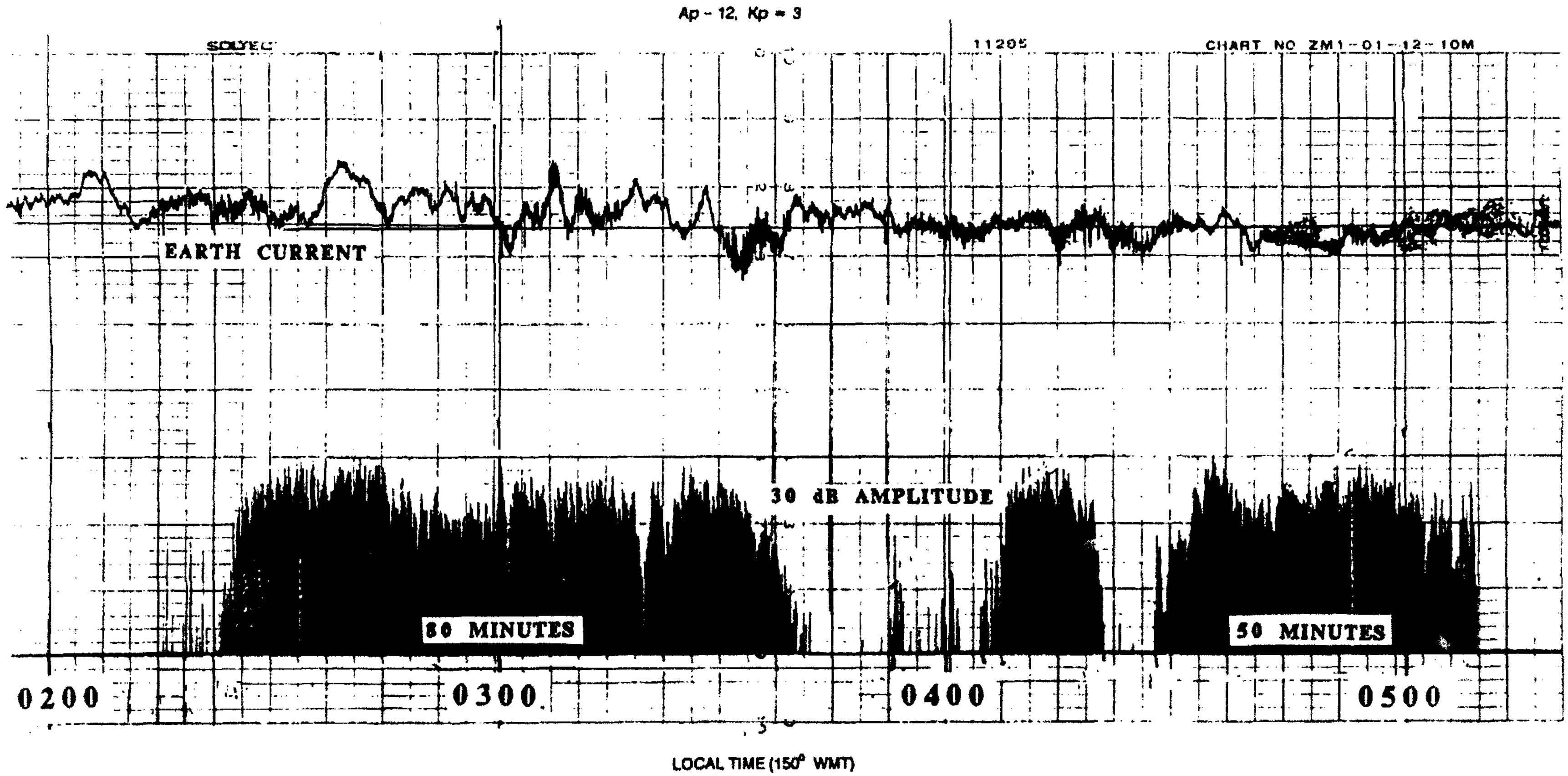


Figure 16. Long duration auroroal-E events, 28 November 1991.

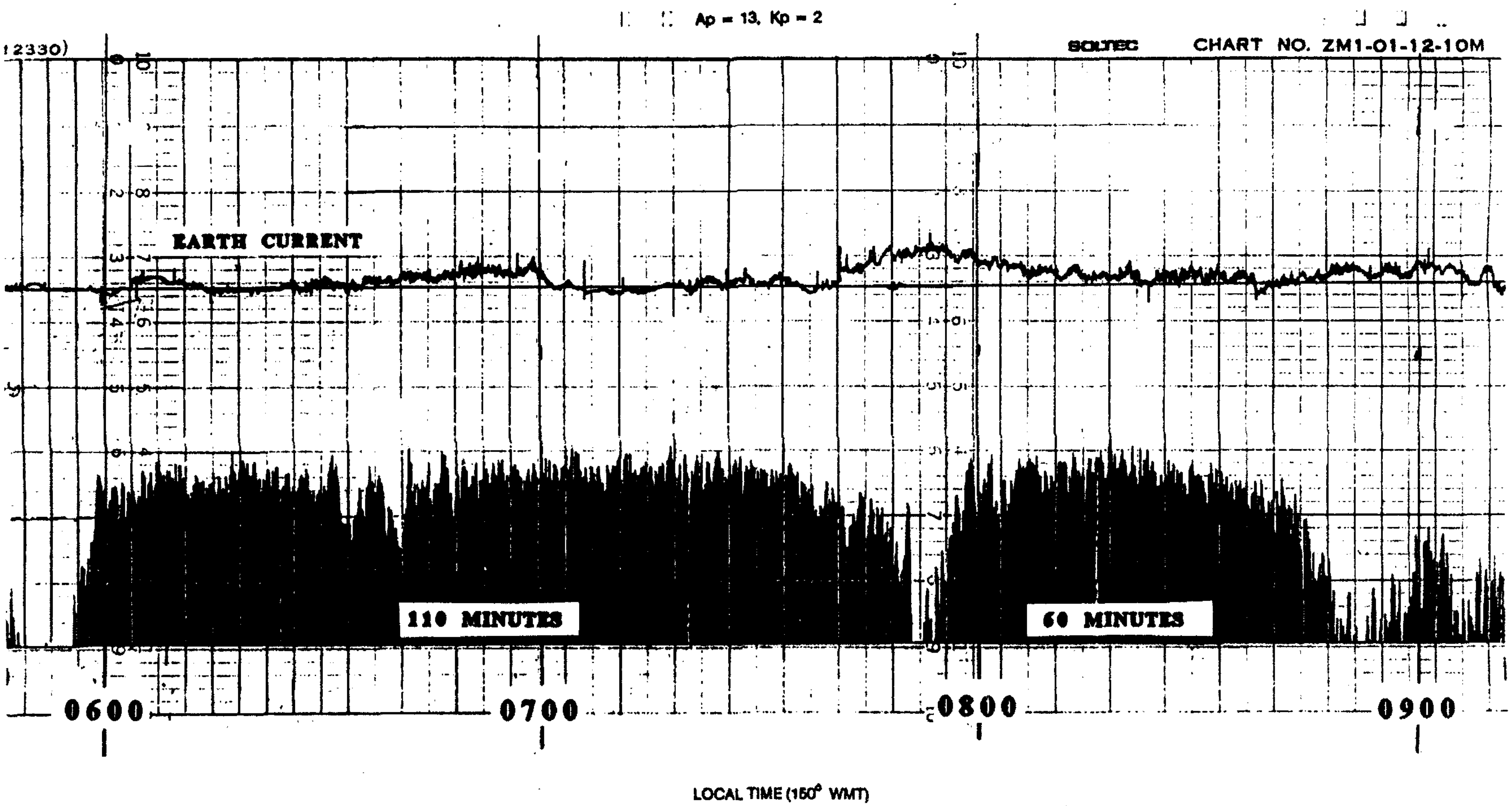


Figure 17. Longest duration event, 19 June 1992.

(4) The ionization patches are sufficiently dense to support oblique propagation in the high HF and LoVHF spectrum. Signal amplitudes were consistently between 20 and 30 dB above the receiver detection threshold of –115 dBm.

(5) There were no significant correlations between Kp and the duration or amplitude of the observed signals. It appears that Kp is useful only in indicating when the auroral oval expansion is sufficient to place the electrojet in the vicinity of the area of interest.

(6) Since this sporadic mode is generated from a thin, irregular plasma localized in latitude and longitude, only single-hope propagation is likely, restricting oblique propagation to less than 1500 km. However, given the right orientation, the likelihood of reoccurrence could be predictable.

The auroral-E measurement program will be continued for at least another year to observe any changes that might occur as solar minimum approaches. Objectives will be to more closely define the interrelationships between the auroral electrojet and the onset of auroral-E.

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APPENDIX

AURORAL-E DATA SPREADSHEETS

AURORAL-E SPREADSHEETS
AUGUST, SEPTEMBER, OCTOBER 1991

AURORAL-E EXPERIMENTAL DATA, FALL 1991
AUTUMN EQUINOX, AUGUST (LAST 15 DAYS), SEPTEMBER, OCTOBER 1991

Month	Day	Year	StartUTC	150WMT	Dur(min)	Sig(dB)	E/C(+/-)	Ap	Kp	Size
8	16	91	648	2048	4	8	2	22	3	Minor
8	16	91	641	2041	5	10	-1	22	3	Minor
8	16	91	437	1837	13	15	-2	22	4	Moderate
8	16	91	710	2110	4	5	1	22	3	Minor
8	17	91	952	2352	4	11	4	22	4	Minor
8	17	91	1050	50	3	11	3	22	4	Minor
8	17	91	1937	937	13	20	0	22	3	Moderate
8	17	91	1920	920	5	10	0	22	3	Minor
8	17	91	1955	955	10	10	0	22	3	Moderate
8	18	91	5	1405	5	8	3	22	5	Minor
8	18	91	1424	424	2	5	-4	22	3	Minor
8	18	91	2145	1145	55	28	-18	22	5	Major
8	18	91	1421	421	2	5	-4	22	3	Minor
8	18	91	557	1957	16	15	2	22	3	Major
8	18	91	2354	1354	8	13	-4	22	5	Moderate
8	18	91	1413	413	2	5	-4	22	3	Minor
8	18	91	2345	1345	5	15	-7	22	5	Minor
8	18	91	1427	427	2	5	-3	22	3	Minor
8	19	91	1013	13	17	15	8	53	7	Major
8	19	91	945	2345	23	20	10	53	7	Major
8	19	91	1332	332	45	13	10	53	6	Major
8	19	91	313	1713	37	15	8	53	5	Major
8	19	91	1055	55	16	12	6	53	7	Major
8	19	91	35	1435	85	18	-10	53	5	Major
8	20	91	632	2032	3	5	-15	41	4	Minor
8	20	91	603	2003	7	13	15	41	4	Moderate
8	20	91	1210	210	3	11	0	41	4	Minor
8	20	91	612	2012	8	13	-9	41	4	Moderate
8	20	91	1105	105	34	12	-3	41	6	Major
8	20	91	637	2037	6	10	19	41	4	Moderate
8	20	91	647	2047	16	13	-17	41	4	Major
8	20	91	1005	5	50	10	15	41	6	Major
8	20	91	1227	227	2	12	-3	41	4	Minor
8	21	91	845	2245	68	25	3	44	6	Major
8	21	91	1245	245	5	5	-4	44	4	Minor
8	21	91	1112	112	8	15	4	44	4	Moderate
8	21	91	1123	123	7	15	-10	44	4	Moderate
8	21	91	1027	27	19	15	10	44	4	Major
8	21	91	525	1925	5	20	-35	44	6	Minor
8	21	91	1103	103	6	12	10	44	4	Moderate
8	21	91	1140	140	10	13	5	44	4	Moderate
8	21	91	815	2215	8	15	5	44	6	Moderate
8	22	91	1032	32	8	5	-10	43	6	Moderate
8	22	91	937	2337	8	22	-15	43	6	Moderate
8	22	91	932	2332	6	23	15	43	6	Moderate
8	22	91	705	2105	4	5	5	43	6	Minor

8	22	91	715	2115	5	13	15	43	6	Moderate
8	24	91	934	2334	18	12	1	12	2	Minor
8	24	91	401	1801	3	15	0	12	2	Minor
8	26	91	1044	44	13	10	-3	12	2	Moderate
8	27	91	818	2218	2	9	-5	29	4	Minor
8	27	91	938	2338	3	5	-2	29	4	Minor
8	27	91	914	2314	2	5	-2	29	4	Minor
8	28	91	907	2307	3	11	-6	16	2	Minor
8	28	91	930	2330	10	11	-4	16	2	Moderate
8	29	91	1553	553	9	14	-8	14	3	Moderate
8	29	91	1649	649	16	17	6	14	3	Major
8	29	91	1117	117	12	20	-3	14	3	Moderate
8	29	91	1226	226	6	13	5	14	3	Moderate
8	29	91	1709	709	13	15	2	14	3	Moderate
8	29	91	1142	142	36	7	-5	14	3	Major
8	29	91	1237	237	36	22	11	14	3	Major
8	29	91	1132	132	4	13	0	14	3	Moderate
8	29	91	1113	113	4	13	-3	14	3	Minor
8	29	91	1537	537	8	15	-5	14	3	Moderate
8	29	91	1321	321	17	15	-5	14	3	Moderate
8	29	91	1622	622	9	16	4	14	3	Moderate
8	29	91	1605	605	8	11	0	14	3	Moderate
8	29	91	1107	107	3	10	-4	14	3	Minor
8	29	91	57	1457	6	15	0	14	3	Moderate
8	30	91	1222	222	3	15	10	39	5	Minor
8	30	91	1100	100	32	20	6	39	5	Major
8	30	91	1033	33	5	9	0	39	5	Minor
8	30	91	1055	55	2	13	3	39	5	Minor
8	30	91	1144	144	7	15	-10	39	5	Moderate
8	30	91	1207	207	3	15	-5	39	5	Minor
8	30	91	1230	230	5	15	3	39	5	Minor
8	30	91	1235	235	8	15	-4	39	5	Moderate
8	30	91	1302	302	2	20	12	39	5	Minor
8	30	91	1305	305	3	15	-12	39	5	Minor
8	30	91	1247	247	6	14	-4	39	5	Moderate
8	31	91	829	2229	7	15	-13	36	5	Moderate
8	31	91	1037	37	2	15	9	36	5	Minor
8	31	91	1545	545	7	10	-23	36	5	Moderate
8	31	91	655	2055	12	10	10	36	5	Moderate
8	31	91	945	2345	2	20	-4	36	5	Minor
8	31	91	840	2240	10	13	-5	36	5	Moderate
8	31	91	1557	557	2	10	-5	36	5	Minor
8	31	91	1053	53	2	20	-2	36	5	Minor
8	31	91	640	2040	2	5	5	36	5	Minor
8	31	91	1032	32	2	15	-2	36	5	Minor
8	31	91	1617	617	6	20	-4	36	5	Moderate
8	31	91	957	2357	8	15	5	36	5	Moderate
8	31	91	1009	9	2	10	-10	36	5	Minor
8	31	91	915	2315	2	30	0	36	5	Minor
8	31	91	855	2255	4	20	3	36	5	Minor

9	1	91	1028	28	2	13	-12	38	5	Minor
9	1	91	1000	0	4	30	5	38	5	Minor
9	1	91	827	2227	2	20	4	38	5	Minor
9	1	91	1012	12	6	25	0	38	5	Moderate
9	1	91	840	2240	7	25	15	38	5	Moderate
9	1	91	907	2307	40	30	12	38	5	Major
9	1	91	832	2232	7	30	-25	38	5	Moderate
9	1	91	1323	323	2	13	0	21	3	Minor
9	2	91	653	2053	4	25	13	35	6	Minor
9	2	91	700	2100	7	20	-25	35	6	Moderate
9	2	91	1147	147	13	10	-8	35	5	Moderate
9	2	91	912	2312	5	25	20	35	6	Moderate
9	2	91	1133	133	2	10	4	35	5	Minor
9	2	91	1203	203	6	5	0	35	5	Moderate
9	2	91	1107	107	2	15	0	35	5	Minor
9	2	91	825	2225	2	13	-5	35	5	Minor
9	2	91	813	2213	2	20	-5	35	5	Minor
9	2	91	636	2036	4	20	-2	35	6	Minor
9	2	91	617	2017	2	10	-2	35	5	Minor
9	2	91	946	2346	4	15	-2	35	6	Minor
9	3	91	1517	517	26	13	0	21	3	Major
9	3	91	1303	303	3	15	0	21	3	Minor
9	3	91	750	2150	5	15	-8	21	4	Minor
9	3	91	817	2217	27	15	3	21	4	Major
9	3	91	920	2320	23	25	-5	21	4	Major
9	3	91	857	2257	13	10	-10	21	4	Moderate
9	3	91	846	2246	10	20	5	21	4	Moderate
9	3	91	1413	413	43	8	2	21	3	Major
9	4	91	1321	321	9	20	0	12	3	Moderate
9	4	91	1412	412	5	10	0	17	3	Minor
9	4	91	804	2204	49	15	0	31	4	Major
9	4	91	917	2317	8	20	-2	25	4	Moderate
9	4	91	1145	145	60	20	2	15	3	Major
9	4	91	1000	0	65	20	0	16	3	Major
9	4	91	1247	247	6	15	0	15	3	Moderate
9	4	91	1808	808	2	13	0	9	2	Minor
9	5	91	1013	13	62	25	-12	51	5	Major
9	5	91	908	2308	2	10	2	53	5	Minor
9	5	91	1632	632	10	13	0	23	4	Moderate
9	5	91	712	2112	7	25	15	49	5	Moderate
9	5	91	1702	702	6	15	-5	23	4	Moderate
9	5	91	943	2343	2	15	5	53	5	Minor
9	5	91	652	2052	7	25	3	49	5	Moderate
9	5	91	1622	622	2	15	0	23	4	Minor
9	5	91	937	2337	2	13	0	53	5	Minor
9	5	91	1453	453	12	5	0	25	4	Moderate
9	6	91	940	2340	2	15	10	23	4	Minor
9	6	91	1040	40	5	25	-3	23	4	Minor
9	6	91	1707	707	2	10	0	18	3	Minor
9	6	91	957	2357	2	10	0	23	4	Minor

9	6	91	943	2343	2	12	-2	23	4	Minor
9	6	91	1015	15	12	20	10	23	4	Moderate
9	6	91	1035	35	2	20	-5	23	4	Minor
9	6	91	207	1607	22	10	0	16	3	Major
9	6	91	1607	607	12	15	5	18	3	Moderate
9	7	91	1343	343	4	20	-12	16	3	Minor
9	7	91	1338	338	2	15	1	16	3	Minor
9	8	91	937	2337	6	25	-4	14	3	Moderate
9	8	91	1027	27	2	35	10	14	3	Minor
9	8	91	1037	37	2	15	5	14	3	Minor
9	8	91	1017	17	5	25	2	14	3	Minor
9	8	91	1013	13	2	20	0	14	3	Minor
9	8	91	1045	45	12	25	2	14	3	Moderate
9	8	91	1029	29	5	30	10	14	3	Moderate
9	8	91	947	2347	13	30	-2	14	3	Moderate
9	9	91	1332	332	3	25	-5	34	4	Minor
9	9	91	1640	640	2	10	-15	37	5	Minor
9	9	91	1652	652	23	13	18	37	5	Major
9	9	91	1646	646	4	10	20	37	5	Minor
9	9	91	1208	208	21	30	13	34	4	Major
9	9	91	1146	146	2	28	-5	34	4	Minor
9	9	91	1605	605	13	7	20	37	5	Moderate
9	9	91	827	2227	23	10	5	29	4	Major
9	9	91	1148	148	9	13	-5	34	4	Moderate
9	9	91	1107	107	5	15	5	34	4	Moderate
9	9	91	1143	143	2	15	3	34	4	Minor
9	9	91	857	2257	120	25	25	29	4	Major
9	9	91	1126	126	2	25	5	34	4	Minor
9	9	91	1159	159	8	33	-2	34	4	Moderate
9	9	91	1137	137	2	20	5	34	4	Minor
9	9	91	1626	626	2	10	5	37	5	Minor
9	10	91	633	2033	13	15	-16	67	6	Moderate
9	10	91	1103	103	2	5	0	11	3	Minor
9	10	91	1004	4	8	13	0	51	5	Moderate
9	10	91	533	1933	26	18	5	67	6	Major
9	10	91	618	2018	2	13	5	67	6	Minor
9	10	91	1107	107	4	8	0	11	3	Minor
9	10	91	957	2357	2	10	0	51	5	Minor
9	11	91	1023	23	2	10	7	11	3	Minor
9	11	91	1058	58	7	5	-2	11	3	Moderate
9	11	91	1116	116	6	15	-2	11	3	Moderate
9	11	91	1254	254	8	20	-5	37	5	Moderate
9	11	91	1035	35	8	15	-9	11	3	Moderate
9	11	91	1027	27	2	20	14	11	3	Minor
9	11	91	952	2352	2	15	0	11	3	Minor
9	11	91	942	2342	1	3	2	11	3	Minor
9	11	91	946	2346	2	10	-4	11	3	Minor
9	12	91	1017	17	9	20	4	9	2	Moderate
9	12	91	902	2302	5	5	-10	9	2	Minor
9	14	91	1011	11	16	20	-10	27	4	Major

9	14	91	1040	40	7	15	0	27	4	Moderate
9	14	91	747	2147	8	15	3	26	4	Moderate
9	14	91	910	2310	10	15	25	27	4	Moderate
9	14	91	1413	413	3	15	5	18	3	Minor
9	14	91	927	2327	18	25	15	27	4	Major
9	14	91	1410	410	2	15	5	18	3	Minor
9	14	91	1057	57	6	13	10	27	4	Moderate
10	1	91	950	2350	27	18	-5	48	5	Major
10	1	91	1105	105	8	10	-5	48	5	Moderate
10	1	91	1250	250	2	15	0	33	4	Minor
10	1	91	1137	137	2	20	-6	48	5	Minor
10	1	91	1257	257	5	20	-2	33	4	Minor
10	1	91	810	2210	20	35	25	58	5	Major
10	1	91	907	2307	8	20	-10	58	5	Moderate
10	1	91	905	2305	1	15	-10	58	5	Minor
10	1	91	856	2256	4	5	15	58	5	Minor
10	2	91	1634	634	3	10	-30	45	5	Minor
10	2	91	442	1842	5	5	-15	56	6	Moderate
10	2	91	1215	215	20	20	-10	68	6	Major
10	2	91	945	2345	5	10	-20	57	5	Moderate
10	2	91	1207	207	6	8	-4	68	6	Moderate
10	2	91	1257	257	20	15	-15	51	5	Major
10	2	91	1330	330	17	15	-10	51	5	Major
10	2	91	1155	155	8	15	10	68	6	Moderate
10	2	91	827	2227	18	20	-15	57	5	Major
10	2	91	852	2252	35	20	-25	57	5	Major
10	2	91	52	1452	5	15	-5	57	5	Moderate
10	3	91	835	2235	20	35	30	27	4	Major
10	3	91	1410	410	15	15	0	18	3	Moderate
10	3	91	1452	452	13	15	0	18	3	Moderate
10	3	91	910	2310	55	15	-15	27	4	Major
10	4	91	603	2003	4	10	-5	25	4	Minor
10	4	91	630	2030	10	20	5	25	3	Moderate
10	4	91	815	2215	75	15	-20	47	5	Major
10	4	91	740	2140	19	20	-20	40	5	Major
10	4	91	1242	242	5	15	-5	19	3	Minor
10	4	91	723	2123	1	15	3	25	4	Minor
10	4	91	1116	116	34	40	-3	37	5	Major
10	4	91	1432	432	2	5	-5	19	3	Minor
10	4	91	1250	250	10	35	-10	19	3	Moderate
10	4	91	1627	627	7	15	0	25	4	Moderate
10	4	91	1007	7	2	10	12	47	5	Minor
10	4	91	957	2357	2	15	-5	47	5	Minor
10	5	91	740	2140	2	20	-8	29	4	Minor
10	5	91	730	2130	5	25	-15	29	4	Moderate
10	5	91	1317	317	5	10	0	14	3	Minor
10	5	91	703	2103	2	5	-5	29	4	Minor
10	5	91	1422	422	10	23	0	14	3	Moderate
10	5	91	1327	327	48	30	0	14	3	Major
10	5	91	855	2255	2	30	5	29	4	Minor

10	5		1513	513	7	15	0	14	3	Moderate
10	5	91	845	2245	1	25	-4	29	4	Minor
10	5	91	1302	302	8	25	0	14	3	Moderate
10	5	91	847	2247	2	20	-5	29	4	Minor
10	5	91	823	2223	17	10	-5	29	4	Major
10	5	91	1440	440	2	25	0	14	3	Minor
10	6	91	1543	543	3	10	4	33	4	
10	6	91	1240	240	11	30	-5	13	3	
10	6	91	1327	327	2	20	0	13	3	
10	6	91	1535	535	2	10	2	33	4	
10	6	91	1612	612	4	27	-8	33	4	
10	6	91	955	2355	8	25	-2	33	3	
10	6	91	1626	626	4	10	-11	33	4	
10	6	91	1027	27	30	3	0	33	3	
10	6	91	1632	632	6	10	11	33	4	
10	6	91	1509	509	2	17	0	33	3	
10	6	91	1640	640	18	25	-7	33	4	
10	6	91	1023	23	20	4	-2	33	3	
10	6	91	1233	233	4	20	0	13	3	
10	6	91	1031	31	7	36	0	33	3	
10	6	91	1004	4	13	35	2	33	3	
10	7	91	703	2103	14	25	30	33	4	
10	7	91	1138	138	3	20	0	21	3	
10	7	91	1101	101	9	35	0	21	3	
10	7	91	1113	113	19	40	3	21	3	
10	8	91	1022	50	10	25	15	26	4	
10	8	91	646	2046	4	20	2	26	4	
10	8	91	1138	138	17	20	15	26	4	
10	8	91	736	2136	3	35	2	26	4	
10	8	91	633	2033	3	15	-3	26	4	
10	8	91	730	2130	3	30	1	26	4	
10	8	91	1212	212	8	40	-10	26	4	
10	8	91	1038	38	3	15	5	26	4	
10	8	91	1336	336	43	40	-15	26	4	
10	8	91	727	2127	3	25	0	26	4	
10	8	91	742	2142	20	35	15	26	4	
10	8	91	717	2117	3	20	-2	26	4	
10	8	91	827	2227	13	30	-15	26	4	
10	8	91	1034	34	2	15	0	26	4	
10	8	91	850	2250	5	15	-5	26	4	
10	8	91	1327	327	8	15	5	26	4	
10	8	91	1126	126	9	15	-20	26	4	
10	8	91	657	2057	10	25	25	26	4	
10	9	91	1820	820	12	15	10	14	4	
10	9	91	1145	145	2	20	-1	14	3	
10	9	91	1150	150	6	25	0	14	3	
10	9	91	1016	16	8	25	0	14	3	
10	9	91	1043	43	13	25	0	14	3	
10	9	91	1743	743	24	15	20	14	4	
10	9	91	1012	12	2	20	5	14	3	

10	9	91	816	2216	2	12	0	14	3
10	9	91	1212	212	2	30	0	14	3
10	9	91	1447	447	3	10	0	14	3
10	9	91	1436	436	2	10	0	14	3
10	10	91	1400	400	6	10	-2	23	4
10	10	91	1447	447	5	20	15	23	4
10	10	91	1528	528	4	15	-10	23	4
10	10	91	652	2052	4	30	25	23	4
10	10	91	537	1937	10	30	-2	23	4
10	10	91	630	2030	17	40	-25	23	4
10	10	91	1500	500	2	20	-15	23	4
10	10	91	1507	507	8	15	0	23	4
10	10	91	1505	505	2	15	0	23	4
10	10	91	532	1932	2	20	0	23	4
10	10	91	1142	142	10	25	0	23	4
10	10	91	1542	542	3	20	0	23	4
10	11	91	848	2248	4	15	-1	7	2
10	11	91	1105	105	25	40	0	7	2
10	19	91	1035	35	4	25	2	10	2
10	19	91	1027	27	4	15	3	10	2
10	19	91	1021	21	5	15	2	10	2
10	20	91	1335	335	10	25	2	18	4
10	20	91	1305	305	3	30	0	18	4
10	20	91	800	2200	8	20	25	18	4
10	20	91	1210	210	2	10	0	18	4
10	20	91	1206	206	2	10	0	18	4
10	20	91	1144	144	3	20	5	18	4
10	20	91	1058	58	11	20	1	18	4
10	20	91	724	2124	3	25	0	18	4
10	20	91	1316	316	3	5	0	18	4
10	20	91	1046	46	2	25	1	18	4
10	20	91	1330	330	4	10	1	18	4
10	20	91	1140	140	2	25	-3	18	4
10	20	91	1212	212	2	10	0	18	4
10	20	91	738	2124	7	35	-30	18	4
10	20	91	1147	147	4	30	1	18	4
10	20	91	1048	48	3	25	1	18	4
10	21	91	1819	819	4	15	-10	17	4
10	21	91	1429	429	3	15	4	17	4
10	21	91	1717	717	10	15	-10	17	4
10	21	91	1658	658	3	10	15	17	4
10	21	91	1533	533	3	20	-10	17	4
10	21	91	1708	708	3	15	-10	17	4
10	21	91	1817	817	2	20	-10	17	4
10	21	91	1800	800	12	25	2	17	4
10	21	91	1038	2338	7	10	0	17	4
10	21	91	1513	513	5	20	-15	17	4
10	21	91	955	2355	35	25	15	17	4
10	21	91	934	2334	11	25	15	17	4
10	21	91	908	2308	24	30	-10	17	4

10	21	91	947	2347	2	20	0	17	4
10	21	91	950	2350	4	25	15	17	4
10	21	91	1739	739	9	20	-10	17	4
10	22	91	1640	640	6	20	0	18	4
10	22	91	1128	128	3	10	2	18	4
10	22	91	1044	44	46	15	-15	18	4
10	22	91	1203	203	12	20	-2	18	4
10	22	91	1545	545	20	25	-15	18	4
10	22	91	1625	625	7	25	-5	18	4
10	22	91	637	2037	23	20	15	18	4
10	22	91	1529	529	4	10	0	18	4
10	22	91	1120	120	2	15	10	18	4
10	22	91	1130	130	3	10	1	18	4
10	22	91	1535	535	9	15	2	18	4
10	22	91	710	2137	3	25	5	18	4
10	22	91	1007	7	10	15	15	18	4
10	22	91	1133	133	15	20	-10	18	4
10	22	91	1018	18	24	25	5	18	4
10	23	91	745	2145	18	15	-10	18	3
10	24	91	1144	144	11	20	1	17	4
10	24	91	1118	118	7	15	0	17	4
10	24	91	744	2144	2	15	2	17	4
10	24	91	1115	115	3	20	2	17	4
10	24	91	803	2203	7	30	-5	17	4
10	24	91	737	2137	3	25	-3	17	4
10	24	91	730	2130	3	10	2	17	4
10	24	91	1159	159	4	15	0	17	4
10	24	91	1202	202	31	15	0	17	4
10	25	91	1029	29	2	20	-25	27	4
10	25	91	1256	256	6	15	-2	27	4
10	25	91	856	2256	5	25	-2	27	4
10	25	91	1310	310	5	30	1	27	4
10	25	91	937	2337	8	30	-4	27	4
10	25	91	1747	747	3	8	-5	27	4
10	25	91	1645	645	2	10	10	27	4
10	25	91	1002	2	2	20	-4	27	4
10	25	91	1010	10	4	20	-10	27	4
10	25	91	1741	741	5	15	-5	27	4
10	25	91	858	2258	12	25	-5	27	4
10	25	91	916	2316	9	30	2	27	4
10	25	91	1729	729	11	20	10	27	4
10	25	91	1223	223	2	10	-3	27	4
10	25	91	1722	722	2	15	-9	27	4
10	25	91	1650	650	16	15	-10	27	4
10	25	91	950	2350	2	15	-2	27	4
10	25	91	913	2313	3	20	-2	27	4
10	25	91	1725	725	3	15	7	27	4
10	25	91	952	2352	3	20	2	27	4
10	25	91	1013	13	2	10	6	27	4
10	26	91	1325	325	5	15	8	23	4

10	26	91	1040	40	2	20	0	23	4
10	26	91	1222	222	8	20	-8	23	4
10	26	91	900	2300	30	20	0	23	4
10	26	91	747	2147	19	20	-1	23	4
10	26	91	740	2140	4	30	-8	23	4
10	26	91	1029	29	2	25	0	23	4
10	26	91	841	2241	2	35	-1	23	4
				AVG.	9.9	17.4			
				STD	13.2	7.6			

loc	time	data range	sample	AVG DUR	AVG SIG.
	13	255-256	2	14.0	17.5
	14	257-260	4	36.0	17.5
	15		0	0.0	0.0
	16	261	1	19.0	27.0
	17	262	1	5.0	25.0
	18	263-265	3	12.3	7.7
	19	266-270	5	4.6	20.4
	20	271-293	23	8.7	25.7
	21	294-320	27	9.9	20.8
	22	321-356	36	6.2	19.3
	23	357-407	51	8.8	19.2
	0	5-66	63	13.9	12.6
	1	67-116	50	6.3	16.2
	2	117-149	33	14.8	18.6
	3	150-172	23	7.5	19.6
	4	173-191	18	12.9	14.6
	5	192-210	19	7.6	14.9
	6	211-233	23	13.0	16.4
	7	234-245	12	13.7	19.2
	8	246-250	5	13.4	19.6
	9	251-253	3	5.3	21.7
	10		0	0.0	0.0
	11	254	1	2.0	20.0
	12		0	0.0	0.0
	13	255-256	2	9.5	17.5
	14	257-260	4	4.5	17.5
	15		0	0.0	0.0
	16	261	1	4.0	27.0
	17	262	1	8.0	25.0
	18	263-265	3	13.3	7.7
	19	266-270	5	10.2	20.4
	20	271-293	23	9.8	25.7
	21	294-320	27	6.9	20.8
	22	321-356	36	7.4	19.3
	23	357-407	51	7.8	19.2
			403		

Kp	Sample	Avg. Dur
2	13	9.6
3	94	11.0
4	191	10.7
5	79	7.8
6	23	6.9
7	3	2.7

AURORAL–E SPREADSHEETS
NOVEMBER, DECEMBER 1991, JANUARY 1992

AURORAL-E EXPERIMENTAL DATA CAPE WALES TO FAIRBANKS ALASKA
NOVEMBER 1991, DECEMBER 1991, JANUARY 1992 - WINTER

MONTH	DAY	YEAR	startUTC	190 WMT	Dur(min)	Sig(db)	E/C(+/-)	Ap	Kp
1	1	92	1320	320	3	20	-2	11	2
1	1	92	1055	55	5	15	0	11	2
1	1	92	1422	422	3	15	-5	11	2
1	1	92	1316	316	2	13	0	11	2
1	1	92	1325	325	2	20	0	11	2
1	1	92	1312	312	2	15	0	11	2
1	1	92	1327	327	2	20	0	11	2
1	1	92	1134	134	12	30	-5	11	2
1	1	92	1043	43	4	15	10	11	2
1	1	92	1418	418	4	20	5	11	2
1	2	92	1030	30	2	10	-20	18	4
1	2	92	937	2337	8	23	-5	18	4
1	2	92	1105	105	3	11	5	18	4
1	3	92	1300	300	2	25	0	13	4
1	3	92	1140	140	2	15	0	13	4
1	3	92	1427	427	7	15	0	13	4
1	3	92	1153	153	2	10	0	13	4
1	3	92	1310	310	4	25	0	13	4
1	3	92	1317	317	3	25	0	13	4
1	3	92	1307	307	2	25	0	13	4
1	3	92	1245	245	9	30	0	13	4
1	8	92	1308	308	16	15	0	12	3
1	8	92	1055	55	13	13	7	12	3
1	8	92	1352	352	8	13	0	12	3
1	8	92	1140	140	3	10	10	12	3
1	8	92	1013	13	2	17	0	12	3
1	8	92	1122	122	4	10	0	12	3
1	8	92	818	2218	7	20	0	12	3
1	8	92	1328	328	6	13	0	12	3
1	8	92	812	2212	2	20	0	12	3
1	8	92	1550	550	2	10	0	12	3
1	8	92	745	2145	20	25	0	12	3
1	8	92	1028	28	19	20	0	12	3
1	8	92	1445	445	28	18	0	12	3
1	8	92	809	2209	2	15	0	12	3
1	8	92	1433	433	10	20	0	12	3
1	8	92	1632	632	3	18	0	12	3
1	8	92	1530	530	6	20	0	12	3
1	8	92	1607	607	22	28	0	12	3
1	8	92	1047	47	5	18	5	12	3
1	8	92	915	2315	10	25	0	12	3
1	10	92	422	1822	10	30	0	11	2
1	10	92	1140	140	10	20	-20	11	3
1	10	92	1252	252	3	15	0	11	3
1	10	92	817	2217	2	18	-10	11	3
1	10	92	1302	302	2	15	0	11	3

1	10	92	908	2308	3	12	-3	11	3
1	10	92	1208	208	14	20	0	11	3
1	10	92	855	2255	5	12	-4	11	3
1	11	92	1156	156	3	14	0	19	4
1	11	92	1813	813	4	15	0	19	5
1	11	92	1715	715	7	15	15	19	5
1	11	92	1322	322	3	25	-15	19	4
1	11	92	1742	742	3	10	5	19	5
1	11	92	1751	751	2	15	10	19	5
1	11	92	1654	654	8	17	10	19	5
1	11	92	1705	705	3	17	20	19	5
1	11	92	1443	443	3	10	25	19	5
1	11	92	1822	822	8	20	0	19	5
1	11	92	1250	250	6	13	-10	19	4
1	11	92	1438	438	4	15	-25	19	5
1	11	92	1620	620	5	16	25	19	5
1	11	92	1722	722	7	20	25	19	5
1	11	92	1610	610	2	10	-25	19	5
1	11	92	1430	430	2	8	-20	19	5
1	11	92	1307	307	4	14	0	19	4
1	11	92	1730	730	5	20	-10	19	5
1	11	92	1027	27	4	20	0	19	4
1	11	92	1420	402	3	23	-25	19	5
1	11	92	1259	259	4	12	15	19	4
1	11	92	1710	710	4	17	-25	19	5
1	11	92	1402	402	11	15	5	19	5
1	11	92	1550	550	7	10	-20	19	5
1	11	92	1615	615	3	10	10	19	5
1	11	92	1220	220	27	20	15	19	4
1	13	92	1605	605	10	20	0	24	4
1	13	92	941	2341	3	25	-2	24	5
1	13	92	1100	100	20	20	0	24	5
1	13	92	1652	652	4	20	0	24	4
1	13	92	1630	630	15	23	5	24	4
1	13	92	1205	205	15	20	0	24	5
1	13	92	1413	413	3	20	0	24	4
1	13	92	1645	645	2	25	0	24	4
1	13	92	1405	405	3	20	0	24	4
1	13	92	1700	700	4	25	0	24	4
1	13	92	946	2346	3	30	0	24	5
1	13	92	1535	535	7	20	13	24	4
1	13	92	936	2336	1	15	2	24	5
1	13	92	1515	515	15	25	0	24	4
1	13	92	912	2312	23	35	-15	24	5
1	20	92	1041	41	12	20	-5	12	3
1	20	92	1027	27	6	25	10	12	3
1	20	92	1432	432	2	20	0	12	3
1	20	92	1141	141	35	20	0	12	3
1	20	92	1436	436	3	20	0	12	3
1	20	92	958	2358	2	25	0	12	3

1	20	92	922	2322	4	20	2	12	3
1	20	92	1442	442	16	20	0	12	3
1	20	92	929	2329	4	25	0	12	3
1	28	92	1022	22	10	20	0	13	2
1	28	92	1040	40	4	15	0	13	2
1	30	92	1016	16	11	25	0	15	3
1	30	92	1010	10	2	20	0	15	3
1	31	92	1030	30	25	25	5	12	3
1	31	92	930	2330	6	20	0	12	3
1	31	92	1105	105	17	25	-5	12	3
1	31	92	850	2250	2	20	0	12	3
11	1	91	743	2143	2	10	3	61	5
11	1	91	1152	152	13	13	15	61	5
11	1	91	800	2200	9	13	-8	61	5
11	2	91	913	2313	7	17	1	27	2
11	2	91	951	2351	29	32	-2	27	2
11	2	91	1240	240	19	17	1	27	2
11	2	91	927	2327	18	25	1	27	2
11	3	91	1143	143	5	20	-15	11	2
11	3	91	1027	27	6	25	10	11	2
11	3	91	1112	112	6	25	1	11	2
11	4	91	855	2255	22	25	-5	25	3
11	4	91	849	2249	2	25	-5	25	3
11	4	91	842	2242	2	10	1	25	3
11	4	91	845	2245	3	25	1	25	3
11	5	91	733	2133	2	15	13	15	3
11	5	91	955	2355	19	20	1	15	3
11	5	91	642	2042	8	25	1	15	3
11	5	91	720	2120	8	15	4	15	3
11	5	91	703	2103	10	18	3	15	3
11	6	91	501	1901	4	20	25	17	5
11	8	91	945	2345	2	25	2	17	3
11	8	91	1627	627	17	20	-20	66	6
11	8	91	945	2345	2	25	0	66	4
11	8	91	1017	17	3	20	-1	66	4
11	8	91	1002	2	4	15	-2	66	4
11	8	91	955	2355	2	20	0	66	4
11	8	91	1413	413	35	35	18	66	6
11	9	91	1627	627	14	20	15	17	4
11	9	91	1620	620	3	23	-8	17	4
11	9	91	436	1836	84	30	5	101	8
11	9	91	1300	300	27	15	5	17	4
11	9	91	852	2252	6	30	-15	101	7
11	9	91	1330	330	5	10	-8	17	4
11	9	91	345	1745	10	15	2	101	8
11	9	91	415	1805	12	25	5	101	8
11	9	91	1400	400	15	20	-15	17	4
11	9	91	1550	550	7	15	-25	17	4
11	9	91	803	2203	6	20	1	101	7
11	9	91	822	2222	25	18	30	101	7

11	9	91	1347	347	10	18	-18	17	4
11	9	91	405	1805	7	20	10	101	8
11	9	91	1255	255	2	10	-30	17	4
11	9	91	1258	258	3	15	15	17	4
11	9	91	430	1805	2	5	2	101	8
11	9	91	359	1759	4	20	0	101	8
11	10	91	1017	17	3	27	-3	17	3
11	10	91	907	2307	6	18	-9	17	3
11	11	91	1235	235	12	10	0	15	1
11	11	91	1410	410	12	25	0	15	1
11	11	91	1017	17	10	20	0	15	1
11	11	91	913	2313	2	15	0	15	1
11	15	91	1002	2	2	8	0	25	3
11	15	91	959	2359	2	20	2	25	3
11	15	91	900	2300	3	20	0	25	3
11	15	91	1159	159	11	20	-5	25	3
11	15	91	1005	5	10	20	-9	25	3
11	15	91	1135	135	2	10	-8	25	3
11	15	91	950	2350	7	35	15	25	3
11	15	91	937	2337	8	30	-2	25	3
11	15	91	1144	144	3	10	-15	25	3
11	15	91	930	2330	2	25	0	25	3
11	15	91	947	2347	3	18	0	25	3
11	15	91	906	2306	3	25	0	25	3
11	16	91	1023	23	5	28	3	21	3
11	16	91	935	2335	30	18	0	21	3
11	16	91	1017	17	5	30	4	21	3
11	16	91	1115	115	3	20	-4	21	3
11	16	91	1125	125	12	10	14	21	3
11	16	91	1420	420	7	17	-10	21	3
11	17	91	1547	547	5	20	-4	18	3
11	17	91	1131	131	2	12	-20	18	3
11	17	91	1545	545	2	15	-4	18	3
11	17	91	1213	213	12	5	-10	18	3
11	17	91	1258	258	7	25	-2	18	3
11	18	91	1037	37	2	25	8	55	5
11	18	91	1132	132	3	20	1	55	5
11	18	91	1121	121	6	13	8	55	5
11	18	91	1150	150	2	15	7	55	5
11	18	91	1045	45	2	25	0	55	5
11	18	91	1110	110	10	15	15	55	5
11	18	91	1052	52	2	20	0	55	5
11	18	91	1200	200	12	13	-15	55	5
11	18	91	1155	155	2	15	6	55	5
11	19	91	1328	328	2	18	-5	36	5
11	19	91	1312	312	3	10	2	36	5
11	19	91	1627	627	5	10	20	36	5
11	19	91	1203	203	2	18	0	36	5
11	19	91	715	2115	2	10	0	36	5
11	19	91	1437	437	2	10	-2	36	5

11	19	91	823	2223	3	20	-2	36	5
11	19	91	621	2021	21	25	-5	36	5
11	19	91	1353	353	4	30	-5	36	5
11	19	91	927	2327	48	30	-10	36	5
11	19	91	1452	452	2	15	-1	36	5
11	19	91	722	2122	22	18	15	36	5
11	19	91	1320	320	6	20	-5	36	5
11	19	91	751	2151	2	15	8	36	5
11	19	91	1455	455	11	20	4	36	5
11	19	91	1047	47	18	30	-5	36	5
11	19	91	1112	112	5	18	-2	36	5
11	19	91	1507	507	8	20	-10	36	5
11	19	91	1016	16	24	20	0	36	5
11	19	91	815	2215	2	15	-2	36	5
11	19	91	1238	238	4	28	10	36	5
11	19	91	745	2145	10	21	2	36	5
11	19	91	1303	303	3	20	5	36	5
11	19	91	802	2202	5	25	5	36	5
11	19	91	1414	414	2	15	-3	36	5
11	19	91	830	2230	3	23	3	36	5
11	19	91	1043	43	3	20	-4	36	5
11	19	91	1228	228	8	25	0	36	5
11	20	91	927	2323	3	20	-15	36	5
11	20	91	923	2323	3	25	15	36	5
11	21	91	1032	32	2	25	-15	40	5
11	21	91	1532	532	10	10	25	40	5
11	21	91	1055	55	3	15	10	40	5
11	21	91	950	2350	26	35	15	40	5
11	21	91	1058	58	2	10	-5	40	5
11	21	91	750	2150	20	30	0	40	4
11	21	91	825	2225	4	20	-5	40	4
11	21	91	1021	21	7	30	15	40	5
11	21	91	1546	546	12	13	30	40	5
11	22	91	702	2139	6	15	-8	43	5
11	22	91	639	2039	2	15	-30	43	5
11	22	91	537	1937	6	25	2	43	5
11	22	91	622	2022	6	30	-5	43	5
11	22	91	433	1843	12	25	0	43	6
11	22	91	406	1806	9	30	-3	43	6
11	22	91	741	2141	3	30	-30	43	5
11	22	91	721	2121	3	20	2	43	5
11	22	91	1050	50	15	8	15	43	5
11	22	91	1027	27	5	8	20	43	5
11	22	91	630	2030	8	28	-5	43	5
11	22	91	510	1910	2	25	1	43	6
11	22	91	828	2228	6	17	-15	43	5
11	22	91	807	2207	2	20	9	43	5
11	22	91	417	1817	6	20	-2	43	6
11	22	91	817	2217	10	15	15	43	5
11	22	91	1230	230	27	5	15	43	5

11	22	91	733	2133	2	25	0	43	5
11	22	91	230	1630	2	3	15	43	6
11	22	91	424	1824	8	25	-10	43	6
11	23	91	1010	10	4	15	5	24	4
11	23	91	1032	32	14	23	10	24	4
11	23	91	1015	15	10	17	10	24	4
11	23	91	1005	5	4	15	5	24	4
11	23	91	820	2220	5	15	25	24	4
11	23	91	957	2157	5	15	5	24	4
11	23	91	812	2212	6	15	-25	24	4
11	23	91	931	2331	4	7	8	24	4
11	23	91	940	2340	15	23	5	24	4
11	23	91	1055	55	37	15	10	24	4
11	23	91	1255	255	3	13	-27	24	4
11	23	91	745	2145	3	20	0	24	4
11	23	91	1207	207	3	8	0	24	4
11	23	91	1157	157	2	5	-15	24	4
11	23	91	805	2205	6	20	0	24	4
11	23	91	643	2043	12	30	0	24	4
11	28	91	128	1528	16	10	0	12	4
11	28	91	930	2330	13	15	0	12	2
11	28	91	1405	405	15	30	0	12	4
11	28	91	1202	202	2	25	0	12	2
11	28	91	1115	115	14	20	0	12	2
11	28	91	1222	222	78	30	0	12	4
11	28	91	1212	212	8	25	0	12	2
11	28	91	1427	427	43	30	0	12	4
11	28	91	237	1637	7	7	0	12	4
11	28	91	155	1555	12	10	0	12	4
11	28	91	1147	147	4	8	0	12	2
11	28	91	902	2302	23	20	0	12	2
12	8	91	432	1832	6	8	0	12	3
12	10	91	1045	45	20	20	-1	12	3
12	10	91	1107	107	6	17	0	12	3
12	11	91	1305	305	2	20	1	12	3
12	12	91	1314	314	3	20	0	12	3
12	12	91	245	1645	13	20	-1	12	3
12	13	91	950	2350	8	25	3	12	3
12	13	91	1303	303	2	25	0	12	3
12	13	91	1017	17	5	20	5	12	3
12	13	91	1338	338	4	10	0	12	3
12	13	91	1025	25	2	25	-10	12	3
12	13	91	1047	47	3	25	-5	12	3
12	13	91	1345	345	12	20	-25	12	3
12	13	91	1322	322	3	10	-5	12	3
12	13	91	310	1710	18	10	0	12	3
12	14	91	1507	507	30	23	0	14	3
12	14	91	1057	57	3	20	10	14	4
12	14	91	730	2130	10	5	8	14	4
12	14	91	1028	28	9	25	5	14	4

12	14	91	1043	43	4	20	-5	14	4
12	14	91	744	2144	3	15	-2	14	4
12	15	91	757	2157	3	30	0	6	2
12	16	91	1309	309	15	20	3	21	5
12	16	91	1138	138	7	20	-10	21	3
12	16	91	737	2137	5	10	0	30	4
12	16	91	1155	155	3	18	-3	21	3
12	16	91	727	2127	4	20	0	30	4
12	16	91	1205	205	2	18	0	21	3
12	16	91	1026	26	3	10	10	21	3
12	16	91	1120	120	12	20	-10	21	3
12	16	91	1035	35	7	8	5	21	3
12	16	91	1018	18	3	20	0	21	3
12	17	91	1017	17	2	15	5	30	5
12	17	91	1133	133	3	35	-5	30	5
12	17	91	1306	306	3	20	-1	30	5
12	17	91	1117	117	2	15	5	30	5
12	17	91	1232	232	2	15	-10	30	5
12	17	91	1155	155	2	15	5	30	5
12	17	91	1035	35	8	20	-8	30	5
12	17	91	1229	229	2	15	-5	30	5
12	17	91	1312	312	2	15	1	30	5
12	17	91	1217	217	2	20	2	30	5
12	17	91	1124	124	2	20	-5	30	5
12	17	91	1137	137	3	18	-1	30	5
12	17	91	1127	127	2	20	0	30	5
12	17	91	1302	302	2	20	-1	30	5
12	17	91	1237	237	18	25	-10	30	5
12	17	91	1122	122	2	20	-5	30	5
12	17	91	1055	55	15	30	-5	30	5
12	18	91	1027	27	50	25	-15	9	3
12	18	91	923	2323	2	15	5	9	3
12	18	91	1230	230	5	18	-5	9	3
12	18	91	1121	121	31	20	6	9	3
12	18	91	1209	209	2	10	0	9	3
12	18	91	1215	215	13	15	0	9	3
12	18	91	1325	325	7	25	0	9	3
12	18	91	1152	152	5	15	0	9	3
12	18	91	852	2252	2	20	-15	9	3
12	19	91	658	2058	3	15	-5	9	3
12	19	91	935	2335	20	13	15	9	3
12	19	91	715	2115	24	25	0	9	3
12	19	91	910	2310	5	20	15	9	3
12	19	91	652	2052	2	30	30	9	3
12	19	91	1020	20	3	20	-15	9	3
12	20	91	1557	557	3	15	0	8	4
12	20	91	1132	132	4	25	0	8	1
12	20	91	900	2300	7	25	-15	8	1
12	20	91	1217	217	3	28	5	8	1
12	20	91	915	2315	3	15	-20	8	1

12	20	91	943	2343	22	18	2	8	1
12	20	91	1223	223	3	28	5	8	1
12	20	91	918	2318	4	18	15	8	1
12	20	91	1527	527	26	20	0	8	4
12	20	91	1452	452	35	25	5	8	4
12	22	91	857	2257	2	25	-5	6	2
12	22	91	1221	221	3	25	0	6	2
12	22	91	827	2227	2	15	-5	6	2
12	22	91	1209	209	2	20	0	6	2
12	22	91	1136	336	3	25	0	6	2
12	22	91	1215	215	3	28	0	6	2
12	22	91	1159	159	2	15	0	6	2
12	22	91	813	2213	3	23	-5	6	2
12	22	91	1205	205	2	10	0	6	2
12	22	91	1131	131	2	20	2	6	2
12	22	91	1117	117	5	25	-8	6	2
12	27	91	1005	5	8	18	-5	20	3
12	27	91	1647	647	40	17	-10	20	4
12	27	91	945	2345	8	25	15	20	3
12	27	91	1017	17	13	13	-10	20	3
12	27	91	955	2355	5	23	-8	20	3
12	28	91	1313	313	27	17	3	20	3
12	28	91	1305	305	5	10	2	20	3
12	28	91	1027	27	6	20	3	15	3
12	28	91	1207	207	53	15	-15	20	3
12	28	91	1505	505	11	25	-5	20	3
12	28	91	1815	815	8	13	10	20	3
12	28	91	1400	400	35	25	0	20	3
12	28	91	1524	524	4	20	-10	20	3
12	28	91	1437	437	10	20	20	20	3
12	28	91	1037	37	2	17	0	20	3
12	29	91	935	2335	4	20	-5	20	3
12	29	91	1410	410	3	13	0	20	3
12	29	91	1400	400	2	20	0	20	3
12	29	91	1402	402	4	15	0	20	3
12	29	91	910	2310	10	15	0	20	3
12	29	91	952	2352	6	20	10	20	3
				AVG.	8.3	19.0			
				STD	9.9	6.2			

LOC TIME	NUMBERS	SAMPLE	AVG DUR	AVG SIG
12		0	0.0	0.0
13		0	0.0	0.0
14		0	0.0	0.0
15	259-260	3	5.5	15.0
16	261..263	3	18.7	15.0
17	264-266	3	3.0	13.7
18	267-276	10	16.6	21.0
19	277-279	3	20.7	15.7
20	280-287	8	9.6	16.6
21	288-309	22	7.0	18.8
22	310-338	29	7.3	18.6
23	339-387	48	9.4	19.8
0	5-64	60	6.2	17.6
1	65-110	46	8.2	20.0
2	111-148	38	11.7	20.5
3	149-185	37	6.8	18.4
4	186-216	31	8.0	18.8
5	217-232	16	6.5	21.8
6	233-247	15	6.5	20.6
7	248-255	8	9.1	16.4
8	256-258	3	6.3	15.7
9		0	0	0
10		0	0	0
11		0	0	0
12		0	0	0

Kp	Sample	Avg Dur	Avg Sig
1	11	3.7	17.5
2	38	7.3	18.3
3	135	8.4	19.3
4	75	7.9	19.1
5	106	8.8	19.2
6	9	18.1	17.9
7	3	5.3	19.0
8	6	4.8	17.2

AURORAL-E SPREADSHEETS
FEBRUARY, MARCH, APRIL 1992

AURORAL-E EXPERIMENT, SPRING EQUINOX
FEBRUARY, MARCH, APRIL 1992
(Corrected 7-23-92)

MONTH	DAY	YEAR	UTC	LOCAL 150 WMT	Dur(min.)	Sig(dB)	E/C(+/-)	Ap	Kp	ABS SIG (dB)
1	31	92	925	2325	10	-95	2	12	3	20
1	31	92	850	2250	2	-95	0	12	3	20
2	1	92	1318	318	1	-105	0	18	3	10
2	1	92	1408	408	3	-85	5	18	3	30
2	1	92	1233	233	1	-97	-5	18	3	18
2	1	92	1333	333	4	-95	-1	18	3	20
2	1	92	1402	402	5	-95	0	18	3	20
2	1	92	1143	143	1	-80	-5	18	3	35
2	1	92	1236	236	1	-99	0	18	3	16
2	2	92	1422	422	18	-90	1	38	4	25
2	2	92	1455	455	3	-102	-2	38	4	13
2	3	92	936	2336	7	-105	0	5	6	10
2	3	92	950	2350	10	-95	-10	5	6	20
2	3	92	659	2059	1	-100	-4	58	6	15
2	3	92	636	2036	12	-90	-10	58	6	25
2	3	92	820	2220	1	-100	5	58	7	15
2	3	92	729	2129	1	-95	5	58	6	20
2	3	92	1012	12	5	-100	0	5	6	15
2	3	92	832	2232	1	-100	1	58	7	15
2	3	92	820	2220	2	-100	0	58	7	15
2	3	92	729	2129	1	-95	-1	58	7	20
2	3	92	832	2232	1	-100	1	58	7	15
2	3	92	903	2303	16	-105	0	58	7	10
2	3	92	648	2048	3	-97	5	58	6	18
2	3	92	920	2320	13	-102	5	5	6	13
2	7	92	1127	127	13	-85	-5	7	2	30
2	20	92	1540	540	2	-90	5	36	6	25
2	20	92	850	2250	5	-90	0	36	4	25
2	20	92	1528	528	11	-95	-10	36	6	20
2	20	92	1543	543	2	-97	-4	36	6	18
2	20	92	1428	428	1	-97	10	36	6	18
2	20	92	1002	2	4	-105	-1	36	6	10
2	20	92	1710	710	6	-100	-20	36	6	15
2	20	92	1613	613	4	-100	0	36	6	15
2	20	92	918	2318	17	-102	1	36	4	13
2	20	92	822	2222	5	-95	1	36	4	20
2	20	92	1437	437	15	-95	1	36	6	20
2	20	92	858	2258	17	-85	-2	36	4	30
2	20	92	1720	720	5	-100	25	36	6	15
2	21	92	515	1915	2	-105	5	53	6	10
2	21	92	443	1843	9	-95	-7	53	6	20
2	21	92	813	2213	8	-95	-15	53	6	20
2	21	92	443	1843	9	-95	-5	53	6	20
2	21	92	932	2332	33	-100	-5	53	6	15

2	21	92	520	1920	5	-95	0	53	6	20
2	21	92	822	2222	22	-85	0	53	6	30
2	21	92	443	1843	9	-95	4	53	6	20
2	21	92	515	1915	3	-105	6	53	6	10
2	21	92	453	1853	5	-90	4	53	6	25
2	21	92	520	1920	5	-95	0	53	6	20
2	21	92	453	1853	4	-90	4	53	6	25
2	21	92	520	1920	3	-95	0	53	6	20
2	21	92	1536	536	5	-105	20	53	6	10
2	21	92	710	2110	37	-95	-4	53	6	20
2	21	92	453	1853	5	-90	2	53	6	25
2	21	92	515	1915	2	-105	-10	53	6	10
2	21	92	757	2157	15	-95	-4	53	6	20
2	21	92	927	2327	1	-95	0	53	6	20
2	21	92	536	1936	4	-105	24	53	6	10
2	22	92	1445	445	2	-95	0	19	3	20
2	22	92	627	2027	15	-95	-25	19	4	20
2	22	92	1517	517	33	-95	1	19	3	20
2	22	92	957	2357	29	-90	0	19	3	25
2	22	92	1430	430	1	-97	0	19	3	18
2	22	92	935	2335	2	-90	2	19	3	25
2	22	92	1340	340	16	-90	0	19	3	25
2	24	92	727	2127	2	-105	0	21	3	10
2	24	92	733	2133	1	-95	0	21	3	20
2	24	92	1055	55	15	-97	0	21	3	18
2	24	92	1217	217	3	-102	-1	21	3	13
2	24	92	1123	123	2	-95	0	21	3	20
2	24	92	1117	117	2	-90	0	21	3	25
2	24	92	737	2137	10	-95	-2	21	3	20
2	24	92	1152	152	3	-95	-3	21	3	20
2	24	92	1129	129	1	-90	-1	21	3	25
2	24	92	1202	202	11	-100	0	21	3	15
2	24	92	1132	132	7	-95	0	21	3	20
2	25	92	1713	713	19	-90	0	43	4	25
2	25	92	826	2226	12	-92	-10	43	5	23
2	25	92	742	2142	10	-90	4	43	5	25
2	25	92	455	1855	10	-95	0	43	5	20
2	26	92	1300	300	10	-100	0	34	4	15
2	26	92	940	2340	25	-85	0	34	4	30
2	26	92	910	2310	18	-90	0	34	4	25
2	26	92	850	2250	15	-95	0	34	4	20
2	26	92	1317	317	2	-95	0	34	4	20
2	26	92	831	2231	2	-100	0	34	4	15
2	26	92	1328	328	15	-100	0	34	4	15
2	26	92	836	2236	5	-90	-2	34	4	25
2	27	92	1023	23	1	-95	0	40	5	20
2	27	92	1157	157	8	-80	2	40	5	35
2	27	92	1137	137	10	-95	0	40	5	20
2	27	92	1112	112	8	-105	0	40	5	10
2	27	92	1227	227	1	-95	0	40	5	20

2	27	92	850	2250	7	-95	7	40	5	20
2	29	92	1627	627	2	-95	-6	31	6	20
2	29	92	1134	134	2	-100	2	31	5	15
2	29	92	1710	710	7	-100	1	31	6	15
2	29	92	1115	115	5	-97	-15	31	5	18
2	29	92	1032	32	20	-95	1	31	5	20
2	29	92	1405	405	7	-102	8	31	6	13
2	29	92	1730	730	10	-100	1	31	6	15
2	29	92	1635	635	9	-95	1	31	6	20
2	29	92	1633	633	2	-95	0	31	6	20
2	29	92	1120	120	13	-90	4	31	5	25
2	29	92	930	2330	5	-100	1	31	5	15
2	29	92	1646	646	14	-95	0	31	6	20
2	29	92	1533	533	14	-95	12	31	6	20
2	29	92	1422	422	18	-100	0	31	6	15
3	1	92	830	2230	35	-105	2			10
3	9	92	1527	527	10	-110	3	23	5	5
3	9	92	1103	103	13	-90	-2	23	4	25
3	9	92	1034	34	2	-100	2	23	4	15
3	9	92	1002	2	1	-100	4	23	4	15
3	11	92	1115	115	2	-100	1	15	4	15
3	11	92	1059	59	8	-100	-6	15	4	15
3	11	92	1140	140	4	-100	2	15	4	15
3	12	92	1015	15	1	-100	0	13	4	15
3	12	92	950	2350	2	-100	0	13	4	15
3	13	92	1000	0	1	-105	3	6	3	10
3	13	92	1020	20	1	-100	1	6	3	15
3	15	92	1555	555	1	-105	-2	11	2	10
3	16	92	1558	558	17	-100	1	11	3	15
3	16	92	1502	502	15	-105	0	11	3	10
3	16	92	1735	735	32	-90	-1	11	2	25
3	16	92	1620	620	2	-105	-1	11	3	10
3	16	92	1525	525	30	-100	1	11	3	15
3	16	92	837	2237	10	-102	1	11	2	13
3	16	92	1630	630	30	-90	0	11	2	25
3	21	92	1515	515	10	-95	-1	17	5	20
3	21	92	1013	13	7	-103	2	17	3	12
3	21	92	1730	730	1	-105	4	17	3	10
3	21	92	2042	1042	18	-100	1	17	2	15
3	21	92	1108	108	1	-95	1	17	4	20
3	21	92	1725	725	2	-110	1	17	3	5
3	21	92	1810	810	5	-105	1	17	3	10
3	21	92	1325	325	7	-100	1	17	4	15
3	21	92	1755	755	8	-105	9	17	3	10
3	21	92	1124	124	1	-105	1	17	4	10
3	21	92	1540	540	5	-95	-1	17	5	20
3	21	92	2010	1010	7	-100	1	17	2	15
3	21	92	1445	445	5	-105	2	17	5	10
3	21	92	1830	830	2	-105	-1	17	3	10
3	21	92	1735	735	10	-105	-3	17	3	10

3	21	92	1535	535	2	-105	1	17	5	10
3	23	92	740	2140	7	-85	1	19	4	30
3	23	92	755	2155	2	-85	3	19	4	30
3	23	92	707	2107	1	-95	2	19	4	20
3	23	92	807	2207	1	-90	1	19	4	25
3	23	92	1240	240	10	-100	-1	19	3	15
3	23	92	1332	332	55	-90	0	19	3	25
3	23	92	1255	255	1	-100	1	19	3	15
3	23	92	1430	430	10	-90	0	19	3	25
3	23	92	1137	137	5	-95	1	19	3	20
3	23	92	1125	125	6	-90	2	19	3	25
3	24	92	1015	15	1	-105	-1	19	4	10
3	24	92	1517	517	8	-90	-1	19	3	25
3	24	92	940	2340	3	-95	-1	19	4	20
3	24	92	1220	220	15	-95	0	19	3	20
3	24	92	910	2310	6	-95	0	19	4	20
3	24	92	1052	52	1	-93	-1	19	4	22
3	24	92	1322	322	48	-90	0	19	3	25
3	24	92	926	2326	1	-95	1	19	4	20
3	24	92	1415	415	1	-107	-1	19	3	8
3	24	92	1430	430	25	-90	-1	19	3	25
3	25	92	1040	40	1	-105	1	14	3	10
3	25	92	925	2325	25	-90	1	14	4	25
3	25	92	1110	110	3	-90	2	14	3	25
3	25	92	1211	211	24	-105	7	14	3	10
3	25	92	842	2242	1	-90	1	14	4	25
3	25	92	1247	247	8	-90	6	14	3	25
3	26	92	1105	105	1	-90	2	12	3	25
3	26	92	1042	42	3	-105	7	12	3	10
3	26	92	1020	20	10	-95	-1	12	3	20
3	26	92	1130	130	2	-100	1	12	3	15
3	28	92	1025	25	10	-85	0	12	2	30
3	28	92	930	2330	4	-95	20	12	2	20
3	28	92	1050	50	10	-85	-1	12	2	30
3	29	92	1325	325	3	-100	0	15	3	15
3	29	92	1520	520	2	-95	2	15	2	20
3	29	92	1455	455	20	-90	1	15	2	25
3	29	92	1440	440	5	-105	-2	15	2	10
3	30	92	745	2145	2	-105	0	14	2	10
3	31	92	1020	20	2	-95	0	11	1	20
4	1	92	855	2255	2	-95	0	12	3	20
4	1	92	1010	10	65	-95	-2	12	3	20
4	1	92	840	2240	2	-100	2	12	3	15
4	1	92	845	2245	3	-85	0	12	3	30
4	3	92	1515	515	10	-103	-20	17	4	12
4	3	92	840	2240	2	-100	-1	17	3	15
4	3	92	900	2300	2	-100	-1	17	3	15
4	3	92	737	2137	8	-105	3	17	3	10
4	3	92	1540	540	15	-105	-5	14	4	10
4	3	92	1715	715	1	-105	4	17	4	10

4	3	92	1215	215	13	-105	7	17	4	10
4	3	92	1627	627	9	-105	-1	17	4	10
4	3	92	1237	237	13	-90	-10	17	4	25
4	3	92	925	2325	10	-95	-7	17	3	20
4	3	92	1310	310	1	-95	1	17	4	20
4	3	92	1015	15	2	-100	3	17	4	15
4	3	92	1445	445	1	-100	-4	17	4	15
4	3	92	1020	20	25	-95	4	17	4	20
4	3	92	1705	705	2	-100	3	17	4	15
4	3	92	915	2315	3	-100	1	17	3	15
4	3	92	802	2202	18	-105	0	17	3	10
4	4	92	505	1905	11	-100	0	9	2	15
4	4	92	1047	47	2	-105	-1	9	3	10
4	4	92	405	1805	28	-105	0	9	2	10
4	4	92	945	2345	15	-90	2	9	3	25
4	4	92	1012	12	18	-85	2	9	3	30
4	5	92	1020	20	15	-105	-1	11	3	10
4	5	92	1049	49	11	-105	1	11	3	10
4	5	92	1315	315	15	-95	1	11	3	20
4	5	92	1510	510	10	-100	1	11	3	15
4	5	92	1420	420	1	-90	0	11	3	25
4	5	92	905	2305	2	-100	0	11	2	15
4	6	92	920	2320	17	-95	2	16	4	20
4	6	92	1910	910	25	-110	1	19	3	5
4	6	92	625	2025	10	-90	-10	16	5	25
4	6	92	1005	5	15	-102	-2	16	4	13
4	7	92	1135	135	2	-100	-3	15	3	15
4	7	92	1510	510	2	-95	1	15	3	20
4	7	92	910	2310	2	-90	-1	15	4	25
4	7	92	1312	312	13	-100	0	15	3	15
4	7	92	1430	430	25	-90	-2	15	3	25
4	7	92	920	2320	2	-100	1	15	4	15
4	7	92	830	2230	25	-90	1	15	4	25
4	8	92	1125	125	47	-85	1	15	3	30
4	8	92	1017	17	28	-90	1	15	3	25
4	8	92	1110	110	2	-90	1	15	3	25
4	8	92	1205	205	10	-100	-1	8	2	15
4	16	92	1200	200	1	-105	0	6	2	10
4	18	92	1340	340	2	-90	-1	18	2	25
4	19	92	902	2302	2	-95	-3	14	3	20
4	19	92	1130	130	14	-105	0	13	3	10
4	19	92	1120	120	2	-103	0	13	3	12
4	19	92	1210	210	15	-95	0	13	3	20
4	20	92	1255	255	2	-100	1	14	3	15
4	20	92	1035	35	11	-90	0	14	3	25
4	20	92	945	2345	1	-90	-2	15	3	25
4	20	92	1055	55	2	-95	1	14	3	20
4	20	92	935	2335	2	-90	-1	14	3	25
4	20	92	1507	507	18	-100	-1	14	3	15
4	22	92	1022	22	2	-110	-1	13	3	5

4	22	92	1315	315	1	-100	1	13	3	15
4	22	92	1155	155	2	-105	0	13	3	10
4	22	92	1005	5	5	-85	1	13	3	30
4	22	92	755	2155	2	-100	-4	13	3	15
4	22	92	1015	15	2	-98	-1	13	3	17
4	22	92	1245	245	5	-90	0	13	3	25
4	22	92	1210	210	1	-105	0	13	3	10
4	22	92	930	2330	25	-85	0	13	3	30
4	24	92	1607	607	5.0	-105	-5	10	3	10
4	24	92	1552	552	13.0	-90	0	10	3	25
4	24	92	1545	545	5	-85	0	10	3	30
4	25	92	1215	215	5	-85	1	11	4	30
4	25	92	1250	250	3	-90	0	11	4	25
4	25	92	1137	137	2	-100	2	11	4	15
4	25	92	1258	258	2	-105	0	11	4	10
4	25	92	1245	245	2	-85	0	11	4	30
4	25	92	1252	252	2	-95	0	11	4	20
4	25	92	1158	158	7	-87	0	11	4	28
4	26	92	1120	120	2	-105	0	6	1	10
4	26	92	1132	132	3	-100	0	6	1	15
4	26	92	1045	45	4	-95	0	6	1	20
4	28	92	843	2243	47	-85	0	9	1	30
4	28	92	1208	208	4	-90	4	9	1	25
4	28	92	1254	254	2	-95	1	9	1	20
4	28	92	1415	415	4	-85	1	9	1	30
4	28	92	1312	312	3	-105	1	9	1	10
4	28	92	905	2305	10	-95	0	9	1	20
4	28	92	1412	412	2	-95	1	9	1	20
4	28	92	1237	237	15	-85	1	9	1	30
				AVG.	8.6					18.4
				STD.	9.8					6.3

SUMMARY TABLE, SPRING EQUINOX
FEBRUARY, MARCH, APRIL 92

	Occur	Dur	STD Dur	Ampl	Std Ampl
1300	0	0.0	0.0	0.0	0.0
1400	0	0.0	0.0	0.0	0.0
1500	0	0.0	0.0	0.0	0.0
1600	0	0.0	0.0	0.0	0.0
1700	0	0.0	0.0	0.0	0.0
1800	8	12.6	20.6	18.8	6.5
1900	8	7.5	5.0	11.5	3.7
2000	5	5.4	5.1	19.0	3.7
2100	14	12.4	8.1	16.4	6.4
2200	24	10.7	11.3	19.0	6.2
2300	32	6.5	9.0	20.3	7.8
0000	36	5.4	5.1	18.3	5.9
0100	33	10.0	10.1	19.3	5.5
0200	26	8.7	6.3	20.7	5.3
0300	15	10.6	8.3	17.6	3.6
0400	21	9.5	9.9	15.0	5.1
0500	23	7.2	11.0	16.3	6.9
0600	9	9.9	14.1	20.8	4.4
0700	13	8.7	9.6	18.6	7.0
0800	2	7.0	3.0	25.0	5.0
0900	1	10.0	0.0	30.0	0.0
1000	2	2.5	0.5	17.5	0.0
1100	0	0.0	0.0	0.0	0.0
1200	0	0.0	0.0	0.0	0.0

272 Total Events

AURORAL-E SPREADSHEETS
MAY, JUNE, JULY, AUGUST 1992

AURORAL-L EXPERIMENT, SUMMER 1992
MAY,JUNE,JULY,AUGUST (15 DAYS)

MONTH	DAY	YEAR	startUTC	150WMT LocTime	Dur(min.)	Sig(dB)	E/C(+/-)	Ap	Kp	AMP
5	2	92	1400	400	20	-95	0	12	1	20
5	2	92	1307	307	8	-100	0	12	1	15
5	2	92	1320	320	5	-100	0	12	1	15
5	4	92	925	2325	30	-85	1	13	2	30
5	4	92	900	2300	15	-90	3	13	2	25
5	4	92	1355	355	55	-90	0	13	3	25
5	4	92	1005	5	5	-85	0	13	2	30
5	4	92	1255	255	60	-80	-1	13	3	35
5	4	92	1220	220	35	-90	0	13	3	25
5	4	92	525	1925	2	-105	-4	13	4	10
5	4	92	1450	450	90	-85	-2	13	3	30
5	8	92	1555	555	25	-90	0	31	4	25
5	8	92	1445	445	10	-95	4	31	4	20
5	8	92	1100	100	25	-95	10	31	4	20
5	8	92	1840	840	10	-100	10	31	4	15
5	8	92	1225	225	3	-95	4	31	4	20
5	8	92	600	2000	2	-100	2	31	3	15
5	8	92	1140	140	5	-90	1	31	4	25
5	8	92	1605	605	15	-90	0	31	4	25
5	8	92	1010	10	10	-90	1	31	4	25
5	8	92	1650	650	80	-100	3	31	4	15
5	8	92	1155	155	2	-90	0	31	4	25
5	8	92	905	2305	5	-90	-5	31	4	25
5	8	92	920	2320	40	-80	0	31	4	35
5	9	92	1310	310	1	-100	0	28	3	15
5	9	92	1410	410	25	-85	0	28	3	30
5	9	92	1355	355	1	-95	1	28	3	20
5	9	92	1120	120	15	-90	15	28	2	25
5	9	92	1200	200	1	-90	4	28	2	25
5	9	92	1215	215	1	-95	-4	28	2	20
5	10	92	1720	720	30	-105	9	114	8	10
5	10	92	930	2330	10	-105	0	114	6	10
5	10	92	845	2245	1	-100	-1	114	6	15
5	10	92	745	2145	35	-95	4	114	6	20
5	10	92	1550	550	5	-90	0	114	8	25
5	10	92	955	2355	10	-95	-4	114	7	20
5	10	92	1450	450	5	-100	-2	114	7	15
5	10	92	1110	110	10	-105	0	114	7	10
5	10	92	855	2255	3	-100	0	114	6	15
5	10	92	1535	535	2	-100	4	114	8	15
5	10	92	1025	25	30	-95	-15	114	7	20
5	10	92	1255	255	15	-90	-2	114	7	25
5	10	92	1405	405	3	-100	-3	114	7	15
5	10	92	1420	420	2	-100	4	114	7	15
5	10	92	1130	130	30	-90	-1	114	7	25
5	10	92	1230	230	1	-105	-2	114	7	10

5	10	92	1425	425	2	-100	2	114	7	15
5	10	92	1335	335	10	-90	5	114	7	25
5	11	92	1220	220	1	-90	-3	47	5	25
5	11	92	530	1930	20	-100	-4	47	6	15
5	11	92	1355	355	20	-102	7	47	4	13
5	11	92	1130	130	5	-95	0	47	3	20
5	11	92	605	2005	5	-95	10	47	6	20
5	11	92	1230	230	75	-100	3	47	5	15
5	11	92	250	1650	5	-105	-15	47	6	10
5	11	92	1010	10	45	-105	0	47	3	10
5	11	92	430	1830	30	-100	0	47	6	15
5	11	92	915	2315	2	-105	0	47	3	10
5	11	92	755	2155	25	-105	1	47	6	10
5	11	92	930	2330	2	-100	4	47	3	15
5	11	92	830	2230	2	-90	0	47	3	25
5	11	92	415	1815	10	-105	0	47	6	10
5	12	92	720	2120	2	-95	0	9	3	20
5	12	92	1355	355	35	-90	0	9	2	25
5	12	92	650	2050	2	-95	0	9	3	20
5	12	92	355	1755	5	-103	0	9	3	12
5	12	92	430	1830	25	-90	0	9	3	25
5	12	92	655	2055	10	-95	0	9	3	20
5	13	92	1210	210	10	-100	0	18	4	15
5	13	92	1810	810	2	-90	1	18	2	25
5	13	92	1720	720	15	-95	0	18	2	20
5	13	92	745	2145	5	-95	5	18	3	20
5	13	92	1025	25	70	-90	5	18	4	25
5	13	92	1300	300	40	-100	2	18	4	15
5	14	92	350	1750	95	-95	0	5	2	20
5	14	92	935	2335	50	-95	0	14	5	20
5	14	92	1035	35	60	-95	0	14	5	20
5	14	92	650	2050	60	-80	0	5	2	35
5	15	92	545	1945	20	-100	0	6	1	15
5	15	92	705	2105	40	-95	0	6	1	20
5	19	92	1440	440	2	-95	0	12	2	20
5	19	92	1355	355	7	-90	0	12	3	25
5	19	92	1505	505	30	-90	0	12	2	25
5	19	92	1450	450	3	-95	0	12	2	20
5	19	92	1307	307	5	-95	0	12	3	20
5	19	92	1545	545	25	-90	1	12	3	25
5	21	92	1130	130	15	-80	0	9	1	35
5	22	92	1640	640	3	-90	0	27	5	25
5	22	92	1340	340	3	-80	0	27	3	35
5	22	92	1630	630	5	-90	2	27	5	25
5	22	92	1520	520	3	-95	-4	27	5	20
5	22	92	1515	515	1	-105	-10	27	5	10
5	22	92	1350	350	2	-95	0	27	3	20
5	22	92	1130	130	85	-90	1	27	3	25
5	22	92	1545	545	2	-95	-7	27	5	20
5	22	92	1500	500	2	-95	2	27	5	20

5	22	92	1440	440	4	-95	4	27	5	20
5	22	92	1510	510	2	-95	2	27	5	20
5	22	92	1620	620	4	-90	4	27	5	25
5	22	92	1650	650	1	-90	-1	27	5	25
5	22	92	1425	425	2	-90	-3	27	5	25
5	24	92	1305	305	2	-100	0	9	2	15
5	24	92	1425	425	15	-90	0	9	2	25
5	24	92	1400	400	10	-100	0	9	2	15
5	25	92	1250	250	55	-85	0	10	2	30
5	25	92	1135	135	25	-85	0	10	2	30
5	26	92	1450	450	3	-90	-2	8	2	25
5	28	92	1340	340	2	-102	0	15	2	13
5	28	92	1350	350	2	-102	0	15	2	13
5	28	92	1355	355	25	-95	0	15	2	20
5	28	92	1320	320	10	-100	0	15	2	15
5	28	92	1430	430	2	-90	0	15	2	25
5	29	92	1305	305	25	-95	-4	18	4	20
5	29	92	1345	345	70	-90	1	18	4	25
5	30	92	1220	220	3	-90	0	16	1	25
5	30	92	1250	250	1	-90	4	16	1	25
5	30	92	1600	600	3	-90	-2	16	3	25
6	1	92	1310	310	25	-100	0	13	2	15
6	1	92	1210	210	1	-95	0	13	2	20
6	1	92	1230	230	10	-85	0	13	2	30
6	1	92	1145	145	2	-95	-1	13	2	20
6	7	92	1050	50	70	-90	1	11	1	25
6	8	92	1400	400	15	-80	-1	29	4	35
6	8	92	1550	550	10	-85	1	29	3	30
6	8	92	1215	215	2	-90	-1	29	5	25
6	8	92	1640	640	10	-100	-4	29	3	15
6	8	92	1000	0	70	-80	-1	29	5	35
6	8	92	1155	155	2	-102	-1	29	5	13
6	8	92	1120	120	5	-105	0	29	5	10
6	8	92	1315	315	5	-90	4	29	4	25
6	8	92	1420	420	20	-85	1	29	4	30
6	8	92	2315	1315	35	-95	-4	29	5	20
6	8	92	1220	220	2	-90	-1	29	4	25
6	8	92	1445	445	10	-85	-2	29	4	30
6	8	92	1700	700	45	-90	1	29	3	25
6	8	92	1755	755	25	-90	-2	29	3	25
6	8	92	1615	615	10	-90	20	29	3	25
6	9	92	915	2315	25	-85	1	21	5	30
6	9	92	840	2240	30	-85	-1	21	5	30
6	9	92	745	2145	20	-90	-1	21	5	25
6	9	92	1255	255	2	-90	-1	21	4	25
6	9	92	1045	45	50	-90	1	21	5	25
6	9	92	815	2215	15	-80	0	21	5	35
6	9	92	955	2355	35	-90	-1	21	5	25
6	9	92	1305	305	10	-90	-1	21	4	25
6	9	92	1215	215	3	-100	0	21	4	15

6	10	92	1000	0	110	-85	0	22	4	30
6	10	92	855	2255	2	-95	-1	22	4	20
6	10	92	1247	247	5	-105	0	22	5	10
6	11	92	1535	535	20	-85	0	19	2	30
6	11	92	1435	435	60	-85	0	19	3	30
6	11	92	1125	125	170	-85	0	19	3	30
6	11	92	1015	15	65	-85	0	19	3	30
6	11	92	1005	5	3	-100	0	19	3	15
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8	10	92	1315	315	30	-85	0	10	3	30
8	10	92	1300	300	13	-85	0	10	3	30
				Avg	21					
				Std.	28					

Local Time	No. of Events	Avg Dur	Std.Dev. Dur	Avg Amp	Std.Dev. Amp
13	2	15	5	25	0
14	0	0	0	0	0
15	0	0	0	0	0
16	6	22	22	23	7
17	2	108	85	30	5
18	9	14	19	24	7
19	14	33	46	22	9
20	14	29	43	21	5
21	21	8	10	23	8
22	17	11	9	22	6
23	31	15	19	21	7
00	29	21	23	23	6
01	42	13	15	17	5
02	39	20	25	22	6
03	47	24	32	24	6
04	45	22	26	26	6
05	22	18	18	23	6
06	30	35	36	24	6
07	13	26	9	24	7
08	3	17	14	27	2
09	0	0	0	0	0
10	1	10	0	20	0
11	0	0	0	0	0
12	1	5	0	10	0
	388				

Dur>120 min =7
Dur>90 min=11
Dur>60 min=36
Dur>30 min=92
Dur>21 min=123 (32%)

Median Dur= 10minutes

May = 117 events
June = 117 events
July = 154 events

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13. ABSTRACT *(Maximum 200 words)*

Personnel at the Naval Command, Control and Ocean Surveillance Center, RDT&E Division, and RP Consultants conducted a year-long study to measure and characterize auroral-E propagation. Personnel installed a 100-watt transmitter at the Arctic Submarine Laboratory at Cape Prince of Wales (67 N, 168 W) and a receiver at RP Consultants' facilities 900 kilometers away. Both sites used simple dipole antennas. The transmitter sent a slow morse "R" on a frequency of 25.545 megahertz (MHz). Only a very dense patch of ionization, typical of sporadic-E or auroral-E with foEs greater than 5 MHz, would sustain a sky-wave signal over this path. The solar sunspot number declined from 175 to less than 100 during the test period. Personnel recorded over 1400 auroral sporadic-mode observations whose durations spanned 1 minute to several hours. A strong diurnal dependence was noted.

This document presents an initial characterization of auroral-E occurrences, noting time of day, season, and magnetic activity. It discusses some implications of auroral-E occurrence intensity. The data are also discussed with respect to the development of a new auroral-E expert system model.

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sporadic ionization
auroral electrojet

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