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AUSTRALIAN ATOMIC ENERGY COMMISSION
RESEARCH ESTABLISHMENT
LUCAS HEIGHTS

AAEC TRITIUM LIST NO. 2

1975 - 1976

by

G.E. CALF
L.W. SMITH
R.C. STOKES

August 1977

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ABSTRACT

Details are given of the concentration of the environmental isotope tritium in monthly samples of precipitation taken at 16 stations, situated throughout Australia, during the period 1975-1976.

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The following descriptors have been selected from the INIS Thesaurus to describe the subject content of this report for information retrieval purposes. For further details please refer to IAEA-INIS-12 (INIS: Manual for Indexing) and IAEA-INIS-13 (INIS: Thesaurus) published in Vienna by the International Atomic Energy Agency.

ATMOSPHERIC PRECIPITATIONS; RADIOACTIVITY; RADIATION MONITORING
SAMPLING; TRITIUM; AUSTRALIA

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1. INTRODUCTION

Since 1970, monthly precipitation samples have been collected for the Australian Atomic Energy Commission from sixteen stations in Australia. This report is the second AAEC Tritium List; the first publication included data from 1970 to 1974 [Calf, Seatonberry, Smith & Stokes, 1976].

Precipitation survey stations are shown in Figure 1.



FIGURE 1

2. STATION DATA

Basic information, including latitude, longitude, and altitude are given for each location for which the tritium activity is reported.

3. SAMPLE ANALYSIS

Samples are composites from the total precipitation at a station during one calendar month and were assayed using methods reported by Calf, Seatonberry & Smith [1975]. The tritium concentration, given in

tritium units (TU), has been corrected for decay to the last day of the sampling month. One TU is defined as one atom of tritium per 10^{18} atoms of hydrogen and is equivalent to 7.2 disintegrations per minute or 3.24 picocuries per litre of water. All results have an estimated standard deviation of 8.5% or 0.4 TU, whichever is the larger.

4. RESULTS

Yearly weighted means for tritium, weighted by the total amount of precipitation, have been calculated where all values are available:

$$\text{Weighted mean} = \frac{\Sigma(\text{monthly precipitation} \times \text{monthly tritium concentration})}{\Sigma(\text{monthly precipitation})}$$

5. ACKNOWLEDGEMENTS

We wish to acknowledge the assistance of the Department of Science - Bureau of Meteorology, the Water Resources Commission of NSW and the Irrigation and Water Supply Commission of Queensland, in collecting the samples and relaying the relevant monthly precipitation values.

6. REFERENCES

- Calf, G.E., Seatonberry, B.W. & Smith, L.W. [1975] - The Measurement of Natural Levels of Tritium in Water. AAEC/E373.
- Calf, G.E., Seatonberry, B.W., Smith, L.W. & Stokes, R.C. [1976] - AAEC Tritium List No. 1 1970-1974. AAEC/E377.

The following footnotes a, b and c apply to all tables in this set.

- (a) Precipitation in mm.
- (b) TU = tritium unit.
- (c) Calculated where all values are available.

TABLE 1 - ADELAIDE

Latitude: 34.56S Longitude: 138.35E
 Altitude: 42.7 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	28	rain	16.5
	02	7		19.5
	03	82		10.4
	04	20		11.4
	05	88		6.0
	06	18		31.9
	07	95		11.3
	08	33		17.9
	09	48		17.0
	10	81		18.2
	11	18		19.4
	12	5		7.0
Sum		523		
Weighted Mean ^(c)				13.6
1976	01	14	rain	15.3
	02	64		10.4
	03	1		12.2
	04	26		11.5
	05	24		6.4
	06	44		8.5
	07	25		6.1
	08	44		13.5
	09	25		13.9
	10	46		13.0
	11	25		12.7
	12	30		8.3
Sum		368		
Weighted Mean ^(c)				10.8

TABLE 2 - ALICE SPRINGS

Latitude: 23.49S Longitude: 133.53E
 Altitude: 544.0 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	17	rain	23.5
	02	84		10.2
	03	60		7.8
	04	0		-
	05	0		-
	06	4		11.0
	07	28		15.0
	08	33		-
	09	57		12.6
	10	32		16.4
	11	57		18.4
	12	229		9.0
Sum		601		
Weighted Mean ^(c)				
1976	01	98	rain	10.1
	02	211		8.1
	03	157		5.3
	04	0		-
	05	0		-
	06	0		-
	07	3		6.5
	08	0		-
	09	0		-
	10	47		15.4
	11	34		12.1
	12	1		-
Sum		551		
Weighted Mean ^(c)				

TABLE 3 - BRISBANE

Latitude: 27.26S Longitude: 153.05E
 Altitude: 2.1 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	175	rain	10.3
	02	135		13.2
	03	28		7.1
	04	38		9.6
	05	3		6.7
	06	74		6.0
	07	20		13.3
	08	48		10.3
	09	77		9.5
	10	85		7.7
	11	60		15.4
	12	120		5.5
Sum		863		
Weighted Mean ^(c)				9.7
1976	01	184	rain	3.7
	02	299		5.2
	03	192		4.7
	04	45		4.5
	05	93		3.0
	06	25		5.6
	07	49		5.6
	08	2		-
	09	41		9.6
	10	85		11.6
	11	279		15.7
	12	94		5.5
Sum		1388		
Weighted Mean ^(c)				

TABLE 4 - BUNDABERG

Latitude: 24.52S Longitude: 152.21E
 Altitude: 13.7 m

Year	Month	Precipitation (a)	Type	TU (b)
1975	01	60	rain	5.6
	02	119		4.4
	03	21		6.6
	04	52		5.9
	05	24		1.9
	06	69		4.3
	07	37		5.0
	08	76		5.5
	09	20		3.4
	10	109		4.6
	11	117		7.2
	12	148		3.3
Sum		852		
Weighted Mean (c)				5.2
1976	01	182	rain	3.6
	02	258		2.1
	03	209		4.5
	04	79		4.0
	05	36		3.8
	06	18		5.2
	07	29		3.0
	08	11		-
	09	66		7.8
	10	38		10.0
	11	335		8.2
	12	194		3.5
Sum		1455		
Weighted Mean (c)				

TABLE 5 - CAMPBELLTOWN

Latitude: 34.05S Longitude: 150.49E
 Altitude: 66.7 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	22	rain	21.2
	02	101		12.3
	03	119		13.8
	04	71		8.0
	05	8		17.7
	06	224		7.5
	07	95		4.7
	08	17		12.6
	09	37		10.4
	10	58		19.9
	11	47		12.0
	12	19		7.2
Sum		818		
Weighted Mean ^(c)				10.6
1976	01	199	rain	5.6
	02	123		6.4
	03	197		5.6
	04	19		11.7
	05	10		7.8
	06	75		5.1
	07	76		6.2
	08	8		16.8
	09	45		17.5
	10	168		14.6
	11	55		16.9
	12	18		13.3
Sum		993		
Weighted Mean ^(c)				8.8

TABLE 6 - CHARLEVILLE

Latitude: 26.25S

Longitude: 146.17E

Altitude: 303.8 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	55	rain	12.5
	02	60		8.1
	03	77		6.9
	04	3		-
	05	0		-
	06	32		11.0
	07	18		11.4
	08	47		16.2
	09	10		10.7
	10	40		15.8
	11	4		21.1
	12	160		6.8
Sum		506		
Weighted Mean ^(c)				
1976	01	143	rain	7.1
	02	169		5.9
	03	53		7.9
	04	0		-
	05	55		9.3
	06	1		-
	07	24		7.9
	08	2		12.2
	09	15		24.3
	10	18		13.0
	11	19		14.8
	12	48		5.6
Sum		547		
Weighted Mean ^(c)				

TABLE 7 - CLAREDALE

Latitude: 19.36S

Longitude: 147.25E

Altitude: 9.7 m

Year	Month	Precipitation ^{*(a)}	Type	TU (b)
1975	01	243	rain	7.6
	02	131		5.9
	03	164		5.0
	04	23		9.8
	05	2		4.8
	06	13		6.5
	07	2		5.4
	08	59		7.9
	09	42		6.4
	10	237		4.8
	11	59		8.7
	12	505		4.1
Sum		1480		
Weighted Mean (c)				5.6
1976	01	109	rain	5.3
	02	486		3.5
	03	419		4.2
	04	23		-
	05	3		4.1
	06	2		5.2
	07	0		-
	08	0		-
	09	0		5.1
	10	52		4.4
	11	59		6.4
	12	295		5.0
Sum		1448		
Weighted Mean (c)				

* The precipitation figures are for Ayr, which is situated 28 km from Claredale. No precipitation figures for Claredale are available.

TABLE 8 - DARWIN

Latitude: 12.26S

Longitude : 130.52E

Altitude: 28.6 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	337	rain	-
	02	515		6.1
	03	361		6.9
	04	100		5.8
	05	1		-
	06	0		-
	07	0		-
	08	0		-
	09	7		4.5
	10	155		6.1
	11	238		6.3
	12	196		5.6
Sum		1910		
Weighted Mean ^(c)				
1976	01	532	rain	5.4
	02	381		5.9
	03	502		-
	04	36		6.7
	05	1		-
	06	0		-
	07	0		-
	08	0		-
	09	0		-
	10	16		-
	11	17		6.5
	12	78		5.8
Sum		1563		
Weighted Mean ^(c)				

TABLE 9 - HOBART

Latitude: 42.53S Longitude: 147.20E
 Altitude: 55.2 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	58	rain	20.1
	02	9		11.6
	03	113		15.0
	04	28		9.2
	05	75		9.1
	06	25		6.7
	07	95		9.9
	08	124		14.8
	09	36		19.7
	10	142		12.3
	11	100		18.4
	12	22		16.8
Sum		827		
Weighted Mean ^(c)				13.9
1976	01	75	rain	13.1
	02	6		11.1
	03	47		12.1
	04	18		9.1
	05	28		6.4
	06	41		7.8
	07	30		8.1
	08	148		9.3
	09	46		13.8
	10	71		9.8
	11	85		6.7
	12	70		8.0
Sum		665		
Weighted Mean ^(c)				9.6

TABLE 10 - LONGREACH

Latitude: 23.26S

Longitude: 144.16E

Altitude: 190.5 m

Year	Month	Precipitation (a)	Type	TU (b)
1975	01	110	rain	11.5
	02	110		7.0
	03	62		7.4
	04	2		-
	05	0		-
	06	4		8.3
	07	0		-
	08	23		8.9
	09	7		9.0
	10	25		15.3
	11	0		-
	12	114		7.4
Sum		457		
Weighted Mean (c)				
1976	01	119	rain	5.0
	02	116		3.6
	03	76		6.5
	04	0		-
	05	13		6.4
	06	3		4.1
	07	10		7.5
	08	4		6.8
	09	0		-
	10	7		13.1
	11	21		10.7
	12	98		9.4
Sum		467		
Weighted Mean (c)				6.3

TABLE 11 - MACKAY

Latitude: 21.07S Longitude: 149.10E
 Altitude: 30.8 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	428	rain	4.2
	02	137		3.6
	03	317		3.2
	04	114		5.2
	05	27		4.5
	06	72		6.4
	07	24		4.8
	08	28		5.5
	09	58		4.9
	10	68		6.6
	11	42		3.3
	12	395		4.2
Sum		1710		
Weighted Mean ^(c)				4.3
1976	01	231	rain	3.5
	02	275		2.7
	03	893		3.7
	04	157		2.7
	05	66		3.5
	06	57		2.9
	07	28		1.6
	08	2		4.1
	09	13		-
	10	132		7.6
	11	92		6.7
	12	302		4.0
Sum		2248		
Weighted Mean ^(c)				

TABLE 12 - MELBOURNE

Latitude: 37.49S Longitude: 144.58E
 Altitude: 34.7 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	21	rain	17.2
	02	7		15.5
	03	48		13.8
	04	20		16.5
	05	44		10.3
	06	29		8.3
	07	36		15.4
	08	109		17.9
	09	99		17.8
	10	150		26.7
	11	76		22.2
	12	71		16.8
Sum		710		
Weighted Mean (c)				18.7
1976	01	24	rain	21.8
	02	20		12.1
	03	33		14.1
	04	14		9.8
	05	21		11.3
	06	30		10.7
	07	17		11.2
	08	56		20.5
	09	79		23.7
	10	72		19.3
	11	96		15.6
	12	41		13.0
Sum		503		
Weighted Mean (c)				17.0

TABLE 13 - NARRABRI

Latitude: 30.20S Longitude: 149.45E
 Altitude: 212.4 m

Year	Month	Precipitation (a)	Type	TU (b)
1975	01	75	rain	10.4
	02	146		9.8
	03	110		10.0
	04	2		-
	05	0		-
	06	47		9.3
	07	34		13.4
	08	39		14.8
	09	17		14.8
	10	73		16.6
	11	57		21.0
	12	63		11.0
Sum		663		
Weighted Mean (c)				
1976	01	215	rain	6.6
	02	157		6.2
	03	30		7.0
	04	6		-
	05	25		9.6
	06	69		7.6
	07	60		6.6
	08	8		18.1
	09	31		20.1
	10	49		16.2
	11	67		18.5
	12	38		9.3
Sum		755		
Weighted Mean (c)				

TABLE 14 - PERTH

Latitude: 31.55 S

Longitude: 115.58E

Altitude: 17.1 m

Year	Month	Precipitation ^(a)	Type	TU ^(b)
1975	01	0	rain	-
	02	0		-
	03	17		9.0
	04	33		9.6
	05	67		5.9
	06	156		8.5
	07	209		8.2
	08	84		13.5
	09	59		9.3
	10	47		14.5
	11	19		7.0
	12	1		-
Sum		692		
Weighted Mean ^(c)				
1976	01	25	rain	15.3
	02	46		11.4
	03	2		7.7
	04	66		6.1
	05	72		6.7
	06	85		6.1
	07	117		6.4
	08	140		8.6
	09	58		11.6
	10	53		9.1
	11	39		6.2
	12	7		5.5
Sum		710		
Weighted Mean ^(c)				8.0

TABLE 15 - RYDE

(SYDNEY REGIONAL OFFICE*)

Latitude: 33.52 S

Longitude: 151.12 E

Altitude: 92.0 m

Year	Month	Precipitation (a)	Type	TU (b)
1975	01	39	rain	19.9
	02	137		9.2
	03	380		12.4
	04	76		6.1
	05	16		8.2
	06	356		7.8
	07	46		11.8
	08	22		16.2
	09	48		9.5
	10	109		17.4
	11	28		-
	12	36		6.4
Sum		1293		
Weighted Mean (c)				
1976	01	296	rain	5.5
	02	233		5.6
	03	297		5.1
	04	52		8.0
	05	26		4.6
	06	147		5.7
	07	154		5.3
	08	42		12.7
	09	125		13.5
	10	260		10.9
	11	124		16.1
	12	28		10.2
Sum		1784		
Weighted Mean (c)				7.8

* The precipitation figures are for Sydney Regional Office, which is situated 12 km from Ryde. No precipitation figures for Ryde are available.

TABLE 16 - TOOWOOMBA

Latitude: 27.35 S Longitude : 151.56E

Altitude: 586.6 m

Year	Month	Precipitation(a)	Type	TU(b)
1975	01	66	rain	16.2
	02	122		10.9
	03	122		8.7
	04	43		6.8
	05	9		-
	06	59		7.4
	07	64		8.8
	08	61		9.8
	09	98		9.6
	10	182		13.3
	11	110		16.0
	12	266		8.7
Sum		1202		
Weighted Mean (c)				
1976	01	225	rain	2.7
	02	228		2.8
	03	103		5.0
	04	44		6.4
	05	57		4.3
	06	42		6.5
	07	58		4.6
	08	10		13.3
	09	97		14.8
	10	54		12.6
	11	190		14.4
	12	56		12.0
Sum		1164		
Weighted Mean (c)				7.3