ABSORPTION MEASUREMENTS WITH RIOMETER

Data Summary for the period October 1964 through March 1965

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REPORT Nº LAFE-28 July 1965

The measurements reported herein were performed in cooperation with Stanford Research Institute and A.F. Cambridge Research Laboratories

Comissão Nacional de Atividades Espaciais São José dos Campos São Paulo — Brasil C

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RIOMETER MEASUREMENTS

DATA SUMMARY Nº 6

I - INTRODUCTION

This summary is a catalogue of reduced riometer data, for the period of observations from October 1964 through March 1965. Equipment failure occurred during the months October and November, so that, no absorption data is available for those months.

This summary will show (fig. 1) 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 absorption 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 value are in - dicated in the same table. See for instance Tables II through IX. Note that fig. 2 also shows the monthly medians mentioned above.

A listing of the registered solar flares bursts, and related ab sorption effects during the period under consideration is presented in the Table I.

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 be tween one antenna and a noise diode at a given switching frequency (340 cps).

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 power is proportional to the current which in turn is directly 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 value of current readings of the riometer.

The frequency used of 30 Mc/s 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" curve, 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 = power noise actually received at a given time

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

IV - TYPE OF SCALING AND DATA REDUCTION

In reducing the riometer data, scaling 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 observation is recorded and then averaged. The results give a picture of the daily and seasonal variation of absorp tion.

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 Iq is calculated. For the given ratio, the absorption in db is I

obtained from regular tables .

The following qualifying symbols have been used for values ob tained 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 at tenutation and depending on the relative position of the Sun and antenna bean, one observes an increase in the flux of energy reaching the antenna as a result of the Sun's HF radio emissions, during solar bursts of intensity greater than 1.

Some flares occurring during the local sunlight hours could be clearly related to absorption effect showed in the riometer records.

The information on solar flares, published on the Solar Geophysical Data - Part B - of the Central Radio Propagation Laboratory was used to analyse the absorption effects on the riometer records. There is a good correlation between the increase in the absorption and solar flares accompained by ionospheric effects S - SWF (sudden drop-out and slow recovery).

For the period December 1964 through March 1965, the solar activity was low and there were no observed flares which produced ab sorption effects.

Some bursts occurred, as indicated below, producing a current peak on the riometer record. Local thunderstorms which occurred frequently during this period produced interference, making unclear in many cases the presence of bursts.

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TABLE I

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				Burst		Remarks
Date		Туре	In- ten- sity	Time Interval	Frequence Range Mc/s	
1964 Dec.	1	III	1	1504:30 - 1505	21 - 41	
Dec.	3	III	1	1655 - 1655:30	20 - 41	
	26	III	2	1620:30 - 1621	21 - 41	
	30	III	1-	1519:30 - 1519:45	25 - 41	
	•••	III	1-	1617 - 1617:15	19 - 41	
1965	5					
Feb.	2	III	1 -	1512 - 1512:15	20 - 41	
		III	1	1512:30 - 1512:45	20 - 41	
		III	1+	1529:30 - 15:30	15 - 41	
		III	1	1613:30 - 1614:15	16 - 41	
1		III	1 -	1614:30 - 1614:45	20 - 41	
		III	1	1615 - 1615:45	16 - 41	
		III	1	1706:45 - 1707	24 - 41	
}		III	1+	1707:15 - 1707:45	16 - 41 20 - 41	
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				1709:30 - 1709:45 1710 - 1710:15	21 - 41	
		III	1-	1744:30 - 1744:45	19 - 41	
		III	1 -	1747 - 1747:15	21 - 41	
		III	1+	1859:30 - 1901:45	20 - 41	
	3	III	1 -	1559 - 1559:45	21 - 41	
ł ·	5	III	1+	1758 - 1759:15	24 - 41	associated
]	-	II	2	1800 - 1817	14 - 41	flare
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ļ					1	end 2006 UT
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March	12	III 、	2	1714:30 - 1715	20 - 41	
		III	2	1721 - 1721:30	18 - 41	
1	13	III	1+	1549 - 1551	19 - 41	
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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 ratio 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.

Starting with December, 1964 the absorption is obtained by assuming an average " quiet - day " curve for each month which is presented in Fig. II.

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 every 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 quite 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 will provide data for a detailed study of the seasonal variation of non - deviative absorption.

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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.

Acknowledgement :

The riometer in operation at this site was provide to us by the Air Force Cambridge Research Laboratories. We appreciate this opportunity for participating in their program of Global Riometer Measure ments.

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MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

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23912 ¹ 4 45951 ¹ 3 22.59S 11.79S 623m		030 0	I		9505	030	030	030			020						1	╉	+		
N ₩ N - O	13					030 0							Į	L	Ι.	Ļ	1	╉			
	12	020	0.40				070	020	030	<u> </u>	010			1				+	-		
	11	020	050	030	0.40	0.10	010	010	020	ļ	0	Ľ			Ł	1	+-		_		
L.at.	10	6	080	010	0.20	010	0	0	010	0.30	c	ala	0.0	020	010	010	27.2				
Lat	60	6	030	0	020	ΰ	- 010	0.0-	0	030	2	010	010	0.00	010	0.20	2	Ţ			ſ
	80		0	.	0	0	-010-	÷		t			020	010	010		+	┥	-	Γ	
			+		┝	0		1	Γ	6			╋			4	_	+			┝
ц	01	-	+	+			<u> </u>	┢	╞	-	-	1-	4-	+	_	+	00.0	-		┝	ł
SJ Janus 1965 Mark	90	6	+-	<u> </u>	<u> </u>	-	0	Ľ	╞	╋	_	+-	_		+	+	+	_		╞	╞
CS	05	5	270				1	┿	16	220			1_			+	050	-			
	04		2 2 2	0	050	020	0	5	0.0		2010	200			250	000	0.60				
Station SJ Month January Year 1965 Riometer Mark II	03		0.20	0.80	090	020			204.0	2020	200	_		26.0	0.50	20	0.60				Ī
n eter .	02		_	1070		1	. 1			_	_		.]		0.40	6.79	0.70		╞	t	Ì
Station Month Year Riomet	-			2000	000				L			_	_			<u>+</u>	0.50		┢	╀	
V] F1 F7 F4	10		<u> </u>		ी है रु		.+-		F						е 5 Ч		- 1		┞	╞	-
	8		000	502.0	2020					0.00	2040	630	080	242	020	╉	0503		╞	╞	
	Hour	Day	- -		2 4		, ka	, -	- 8	┝		:	-	2	2	* ;	12				
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Month: January Year: 1965

TAB			īv																	
23	0.705	0.305	0705	020	030	0:30		0905	0505	040	5050	0605	0.905	040	060	120	١e	0.70	0.40	030
53	2605	2050	0902	5090	0 .3a	0.30	02.0	2050	0305	0:00	<0+0>	5 990	5040	1.10	100	011	31	0,60	0.30	050
51	0.605	0.405	0.605	0.705	040	040	0605	2090	0305	5090	2050	0.905	0.405	100	100	5 001	31	090	040	050
20	6.705	0705	5001	0.605	090	090	0305	0305	040	<050	0.605	0905	0.905	00.1	00'	00	31	070	000	0.50
18	0705	0705	0205	0.605	090	0.90	2000	0504	0805	5050	208.0	0105	2021	0,70	1.00	5 011	31	080	01 O	090
18	0405	0505	1.005	080	0.60	0.90	0805	0805	0.805	2050	5050	020	100	0805	1.00	5 001	31	0.80	0.80	0.60
17	S	0.709	1205	080	080	0.90	1.005	5010	0405	6305	0.505	070	1.005	0.60	100	0.809	30	040	080	020
16	6050	0.705	С	110	0.70	0.90	0.00	0.705	060	0.605	0205	0.805	1-00	011	011	0.803	30	060	010	090
15	0.00	12050	0.805	030 ⁵	050	090	070	5090	080 ⁵	0.705	20805	010 ⁵	5060	1.10	001	0.80	31	080	090	070
14	020	5050	0.9.0	2050	090	0.50	0.60	a50	2010	050	090	099	0.50	080	070	0.60	31	090	0:50	050
13	040	5 0 40	050	0.60%	2090	050	040	040	050	040	040	0.60	0.50	08.0	0.70	050	3)	090	0.50	0.50
12	0.30	0.605	040	6	0.60	0.40	040	030	0.30	040	030	030	0.50	010	010	040	30	040	040	080
11	0.30	070	040	0,603	080	040	020	020	030	0.30	030	030	080	0.70	050	020	ۍ ۲	040	030	020
10	a 30	030	0.50	0 70 5	090	020	050	0.30	0.20	020	01.0	0.20	020	0.50	0.50	070	12	630	020	010
09	0.20	0:30	040	0505	0.60	010	010	010	020	020	010	030	020	0.00	050	020	ŝ	020	020	010
08	020	0.40	0.30	05050	0.50	0	010	0	0	0	0	010	0.10	050	050	010	3-	030	0/0	٩
07	0.20	0.50	040	0405	0.50	0	0	010	010	010	0.20	0.20	070	01.0	050	0.10	16	030	010	٥
06	0.30	050	050	0505	020	0	0.10	050	010	010	010	070	0,20	090	040	0.70	31	050	050	020
05	020	0.70	050	0.605	0.70	020	070	050	020	030	0.30	0.40	040	090	060	0.10	10	550	040	020
04	0:30	0.60	0.60	070	070	070	0.20	040	0%0			040	040	0.60	0.80	0.40	m	0.00	040	0.20
03	050	0.60	090	090	000	010	030	050	050	0305		0.90			050	0.60	ñ	0.60	050	0.5.0
02	050	0.60	5080	090	0.60	020	030	0.60	030				2050	040	060	0.50		0.60	050	030
10	080	080	15090		0.60	020	030	070	0.2.0	4			L	080	i	010	6	0.70	050	0.30
00	15060	2040	20E0	5020	0.70	0.20	030	070	030	5000	0505	0505	080	c060	080	0.00	ñ	0.70	050	930
Hour Day	15	11	18	1-	20	21	22	23	24	25	26	27	88	29	30	31	Count	GII	Median	гo

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PR - CNPq Comissão Nacional de Atividades Espaciais São José dos Campos - SP - Brasil MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

 Freq
Lat
Station SJ Month February Year 1965 Riometer Mark II

TA	BĻ	E	V																
TA1	090	0.305	020	5090	010	010	t i	0/0	000	0.60	0 L'A	0805	050	0	030				
22	29°5	0.30 S	\$050	¢ 0€ 0	0:30	0.305	1 ·	040	050	0405	080	2011	0.50	S	0.305				
21	050	0305	5090	\$050	0.30	2050		050	2060	1 040	060	1 0.90	0.70	040	0305				
8	090	090	5090	0.90	030	0.605		C802	0.905	5007	0.90	080	50015	0.605	0:00 S				
19	070	2020	0405	\$001	2040	26.0	090	0-0	ori	1,005	060	0.00	1.005	5090					
18	001	010	090	\$001	+ 0405	0.80	2000	080	1.10	1.105	0.60	1011	080 ₅	0.705					
17	080	020	5010	5090	0000	2080	\$ 96.0	080	060	0.90	010	080 5	0.80	6960	5090				
16	0.90	080	0.80 5	208.0	0.90	080 5	110	270	0.80	0.90	050 S	080	0.70	5050	0.60			Γ	
15	0.80	\$080	0.60	5020	0.905	060	1.00	080	0.80	060	0.60	0.80	0.70	\$ 010		-			
14	0.40	070	0.60	010	010	0.80	010	0.9.0	0.70	020	090	010	0.60	2.603	-040				
13	050	0.90	050	040	650	050	020	010	040	0.50	040	240	010	e.505	030		 	<u> </u>	
12	060	0.30	0.30	050	040	0.30	020	040	030	030	0.30	0:30	040	040	050				
11	0.50	050	0.20	0.20	960	020	01.0	030	a 10 5	010	020	Q 3 0	040	040	0.20				
10	050	050	٥	010	020	0	0	070	50	٥	0	0	0.30	0.30	٥				
60	020	0:30	010	010	0.20	0	0	0	oto -	010	0/0	0	090	0.3 D	0				ļ
80	040	040	0	0	0.20	0	0	010	0	010	010	0	020	070	0				
20	0.50	0.30	01.0-	0	0.20	0	0	0.20	0	0	0.10	0.10	040	030	0				
90	0.50	a.3 0	0	0.10	070	0	01.0	010	- 010	0.10	0	0	040	040	0				
05	040	050	0	0.20	0.90	0	0	010	0	010	0.10	0.10	0.40	5010	υ υ				
04	080	0.70	0	030	0.50	0.20	020	070	020	0:20	0.20	0.30	090	5050	U				
03	070	U 0.70 C	010	0.30	0.60	040	020	0.20	070	0.60	040	0.40	08.0	040	J				
03	0,90	0.30	0.0	0.30	0.50	0.30	0.30	030	010	050	0:30	0,30	e.70	0.50	υ				
01	1.0 0 5	040	0205	020	0.60	0,30	0.30	030	0.30	0.50	0.30	0.50	1.105	040	c				
00	0,90	050 ⁵	020	0.20	0.60	0.30	0.305	040	0-10	0.50	0.50	050	5001	040	ä				
Hour Day	1	~	3	4	ŝ	6	4	8	6	10	11	12	13	14	15				

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Month: February **Year: 19**65

	TAE	3LI	Εv	VII																		-
	23	0.30	0.30	020	030	070	0.00	09.0		001	050	0705	011	001				2 2	090	0.50	030	
I	22	0202	5050	0	090	0.30	1.005	6,605	0.405	0110	0.705	0805	110	060				27	0.80	050	030	
Ì	21	0.705	2080	05.0	080	050	1005	080	0.80	1100	1.10	1.305	201.L	2011				28	0.90	040	0.30	
ľ	20	0.605	0.90	0.305	0.90	6000	1.005	1.10 5	0.905	1100	ں ا	1.905	1.60	160				27	1.00	0,40	0.60	
	19	2,605	1005	0395	060	0.90	1.00	1.005		V10001	ა	J	150	150				26	001	0,90	0.60	
	18	2020	5011	0.70	5001	100	0905	2060	2002	0.900	140	0.905	1.00	150				28	1.10	060	0.70	
	11	1005	0205	1.20	0.90	0.90	2.905	0.90	0.804	1 /0 C	1.10	5080	0.01	1.70		_		28	0.90	080	0.70	
	16	080	020	0.70	040	0.60	0.60	080	0.80	0.805	060	5080	080	1.50	-			23	0,90	0.80	0.70	
	15	060	0.80	0.80	0.80	0.60	5050	0.50	0.60	2090	080	080	080	120				28	08.0	080	0.70	
	14	080	080	0.60	0.60	090	5050	090	0 9 0	020	010	0.80	070	080				28	0.70	0.60	0.60	
	13	0.50	0.60	0.40	040	040	010	050	c5.a	5050	0.70	090	0,0	0.60				28	050	020	0.40	
	12	010	0.50	0.2.0	0.30	0.20	0.20	0.30	050	030	0.60	0.50	050	040				. 8	040	0.30	0.30	
	11	020	n N	010	020	010	010	070	040	020	050	0:30	040	0.30				28	040	0720	020	
	10	•	010	0	0	0	070	010	0.20	010	050	0.30	050	070				38	0.30	0.0	0	
	60	6	0	0	040	-0.10	٥	0	0.10	•	030	070	030	020				28	0.30		٥	
	80	0	٥	0	0	- 01 0	Т	0	010	4	0.30	010	0.20	9				8 Z	0.20	0	0	
	07	0	0	0	٩	0	0	040		0	040	010	020	0.10				28		0	a	
	90	6	0	0	0	٥	0	010	0.30	50	040	0.10	0.20	0.30				38	0.30	010	0	
	05	6	- 01 0	0	0	0	0	0	0.90	0.10	040	010	0,0	052				27	030	010	0	
	10	0.10	•	10		0	020	0	050	0/0	030	470	i					27	030	0.20	010	
	03	020	010	1	1	920	0.20	020	080	_					L_			27	1	1		4
	02	0.00	010			0.40	L		270	040	1			ļ				27	050	000		
	10	() F ()		1	1	050	0/0	020	0.60	0.50	i –							37	4		0.30	
	00	000	5 - 20	<000	010	050	0.50	0.00	050		2000	200	15 07 0	0 11				27	090			
	Hour	1	12	81	19	20	21	22	23	24	25	26	27	28	29	30	31			Median	01	

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PR - CNPq Comissão Nacional de Atividades Espaciais São José dos Campos - SP - Brasil

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MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

Freq = 30 Mc/s Bandwidth = 30 Kc/s Diode Load Resist, = 750 ohm Audio Threshold = 3 Int. Time = 4 sec ACG Time = 4 sec	
Lat	
Station - - - SJ Month - - - March Year - - 1965 - Riometer - - - - -	

09 10 0 0.30 0.30 0 0.47 0.40 0 0.49 0.40 0 0.40 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.30 0 0.10 0.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 </th <th>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</th> <th></th> <th></th> <th></th> <th>─────┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼</th> <th>14 0605 0805 0805 0805 0605 0605 0605 060 010 0105 010 0105 0105</th> <th>14 15 0505 0505 0505 0505 0505 0505 050 0505 050 050 050 050 050 050 050 050 050 050 050 050 050 050 050 050 010 040 010 040 010 050 010 050 050 050</th> <th>14 15 16 0505 0505 0705 0505 0505 0705 0505 0505 0705 0505 0505 0705 050 050 090 050 040 040 050 050 0405 050 050 050 050 050 050 050 050 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 050 050 010 050 050 050 050 050</th> <th>14 15 16 17 0505 0505 0705 1005 0505 0505 0705 1005 0505 0505 0705 1005 050 050 070 1005 050 050 050 070 050 050 050 1005 050 050 050 1005 050 050 050 1005 050 050 050 090 050 050 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 050 050 050 010 050 050 050 010 050 050 050 0105 050 050 050 050 050 050 050 050 050 050 050 050 050<th>14 15 16 17 18 0505 0505 0705 1005 1005 0505 0505 1005 1005 0005 0505 0505 1005 0.005 0.005 050 040 050 1005 0.005 050 040 040 1.005 1.005 050 040 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.050 0.005 0.005 050 0.050 0.050 0.005 0.005 050 0.050 0.050 0.050 0.050 050 0.050 0.055 0.055 0.055 050 0.050 0.050 0.055 0.050 050 0.050 0.050 0.050 0.050 050 0.050 0.050 0.050 0.050 050 0.0</th><th></th><th>0 0.30 0.40</th><th>040 050</th><th>050 040 0605</th><th>030 020 030</th><th>020 020 030</th><th></th><th>030 020 040</th><th>020 020 0.20</th><th>010 V 020 V 010</th><th>100100 50</th><th>0</th><th>010</th><th>5 010 5</th><th>010 020 030</th><th>5 610</th><th></th><th></th><th></th><th></th></th>	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				─────┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼	14 0605 0805 0805 0805 0605 0605 0605 060 010 0105 010 0105 0105	14 15 0505 0505 0505 0505 0505 0505 050 0505 050 050 050 050 050 050 050 050 050 050 050 050 050 050 050 050 010 040 010 040 010 050 010 050 050 050	14 15 16 0505 0505 0705 0505 0505 0705 0505 0505 0705 0505 0505 0705 050 050 090 050 040 040 050 050 0405 050 050 050 050 050 050 050 050 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 020 050 010 050 050 010 050 050 050 050 050	14 15 16 17 0505 0505 0705 1005 0505 0505 0705 1005 0505 0505 0705 1005 050 050 070 1005 050 050 050 070 050 050 050 1005 050 050 050 1005 050 050 050 1005 050 050 050 090 050 050 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 040 050 050 010 050 050 050 010 050 050 050 010 050 050 050 0105 050 050 050 050 050 050 050 050 050 050 050 050 050 <th>14 15 16 17 18 0505 0505 0705 1005 1005 0505 0505 1005 1005 0005 0505 0505 1005 0.005 0.005 050 040 050 1005 0.005 050 040 040 1.005 1.005 050 040 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.050 0.005 0.005 050 0.050 0.050 0.005 0.005 050 0.050 0.050 0.050 0.050 050 0.050 0.055 0.055 0.055 050 0.050 0.050 0.055 0.050 050 0.050 0.050 0.050 0.050 050 0.050 0.050 0.050 0.050 050 0.0</th> <th></th> <th>0 0.30 0.40</th> <th>040 050</th> <th>050 040 0605</th> <th>030 020 030</th> <th>020 020 030</th> <th></th> <th>030 020 040</th> <th>020 020 0.20</th> <th>010 V 020 V 010</th> <th>100100 50</th> <th>0</th> <th>010</th> <th>5 010 5</th> <th>010 020 030</th> <th>5 610</th> <th></th> <th></th> <th></th> <th></th>	14 15 16 17 18 0505 0505 0705 1005 1005 0505 0505 1005 1005 0005 0505 0505 1005 0.005 0.005 050 040 050 1005 0.005 050 040 040 1.005 1.005 050 040 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 1.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.005 0.005 0.005 050 050 0.050 0.005 0.005 050 0.050 0.050 0.005 0.005 050 0.050 0.050 0.050 0.050 050 0.050 0.055 0.055 0.055 050 0.050 0.050 0.055 0.050 050 0.050 0.050 0.050 0.050 050 0.050 0.050 0.050 0.050 050 0.0		0 0.30 0.40	040 050	050 040 0605	030 020 030	020 020 030		030 020 040	020 020 0.20	010 V 020 V 010	100100 50	0	010	5 010 5	010 020 030	5 610				
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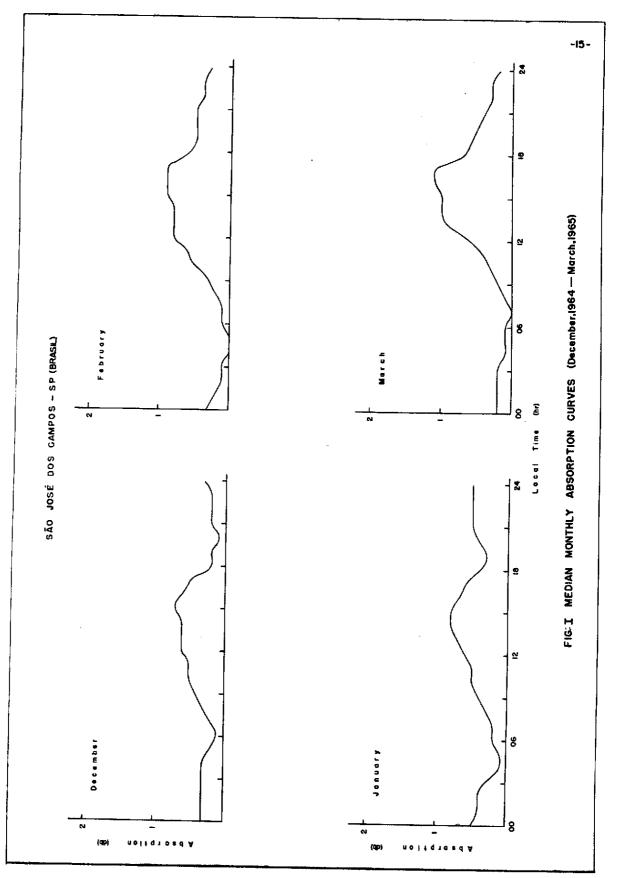
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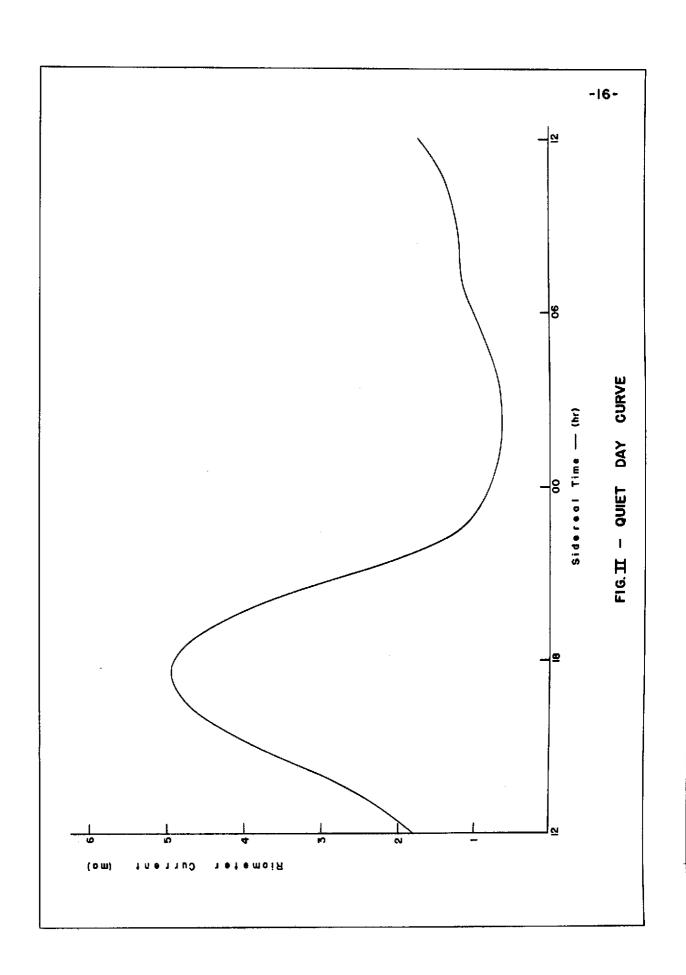
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APPENDIX I

" 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. I, 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.

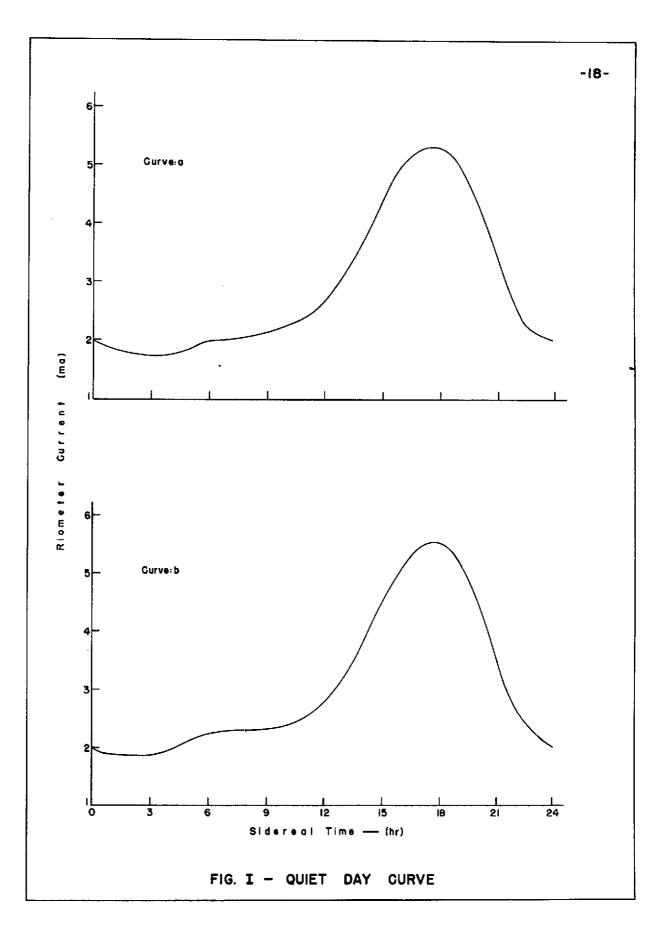
Curve b in Fig. I, was obtained with more data of regular operation of the riometer. It can be considered as the basic "quiet - day" curve for our station (São José dos Campos)

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	Add 0.25 MA to the values of the " quiet - day "
1963	curve, Fig. I, curve b.
Jan. 1 - May 4	Curve b of Fig. I is adequated for this
1964	period.
May 6 - Sept. 5	Divide the values of curve b in Fig. I by the
1964	factor 1.12 MA.
Sept. 7 - Sept. 26	Divide the values of curve b in Fig. I by the
1964	factor 1.15 MA.

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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".

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 "quietday" curve. That is, the maximum value of the curve corresponds approximately to the sidereal hour 17h 36 m or SHA = 96?

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	
hm 00:00 "" "" "" "" "" "" ""	Jan., 15 Feb., 15 March, 15 April, 15 May, 15 June, 15 July, 15 August,15 Sept., 15 Oct., 15 Nov., 15 Dec., 15	04 06 08 10 12 14 16	33 35 26 28 26 28 26 31 33 31 33 31	h 04 06 08 10 12 14 16 18 20 22 24 02	m 33 35 29 30 30 30 28 34 36 34 36 34 36 34	h 04 06 08 10 12 14 16 18 20 22 24 02	m 36 38 28 30 27 29 27 33 35 33 35 33 35 33