

θ_I - irradiance zenith angle
 ϕ_I - irradiance azimuth angle
 θ_v - view zenith angle
 ϕ_v - view azimuth angle

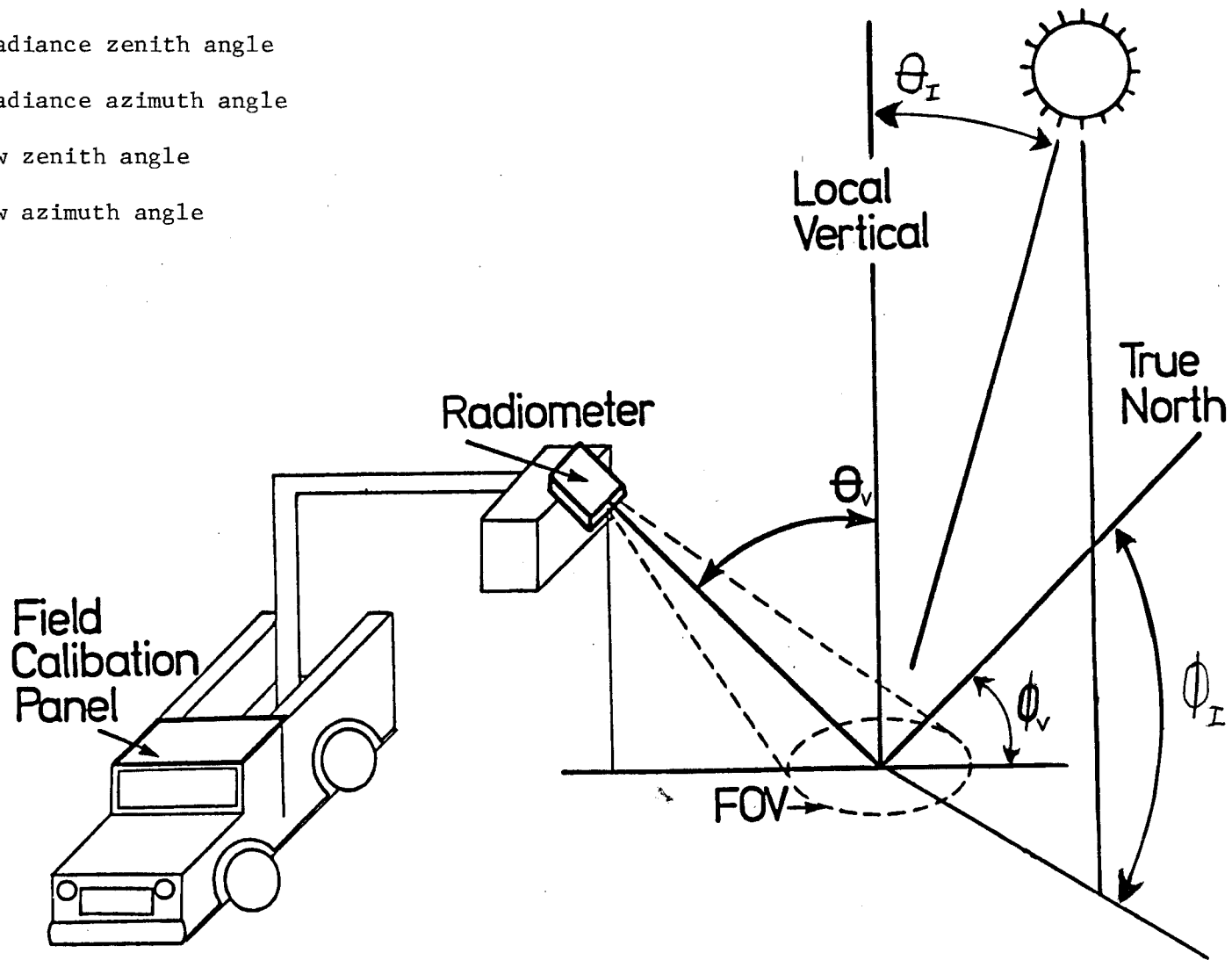


Figure 118.1 Illustration of data collection for soybean sun-view angle experiment. Data for seven view zenith and eight view azimuth angles were obtained for several different solar zenith and azimuth angles.

Illumination Conditions for Spectral Data Collection

Solar Angle Period	Time Period		Solar Zenith	Solar Azimuth	Cloud
	Start	Stop	Angle Range max - min - max	Angle Range	Cover
	GMT		degrees	degrees	%
Date: 7/17/80, Day of Year: 199					
1	17:59	18:32	19 - 21	183-205	10
2	19:03	19:29	24 - 28	222-233	10
3	19:47	20:06	31 - 34	240-245	20
4	20:28	20:49	38 - 42	251-256	10
5	21:19	21:35	47 - 50	262-265	10
Date: 7/24/80, Day of Year: 206					
1	15:14	15:31	40 - 37	109-113	1
2	15:51	16:06	33 - 31	119-124	20
3	16:31	16:51	27 - 25	133-142	10
4	17:10	17:25	23 - 22	152-161	5
5	17:51	18:06	21	178-188	5
6	18:36	18:49	22 - 24	206-214	20
Date: 8/27/80, Day of Year: 240					
1	15:55	16:14	40 - 37	132-139	0
2	16:23	16:39	36 - 34	142-148	0
3	17:07	17:23	32 - 31	160-167	0
4	17:30	17:45	31 - 30	171-178	0
5	18:17	18:31	31 - 32	193-200	0
6	18:38	18:52	32 - 33	203-209	0
7	19:06	19:20	35 - 36	214-220	0
8	19:27	19:43	37 - 39	222-227	0
9	20:10	20:23	43 - 46	235-239	0
10	20:32	20:46	47 - 49	241-245	0
11	21:08	21:26	53 - 56	249-253	0
12	21:42	21:59	59 - 60	256-237	0

Date Spectral Data Collected: 7/17/80

Soybean Observations

View Zenith Angle degrees	View Azimuth Angle (degrees)									
	0	45	90	135	155	180	225	270	315	340
0	-	-	7	5	5	-	-	5	5	5
5	-	-	-	-	-	-	-	4	-	-
6	-	-	-	-	-	-	5	-	5	-
7	5	-	-	-	-	6	-	-	-	-
9	-	-	-	6	-	-	-	-	-	-
10	-	-	6	-	-	-	-	-	-	-
11	-	6	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	5	-	-
14	-	-	-	-	-	-	5	-	5	-
15	5	-	-	-	-	5	-	-	-	-
17	-	-	-	5	-	-	-	-	-	-
18	-	-	5	-	-	-	-	-	-	-
19	-	5	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	5	-	-
21	-	-	-	-	-	-	5	-	5	-
22	5	-	-	-	-	5	-	-	-	-
24	-	-	-	5	-	-	-	-	-	-
25	-	-	5	-	-	-	-	-	-	-
26	-	5	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	5	-	-
29	-	-	-	-	-	-	5	-	5	-
30	5	-	-	-	-	5	-	-	-	-
32	-	-	-	5	-	-	-	-	-	-
33	-	-	5	-	-	-	-	-	-	-
34	-	5	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	5	-	-
44	-	-	-	-	-	-	5	-	5	-
45	5	-	-	-	-	5	-	-	-	-
47	-	-	-	5	-	-	-	-	-	-
48	-	-	5	-	-	-	-	-	-	-
49	-	5	-	-	-	-	-	-	-	-
58	-	-	-	-	-	-	-	5	-	-
59	-	-	-	-	-	-	5	-	5	-
60	5	-	-	-	-	5	-	-	-	-
62	-	-	-	5	-	-	-	-	-	-
63	-	-	5	-	-	-	-	-	-	-
64	-	5	-	-	-	-	-	-	-	-

Date Spectral Data Collected: 7/24/80

Soybean Observations

View Azimuth Angle (degrees)

View Zenith Angle	View Azimuth Angle (degrees)									
	0	45	90	135	155	180	225	270	315	340
degrees	number of observations									
0	-	-	6	6	6	-	-	6	6	6
5	-	-	-	-	-	-	5	5	-	-
6	-	-	-	-	-	-	-	-	6	-
7	6	-	-	6	-	6	1	1	-	-
8	-	-	5	-	-	-	-	-	-	-
11	-	5	1	-	-	-	-	-	-	-
13	-	-	-	-	-	-	5	5	-	-
14	-	1	-	-	-	-	-	-	6	-
15	6	-	-	6	-	6	1	1	-	-
16	-	-	5	-	-	-	-	-	-	-
19	-	5	1	-	-	-	-	-	-	-
20	-	-	-	-	-	-	5	5	-	-
21	-	-	-	-	-	-	-	-	6	-
22	6	1	-	6	-	5	1	1	-	-
23	-	-	5	-	-	-	-	-	-	-
26	-	5	1	-	-	-	-	-	-	-
28	-	-	-	-	-	-	5	5	-	-
29	-	1	-	-	-	-	-	-	6	-
30	6	-	-	6	-	6	1	1	-	-
31	-	-	5	-	-	-	-	-	-	-
34	-	5	1	-	-	-	-	-	-	-
37	-	1	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	5	5	-	-
44	-	-	-	-	-	-	-	-	6	-
45	6	-	-	6	-	6	1	1	-	-
46	-	-	5	-	-	-	-	-	-	-
49	-	5	1	-	-	-	-	-	-	-
52	-	1	-	-	-	-	-	-	-	-
58	-	-	-	-	-	-	5	5	-	-
59	-	-	-	-	-	-	-	-	6	-
60	6	-	-	6	-	6	1	1	-	-
61	-	-	5	-	-	-	-	-	-	-
64	-	5	1	-	-	-	-	-	-	-
67	-	1	-	-	-	-	-	-	-	-

Date Spectral Data Collected: 8/27/80

Soybean Observations

View Zenith Angle	View Azimuth Angle (degrees)									
	0	45	90	135	155	180	225	270	315	340
degrees	number of observations									
0	-	-	12	12	12	-	-	12	11	12
7	12	12	12	12	-	12	12	12	12	-
15	12	12	12	12	-	12	12	12	12	-
22	12	12	12	12	-	12	12	12	12	-
30	12	12	12	12	-	12	12	12	12	-
45	12	12	12	12	-	12	12	12	12	-
60	12	12	12	12	-	12	12	12	12	-

Dates Spectral Data Collected:

Bare Soil Observations

View Zenith Angle = 0
View Azimuth Angle = 205

Date Data Collected	Number of Observations
7/17	6
7/24	4
8/27	12

```

C... PROGRAM NONLAM... K. J. RANSON JUNE 9, 1982.
C... PROGRAM TO COMPUTE CORRECTION FACTORS TO ACCOUNT FOR NON-LAMBERTIAN
C... CAL PANEL PROPERTIES. INTERPOLATES LINEARLY BETWEEN MEASURED VALUES.
C... RUC = ARRAY OF MEASURED CAL PANEL REFLECTANCES AT IRRADIANCE
C... ZENITH ANGLES SPECIFIED BY ZEN(THETA). RUC(LAMBDA,THETA)
C... RPC = ARRAY OF MEASURED REFLECTANCE VALUES FOR PANEL USED TO
C... CALCULATE BRF OF FIELD DATA. RPC(LAMBDA,10)
C... ZEN = VALUES FOR IRRADIANCE ZENITH ANGLE USED FOR CAL PANEL
C... PROPERTY MEASUREMENTS. ZEN(THETA)
C... OUTPUT IS IRRADIANCE ANGLE AND N BAND FACTORS OF RUC/RPC.
IMPLICIT REAL*4(A-H,O-Z)
INTEGER INTRVL
DIMENSION ZZ(100),RUC(4,6),ZEN(7),RPC(4),RR(4,100)
DATA ZEN/10,20,30,40,50,55,65/
DATA RUC/ 643, 937, 933, 920, 918, 914, 909, 903, 898, 893, 884,
* 878, 888, 884, 878, 875, 875, 869, 869, 865, 857, 859, 853, 849/
DATA RPC/ 935, 930, 923, 919/

C
NPTS = 6
NBANDS = 4

C... INTERPOLATION OF RUC VALUES WITH IRRADIANCE ZENITH ANGLE.
DO 20 I = 1,NBANDS
L = 1
DO 20 J = 1,NPTS
IF(J.EQ.6)GO TO 5
A = (RUC(I,J+1)-RUC(I,J))/(ZEN(J+1)-ZEN(J))
B = RUC(I,J)-A*ZEN(J)
5 INTRVL = INT(ZEN(J+1)-ZEN(J))
IF(J.EQ.NPTS)INTRVL = INTRVL + 1
Z1 = ZEN(J)
DO 10 K = 1,INTRVL
ZZ(L) =Z1
C... CALCULATE CONVERSION FACTOR RUC(LAMBDA,THETA)/RPC(LAMBDA,10).
RR(I,L) = (A*Z1+B)/RPC(I)
C... NORMALIZE SO RR(LAMBDA,10) = 1.000
IF(L.EQ.1)FACTOR = RR(I,1)
RR(I,L) = RR(I,L)/FACTOR
Z1 = Z1 +1
L = L + 1
10 CONTINUE
20 CONTINUE
KNT = L - 1
DO 30 N = 1,KNT
C DO 25 M = 1,4
C 25 WRITE(9,200)ZZ(N),M,M,RR(M,N)
WRITE(9,200)ZZ(N),(RR(M,N),M=1,4)
30 CONTINUE
C 200 FORMAT('IF IRZE = ',F3.0,' THEN BC',I1,' = B',I1,' * ',F6.4,';')
200 FORMAT(F3.0,4F10.4)
STOP
END

```

FILE: AB
Solar zenith

JON

A

VM/SP CONVERSATIONAL MONITOR SYSTEM

10.	1.0000	1.0000	1.0000	1.0000
11.	0.9973	0.9975	0.9974	0.9975
12.	0.9947	0.9951	0.9949	0.9950
13.	0.9920	0.9926	0.9923	0.9925
14.	0.9894	0.9902	0.9897	0.9901
15.	0.9867	0.9877	0.9871	0.9876
16.	0.9841	0.9853	0.9846	0.9851
17.	0.9814	0.9828	0.9820	0.9826
18.	0.9788	0.9804	0.9794	0.9801
19.	0.9761	0.9779	0.9768	0.9776
20.	0.9735	0.9755	0.9743	0.9752
21.	0.9714	0.9732	0.9716	0.9725
22.	0.9692	0.9710	0.9689	0.9698
23.	0.9671	0.9687	0.9662	0.9671
24.	0.9650	0.9665	0.9636	0.9644
25.	0.9629	0.9642	0.9609	0.9617
26.	0.9608	0.9620	0.9582	0.9590
27.	0.9586	0.9598	0.9555	0.9563
28.	0.9565	0.9575	0.9528	0.9536
29.	0.9544	0.9553	0.9502	0.9509
30.	0.9523	0.9530	0.9475	0.9482
31.	0.9512	0.9521	0.9468	0.9478
32.	0.9502	0.9511	0.9462	0.9475
33.	0.9491	0.9502	0.9456	0.9472
34.	0.9480	0.9492	0.9449	0.9469
35.	0.9470	0.9482	0.9443	0.9465
36.	0.9459	0.9473	0.9436	0.9462
37.	0.9449	0.9463	0.9430	0.9459
38.	0.9438	0.9454	0.9423	0.9456
39.	0.9427	0.9444	0.9417	0.9452
40.	0.9417	0.9434	0.9411	0.9449
41.	0.9403	0.9418	0.9401	0.9440
42.	0.9389	0.9402	0.9391	0.9430
43.	0.9375	0.9386	0.9382	0.9420
44.	0.9362	0.9370	0.9372	0.9410
45.	0.9348	0.9354	0.9362	0.9401
46.	0.9334	0.9338	0.9353	0.9391
47.	0.9320	0.9322	0.9343	0.9381
48.	0.9306	0.9306	0.9333	0.9371
49.	0.9293	0.9290	0.9324	0.9362
50.	0.9279	0.9274	0.9314	0.9352
51.	0.9241	0.9253	0.9280	0.9315
52.	0.9203	0.9232	0.9245	0.9279
53.	0.9164	0.9210	0.9211	0.9242
54.	0.9126	0.9189	0.9177	0.9205
55.	0.9088	0.9168	0.9143	0.9168
56.	0.9050	0.9146	0.9108	0.9132
57.	0.9012	0.9125	0.9074	0.9095
58.	0.8973	0.9104	0.9040	0.9058
59.	0.8935	0.9082	0.9005	0.9022
60.	0.8897	0.9061	0.8971	0.8985
61.	0.8859	0.9039	0.8937	0.8948
62.	0.8821	0.9018	0.8902	0.8911
63.	0.8783	0.8997	0.8868	0.8875
64.	0.8744	0.8975	0.8834	0.8838

*Adjustment
proper*

87.5

*Adjustment for non-Lambertian
properties of cal panel.*

Used for soybean data set.

FILE: AB

JDN

A

VM/SP CONVERSATIONAL MONITOR SYSTEM

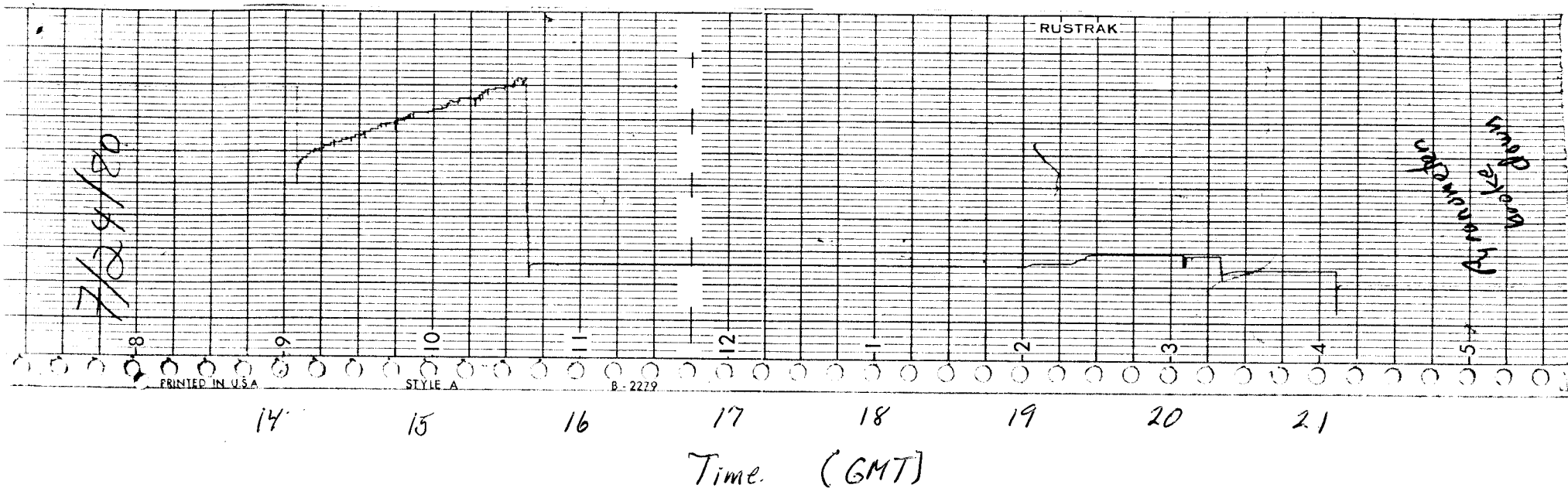
65

0.8706

0.8954

0.8800

0.8801



Strip chart of relative global irradiance for July 24, 1960.

Exotech 100

REFERENCE PANEL DATA OF 07/24/80

