ABSORPTION MEASUREMENTS WITH RIOMETER

Data Summary Nº 8 for the period
October 1965 through December 1965

by

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Conselho Nacional de Pesquisas

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Laboratório de Física Espacial

São José dos Campos

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RIOMETER MEASUREMENTS

DATA SUMMARY Nº 8

I - INTRODUCTION

This summary is a catalogue of reduced riometer data, for the period of observations from October 1965 through December 1965.

Figure 1 shows a "quiet-day" curve for São José dos Campos station which was obtained from the available data since the riometer was set in operation at this site, on March 15, 1963.

For each month, the value of observation is tabulated for the first minute of each hour to the nearest 0.1 db, and the total number of readings for the month as well as the median and quartiles values are indicated in the same table. See for instance Tables IV through IX. Note that Fig. 2 also shows the monthly medians mentioned above.

Table I shows a listing of important flares which occurred under sunlight periods for the station, whereas the Table II contains all burst under sunlight period as published by H.A.O. - Boulder (Colorado).

The absorption events at the Riometer of São José dos Campos are listed in the Table III carrying time interval, maximum value of absorption, and maximum variation about cosmic noise level.

II - DESCRIPTION OF THE EQUIPMENT

RIOMETER : The riometer (Relative Ionospheric Opacity Meter) is a device for measuring ionospheric absorption using the cosmic noise method.

A high gain and stable receiver is switched automatically between an antenna and a noise diode at a given switching frequency (340 Hz).

The antenna, which in our station is an east-west four elements Yagi, points vertically and receives the cosmic noise. If there is a difference between the antenna power and the noise diode power, a wave at the switching frequency appears at the detector of the receiver. The detector output is a DC voltage which has an amplitude that is proportional to the difference between the antenna and the diode signal. The voltage is used to adjust the current of a servo diode in order to reduce the above mentioned difference to zero. The diode noise is proportional to the antenna noise power. The diode current is recorded in a common pen recorder.

The riometer is calibrated daily by connecting a test noise diode in place of the antenna and passing different values of current for readings of the riometer.

The frequency used of 30 MHz is low enough to be sensitive to the non deviative absorption effects of the lower ionosphere and yet it is sufficiently high so that a signal is detectable even under ionospheric disturbances.

III - MEASUREMENTS TECHNIQUE

In the noise method already mentioned, the absorption is measured by comparing the signal actually received with the signal that would be received in the same sidereal time under conditions of zero absorption.

In order to measure the absorption it is necessary to establish the local "quiet-day" curve. This curve is obtained from the riometer recording in the hours before the sunrise, when absorption is low. The values of current observed are transferred to the corresponding sidereal time. The highest reliable readings are considered points of the "quiet-day", which is assumed, as pointed before, to represent values of zero absorption condition.

Using the "quiet-day" curve, one can obtain the absorption in db at any given time by the relation:

$$A\,(db) = 10 \log_{10} Ir/Iq$$

where:

Ir = noise power actually received at a given time

Iq = noise power from the "quiet-day" curve for the corresponding sidereal time.

IV - TYPE OF SCALING AND DATA REDUCTION

In reducing the riometer data, scalling TYPE I (URSI-AGI Committee 1958) has been used .

The absorption during the first minute of each hour of every day throughout a given period of absorption is recorded and then averaged . The results give a picture of the daily and seasonal variations of absorption.

The data reduction was performed in the following manner:

The "quiet-day" curve, assumed to represent zero absorption is plotted and hourly values of Iq is obtained. The actual values of current for each hour are translated to the correct sidereal time and the ratio $\frac{Iq}{Ir}$ is calculated. For the given ratio, the absorption in db is obtained from regular tables.

The following qualifying symbols have been used for values obtained indirectly from the record:

C = failure of equipment
S = interference
U = value uncertain
I = value interpolated

V - ABSORPTION EFFECTS ASSOCIATED WITH SOLAR FLARES

The Sun's ionizing radiation during solar flares is normally enhanced and reaches the lower level of the ionosphere increasing the absorption through the D-region producing the attenuation of the cosmic noise reaching the antenna. Sometimes prior to the observation of attenuation and depending on the relative position of the Sun and antenna beam an enhancement of noise current is observed as a result of the Sun's HF radio emissions, during solar bursts of intensity greater than 1.

Five flares occurred during the local sunlight hours, namely on October 1 and 2 and December 29 which could be clearly related to the absorption effects shown in the Riometer records, although the peak of absorption is relatively small in most of cases.

A large number of events of noise enhancements at the frequency used in the Riometer are correlated to radio emissions from the sun on 30 MHz, during solar burst phenomena.

TABLE I

IMPORTANT FLARES OCCURRED UNDER SUNLIT PERIOD

Date 1965	Flare Importance	Time Interval (UT)			Remarks
		Start	Max Phase	End	
October 1	-	2000	2013	2151	Phase recorded at VLF
	2	2025	2037	2204	H. A. O. - Boulder
2	-	1539	1557	1730	Phase recorded at VLF
	2	1612	-	1650	H. A. O. - Boulder
December 29	2	1133	-	1155	H. A. O. - Boulder

TABLE II

BURSTS UNDER SUNLIT PERIOD AS PUBLISHED BY H.A.O. BOULDER (COLORADO)

DATE 1965	B U R S T			
	TYPE	TIME INTERVAL (UT)		FREQ. RANGE (MHz)
October 2	III	1612:15	1612:45	14-41
	III	1626	1627:30	8-41
	III	1735:45	1736:45	8-41
	III	1742:25	1744	8-41
	III	1848:30	1850:30	8-41
	III	1906	1907:15	8-41
	III	1910	1910:15	10-41
	III	1912:30	1913:15	8-41
3	III	1541:30	1541:45	23-36
	III	1549:15	1949:30	25-36
	III	1723:30	1724	21-38
	III	1743:15	1744:30	17-41
	III	1829:30	1829:45	27-41
4	IV	1411:30	2000	19-41
	cont.	2000	2140	23-41
	III	2007:30	2008	23-41
	III	2009:15	2010	20-41
	III	2045:45	2046	17-41
	III	2054:30	2055	24-41
5	III	1544	1544:15	20-41
	III	1600	1600:15	19-31
	III	1634:30	1635	21-38
	III	1736:30	1737:30	25-36
	III	1757:15	1757:45	10-41
	III	1808:15	1808:45	22-38
	III	1819	1819:30	19-41
	III	2027:45	2029:45	17-41
	III	2031:30	2031:45	22-35
	III	2038:15	2038:45	22-30
	III	2040:30	2041	16-41
6	III	1419:15	1420	20-41
	III	1540:30	1541:15	24-34

TABLE II (Cont.)

BURSTS UNDER SUNLIT PERIOD AS PUBLISHED BY H. A. O.
BOULDER (COLORADO)

DATE 1965	B U R S T		
	TYPE	TIME INTERVAL (UT)	FREQ. RANGE (MHz)
October 6	III	1733:15 1733:45	24-40
	III	1950:15 1950:45	19-34
7	III	1533 1534:15	21-41
	III	2002:45 2003:30	26-41
8	III	1542 1542:30	26-41
	III	1603:15 1606:45	16-41
22	III	1711:45 1713:30	17-41
November 2	III	2008:15 2008:45	24-41
4	III	1947:30 1947:45	24-41
5	III	2118 2118:45	16-41
6	III	1723:30 1725:25	25-41
12	III	1640:45 1641:15	24-41
	III	1645:15 1645:45	22-41
	III	1654 1654:15	22-41
	III	1741:45 1742	24-41
	III	1747:15 1747:30	24-35
	III	1755:30 1756	17-41
	III	1823:45 1824:15	17-39
	III	1833:45 1834:15	22-41
	III	1904 1904:15	22-36
	III	1905:45 1906:15	20-35
	III	1906:45 1907:15	21-34
	III	1916:15 1916:30	25-36
	III	1917 1917:30	16-41
	III	1919 1919:15	23-35
	III	1925 1925:30	21-41
	III	1935:45 1936	23-34
	III	1940 1940:15	24-38
	III	1944:45 1945	26-37
	III	1947 1947:15	21-41
	III	1953:30 1953:45	27-34
	III	1954:45 1955:15	26-41
	III	1955:45 1956	26-34
	cont.	1937 2135	21-41

TABLE II (Cont.)

BURSTS UNDER SUNLIT PERIOD AS PUBLISHED BY H.A.O.
BOULDER (COLORADO)

DATE	B U R S T			
1965	TYPE	TIME INTERVAL (UT)		FREQ. RANGE (MHz)
November 13	cont.	1502	2145	20-41
15	III	1833	1833:30	24-41
18	III	1813	1813:45	29-41
19	III	1645:45	1646:15	24-41
22	III	1610:30	1610:45	20-41
	III	1615:45	1616:15	24-41
December 4	III	1835:15	1836:15	23-41
12	III	1653:45	1654:15	21-41
17	III	1641	1641:45	23-41
21	III	1542:45	1543:15	27-38
	III	1543:30	1544	25-36
	III	1646:15	1647	26-41
	III	1650	1650:30	26-41
	III	1941:30	1942:45	24-41
	III	2007:30	2008:30	21-41
24	III	1739:15	1739:30	22-41
	III	1740:15	1740:45	22-41
26	III	1951	1951:30	23-31
	III	1954:45	1955:15	22-30
27	III	1510	1510:15	22-30
28	III	1629:30	1630	13-41
	III	1631	1631:30	27-41
	III	1750:45	1751:45	23-38
	III	1752:15	1752:45	27-38
	III	1753	1753:30	24-39
	III	1759:30	1800	22-38
	III	1800	1801:15	23-41
	III	1943:45	1945:15	15-41
	III	2030	2032	22-41
	III	2125:15	2125:30	23-41
29	cont.	1425	1700	22-41
	II	1507	1513:30	25-41
	II	1534	1540:30	25-41

TABLE III

SCNAs AT THE RIOMETER OF SJC

DATE 1965	ABSORPTION					RELATED FLARE			
	PERIOD (UT)			MAX VALUE (db)	MAX VARIATION (db)	IMPORTANCE	PERIOD (UT)		
	START	MAX PHASE	END				START	MAX PHASE	END
Oct. 1	1300	1305	1315	1.07	0.10	1+	1251	-	1315
	1755	1757	1800	1.70	0.15				
	1850	1852	1853	1.61	0.12				
2	1014	1017	1018	0.93	0.21				
	1617	1623	1655	1.70	0.33	2	1612	-	1650
4	0933	0940	0943	0.61	0.12	1+	0938	-	1030
	1318	1319	1320	0.61	0.20				
	1347	1350	1354	0.76	0.23				
5	1657	1700	1705	1.82	0.39				
	1710	1712	1720	1.79	0.18				
7	1450	1451	1452	1.64	0.40				
10	1318	1319	1320	1.17	0.20				
11	0913	0915	0922	0.83	0.22				
	0925	0930	0932	0.93	0.32				
12	1617	1619	1621	1.40	0.40				
	1623	1625	1628	1.30	0.26				
14	2125	2126	2127	1.90	0.47				
17	1344	1345	1345	1.14	0.35				
18	0837	0840	0842	0.83	0.34				
19	1130	1133	1135	1.07	0.21				
20	1123	1125	1129	1.07	0.24				
25	1435	1436	1600	1.46	0.22				
29	1815	1816	1817	1.61	0.37				
	1923	1935	2000	1.85	0.21				
Nov. 1	1256	1258	1300	0.79	0.11	1	1217	-	-
7	1545	1555	1557	2.04	0.34				
	1603	1605	1630	2.25	0.46	1	1558	1606	1629
	2141	2142	2143	1.99	0.31	1	2001	2019	2045
19	1058	1059	1102	0.79	0.18				
	1109	1111	1113	0.90	0.26				

TABLE III (Cont.)

SCNAs AT THE RIOMETER OF SJC

DATE 1965	ABSORPTION					RELATED FLARE			
	PERIOD (UT)			MAX VALUE (db)	MAX VARIATION (db)	IMPORTANCE	PERIOD (UT)		
	START	MAX PHASE	END				START	MAX PHASE	END
Nov. 20	1105	1106	1108	0.90	0.22				
Dec. 1	1445	1447	1448	1.37	0.20				
3	0823	0825	0827	0.72	0.23				
4	0906	0910	0913	0.97	0.33				
5	1722	1725	1730	1.46	0.42				
8	0823	0825	0827	0.79	0.11				
9	1625	1631	1640	1.37	0.16				
12	0838	0839	0840	0.64	0.19				
	1825	1827	1828	1.70	0.33				
18	1745	1755	1800	1.99	0.12				
19	1636	1638	1642	1.76	0.33				
	1930	1935	1938	1.37	0.23				
23	1221	1223	1224	0.45	0.32				
	1243	1247	1249	0.61	0.28				
24	0954	1000	1008	0.64	0.35				
25	0835	0837	0845	0.53	0.16				
29	1210	1212	1213	1.20	0.27	2	1133	-	1155
31	0855	0857	0858	0.49	0.12				

VI - " QUIET-DAY " CURVE

The "quiet-day" curve for this station has been obtained from all the available data from the operation of the riometer during a period of relatively low absorption.

However in this procedure it seems that some errors have been introduced in the "quiet-day" curve, which became apparent while reduction of riometer data was performed in terms of daily absorption. They occurred as a consequence of including values obtained from hours when the absorption was low but could not be disregarded or considered equal to ZERO.

The whole "quiet-day" curve is being revised continuously using data corresponding to local time between 0300 AM and 0600 AM, when the absorption is low.

Due to equipment failure which occurred during the regular operation of the riometer, care should be taken while using the " quiet-day " curve to reduce riometer data (see Appendix I).

During the months of October and November, 1964 the riometer records presented a distortion on the daily curve with the $\frac{I\ max}{I\ min}$ reduced of 15% to 25%, This was attributed to an equipment failure rather than to an external cause, solar or ionospheric. For the above reason the data of October was considered unreliable and was not reduced to absorption.

The "quiet-day" curve "b" of Fig. IV corrected as shown in Fig. I was used in the data reduction in the period from October through December 1965.

The time scale in the "quiet day" curve is the sidereal hour (referred to the first point of Aries). The sidereal time corresponding to 0000 GMT for the middle of each month is given in the table in Appendix II.

VII - CONCLUSION

Except for very strong interference produced by thunder storms, typical of the summer period in this latitude, this station is placed in a very quiet location.

The riometer records are quiet free from man made interferences.

Due to the reasons mentioned before, the results on the absorption deduced from the "quiet-day" curve as it stands now, should be considered qualitative rather than quantitative information.

More results with consistent operation of the riometer are needed and provide data for a detailed study of the seasonal variation of non-deviative absorption.

This station will continue its operation and will provide data on

ionospheric absorption in a cooperative program for the International Quiet Sun Year (1964 - 1965).

Data will be sent to the World Data Center, as established in the Guide to International Data Exchange, CIG - IQSY Committee.The recordings are reproduced in the AFCRL publication Geophysics and Space Data Bulletin.

References :

1) Little,C.G., and Leinbach ,H. - "The Riometer" - A Device for the Continuous Measurements of Ionospheric Proceedings of IRE,Feb 1959,Vol. 47,pp. 315-320.

2) Little,C.G., and Leinbach ,H. - "Some Measurements of High-latitude Ionospheric Absorption Using Extra-terrestrial Radio Waves" - Proceedings of IRE,Jan. 1958,Vol. 46,pp. 334 - 348.

3) Mitra,A.P., and Shain,C.A. - "The Measurements of the Ionospheric Absorption Using Observations of 18.3 MHz Cosmic Radio Noise" - J. Atmosph. & Terrestrial Physics,Vol. IV,pp. 203-218,1953.

4) URSI - AGI Committee - letter in "Questionnaire on Ionospheric Absorption Measurements" - A2,Appendix A,Sept. 15, 1958.

5) Lusignan,B.B. - " Cosmic Noise Absorption Measurements at Stanford,California and Pullman (Washington)"J. G.R., Vol. 65 and 12, Dec. 1960,pp. 3896 - 3902 .

6) " Riometer Measurements,Data Summary nº 1, January to December 1958 " - Radioscience Laboratory, Stanford Electronics Laboratories - Stanford University,Nov. 1959 .

7) Goldman ,S.C. and Horowitz,S. - "Global Riometer Measurement".

P.R. - CNPq.
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São José dos Campos - SP - Brasil

MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

Station ..... SJ
Month ..... October
Year 1965
Riometer ..... Mark II

Lat. ..... 23°12'43"S
Long. ..... 45°51'35"W
DIP ..... 22.5°S
Mag. Lat. ..... 11.7°S
Alt. ..... 623 m

Freq. ..... 30 MHz
Bandwith ..... 30 KHz
Diode Load Resist... 750 ohm
Audio Threshold 3
Int. Time ..... 4 sec
ACG Time ..... 4 sec

TABLE IV

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.04	0.72	0.49	0.53	0.61	0.61	0.45	0.72	0.76	0.57	0.86	0.83	0.93	0.93	1.00	1.27	1.52	1.58	1.58	1.52	1.24	1.07	0.86	0.76
2	0.79	0.72	0.45	0.49	0.61	0.64	0.76	0.76	0.79	0.79	0.86	0.83	0.93	0.93	1.04	1.14	1.40	1.55	1.14	1.24	1.46	1.46	1.40	1.58
3	1.14	1.00	0.57	0.49	0.61	0.64	0.49	0.53	0.68	0.57	0.61	0.83	0.72	0.86	0.90	0.97	1.14	1.14	0.83	0.64	0.68	0.64	0.49	0.76
4	0.79	0.64	0.53	0.45	0.61	0.64	0.25	0.41	0.49	0.49	0 [5]	0 [5]	0.17 [5]	0.41 [5]	0.83	0.93 [5]	1.21	1.17	1.49	1.43 [5]	1.24	1.10	1.24	1.27
5	0.97	0.97	0.76	0.53	0.61	0.64	0.49	0.45	0.49	0.57	0.61	0.83	0.97	1.04	1.14	1.43	1.72	1.90	1.70	1.61	1.58 [5]	1.52 [5]	1.24	1.33
6	0.86	0.93	0.72	0.53	0.61	0.64	0.53	0.49	0.72	0.57	0.61	0.86	0.79	0.93	0.97	1.30	1.61	1.93	1.90 [5]	2.01	1.64	1.46	1.52 [5]	1.58
7	1.00	1.00	0.72	0.68	0.61	0.93	0.53	0.61	0.49	0.57	0.61	0.64	0.79	0.97	1.04	1.33	1.85	1.90	1.70	1.85	[5] 1.87 [5]	1.46	1.27 [5]	1.37
8	0.76 [5]	0.17 [5]	0.45	0.68	0.86	0.93	0.79	0.61	0.72	0.61	0.61	0.64	0.79	1.00 [5]	1.04	1.14	1.00 [5]	1.17 [5]	1.14 [5]	1.14 [5]	1.00 [5]	0.83 [5]	1.43	1.87
9	1.04	1.00	0.64	0.64	0.61	0.64	0.83	0.64	0.53	0.61	0.61	0.64	0.72	0.79	0.83	0.83	1.17	1.33	1.24	1.58	1.14	1.10	1.24	1.17
10	0.79 [5]	0.86 [5]	0.86 [5]	0.93 [5]	0.86	0.93	0.61	0.90	0.76	0.61	0.61	0.64	0.83	1.04	1.04	0.86 [5]	1.10	2.33	1.07	1.30	1.43 [5]	1.58 [5]	1.79 [5]	1.27 [5]
11	0.53 [5]	0.86	0.61	0.61	0.86	0.93	0.86	0.68	0.76	0.61	0.83	0.90	0.83	0.86	0.90	1.10	1.52	1.58	1.43	1.43	1.27	1.07	1.10	1.27 [5]
12	[5] 1.00 [5]	0.61	0.33	0.37	0.61	0.68	0.64	0.72	0.53	0.49	0.49	0.57	0.76	0.68	0.72	0.83	0.97	1.17	1.10	1.04	1.10	1.30	1.30	1.10
13	0.86	0.68	0.33	0.37	0.61	0.45	0.64	0.61	0.53	0.49	0.61	0.57	0.79	0.93	0.97	1.21	1.61	1.70	1.90	1.90 [5]	1.99 [5]	2.01 [5]	1.95 [5]	1.27
14	0.90	0.68 [5]	0.57	0.64	0.61	0.49	0.68	0.76	0.53	0.61	0.61	0.49	0.79	0.76 [5]	[5] 1.21 [5]	[5] 1.27 [5]	1.46 [5]	c	c	1.46 [5]	1.87 [5]	1.82	1.33	1.04
15	0.57	0.53	0.53	0.61	0.61	0.72	0.68	0.64	0.57	0.49	0.49	0.68	0.61	0.79	0.86	1.14	1.37	1.67	[5] 1.87 [5]	1.61 [5]	1.64	1.49	1.30	1.30

TIME - UT

Month: October
Year: 1965

TABLE V

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
16	0.72	0.64	0.53	0.61	0.61	0.72	0.49	0.64	0.57	0.49	0.61	0.61	0.61	0.72	0.83	1.04	1.17	1.17	1.30	1.37	1.17	0.79	0.90	0.86
17	0.68	0.46	0.49	0.37	0.64	0.76	0.49	0.68	0.57	0.49	0.61	0.61	0.64	0.76	0.86	1.07	1.40	1.43	1.33	1.21	1.17	0.93	0.83	0.72
18	0.49	0.46	0.49	0.61	0.64	0.76	0.53	0.68	0.57	0.49	0.61	0.64	0.68	0.90	0.97	1.14	1.27	1.17	1.24	1.37	1.14	1.52	1.48^{5}	0.86
19	0.64^{5}	0.21^{5}	0.72	0.86	0.64	1.04	0.79	0.68^{5}	0.57	0.61	0.61	0.76^{5}	0.90	0.90	0.93^{5}	1.10^{5}	1.30^{5}	1.37^{5}	1.55^{5}	1.49^{5}	1.55^{5}	1.76	1.40^{5}	0.79^{5}
20	0.41	0.49^{5}	0.45^{5}	0.61	0.90	1.04	0.79	0.68	0.61	0.61	0.61	0.97	0.90	0.93	1.24	1.40	1.82	1.82	1.61	1.58^{5}	1.76^{5}	1.85^{5}	1.76^{5}	0.90^{5}
21	0.72^{5}	0.49^{5}	0.68	0.86	0.90	0.79	0.83	0.72	0.61	0.61	0.64	0.76	0.72	0.97	1.04^{5}	1.07^{5}	1.40^{5}	1.30^{5}	1.40^{5}	1.14^{5}	1.04^{5}	1.52^{5}	2.04	1.07^{5}
22	0.90	0.72	0.68	0.61	0.93	1.07	0.86	0.72	0.61	0.61	0.64	0.79	0.97	1.04	1.19	1.37	1.49	1.70	1.30	c	c	c	c	c
23	c	c	c	c	c	c	c	c	c	c	c	c	c	0.76	1.10	1.24	1.33	1.37^{5}	1.43	1.00^{5}	0.90	0.93	0.97	0.93
24	0.90	0.64	0.64	0.61	0.64	0.57	0.64	0.72	0.61	0.61	0.86	0.79	0.79	0.76	1.24	1.46	1.58	1.76	1.76	1.72	1.64	1.72	1.90	1.40
25	1.21^{5}	0.86^{5}	0.93^{5}	0.86^{5}	0.93^{5}	0.83^{5}	0.68^{5}	0.53^{5}	0.61^{5}	0.61	0.86	0.83^{5}	1.04^{5}	1.04	1.21	1.30	1.61^{5}	1.82^{5}	1.76^{5}	1.61^{5}	1.58^{5}	1.87^{5}	2.33^{5}	1.70
26	1.21	0.86	0.90	0.86	0.93^{5}	0.86	0.93	0.76	0.61	0.61	0.64	0.72	0.86	1.07	1.10	1.17	1.76	1.85	1.79	1.61	1.33	1.24	1.27	1.04
27	1.17	0.83	0.61	0.61	0.93	0.64	0.61	0.53	0.49	0.61	0.57	0.37	0.68	0.76	0.97	1.37	1.67	1.79	1.79^{5}	2.09^{5}	1.79^{5}	1.30	1.55	1.00
28	0.79	0.57	0.64	0.90	0.97	0.93	0.97	0.53	0.61	0.61	0.57	0.57	0.72	0.97	1.04	1.27	1.24	1.27	1.37	1.40	1.27	1.24	1.58	1.30
29	0.68^{5}	0.33^{5}	0.37^{5}	0.37^{5}	0.45	0.68^{5}	0.76^{5}	0.76^{5}	0.61^{5}	0.61^{5}	0.61^{5}	0.79^{5}	0.64^{5}	0.76^{5}	0.49^{5}	0.86^{5}	0.93^{5}	1.17^{5}	1.24^{5}	1.30^{5}	1.67^{5}	1.93^{5}	1.99^{5}	1.24^{5}
30	0.68	0.53	0.61	0.61	0.72	0.68	0.64	0.57	0.49	0.49	0.61	0.41	0.68	0.79^{5}	0.90	1.10	1.40	1.64	1.52	1.46	1.43	1.70	1.79	1.21
31	1.14	0.76	0.61	0.61	0.72	0.45	0.64	0.45	0.49	0.49	0.61	0.61	0.72	0.64	0.76	1.10	1.30	1.46	1.52	1.43	1.43	1.61	2.04	2.09
Count	30	30	30	30	30	30	30	30	30	30	30	30	30	31	31	31	31	30	30	30	30	30	30	30
UQ	1.04	0.86	0.72	0.68	0.90	0.93	0.79	0.72	0.68	0.61	0.64	0.83	0.90	0.97	1.10	1.30	1.61	1.82	1.76	1.61	1.64	1.72	1.79	1.37
Median	0.86	0.68	0.61	0.61	0.64	0.72	0.64	0.68	0.57	0.61	0.61	0.68	0.79	0.90	0.97	1.14	1.40	1.58	1.49	1.46	1.43	1.46	1.40	1.24
LQ	0.68	0.49	0.49	0.49	0.61	0.64	0.53	0.53	0.53	0.49	0.61	0.61	0.68	0.76	0.86	1.07	1.21	1.17	1.24	1.24	1.17	1.07	1.24	0.90

TIME - UT

P.R. - CNPq.
Comissão Nacional de Atividades Espaciais
São José dos Campos - SP - Brasil

MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

Station ..... - SJ
Month ..... - November
Year ..... - 1965
Riometer ..... - Mark II

Lat. ..... - 23°12'43"S
Long. ..... - 45°51'35"W
DIP ..... - 22.5°S
Mag. Lat. ..... - 11.7° S
Alt. ..... - 623 m

Freq. ..... - 30 MHz
Bandwith ..... - 30 KHz
Diode Load Resist ..... - 750 ohm
Audio Threshold ..... - 3
Int. Times ..... - 4 sec
ACG Time ..... - 4 sec

TABLE VI

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.37	1.00	0.86	0.90	1.00	0.76	0.68	0.57	0.61	0.61	0.61	0.64	0.76	0.68	0.86	1.14	1.14	1.33	1.37	1.43[5]	1.70	2.33[5]	2.09[5]	1.40[5]
2	1.07	0.76	0.61	0.64	0.76	0.76	0.68	0.57	0.49	0.53	0.64	0.49	0.61	0.92	0.90	1.21	1.24	1.40	1.46	1.46	1.55	1.82[5]	1.97[5]	1.37
3	0.79	0.72	0.61	0.90	0.76	0.79	0.68	0.49	0.49	0.53	0.64	0.49	0.64	0.76	0.97	1.27	1.27	1.43[5]	1.61	1.43[5]	[5]1.24[5]	0.97[5]	0.97	0.97
4	0.76	0.68	0.61	0.64	0.76	0.79	0.45	0.49	0.49	0.53	0.64	[5]0.90[5]	[5]0.93	1.24	1.14	1.37	1.40	1.55	1.46[5]	1.64[5]	1.85[5]	1.76[5]	1.37	1.07
5	0.97	0.68	0.86	0.90	0.79	0.83	0.83	0.57	0.61	0.64	0.76	0.72	0.97	1.04	1.07	1.14	1.33	1.40[5]	1.30[5]	[5]1.37[5]	1.21[5]	0.97[5]	1.30[5]	0.93[5]
6	0.97[5]	0.68	0.61[5]	0.64[5]	0.79[5]	0.64[5]	0.49[5]	0.49[5]	0.29[5]	0.53[5]	0.49[5]	0.45[5]	0.57	0.76	0.93	1.21[5]	1.33[5]	1.55[5]	1.46[5]	1.10[5]	1.33[5]	1.79[5]	1.21[5]	0.61[5]
7	0.68	0.93	1.04	0.64	1.07	0.86	0.72	0.61	0.61	0.64	0.68	0.61	0.97	1.14	1.37	1.61	1.96	1.58[5]	[5]1.76[5]	1.55[5]	1.93[5]	1.96[5]	1.24[5]	1.24[5]
8	0.61[5]	0.41	0.61	0.64	0.57	0.90	0.72	0.61	0.49	0.57	0.49	0.79	1.00	1.17	1.17	1.30[5]	1.52[5]	1.46[5]	[5]1.55[5]	1.52[5]	1.67[5]	1.79[5]	1.40	1.49
9	0.61	0.64	0.61	0.97	0.86	0.90	0.76	0.61	0.61	0.64	0.72	0.64	0.86	0.86	1.10	1.21	1.24	1.33	1.04	0.93	0.97	1.37	1.10	0.97
10	0.61	0.64	0.90	0.97	0.86	0.93	0.57	0.61	0.61	0.64	0.72	0.68	0.72	0.79	0.90	1.04	1.21	1.43[5]	1.40[5]	1.33[5]	1.37[5]	1.70[5]	1.27[5]	1.21[5]
11	0.57[5]	c	c	0.93	0.90	0.93	0.76	0.61	0.61	0.68	0.76	0.90	0.76[5]	0.83	0.97[5]	1.27	1.40[5]	1.33[5]	1.40[5]	1.21[5]	1.52[5]	1.55[5]	1.21[5]	1.17
12	0.57	0.64	0.61	0.72	0.68	0.53	0.76	0.61	0.61	0.68	0.76	0.93	0.97[5]	1.04	1.27	1.17[5]	1.27	1.37[5]	1.52[5]	[5]1.37[5]	1.24	1.46	1.30	1.04[5]
13	0.79	0.64	0.90	0.97	1.00	1.00	0.76	0.83	0.61	0.68	0.79	0.76	0.83	0.93	1.33	1.52	1.85	2.04[5]	1.87[5]	1.85[5]	1.61[5]	1.49[5]	1.14[5]	1.17[5]
14	1.07	0.86	0.90	1.00	0.93	1.00	0.79	0.83	0.61	0.68	0.79	0.79	0.86	0.97	1.24	1.37	1.21[5]	1.33[5]	1.64[5]	2.07[5]	2.04[5]	1.61[5]	0.86	0.68[5]
15	0.79	0.61[5]	0.61[5]	0.72[5]	0.97	1.00	0.99	0.83	0.61	0.72	0.83	0.83	0.90	1.21	1.17	1.40	1.46	1.46[5]	1.49[5]	1.52[5]	1.40[5]	1.52[5]	1.43[5]	1.14[5]

TIME - UT

Month: November
Year: 1965

TABLE VII

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
16	0.76	0.86[5]	1.04[5]	1.14	1.00	1.04	0.79	0.83	0.83	0.93	1.17	1.04	1.10	1.07	1.21	1.21	1.24	1.24	[5]1.27[5]	1.33[5]	1.58[5]	1.24	0.79	0.49[5]
17	0.76[5]	0.61	0.64	0.76	0.76	1.04	0.57	0.61	0.61	0.64	0.68	0.61	1.10	1.00	1.04	1.07	1.24	1.37	1.27	1.33	1.33	1.55	1.61	1.46
18	0.72	0.86[5]	0.90	1.04	1.04	1.30	0.79	0.61	0.61	0.76	0.68	0.83	0.76	0.97	1.14	1.27[5]	1.27	1.46	1.43	1.30	1.17	1.27	1.58	1.30
19	0.68	0.61	0.90	1.04	0.83	1.04	0.61	0.61	0.61	0.64	0.72	0.86	0.79	0.97	1.14	1.24	1.27	1.30	1.17	1.17	0.97	0.90	0.97	0.49
20	0.45	0.61	0.90	0.53	0.57	0.83	0.49	0.49	0.53	0.64	0.72	0.68	0.86	0.72	1.14	1.27	1.27	1.21	1.30	1.21	1.10	1.30	1.55	1.40
21	0.93	1.00	0.93	0.79	0.64	0.72	0.61	0.49	0.53	0.49	0.57	0.57	0.76	0.93	1.07	1.30	1.40	1.30[5]	1.30	1.27	1.52[5]	1.33[5]	1.24	1.24
22	0.97	0.90	0.93	1.07	1.10	0.64	0.61	0.61	0.53	0.68	0.57	0.76	0.79	1.14	1.10	1.30	1.43	1.46	1.43	1.43[5]	1.43	1.14	0.90	0.29
23	0.41	0.61	0.64	0.57	0.64	0.72	0.61	0.49	0.57	0.53	0.61	0.57	0.45	0.76	0.86	0.97	1.24	1.27	1.10	C	0.79	0.68	0.90	0.64
24	0.64	0.61	0.68	0.61	0.68	0.76	0.61	0.49	0.53	0.72	0.64	0.68	0.86	0.97	1.21	1.24	1.33	1.40	1.37	1.43	1.27	1.00	0.86	0.61
25	0.64	0.61	0.68	0.61	0.68	0.76	0.61	0.49	0.53	0.53	0.68	0.72	0.79	1.04	1.24	1.37	1.49	1.61	1.76	1.24	1.27	1.04	0.97	0.86
26	0.64	0.61	0.68	0.64	0.72	0.53	0.49[5]	0.61	0.57[5]	0.57	0.61	0.64	0.76	0.97	1.17	1.37	1.49[5]	1.90[5]	1.61[5]	1.52[5]	1.37[5]	1.00[5]	0.93[5]	0.83[5]
27	0.64[5]	0.61[5]	[5]0.45[5]	[5]0.68[5]	0.61[5]	0.53[5]	0.49	0.49	0.57	0.57	0.61	0.72	0.68	0.93	1.00	1.04	1.21[5]	1.10[5]	1.40[5]	0.97[5]	0.86[5]	0.86[5]	1.04[5]	0.57[5]
28	0.37[5]	0.33[5]	0.68	0.68	0.76	0.76	0.61	0.61	0.61	0.57	0.64	0.83	0.93	1.21	1.10[5]	1.27[5]	1.46[5]	1.64[5]	1.46[5]	1.04[5]	0.76	0.79[5]	0.57[5]	0.57[5]
29	[5]0.61[5]	0.61[5]	0.72	0.68	0.76	0.79	0.61	0.49	0.61	0.61	0.49	0.61	0.90	0.93	0.97	1.21[5]	1.21[5]	1.10[5]	1.17[5]	1.24[5]	1.10[5]	0.86	0.64	0.53
30	0.37	0.61[5]	0.72	0.72	0.76	0.79	0.61	0.49	0.61	0.41	0.53	0.64	0.83	0.79	0.86	1.04	1.04	0.90[5]	0.76	1.04	1.21	1.07	0.86	1.04
31																								
Count	30	29	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	29	30	30	30	30
UQ	0.93	0.86	0.90	0.97	0.97	1.00	0.76	0.61	0.61	0.68	0.76	0.83	0.93	1.07	1.21	1.37	1.40	1.55	1.55	1.52	1.58	1.70	1.37	1.24
Median	0.68	0.64	0.68	0.72	0.76	0.79	0.61	0.61	0.61	0.64	0.68	0.72	0.83	0.97	1.10	1.24	1.27	1.40	1.43	1.33	1.33	1.30	1.14	0.97
LQ	0.61	0.61	0.61	0.64	0.68	0.72	0.57	0.49	0.53	0.53	0.61	0.61	0.76	0.79	0.97	1.14	1.24	1.30	1.27	1.21	1.10	0.97	0.90	0.61

TIME - UT

P. R. - CNPq.
Comissão Nacional de Atividades Espaciais
São José dos Campos - SP - Brasil

MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

Station	- SJ	Lat.	- 23°12'43"S	Freq.	- 30 MHz
Month	- December	Long.	- 45°51'35"W	Bandwith	- 30 KHz
Year	- 1965	DIP	- 22.5°S	Diode Load Resist.	- 750 ohm
Riometer	- Mark II	Mag. Lat.	- 11.7°S	Audio Threshold	- 3
		Alt.	- 623 m	Int. Time	- 4 sec
				ACG Time	- 4 sec

TABLE III

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.76	0.76	0.72	0.72	0.72	0.68	0.72	0.72	0.72	0.83	0.72	0.83	1.04	1.17	1.07	1.24	1.30	1.21	1.43	1.46	1.21	0.93	0.90	0.90
2	1.04	0.49	0.76	0.76	0.57	0.57	0.49	0.53	0.61	0.53	0.68	0.79	1.07	1.27	1.21	1.30	1.40	1.30	0.97	1.49	1.14	0.90	0.83	0.61
3	0.49	0.49	0.76	0.76	0.57	0.57	0.49	0.53	0.41	0.57	0.49	0.90	0.90	1.14	1.24	1.30	1.40	1.43	1.55	1.33	1.33	1.37	0.93	0.86
4	0.76	0.76	0.79	0.79	0.79	0.68	0.61	0.61	0.64	0.57	0.92	0.68	0.97	1.17	1.10	1.24	1.24	1.27	1.30	1.33	1.27	0.86	0.79	0.61
5	0.49	0.49	0.79	0.79	0.57	0.57	0.49	0.49	0.45	0.61	0.76	0.90	1.00	1.04	1.00	1.07	1.10	1.14	1.27	1.43	1.07	0.83	0.49	0.57
6	0.49	0.49	0.57	0.57	0.61	0.49	c	c	c	c	c	0.53	0.79	1.14	1.21	1.24	1.27	1.10	1.27	1.17	0.79	0.72	0.49	0.45
7	0.49	0.53	0.61	0.61	0.49	0.49	0.29	0.33	0.49	0.37	0.41	0.45	0.53	0.72	1.10	0.93	1.07	0.90	1.14	1.10	1.00	1.04	0.72	0.83
8	0.76	0.79	0.61	0.61	0.61	0.61	0.61	0.64	0.68	0.68	0.68	0.68	0.93	1.04	0.97	1.21	1.27	1.30	1.43	1.33	1.14	1.27	0.93	0.86
9	0.76	1.07	1.00	1.00	1.07	0.93	0.93	0.57	0.37	0.25	0.72	0.33	0.97	1.10	1.14	1.27	1.43	1.27	1.37	1.33	1.07	1.24	0.64	0.57
10	0.76	0.83	0.90	0.53	0.86	0.72	0.93	0.57	0.41	0.09	0.57	0.79	0.72	0.90	0.97	1.07	1.21	1.14	1.37	1.43	1.10	1.24	0.61	0.53
11	0.49	0.53	0.68	0.68	0.53	0.49	0.49	0.33	0.13	0	0.53	0.57	0.72	0.79	0.90	1.07	1.17	1.21	1.30	1.37	1.17	0.97	0.61	0.49
12	0.49	0.53	0.72	0.72	0.64	0.61	0.49	0.37	0.17	0	0.57	0.61	0.83	0.90	0.93	1.07	1.14	1.17	1.37	1.46	1.33	1.17	0.57	0.76
13	0.49	0.68	0.72	0.72	0.64	0.72	0.61	0.57	0.57	0.53	0.61	0.64	0.79	0.93	0.90	1.10	1.21	1.40	1.46	1.67	1.07	0.79	0.57	0.49
14	0.49	0.57	0.53	0.53	0.53	0.49	0.49	0.37	0.49	0.41	0.49	0.57	0.68	0.93	1.04	1.24	1.24	1.30	1.37	1.10	0.90	0.68	0.53	0.41
15	0.49	0.45	0.41	0.41	0.57	0.49	0.49	0.37	0.29	0.41	0.37	0.76	0.79	0.97	1.07	1.24	1.37	1.37	1.55	1.49	1.00	0.90	0.90	0.72

TIME - UT

Month: December
Year: 1965

TABLE IX

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
16	0.72	0.61	0.53	0.53	0.57	0.61	0.61	0.97	0.53	0.45	0.41	0.53	0.79	0.79	1.00	1.14	1.21	1.24[3]	1.30	1.40	1.17	1.00	0.90	0.76
17	0.76	0.49	0.49	0.79	0.68	0.49	0.49	0.61	0.53	0.49	0.45	0.86	1.07	1.49	1.17	1.30	1.37	1.79	1.49	1.64[3]	1.14	0.93	0.86	0.76
18	0.76	0.61	0.76	0.79	0.68	0.61	0.61	0.64	0.57	0.53	0.64	0.76	1.00	1.07	1.47	1.33	1.46	1.40	1.92[3]	1.55[3]	1.14[3]	0.79[3]	0.86[3]	0.49[3]
19	0.37	0.64	0.53	0.57	0.57	0.61	0.53	0.64	0.37	0.53	0.68	0.97	1.24	1.37	1.40	1.40	1.55[3]	1.49[3]	1.64[3]	1.46[3]	1.33[3]	0.90	0.61	0.49[3]
20	0.76	0.90	0.79	0.57	0.61	0.49	0.72	0.45	0.41	0.41	0.57	0.68	0.90	0.90	1.17	1.21[3]	1.40	1.43[3]	1.43[3]	1.07	0.83[3]	0.76[3]	0.45[3]	0.49
21	0.37[3]	0.53[3]	0.37	0.49	0.49	0.49	0.33	0.33	0.33	0.33	0.33	0.45	0.64	1.14	1.17	1.24[3]	0.97	1.07[3]	1.49[3]	1.07	0.61[3]	0.13[3]	0.21[3]	0.13[3]
22	0.41	0.29	0.41[3]	0.37	0.49	0.29	0.64	0.45	0.37	0.25	0.37	0.45	0.61	0.68	0.79	0.83	0.79	0.86	0.90	0.93	0.57	0.13	0.17	0.33
23	0.41	0.29	0.41	0.41	0.29	0.29	0.21	0.17	0.21	0.09	0.09	0.13	0.17	0.61	0.61	0.86	0.97	1.17	1.61	1.14	0.61	0.45	0.41	0.49
24	0.53	0.57	0.41	0.49	0.49	0.29	0.33	0.41	0.25	0.29	0.68	0.57	0.13	0.83	0.97	1.04	1.10	1.10	0.93	0.79	1.00	0.64	0.41	0.49
25	0.53	0.61	0.64	0.64	0.49	0.49	0.57	0.49	0.45	0.49	0.49	0.53	0.45	0.49	(1.07)	1.17	1.10	0.79	1.17	0.79	0.53	0	0.17	0.33
26	0.41	0.17	0.25	0.41	0.49	0.29	0.33	0.25	0.29	0.37	0.57	0.41	0.76	0.90	1.10	1.17	0.93	0.97	1.17	0.93	0.61	0.33	0.13	0.33
27	0.41	0.17	0.37	0.21	0.21	0.21	0.09	0.17	0	0	0.25	0.37	0.79	0.93	0.97	1.14[3]	1.43	0.93	1.04	0.90	0.72	0.09	0.13	0.33
28	0.45	0.64	0.49	0.53	0.49	0.49	0.57	0.57	0.53	0.45	0.53	0.68	0.83	1.07	1.14	1.21	1.37	1.30	0.37	0.67	0.79	0.57	0.37	0.49
29	0.57	0.68	0.53	0.53	0.61	0.49	0.61	0.57	0.57	0.49	0.57	0.86	0.83	1.10	1.14	0.93	1.17	1.04	1.30	0.61	0.45	0.57	0.37	0.49
30	0.86	0.68	0.53	0.45	0.29	0.29	0.37	0.29	0.25	0.29	0.41	0.41	0.61	0.76	0.86	0.93	0.97	0.97	0.86	0.57	0.45	0.53	0.49	0.33
31	0.49	0.72	0.76	0.57	0.49	0.49	0.61	0.53	0.45	0.41	0.13	0.29	0.61	0.61	0.64	0.72	0.86	0.97	1.21	0.83	0.90	0.90	0.76	1.00
Count	31	31	31	31	31	31	30	30	30	30	30	31	31	31	31	31	31	31	31	31	31	31	31	31
UQ	0.77	0.68	0.76	0.72	0.64	0.61	0.61	0.61	0.57	0.53	0.68	0.79	0.97	1.14	1.17	1.24	1.37	1.30	1.46	1.46	1.14	0.97	0.83	0.76
Median	0.49	0.57	0.61	0.57	0.57	0.49	0.53	0.49	0.45	0.41	0.57	0.61	0.79	0.93	1.07	1.17	1.21	1.21	1.30	1.33	1.00	0.83	0.57	0.49
LQ	0.49	0.49	0.49	0.49	0.49	0.49	0.37	0.33	0.29	0.25	0.41	0.45	0.64	0.79	0.97	1.07	1.10	1.04	1.17	0.93	0.72	0.57	0.41	0.49

TIME - UT

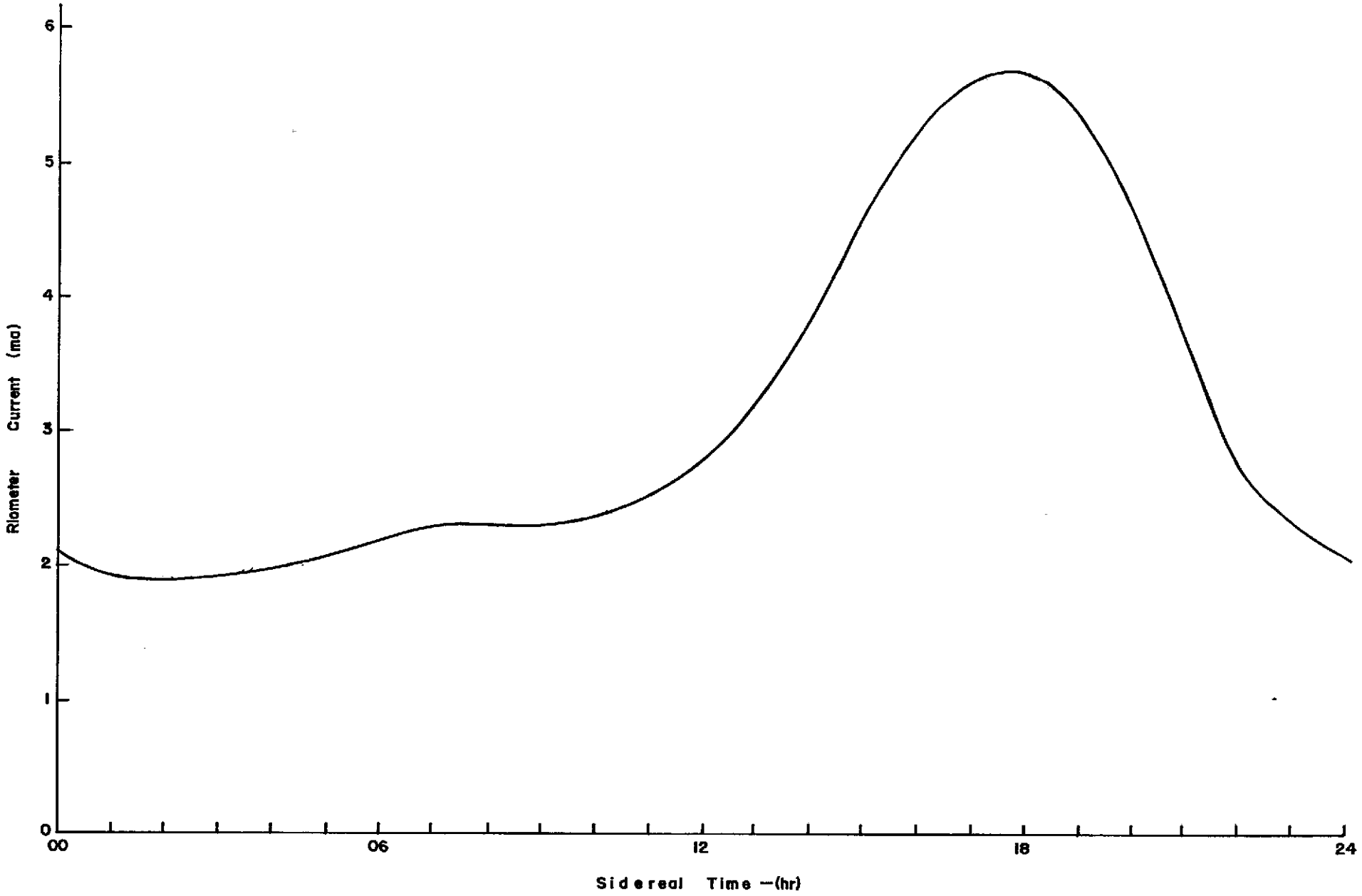

Fig: I - QUIET-DAY CURVE

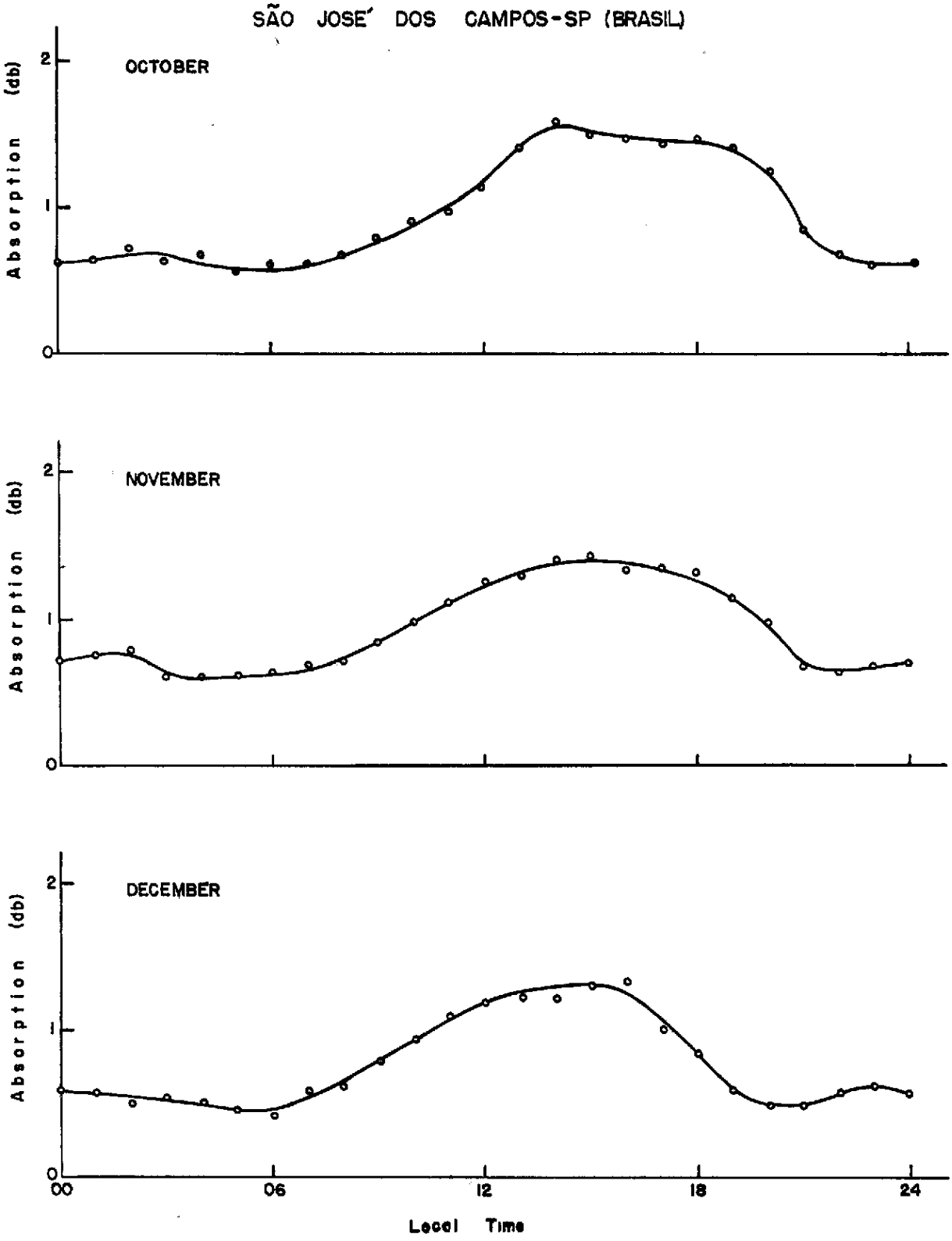

Fig:II MEDIAN MONTHLY ABSORPTION CURVES (October-December 1965)

APPENDIX I

" EXPLANATION ON THE USE OF THE "QUIET - DAY" CURVE TO REDUCE THE RIOMETER DATA FROM SÃO JOSÉ DOS CAMPOS".

During the regular operation of the riometer at this site which started in March 1963, some equipment failure occurred for short periods. After each time the equipment failed, it was recalibrated and reset, but the output did not repeat exactly the former characteristics , presenting a different level on the daily recorded current. In order to reduce the current to absorption , an adequate "quiet-day" curve, must be used for the different periods of operation of the riometer.

For the period April 1 to July 24, 1963, the "quiet-day" curve is shown in Fig. IV curve a . It was obtained with data acquired during the first few months of operation and should be considered as an approximation to the "quiet-day" curve.

Curve b in Fig. IV was obtained with more data of regular operation of the riometer. It can be considered as the basic "quiet-day" curve for our station (São José dos Campos).

Corrections should be introduced in this curve in order to compensate for the different levels of current which occurred after each time the equipment failed.

The adequate correction factor for the different periods of operation is indicated in the table below:

Period	Correction
Aug. 1 - Dec. 31 1963	Add 0.25 MA to the values of the "quiet-day" curve, Fig. IV curve b.
Jan. 1 - May 4 1964	Curve b of Fig. IV is adequated for this period .
May 6 - Sept. 5 1964	Divide the values of curve b in Fig. IV by the factor 1.12 MA .
Sept. 7 - Sept. 8 1964	Divide the values of curve b in Fig. IV by the factor 1.15 MA .

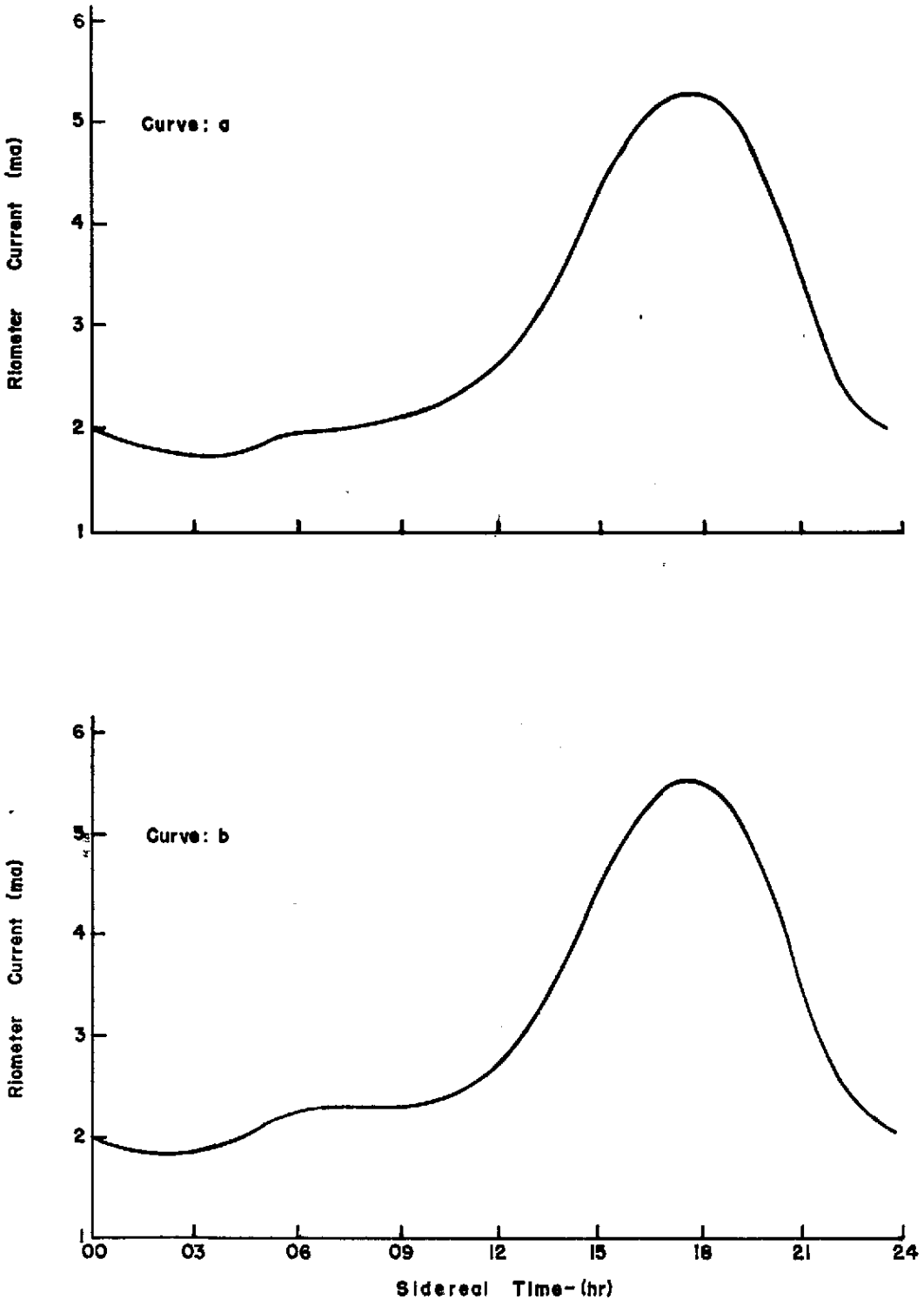

Fig: IV — QUIET-DAY CURVE

APPENDIX II

" NOTE ON THE TIME SCALE OF THE "QUIET-DAY" CURVE , PRESENTED IN THE ABSORPTION MEASUREMENTS WITH RIO-METER DATA SUMMARY : REPORT Nº LAFE 9,12,16,17,22,28."

In order to reduce the time scale of the "quiet-day" curve to the true sidereal time (referred to the first point of Aries) one should add 17h 36 m to the hours indicated in the figure showing the " quiet-day " curve. That is, the maximum value of the curve corresponds approximately to the sidereal hour 17h 36 m or SHA = 96º .

The table below indicates the sidereal time corresponding to 00:00 GMT for the middle of each month starting on 1963.

GMT hour	Month	Sidereal Time					
		1963		1964		1965	
h...m...		h.....	m...	h	m...	h	m..
00:00	Jan., 15	04	33	04	33	04	36
"	Feb., 15	06	35	06	35	06	38
"	March,15	08	26	08	29	08	28
"	April, 15	10	28	10	30	10	30
"	May, 15	12	26	12	30	12	27
"	June, 15	14	28	14	30	14	29
"	July, 15	16	26	16	28	16	27
"	Aug., 15	18	31	18	34	18	33
"	Sept., 15	20	33	20	36	20	35
"	Oct., 15	22	31	22	34	22	33
"	Nov., 15	24	33	24	36	24	35
"	Dec., 15	02	31	02	34	02	33