ABSORPTION MEASUREMENTS WITH RIOMETER

C.N.Pq.

Data Summary Nº 5 for the period
July through September 1964

by
M. A. SETTE

and
F. DE MENDONÇA

REPORT Nº LAFE-22
October, 1964

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

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Comissão Nacional de Atividades Espaciais
São José dos Campos
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RIOMETER MEASUREMENTS

DATA SUMMARY Nº 5

I - INTRODUCTION

This summary is a catalogue of reduced riometer data, for the period of observations from July through September 1964 at São José dos Campos.

This summary will also 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.

The dotted part of the "quiet-day" curve indicates that section of the curve which will need future corrections for errors that became apparent while reduction of the riometer data was performed in terms of daily absorption.

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 indicated in the same table. See for instance Tables II through VII. Note that fig. 2 also shows the monthly medians mentioned above

A listing of the registered solar flares and related absorption 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 between 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 square 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 heavy ionospheric disturbances.

III - MEASUREMENTS TECHNIQUE

In the cosmic noise method already mentioned, the absorption is measured by comparing the signal actually received with the signal that would be received in the same system at 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 corresponding 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 absorption.

The data reduction was performed in the following manner:

The "quiet-day" curve, assumed to represent zero absorption, was plotted as well as curves of constant ratio (I_o/I), in order to obtain a set of parametric curves for given values of absorption in db.

The actual values of current for each hour are translated to the corrett sidereal time and the value of absorption in db is obtained from the parametric curves mentioned above.

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 encreasing the absorption through the D-region producing the attenuation of the cosmic noise reaching the antenna. Sometimes prior to the observation of attenutation and depending on the relative position of the Sun and antenna beam, 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 occuring 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 Geo - physical 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 absorption and solar flares accompained by ionospheric effects S - SWF (sudden drop-out and slow recovery).

For the period of observation, July through September 1964, the solar activity was quite low and there were no observed flares which produced absorption effects.

A few bursts occurred, as indicated below, producing a current peak on the riometer record.

TABLE I

Date 1964	Burst				
	Type	Intensity	Time Interval		Frequence range Mc / s
July, 7	III	1 +	1420:30	1421:30	15 - 41
August, 2	III	1 +	1726:15	1727:30	7 - 41
22	III	1	1557:30	1558:15	20 - 41
	III	2	1603	1604:45	7 - 41

VI - MAGNETIC BREMSSTRAHLUNG FROM RELATIVISTIC ELECTRONS

We expected to make measurements on the excess signal component from the Synchroton radiation of high energy particles trapped in the earth's magnetic field after July 9, 1962 detonation over Johnston Island. This was not possible however, due to the fact that our riometer was set in operation on March 16, 1963, that is eight months after the detonation. Since the decay of the bremsstrahlung radiation has a time constant of about sixty days, the excess radiation component was already reduced by that time to about 20% of its original value.

This excess signal already reduced in its strenght was not easily noticeable over the background signal.

In fact the values of the "quiet-day" curve for this station, taken from the riometer records during the hours of low absorption are affected by this excess signal component.

It is hoped that using next years ZERO absorption levels , one might be able to go back in time and establish the above mentioned contribution.

VII - " 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.

A portion of the curve which shows low value of current comes as 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,

So far, however the results presented on monthly absorption showing negative values of absorption, should be considered as qualitative rather than quantitative information of absorption.

This riometer has been in operation regularly since March 16, 1963. Some equipment failures occurred for short periods during the months of July and December 1963 and also May 1964. After each time the equipment failed it was recalibrated and reset, but the output did not repeat exactly the former characteristics.

The available data used in deducing the "quiet-day" curve came from the receiver operating with different set of parameters. The variation on the level of the absorption from one month to the other could be related to the change in the receiver gain.

Some more data from regular operation of the riometer will be necessary to introduce a correction factor for the level of the "quiet-day " curve in order to make all the readings comparable.

VIII - 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 quite free from man made interferences.

Due two reasons mentioned before, there are some errors in the "quiet-day" curve; this report presents the data as a provisional average of monthly absorption.

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

Acknowledgement :

The riometer in operation at this site was provided to us by the Air Force Cambridge Research Laboratories (Mr. S. Horowitz) - through the Stanford Research Institute, Menlo Park, California(Dr. Rolf B. Dyce) . Copies of our recordings are sent regularly to SRI. We do appreciate this opportunity for participating in their program of Global Riometer Measurements .

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

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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".

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São José dos Campos - SP - Brasil

MEAN VALUE OF ABSORPTION DURING THE FIRST MINUTE OF EACH HOUR

Station .... - SJ
Month .... - July
Year .... - 1964
Riometer .... - Mark II

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

Freq. .... - 30 Mc/s
Bandwidth .... - 30 Kc/s
Diode Load Resist ... - 750 ohm
Audio Threshold .... - 3
Int Time .... - 4 sec
ACG Time .... - 4 sec

TABLE II

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	0.10	0.10	0.10	0	0	0.10	0	0.10	0.10	0.10	0.10	0.30	0.40	0.60	0.60	0.50	0.60	0.60	0.60	0.30	0.10	0	0.10	0
2	0	0	0.10	0.10	0	0	0	Y 0.50C	0.10	0.20	0.20	0.40	0.40	0.60	0.60	0.50	0.40	0.40S	0.50S	0.60S	0.40S	0.10	0.10	0.10
3	0.10	0.10	0.10	0.10	0	0.10	0	0	0.10	-0.10	0.10	0.30	0.30	0.40S	0.40S	0.40S	0.60S	0.60S	0.30S	0.10S	0.10	0.10	0.30	0.10
4	0.10	0.20S	0.10S	0.20	0.10	0.20	0.10	0.20	0.30	0.20	0.10	0.40	0.40	0.60	0.40	0.40	0.40	0.50	0.30	0.10	0.10	0.10	-0.10	-0.10
5	0	0	0.10	0	-0.10	0	-0.10	0.10	0	0.10	0.10	0.20	0.30	0.40	0.40	0.40	0.40	0.40	0.20	0.10	0.10	-0.10	-0.10	-0.20
6	0	0	0	0	0	0.10	0	0.10	0	0.10	0.10	0.10	0.30	0.40	0.40	0.50	0.50	0.50	0.40	0.20	0.20	0.10	0.10	0
7	0	0.10	0	0	0	0	0	0.10	-0.10	0	0.10	0.10	0.40	0.50	0.70	0.70	0.60	0.60	0.60	0.40	0.10	0.10	0.10	0.10
8	0.20	0.10	0.10	0	0	0	0.10	0.10	0	0.10	0.10	0.30	0.40	0.50	0.50	0.60	0.60	0.60	0.50	0.40	0.40	0.10	0.10	0.10
9	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.10	0.10	0.20	0.30	0.40	0.50	0.60	0.40	0.80	0.70	0.60	0.30	0.10	0	0	-0.10
10	0	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.30	0.40	0.50	0.50	0.40	0.60	0.60	0.40	0.30	0.10	0.10	0	-0.10
11	0	0	0	0.10	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.30	0.40	0.50	0.50	0.40	0.60	0.60	0.40	0.40	0.20	0.10	0.10	0.10
12	0.10	0.10	0.10	0.10	0.10	0	0.10	0.30	0.30	0.10	0.40	0.50	0.50	0.60	0.60	0.60	0.70	0.60	0.40	0.20	0.20	0.10	0.10	0
13	0.10	0.10	0.10	0	0.10	0	0	0.10	0	0.10	0.20	0.20	0.50	0.60	0.60	0.60C	0.60	0.50	0.40	0.30	0.10	0	0	0
14	0	0	0	0	0	0.10	0.10	0.10	0	0.10	0.20	0.20	0.50	0.40	0.60	0.60	0.60	0.50	0.40	0.20	0.10	0	0	-0.10
15	0	0	0	0	-0.10	0.10	0	0.10	0	0.10	0.20	0.20	0.40	0.50	0.50	0.60	0.60	0.50	0.40	0.20	0.20	0.10	0	0

TIME - UT

Month: July
Year: 1964

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
16	0	0	0	0	0	0	0.10	0.10	0	0.10	0.10	0.20	0.40	0.50	0.40	0.40	0.60	0.60	0.40	0.30	0.10	0.10	0.10	0.10
17	0	0	0	0	0.10	0.20	0.30	0.40	0.20	0.20	0.30	0.30	0.50	0.50	0.60	0.50	0.60	0.50	S 0.30 C	0.20	0.10	0	-0.10	-0.10
18	0	0	0	0	0.10	0	0.10	0.10	0.10	0.10	0.10	0.30	0.50	0.50	0.60	0.70	0.70	0.60	0.40	0.20	0.20	0.40	0	0
19	0	0	0.10	0	0.10	-0.10	0	0	0.10	0.10	0.30	0.30	0.40	0.50	0.50	0.50	0.60	0.40	0.30	0.10	0.10	0.10	-0.10	0
20	0	0	-0.10	0	0	-0.10	0.10	0.10	-0.10	0.10	0.10	0.30	0.40	0.60	0.40	0.40	0.40	0.30	0.30	0.20	0.10	0.10	0.10	0.10
21	0.10	0.10	0	0	0.10	0	0.10	0.10	0.20	0.10	0.30	0.40	0.40	0.60	0.50	0.50	0.50	0.40	0.30	0.20	0.10	0.10	0	0
22	0.10	0.10	0	0.10	0	-0.10	0.10	0.10	-0.10	0.10	0.10	0.40	0.60	0.40	0.50	0.50	0.60	0.70	0.60	0.20	0.20	0	0	0.10
23	0.10	0.10	0.10	0	0.10	0	0.10	0	0.10	0.10	0.10	0.40	0.50	0.60	0.40	0.60	0.60	0.60	0.60	0.40	0.50	0.10	0.10	0.10
24	0.10	0.10	0.10	0.10	0	-0.10	0.10	0.10	0.10	0.10	0.20	0.40	0.60	0.60	0.60	0.60	0.60	0.40	0.40	0.30	0.50	0.40	0.10	0.10
25	0.10	0	0.10	0.10	0.20	0.30	0.10	0.20	0.10	0.10	0.30	0.60	0.80	0.60	0.60	0.60	0.50	0.40	0.40	0.20	0.20	0.10	0.10	0.10
26	0.10	0.10	0	0.10	0.10	0	0.20	0	0.10	0.10	0.10	0.40	0.60	0.60	0.60	0.60	0.50	0.40	0.40	0.10	S 0.20 C	0.20	0	0
27	0	0.10	0	0.10	0	-0.10	0.10	-0.10	0.10	0.10	0.20	0.20	0.30	0.50	0.40	0.40	0.50	0.40	0.40	0.20	U 0.20 S	0.10	0.10	0.10
28	0.10	0.10	0.10	0.20	0.20	0.10	0.20	0.10	0	0.10	0.40	0.40	0.40	0.50	0.40	0.40	0.50	0.40	0.40	0.30	0.30	U 0.40 S	0.10	0.10
29	0	0	0.10	0.20	0.10	0.10	0.10	0	0	0.10	0.20	0.30	0.40	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.20	0	0
30	0	0	0	0	-0.10	0	0	0	0	0.10	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.30	0.20	0.10	0.20	0.10	0.10	0.10
31	0.10	0	0.10	0	-0.10	-0.10	0	0	0	0.10	0.20	0.30 S	0.40	0.40	0.40	0.40	0.50	0.40	0.30	0.20	0.20	0.20	0.10	0.10
Count	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
UQ	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.40	0.50	0.60	0.60	0.60	0.60	0.60	0.40	0.30	0.20	0.10	0.10	0.10
Median	0	0.10	0.10	0	0	0	0.10	0.10	0.10	0.10	0.20	0.30	0.40	0.50	0.50	0.50	0.60	0.50	0.40	0.20	0.20	0.10	0.10	0
LQ	0	0	0	0	0	0	0	0	0	0.10	0.10	0.20	0.40	0.40	0.40	0.40	0.50	0.40	0.30	0.20	0.10	0.10	0	0

TIME-UT

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Bandwidth .... - 30 Kc/s
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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	0.30	0.20	0.20	0.20	0.10	0.10	0.10	0	0	0.10	0.10	0.40	0.40	0.50	0.40	0.40	0.50	0.40	0.40	0.20	0.20	0.20	0.10	0.20
2	0.20	0.20	0.20	0.20	0.10	0	0.10	- 0.10	0	0	0.10	0.40	0.40	0.50	0.60	0.60	0.50	0.50	0.40	0.20	0.20	0.20	0.20	0.20
3	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0	0	0.10	0.30	0.40	0.30	0.40	0.40	0.40	0.40	0.30	0.20S	0.10S	0.10S	0.20	0.20	0.10
4	0.30	0.20	0.20	0.20	0.10	0.20	0.20	0.10	0.20	0.20	0.40	0.50	0.40	0.40	0.40	0.40	0.30	0.40S	0.20S	0S	0.10S	0.10	0.10	0.10
5	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6	0.10	0.10	0.10	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.40	0.40	0.50	0.50	0.60	0.40	0.40	0.20	0.10	0.20	0.10	0.10	0.10
7	0.10	0.20	0.10	0.10	0	0.10	0.10	0	0.10	0.10	0.20	0.40	0.40	0.60	0.60	0.60	0.50	0.40	0.10	0.20	0.20	0.10	0.10	0.20
8	0.10	0.20	0.10	0.10	0.20	0.10	0.10	0	0.10	0.10	0.40	0.40	0.40	0.60	0.70	0.70	0.70	0.60	0.60	0.20	0.20	0.10	0.10	0.10
9	0.20	0.10	0.20	0.20	0.10	0.20	0	0	0.10	0.10	0.40	0.40	0.60	0.60	0.70	0.70	0.60	0.70	0.30	0.20	0.20	0.10	0.10	0.10
10	0.10	0.10	0.20	0.10	0.10	0.30	0.20	0.10	0.10	0.20	0.40	0.40	0.40	0.60	0.60	0.60	0.60	0.60	0.30	0.30	0.20	0.10	0.10	0.10
11	0.10	0.10	0.10	0.10	0	0.30	0.10	0	0.10	0.20	0.40	0.30	0.30	0.40	0.40	0.50	0.40	0.40	0.40	0.20	0.20	0.20	0.10	0.20
12	0.10	0.20	0.10	0	0	0.20	0.20	0.10	0.20	0.30	0.50	0.20C	C	C	0.50	0.30S	0.60	0.60	0.50	0.30	0.10S	0.10	0.10	0.20
13	C	C	C	0	0	0.20	0	0	0.10	0.20	0.50	0.40	0.40	0.30	0.40	0.60	0.60	0.60	0.60S	0.60S	0.40	0.20	0.10	0.10
14	0.10	0.10	0.10	0.10	0.10	0.30	0	0.10	0.20	0.40	0.50	0.50	0.50	0.40	0.60	0.50	0.60	0.30	0.40	0.40	0.70	0.20	0.10	0.20
15	0.10	0	0.10	0.10	0.10	0.10	0	0.10	0.20	0.40	0.40	0.40	0.50	0.40	0.60	0.50	0.50	0.40	0.40	0.30	0.10	0.10	0.10	0.10

TIME - UT

Month: August
Year: 1964

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
15	0.10	0	0.20	0.20	0.10	0.10	0.10	0.10	0.30	0.30	0.60	0.40	0.50	0.60	0.60	0.50	0.50	0.40	0.50	0.40	0.30	0.10	0.10	0.10
17	0.10	0	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.30	0.50	0.40	0.50	0.60	0.60	0.60	0.50	0.50	0.60	0.50	0.40	0.20	0.10	0.10
18	0	-0.20	0	0	0.10	0.10	0.10	0.10	0.30	0.30	0.50	0.40	0.50	0.60	0.60	0.60	0.50	0.50	0.70	0.50	0.30	0.10	0.10	0.10
19	0.10	-0.10	0	0.10	0.30	0.10	0.20	0.10	0.30	0.40	0.50	0.50	0.50	0.40	0.60	0.60	0.90S	0.80S	0.70	0.70	0.40	0.20	0.10	0.10
20	0.10	0	0.40	0.40	0.50	0.40	0.30	0.50	0.50	0.70	0.70	0.70	0.50	0.40	0.60	0.60	0.60	0.40S	0.40	0.40	0.10	0.10	0.10	0.10
21	0.10	-0.10	0.30	0.10	0.30	0.20	0.20	0.20	0.30	0.40	0.60	0.30	0.40	0.40	0.50	0.40	0	U0.20S	0.40	0.30	0	0.10	0.10	0.10
22	0.10	0	0.20	0.20	0.30	0.20	0.20	0.20	0.30	0.40	0.40	0.20	0.40	0.40	0.50	0.50	0.40	0.50	0.40	0.30	0.10	0.10	0.10	0.10
23	0.10	0	0.20	0.20	0.30	0.10	0.10	0.10	0.40	0.40	0.50	0.30	0.60	0.60	0.60	0.60	0.40	0.50	0.50	0.40	0.10	0.20	0.10	0.10
24	0.10	0	0.10	0.20	0.20	0.10	0.10	0.20	0.30	0.40	0.50	0.40	0.40	0.50	0.60	0.60	0.70	0.70	0.50	0.40	0.20	0.20	0.10	0.10
25	0.10	0	0.20	0.20	0.30	0.10	0.10	0.20	0.30	0.40	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.50	0.40	0.40	0.10	0.10	0.10	0.10
26	0.10	0	0.10	0.20	0.30	0.20	0.10	0.20	0.30	0.40	0.60	0.60	0.70	0.70	0.70	0.60	0.60	0.50	0.30	0.30	0.10	0.10	0.10	0.10
27	0	0	0.10	0.10	0.40	0.10	0.10	0.20	0.30	0.50	0.60	0.60	0.50	0.70	0.70	0.60	0.60	0.60	0.70	0.40	0.30	0.10	0.10	0.10
28	0.10	0	0.20	0.10	0.30	0.10	0.10	0.20	0.40	0.50	0.50	0.60	0.70	0.70	0.70	0.70	0.70	0.50	0.70	0.70	0.60S	0.20	0.10	0.10
29	0.10	0	0.10	0.10	0.30	0.10	0.20	0.20	0.40	0.50	0.60	0.60	0.70	0.70	0.70	0.60	0.50	0.60	0.50	0.60	0.70S	0.40S	0.20S	0.10
30	0.10	0.10	0.20	0.10	0.30	0.20	0.30	0.20	0.40	0.60	0.60	0.60	0.70	0.60	0.70	0.60	0.50	0.40	0.60	0.60S	0.60	0.30	0.10	0.10
31	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.30	0.40	0.60	0.60	0.60	C	C	C	0.60	0.50	0.50	0.60	0.30	0.40	0.20	0.20	0.20
Count	29	29	29	30	30	30	30	30	30	30	30	30	28	28	29	30	29	30	30	30	30	30	30	30
UQ	0.10	0.10	0.20	0.20	0.30	0.20	0.20	0.20	0.30	0.40	0.60	0.50	0.60	0.60	0.70	0.60	0.60	0.60	0.60	0.40	0.40	0.20	0.10	0.10
Median	0.10	0	0.20	0.10	0.20	0.10	0.10	0.10	0.20	0.30	0.50	0.40	0.50	0.60	0.60	0.60	0.50	0.50	0.40	0.30	0.20	0.10	0.10	0.10
LQ	0.10	0	0.10	0.10	0.10	0.10	0.10	0	0.10	0.20	0.40	0.40	0.40	0.40	0.50	0.50	0.40	0.40	0.40	0.10	0.10	0.10	0.10	0.10

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 .... - September
Year .... - 1964
Riometer .... - Mark II

Lat. .... - 23º12'43''S
Long. .... - 45º51'35''W
DIP. .... - 22. 5ºS
Mag. Lat. .... - 11. 7ºS
Alt. .... - 623m

Freq. .... - 30 Mc/s
Bandwidth .... - 30 Kc/s
Diode Load Resistor . - 750 ohm
Audio Threshold ..... - 3
Int. Time .... - 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	0.20	0.30	0.30	0.20	0.40	0.20	0.20	0.40	0.30	0.60	0.60	0.60	0.70	0.70	0.60	0.50	0.40	0.40	0.40	0.30 S	0.30 S	0.20	0.20	0.30
2	C	C	0.30	0.20	0.40	0.20	0.20	0.30	0.40	0.60	0.50	0.60	0.50	0.60	0.50	0.50	0.20 S	0.20 S	0.20 S	0.30	0.20 S	0.20 S	0.20 S	0.30 S
3	S 0.30 S	U 0 S	0	0	0	0.20 S	0.20	0.30	0.40	0.50	0.50	0.40	0.40	0.40	0.60	0.40	0.30	0.40	0.50	0.40	0.20	0.20	0.10	0.10
4	0.10	0.10	0.30	0.20	0.10	0.10	0.20	0.30	0.30	0.30	0.50	0.30	0.40	0.50	0.50	0.70	0.60	0.40	0.60 C	0.40	0.40	0.40	0.20	0.10
5	0	0.10	0.10	0.30	0.10	0.10	0.20	0.20	0.30	0.30	0.40	0.30	0.30	0.40	0.40	0.40	0.40	0.10 S	U 0.30 C	U 0.20 C	0.30	0.20	0.10	0.10
6	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
7	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
8	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0.60	0.70	0.50	0.20	0.20	0.30	0.30
9	0.30	0.40	0.30	0.20	0.20	0.20	0.40	0.40	0.40	0.60	0.60	0.60	0.40	0.70	0.80	0.90	1.10	1.20	0.90	0.50	0.30 S	0.30 S	0.20 S	0.20
10	0.30	0.20	0.20	0.20	0.20	0.10	0.20	0.30	0.40	0.50	0.50	0.40	0.40	0.60	0.70	0.90	1.00	1.00	0.90	0.70	0.30	0.30	0.30	0.30
11	0.50	0.30	0.30	0.30	0.30	0.40	0.40	0.50	0.50	0.70	0.60	0.40	0.40	C	0.60	0.80	0.70	0.70	0.40	0.10	0.10	0.10	0.10	0.10
12	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.40	0.40	0.30	0.60	0.30	0.30	0.40	0.30	0.30	0.30	0.30	0.30	0.10	0.10	0.10	0.10	0.10
13	0.10	0.10	0.10	0.10	0.10	0	0.10	0.20	0.40	0.30	0.60	0.50	0.40	0.50	0.40	0.40	0.30	0.40	0.20	0.10	0.10	0.10	0.20	0.10
14	0.20	0.10	0	0.10	0.10	0.10	0.10	0.20	0.40	0.40	0.40	0.30	0.30	0.50	0.40	0.40	0.50	0.20	0.40	0.20	0.30	0.30	0.20	0.20
15	0.20	0.10	0.20	0.10	0.10	0.10	0.10	0.30	0.40	0.20	0.40	0.30	0.40	0.60	0.60	0.50	0.70	0.70	0.50	0.20	0.30	0.30	0.20	0.10

TIME - UT

Month: September
Year: 1964

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	0.10	0.10	0.10	0	0.10	0.10	0.10	0.20	0.30	0.40	0.40	0.30	0.40	0.50	c	0.40	0.40	0.50	0.50	0.20	0.20	0.10	0.10	0.10
17	0.10	0	0.10	0	0.10	0.10	0.10	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.50	0.40	0.30	0.20	0.20	0.10	0.10
18	0.20	0.10	0.10	0.10	0.10	0.10	0.30	0.30	0.50	0.30	0.30	0.30	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.10	0.20	0.20
19	0.30	0.10	0.10	0.10	0.10	0.10	0.10	0.30	0.50	0.30	0.30	0.30	0.40	0.50	0.70	0.60	0.50	0.50	0.50	0.40	0.20	0.20	0.20	0.20
20	0.30	0.10	0.30	0.10	0.10	0.10	0.10	0.20	0.50	0.30	0.30	0.30	0.40	0.50	0.70	0.70	0.70	0.70	0.50	0.30	0.30	0.20	0.30	0.30
21	0.30	0.10	0.20	0.20	0.10	0	0.30	0.30	0.40	0.30	0.30	0.30	0.50	0.80	0.70	0.70	0.90	0.80	0.70	0.40	0.20	0.30	0.30	0.20
22	0.20	0.30	0.20	0.50	0.10	0.10	0.30	0.40	0.40	0.30	0.30	0.30	0.50	0.70	0.90	0.70	0.80	0.50	0.50	0.30	0.20	0.20	0.20	0.20
23	0.30	0.10	0.10	0.10	0.20	0.10	0.10	0.40	0.50	0.30	0.40	0.30	0.50	0.60	0.80	0.70	0.90	0.90	0.70	0.40	0.20	0.10	0.20	0.20
24	0.20	0.20	0.20	0.10	0.10	0.20	0.30	0.40	0.60	0.40	0.50	0.40	0.70	0.60	0.80	1.00	1.00	1.10	0.90	0.80	0.60	0.40	0.30	0.30
25	0.10	0.40	0.40	0.40	0.40	0.40	0.50	0.60	0.60	0.60	0.40	0.40	0.60	0.60	0.60S	0.70S	0.90S	1.10S	1.10S	0.60S	0.40	0.60	0.30	0.30
26	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.30	0.40	0.40	0.30	0.30S	c	c	c	c	c	c	c	c	c	c	c	c
27	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
28	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
29	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
30	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
31																								
Count	23	22	23	23	23	23	23	23	23	23	23	23	22	21	21	22	22	23	23	23	23	23	23	23
UQ	0.20	0.20	0.30	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.50	0.40	0.50	0.60	0.70	0.70	0.90	0.80	0.70	0.40	0.30	0.30	0.30	0.30
Median	0.20	0.10	0.20	0.20	0.10	0.10	0.20	0.30	0.40	0.30	0.40	0.30	0.40	0.50	0.60	0.60	0.60	0.50	0.50	0.30	0.20	0.20	0.20	0.20
LQ	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.30	0.40	0.10	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.20	0.20	0.10	0.10	0.10

TIME-UT

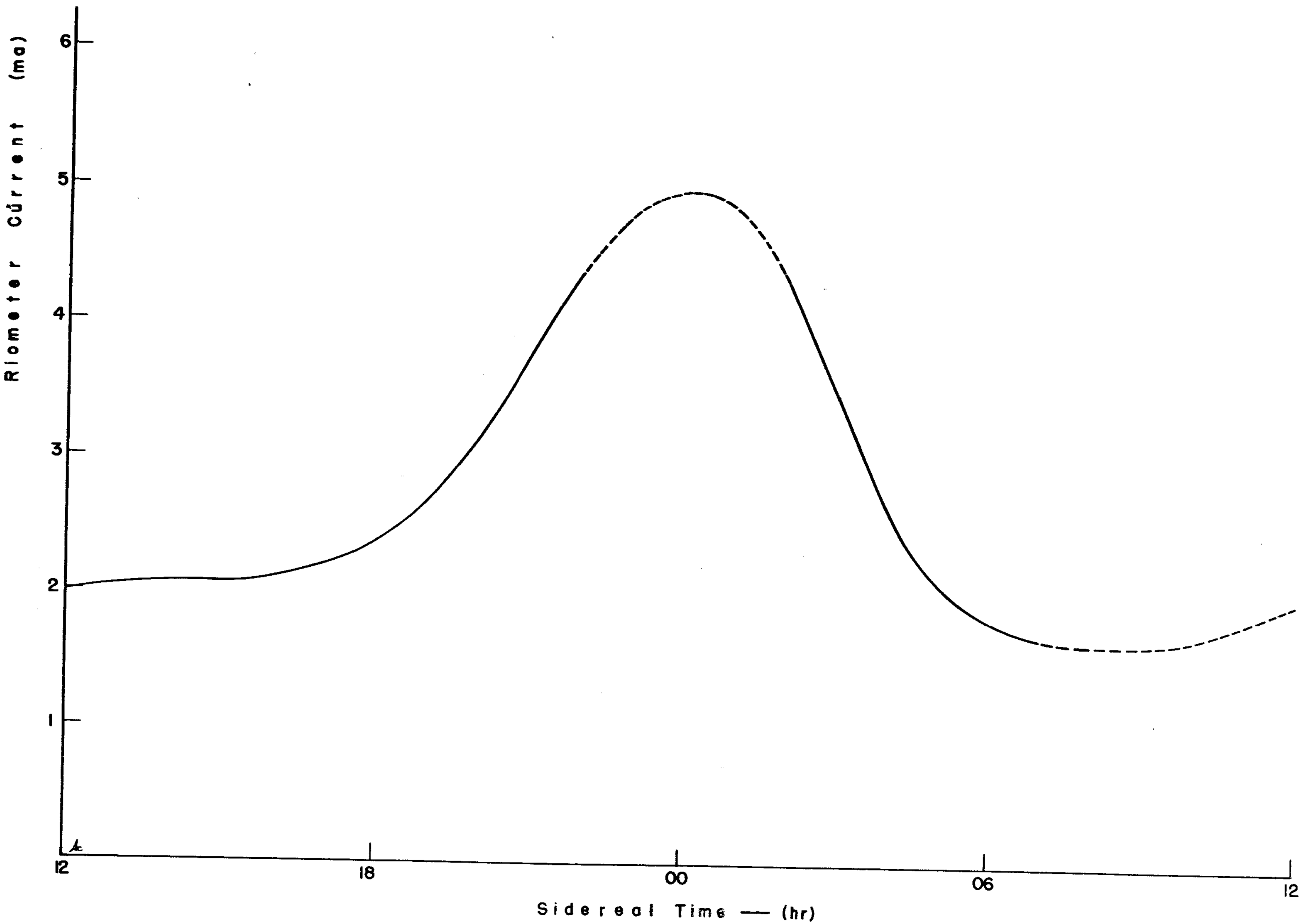

FIG. I - QUIET DAY CURVE

SÃO JOSÉ DOS CAMPOS SP-BRASIL

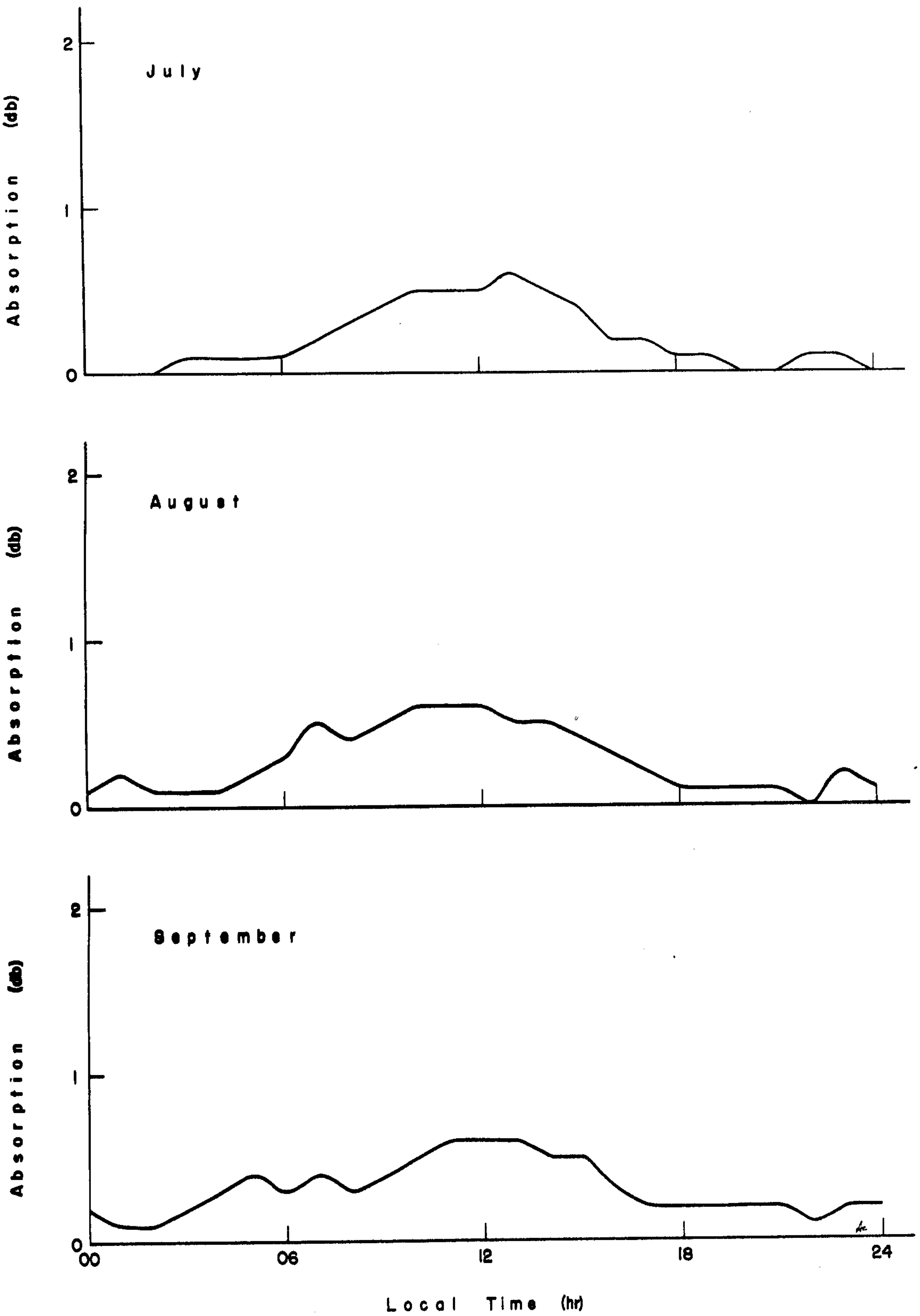

FIG: II . MEDIAN MONTHLY ABSORPTION CURVES (July-September-1964)