



LONDON, METEOROLOGICAL OFFICE.

Met.O.19 Branch Memorandum No.22.

Systematic errors in the radiances measured
by the Nimbus E selective chopper radiometer.
By SLINGO,A.

London,Met.Off.,Met.O.19 Branch
Memo.No.22,[1975],30cm.Pp.[4].1 Ref.

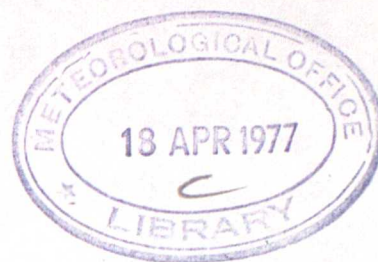
An unofficial document - restriction
on first page to be observed.

FGZ

National Meteorological Library
and Archive

Archive copy - reference only

Met O 19 Branch Memorandum No 22



124047

SYSTEMATIC ERRORS IN THE RADIANCES MEASURED BY THE
NIMBUS E SELECTIVE CHOPPER RADIOMETER
A SLINGO

Permission to quote from this unpublished memorandum should be obtained from
the head of Met O 19, Meteorological Office, Bracknell, Berkshire, RG12 2SZ.

FH33

SYSTEMATIC ERRORS IN THE RADIANCES MEASURED BY THE
NIMBUS E SELECTIVE CHOPPER RADIOMETER

A SLINGO

INTRODUCTION

Comparison of radiances deduced from atmospheric temperature measurements performed in situ by rocket and radio-sondes with those measured simultaneously by a satellite-mounted radiometer constitutes an important method for monitoring the radiometer performance and can also be used to compare different types of sonde, not necessarily released from the same site, using the satellite radiometer as a reference. Temperature profiles reported by the world-wide network of rocket stations have been used by Hunt (1974) to check the radiances measured in channels B_{12} , B_{23} , B_{34} and A_1 of the Nimbus E Selective Chopper Radiometer. In the present report more recent comparisons are presented, which indicate that the systematic errors in the Nimbus E data have greatly increased.

METHOD

During July and August 1974 a programme of rocket-sonde firings timed to coincide as closely as possible with overpasses of the Nimbus E spacecraft was carried out at West Geirinish, Scotland, and Wallops Island, USA. Additional firings in February 1975 were also made at West Geirinish. Temperature profiles and the radiances expected in the four stratospheric channels were determined from the rocket data using the method described by Hunt (1974). The satellite radiances were supplied on magnetic tape by the Department of Atmospheric Physics, at the Clarendon Laboratory, Oxford. The satellite data are usually averaged over a 16-second period and printed out with details of the corresponding latitude and longitude. Nine such means, centred on the rocket station, were averaged in order to obtain an adequate signal to noise ratio. The radiance field is sufficiently large scale for this method to give a good estimate of the radiance required.

It has been known for some time that the radiometer characteristics have been changing with time, due partly to changes in the CO_2 cell pressures. The

effect on the radiances is quite complicated and corrections to the data were applied using a computer programme supplied by the Oxford group.

RESULTS

The radiances are presented in Table 1 in groups of five numbers. The first is the radiance derived from the rocket firing. The second is the uncorrected satellite radiance over the rocket site, averaged as described above. The third is the final satellite radiance after all the correction factors have been applied. The last two numbers are the errors of the satellite radiances with respect to the rocket radiances.

DISCUSSION

It is immediately obvious from Table 1 that there are large systematic differences between the sonde and satellite radiances, which are hardly affected by the correction procedure. The agreement between the Wallops Island and West Geirinish sondes as to the values of these errors for the corrected radiances is good, except for channel B_{34} . Given that the B_{34} errors before correction are in agreement, the disparity following correction is presumably a quirk of the correction procedure.

There is, therefore, little evidence for any systematic differences between the sondes used. The Nimbus E stratospheric radiances analysed here do, however, suffer from large systematic errors which do not disappear when the corrections suggested by the Oxford group are applied.

REFERENCE

- Hunt, R. D. (1974) "Comparisons between rocket- and radio-sonde data and Nimbus E satellite data - preliminary results". Met O 19 Branch Memorandum Number 8.

TABLE 1

NIMBUS E SCR/ROCKET-SONDE COMPARISONSWALLOPS ISLAND OVERPASSES

DATE	B ₁₂		B ₂₃		B ₃₄		A ₁	
30- 7-74	82.1		76.0		66.7		55.9	
	77.4	-4.7	81.0	+5.0	69.2	+2.5	57.3	+1.4
	76.5	-5.6	78.5	+2.5	66.8	+0.1	58.9	+3.0
1- 8-74	80.6		73.5		64.5		54.1	
	75.5	-5.1	79.7	+6.2	67.9	+3.4	56.6	+2.5
	74.6	-6.0	77.1	+3.6	65.5	+1.0	58.0	+3.9
8- 8-74	82.9		75.3		65.4		54.2	
	78.2	-4.7	78.3	+3.0	67.7	+2.3	56.0	+1.8
	77.3	-5.6	79.2	+3.9	65.4	0	58.3	+4.1

WEST GEIRINISH OVERPASSES

DATE	B ₁₂		B ₂₃		B ₃₄		A ₁	
24- 7-74	87.6		80.7		71.1		62.4	
	79.1	-8.5	85.4	+4.7	73.2	+2.1	64.8	+2.4
	80.3	-7.3	84.7	+4.0	76.9	+5.8	67.2	+4.8
31- 7-74	86.3		79.3		69.5		60.4	
	79.9	-6.4	86.1	+6.8	74.0	+4.5	63.6	+3.2
	80.5	-5.8	84.5	+5.2	76.0	+6.5	65.9	+5.4
2- 8-74	89.6		82.4		72.2		62.8	
	82.8	-6.8	88.9	+6.5	75.8	+3.6	65.3	+2.5
	83.3	-6.3	87.1	+4.7	78.0	+5.8	67.6	+4.8
5- 8-74	86.2		79.9		70.5		61.2	
	78.4	-7.8	84.3	+4.4	72.0	+1.5	63.1	+1.9
	79.1	-7.1	82.1	+2.2	73.8	+3.3	65.2	+4.0
5- 2-75	50.3		41.5		40.0		41.2	
	47.5	-2.8	48.0	+6.5	42.1	+2.1	41.0	-0.2
	45.8	-4.5	46.6	+5.1	39.1	-0.9	42.1	+0.9
7- 2-75	53.4		42.8		40.3		40.9	
	48.4	-5.0	50.4	+7.6	42.9	+2.6	41.6	+0.7
	46.7	-6.7	49.0	+6.2	40.0	-0.3	42.5	+1.6
10- 2-75	61.9		45.8		40.4		40.2	
	54.3	-7.6	54.0	+8.2	45.8	+5.4	41.3	+1.1
	53.1	-8.8	52.0	+6.2	43.1	+2.7	42.5	+2.3
12- 2-75	59.9		47.9		42.6		42.1	
	55.8	-4.1	56.1	+8.2	45.1	+2.5	41.5	-0.6
	54.7	-5.2	54.0	+6.1	42.3	-0.3	42.7	+0.6

TABLE 1 (CONTINUED)

SUMMARY OF ERRORSBEFORE CORRECTION

DATE	B ₁₂ W.G.	W.I.	B ₂₃ W.G.	W.I.	B ₃₄ W.G.	W.I.	A ₁ W.G.	W.I.
24- 7-74	-8.5		+4.7		+2.1		+2.4	
30- 7-74		-4.7		+5.0		+2.5		+1.4
31- 7-74	-6.4		+6.8		+4.5		+3.2	
1- 8-74		-5.1		+6.2		+3.4		+2.5
2- 8-74	-6.8		+6.5		+3.6		+2.5	
5- 8-74	-7.8		+4.4		+1.5		+1.9	
8- 8-74		-4.7		+3.0		+2.3		+1.8
5- 2-75	-2.8		+6.5		+2.1		-0.2	
7- 2-75	-5.0		+7.6		+2.6		+0.7	
10- 2-75	-7.6		+8.2		+5.4		+1.1	
12- 2-75	-4.1		+8.2		+2.5		-0.6	

AFTER CORRECTION

DATE	B ₁₂ W.G.	W.I.	B ₂₃ W.G.	W.I.	B ₃₄ W.G.	W.I.	A ₁ W.G.	W.I.
24- 7-74	-7.3		+4.0		+5.8		+4.8	
30- 7-74		-5.6		+2.5		+0.1		+3.0
31- 7-74	-5.8		+5.2		+6.5		+5.4	
1- 8-74		-6.0		+3.6		+1.0		+3.9
2- 8-74	-6.3		+4.7		+5.8		+4.8	
5- 8-74	-7.1		+2.2		+3.3		+4.0	
8- 8-74		-5.6		+3.9		0		+4.1
5- 2-75	-4.5		+5.1		-0.9		+0.9	
7- 2-75	-6.7		+6.2		-0.3		+1.6	
10- 2-75	-8.8		+6.2		+2.7		+2.3	
12- 2-75	-5.2		+6.1		-0.3		+0.6	