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Search for Correlative Data (U)

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Prepared by
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SEARCH FOR CORRELATIVE DATA (U)

Prepared by

C. J. Rice

Approved by

G. A. Paulikas, Director
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The information in a Technical Operating Report is developed for a particular program and is therefore not necessarily of broader technical applicability.

(U) FIGURES

SEARCH FOR CORRELATIVE DATA (U)

by

C. J. Rice

(U) I. Introduction

(S) At [b(1)] seconds system time b(1) on 22 September 1979, two bhangmeters on the Vela spacecraft recorded signals which indicated that a nuclear device had been detonated in the atmosphere (IRON No. 6911). The signals gave the yield [Deleted b(1)] and the location as somewhere within a large region encompassing areas of the South Atlantic and Indian Oceans and southern Africa (the area enclosed by the dotted line in Figure 1). This report will examine data from the Mission A sensors on DSP satellites Flight 6 and Flight 7 which bear on the questions raised by the Vela sighting. [

Deleted b(1)

]

(U) II. Mission A Data

(S) [

Deleted b(1)

]

(S) The bhangmeter light curve for a nuclear event is believed to be unique and unambiguous. [

Deleted b(1)

] The principal characteristics of the source curve are the initial intensity of 2200 MW/sr and the exponential decay with e-folding

Chart Deleted b(1)

Figure 1. (S) [Deleted b(1)]

time of 2.5 seconds. Extrapolations from many tests imply that $\tau = 2.5$ sec is somewhat on the low side in the general case and that τ as high as 4 seconds might be possible (Rawcliffe, 1978). This last referenced report also gives the source intensity at 10 seconds after detonation as proportional to the yield [b(1)] Combining these numbers and the possible yield range [b(1)] an uncertainty in the expected source intensity which is indicated by the cross-hatched area in Figure 2. The [b(1)] curve for N24C18 represents a lower limit to this range and will be used for subsequent calculations; nevertheless, it should be remembered that intensities from 2-3 times greater are not excluded by the level of information otherwise available. (And, practically speaking, the [b(1)] curve has some unknown uncertainty associated with it. This is probably a factor of 3 or more - see, for example, the scatter in Figures 4.1 to 4.3 of Rawcliffe (1978)).

(S) The initial search for a detected signal with the high initial intensity and subsequent exponential decay characteristics typical of a nuclear explosion involved a detailed computer search of an entire quadrant for each of the DSP satellites concerned. For Flight 7, the phasing of the 10-second scan carried the sensor [

Deleted b(1)

] after the Vela sighting. For Flight 6, the phasing [

Deleted b(1)

] after the sighting. In a search of this kind, without any additional information about event location, it would be hopeless to attempt to identify any transient event with a detected signal below about [b(1)] and a more practical limit would actually be about [b(1)] The reason for these limits is [b(1) Deleted b(1)] the only real hope of recognizing a possible candidate return would be that the initial return be bright enough to stand out against this background. Secondarily, there should be ideally a recognizable signal decay which means that a second return should be visible and, even assuming a 4-second time constant, the second pulse would be a factor of 10 or more below the first. A sufficiently bright single pulse would definitely be a candidate, however.

Figure Deleted
b(1)

Figure 3. (S) [

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]

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b(1)

Figure 4. (S) [

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TABLE 2

Transmittance (U)

(from Randall, 1972)

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Relative Humidity	Zenith Angle 0.0	30.0	45.0	60.0	70.0	75.0	80.0	83.0	86.0	88.0
0	40.07	38.78	36.93	33.66	29.95	27.18	22.79	18.84	12.67	6.34
10	9.70	8.69	7.35	5.34	3.52	2.45	1.32	.68	.18	.02
20	5.75	5.01	4.04	2.66	1.53	.95	.42	.17	.03	.00
30	3.91	3.31	2.58	1.56	.81	.46	.17	.06	.01	.00
40	2.83	2.36	1.76	1.00	.47	.25	.08	.02	.00	.00
50	2.14	1.74	1.26	.68	.30	.14	.04	.01	.00	.00
60	1.66	1.33	.94	.48	.19	.09	.02	.01	.00	.00
70	1.31	1.04	.72	.35	.13	.06	.01	.00	.00	.00
80	1.06	.82	.55	.26	.09	.03	.01	.00	.00	.00
90	.87	.66	.44	.19	.06	.02	.00	.00	.00	.00
100	.72	.54	.35	.15	.05	.02	.00	.00	.00	.00

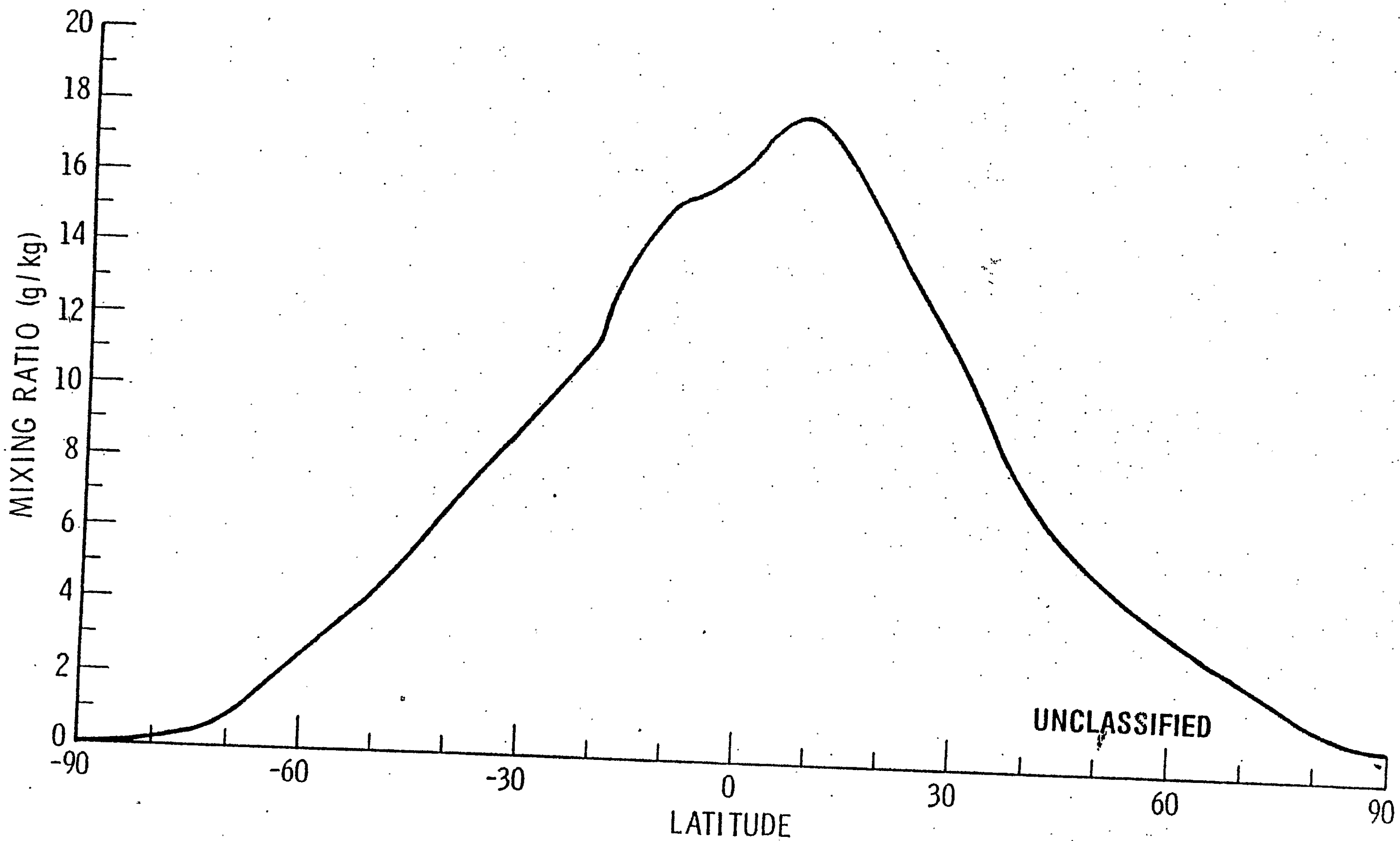

Figure 6. (U) Water vapor mixing ratio at 1000 mb as a function of latitude for the period September to November averaged over all longitudes. The calculation was done by R. L. Walterscheid.

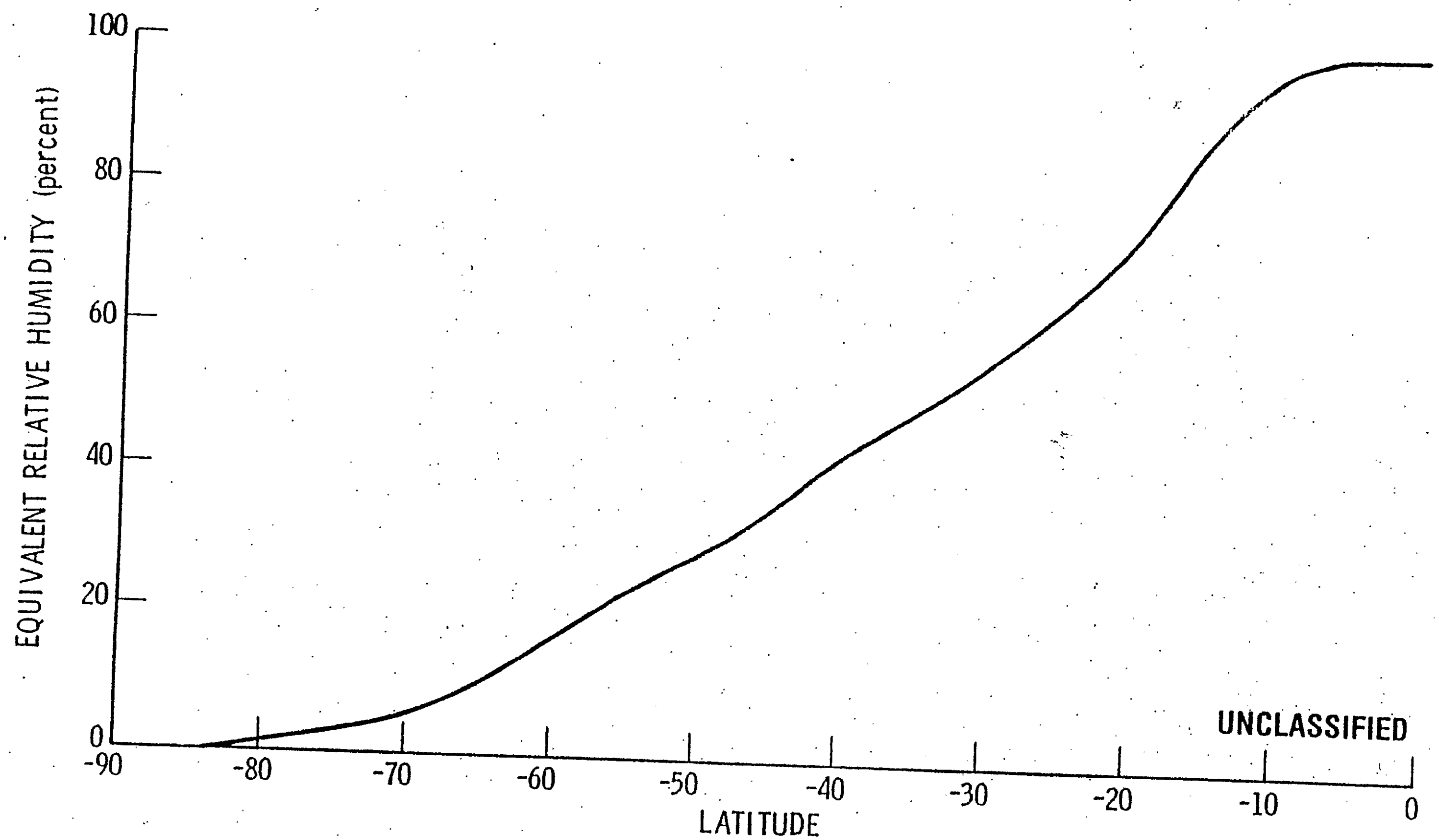

Figure 7. (U) Equivalent relative humidity as a function of latitude in the Southern Hemisphere. This curve is derived by using the water vapor mixing ratio of Figure 6 to determine absolute humidity which in turn determines the value of relative humidity appropriate to the mid-latitude summer model atmosphere used by Randall (1972) to derive the transmittance curves. The value of equivalent relative humidity at a given latitude therefore specifies the transmittance functions to be used from Figure 5. This curve does not represent the actual relative humidity at any latitude, even in an average sense, since the temperature profile as a function of latitude will deviate substantially from that of the mid-latitude summer model atmosphere.

Figure Deleted
b(1)

Figure 9. (S) [

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]

[Figure Deleted b(1)]

Figure 11. (S) Iso-intensity contours at the satellite for [b(1)] the transmission loss factors given by Figure 8. The contours indicate the intensity which could have been detected at the sensor under average conditions [Deleted b(1)] Values for Flight 6 (solid line) and Flight 7 (dashed lines) are shown. The area of interest is enclosed by the dotted line.

(U) REFERENCES

(1) (U) McClatchey, R. A., et al., Optical Properties of the Atmosphere, Air Force Cambridge Research Center Environmental Research Paper 331, September 1970 (Revised 10 May 1971). (U).

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(3) (U) Rawcliffe, R. D., Study of 1976 Test Data (U), TOR-0077(2409-01)-4, The Aerospace Corp., El Segundo, California, (1 May 1977). (U).

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