



AUSTRALIAN ATOMIC ENERGY COMMISSION  
RESEARCH ESTABLISHMENT  
LUCAS HEIGHTS

AAEC TRITIUM LIST NO. 4

1979-1980

by

G.E. CALF  
R.C. STOKES

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ABSTRACT

Details are given of the concentration of the environmental isotope tritium in monthly precipitation samples taken at 16 stations, situated throughout Australia, during the period 1979-1980.

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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. Previous publications included data from 1970 to 1974 [Calf et al. 1976], 1975 to 1976 [Calf et al. 1977] and 1977 to 1978 [Calf & Stokes 1979]. 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 3.19 pCi

(118 mBq) per litre of water if a half-life of 12.43 years is assumed. All results have an estimated standard deviation of 8.5 per cent 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 according to the formula

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

The figures in parenthesis represent the percentage of the total precipitation for which tritium data are available to calculate the weighted means.

#### 5. ACKNOWLEDGEMENTS

We wish to acknowledge the assistance of the Department of Science & the Environment's Bureau of Meteorology, the Water Resources Commission of NSW and the Water Resources 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.
- Calf, G.E., Smith, L.W. & Stokes, R.C. [1977] - AAEC Tritium List No. 2 1975-1976. AAEC/E414.
- Calf, G.E. & Stokes, R.C. [1979] - AAEC Tritium List No. 3 1977-1978. AAEC/E473.

TABLES 1-16  
MONTHLY TRITIUM PRECIPITATION DATA

The following reference symbols apply to all tables in this set:

- (a) Precipitation in mm.
- (b) TU = tritium unit.

TABLE 1

ADELAIDE

Station : 023054

Latitude: 34 57S

Longitude: 138 32 E

Altitude: 7.6 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	29	rain	8.7
	02	12		7.6
	03	11		8.4
	04	38		7.4
	05	54		7.1
	06	16		4.5
	07	46		6.5
	08	90		8.7
	09	101		10.7
	10	44		9.1
	11	37		10.9
	12	34		6.7
Sum		512		
Weighted Mean				8.5 (100.0%)
1980	01	3	rain	11.4
	02	0		
	03	2		
	04	48		7.9
	05	37		6.9
	06	78		7.1
	07	64		4.8
	08	17		4.9
	09	18		4.3
	10	89		9.1
	11	29		9.8
	12	30		6.8
Sum		415		
Weighted Mean				7.2 (99.5%)



TABLE 2

ALICE SPRINGS

Station : 015590

Latitude: 23 49S

Longitude: 133 54E

Altitude: 542.0 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	76	rain	7.5
	02	19		11.2
	03	44		6.4
	04	25		6.8
	05	74		6.2
	06	1		
	07	0		
	08	1		
	09	28		11.0
	10	6		
	11	28		8.8
	12	5		6.5
Sum		307		
Weighted Mean				7.6 (97.4%)
1980	01	8	rain	
	02	7		
	03	0		
	04	26		5.9
	05	39		7.8
	06	7		10.0
	07	11		8.3
	08	5		9.4
	09	0		
	10	44		9.3
	11	0		11.0
	12	22		
Sum		169		
Weighted Mean				8.1 (78.1%)

TABLE 3

BRISBANE

Station : 040223

Latitude: 27 26S

Longitude: 153 05E

Altitude: 2.1 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	167	rain	4.6
	02	64		6.6
	03	52		6.7
	04	77		5.6
	05	8		6.8
	06	62		4.1
	07	40		5.5
	08	3		5.5
	09	1		
	10	85		4.1
	11	98		6.7
	12	64		6.6
Sum		721		
Weighted Mean				5.5 (99.9%)
1980	01	158	rain	6.7
	02	87		4.0
	03	6		7.2
	04	26		3.6
	05	382		4.5
	06	19		5.4
	07	21		9.3
	08	31		8.4
	09	0		9.2
	10	107		4.3
	11	25		8.1
	12	173		5.2
Sum		1035		
Weighted Mean				5.2 (100.0%)

TABLE 4

BUNDABERG

Station : 039015

Latitude: 24 52S

Longitude: 152 21E

Altitude: 13.7 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	43	rain	5.0
	02	76		3.7
	03	118		4.8
	04	35		4.0
	05	4		
	06	26		3.6
	07	6		
	08	4		10.8
	09	4		5.6
	10	69		4.2
	11	54		7.1
	12	38		3.7
Sum		477		
Weighted Mean				4.7 (97.9%)
1980	01	216	rain	3.3
	02	242		3.2
	03	15		
	04	18		3.1
	05	38		3.5
	06	37		6.6
	07	29		5.6
	08	12		5.6
	09	0		
	10	81		4.5
	11	48		4.8
	12	107		4.2
Sum		843		
Weighted Mean				3.9 (98.2%)

TABLE 5

CAMPBELLTOWN

Station : 068081

Latitude: 34 07S

Longitude: 150 49E

Altitude: 65.0 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	20	rain	8.3
	02	10		6.8
	03	65		
	04	39		8.6
	05	66		4.8
	06	55		3.8
	07	22		9.2
	08	3		13.1
	09	23		
	10	43		12.6
	11	75		12.1
	12	4		6.6
Sum		425		
Weighted Mean				8.3 (79.3%)
1980	01	85	rain	12.0
	02	32		5.9
	03	27		6.9
	04	6		7.8
	05	116		4.1
	06	30		5.4
	07	20		3.3
	08	5		11.0
	9	0		
	10	36		12.7
	11	41		10.1
	12	49		7.9
Sum		448		
Weighted Mean				7.7 (100.0%)

TABLE 6

CHARLEVILLE

Station : 044021

Latitude: 26 25S

Longitude: 146 17E

Altitude: 303.9 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	14	rain	8.1
	02	82		7.7
	03	35		7.6
	04	18		7.0
	05	32		6.5
	06	21		5.4
	07	1		
	08	4		15.3
	09	30		11.2
	10	20		9.0
	11	9		9.3
	12	6		8.8
Sum		272		
Weighted Mean				8.0 (99.6%)
1980	01	43	rain	6.7
	02	41		6.4
	03	39		4.2
	04	8		9.9
	05	25		3.6
	06	3		
	07	44		7.7
	08	17		7.5
	09	0		
	10	124		8.5
	11	18		16.1
	12	57		6.3
Sum		419		
Weighted Mean				7.3 (99.3%)

TABLE 7

CLAREDALE

Station : 033011

Latitude: 19 35S

Longitude: 147 24E

Altitude: 9.7 m

Year	Month	Precipitation (a) *	Type	TU (b)
1979	01	204	rain	3.9
	02	450		3.4
	03	543		3.5
	04	60		2.6
	05	9		
	06	58		2.7
	07	15		4.3
	08	0		
	09	10		
	10	4		2.0
	11	2		3.4
	12	123		2.8
Sum		1478		
Weighted Mean				3.4 (98.7%)
1980	01	240	rain	2.9
	02	124		3.5
	03	230		2.3
	04	18		2.1
	05	97		2.8
	06	0		6.7
	07	3		4.1
	08	5		
	09	0		
	10	10		2.9
	11	7		2.7
	12	55		3.7
Sum		789		
Weighted Mean				2.8 (99.4%)

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

TABLE 8

DARWIN

Station : 014015

Latitude: 12 25S

Longitude: 130 52E

Altitude: 28.6 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	444	rain	6.3
	02	143		6.4
	03	228		4.2
	04	38		4.1
	05	64		3.6
	06	0		
	07	0		
	08	0		
	09	3		3.5
	10	76		4.8
	11	37		5.4
	12	164		5.5
Sum		1197		
Weighted Mean				5.5 (100.0%)
1980	01	694	rain	4.1
	02	361		4.1
	03	236		3.2
	04	39		5.4
	05	0		
	06	0		
	07	0		
	08	32		4.5
	09	0		
	10	62		5.1
	11	159		4.9
	12	262		3.3
Sum		1845		
Weighted Mean				4.0 (100.0%)

TABLE 9

HOBART

Station : 094029

Latitude: 42 53S

Longitude: 147 20E

Altitude: 55.2 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	39	rain	12.0
	02	33		6.5
	03	27		7.9
	04	24		5.3
	05	19		6.1
	06	2		
	07	12		8.6
	08	71		8.2
	09	66		15.6
	10	38		9.7
	11	18		7.7
	12	42		7.0
Sum		391		
Weighted Mean				9.4 (99.5%)
1980	01	8	rain	6.9
	02	28		7.8
	03	58		9.2
	04	27		5.8
	05	22		4.3
	06	45		5.6
	07	30		4.3
	08	37		5.0
	09	67		5.4
	10	73		10.9
	11	43		7.5
	12	27		6.0
Sum		465		
Weighted Mean				7.0 (100.0%)



TABLE 10

LONGREACH

Station : 036031

Latitude: 23 26S

Longitude: 144 16E

Altitude: 190.5 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	15	rain	7.2
	02	134		5.6
	03	62		4.8
	04	7		3.9
	05	5		33.0
	06	24		4.6
	07	0		
	08	0		
	09	8		9.0
	10	34		6.3
	11	2		15.9
	12	4		
Sum		295		
Weighted Mean				6.1 (98.6%)
1980	01	193	rain	4.7
	02	138		7.8
	03	122		5.3
	04	5		10.6
	05	22		3.9
	06	0		
	07	17		10.2
	08	7		7.4
	09	0		
	10	22		7.3
	11	16		8.4
	12	56		7.2
Sum		598		
Weighted Mean				6.2 (100.0%)

TABLE 11

MACKAY

Station : 033119

Latitude: 21 07S

Longitude: 149 13E

Altitude: 30.8 m

Year	Month	Precipitation (a)	Type	TI (b)
1979	01	587	rain	4.3
	02	776		3.6
	03	584		3.2
	04	72		2.4
	05	47		2.3
	06	146		3.7
	07	62		5.3
	08	3		5.7
	09	4		4.2
	10	49		3.8
	11	36		4.7
	12	117		2.3
Sum		2483		
Weighted Mean			3.6 (100.0%)	
1980	01	239	rain	2.4
	02	188		3.4
	03	137		3.4
	04	151		2.6
	05	130		2.6
	06	11		5.8
	07	48		3.6
	08	39		4.4
	09	0		
	10	19		3.4
	11	43		3.2
	12	178		4.3
Sum		1183		
Weighted Mean			3.2 (100.0%)	

TABLE 12

MELBOURNE

Station : 086071

Latitude: 37 49S

Longitude: 144 58E

Altitude: 34.7 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	36	rain	10.5
	02	43		9.3
	03	27		11.6
	04	45		9.4
	05	89		7.1
	06	17		8.6
	07	9		9.5
	08	64		12.5
	09	62		13.1
	10	112		14.1
	11	27		12.1
	12	12		11.2
Sum		543		
Weighted Mean				11.1 (100.0%)
1980	01	63	rain	9.2
	02	20		4.7
	03	16		10.2
	04	76		6.5
	05	63		6.2
	06	87		7.3
	07	34		6.2
	08	47		7.9
	09	27		7.6
	10	96		13.3
	11	45		16.6
	12	70		8.5
Sum		644		
Weighted Mean				8.9 (100.0%)

TABLE 13

NARRABRI

Station : 053030

Latitude: 30 20S

Longitude: 149 45E

Altitude: 212.4 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	70	rain	9.6
	02	7		
	03	69		9.7
	04	5		
	05	61		
	06	64		
	07	10		
	08	24		
	09	64		8.3
	10	31		11.5
	11	73		12.5
	12	5		
Sum		483		
Weighted Mean				10.3 (63.6%)
1980	01	60	rain	7.9
	02	67		
	03	12		
	04	3		
	05	136		
	06	20		
	07	24		
	08	14		
	09	0		
	10	50		8.5
	11	10		
	12	90		8.0
Sum		486		
Weighted Mean				8.1 (41.2%)

TABLE 14

PERTH

Station : 009021

Latitude: 31 55S

Longitude: 115 58E

Altitude: 17.1 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	0	rain	
	02	12		9.6
	03	20		5.3
	04	41		4.4
	05	68		3.9
	06	145		4.3
	07	76		5.7
	08	89		6.4
	09	37		6.5
	10	24		3.8
	11	51		5.5
	12	5		5.0
Sum		568		
Weighted Mean				5.2 (100.0%)
1980	01	0		
	02	14		11.3
	03	2		9.5
	04	77		5.0
	05	87		5.2
	06	135		5.2
	07	157		4.5
	08	108		4.2
	09	58		6.6
	10	36		4.2
	11	12		4.9
	12	14		5.6
Sum		700		
Weighted Mean				5.1 (100.0%)

RYDE

Station : 066062

Latitude: 33 52S

Longitude: 151 12E

Altitude: 92.0 m

Year	Month	Precipitation (a) *	Type	TU (b)
1979	01	115	rain	4.4
	02	18		5.9
	03	192		8.1
	04	26		10.3
	05	115		5.6
	06	171		3.7
	07	27		10.0
	08	8		18.8
	09	25		18.3
	10	47		13.2
	11	67		16.9
	12	3		6.7
Sum		814		
Weighted Mean				7.8 (100.0%)
1980	01	173	rain	4.7
	02	75		5.8
	03	66		4.1
	04	12		8.9
	05	125		3.1
	06	48		5.7
	07	44		5.4
	08	14		9.8
	09	6		8.7
	10	32		10.7
	11	60		10.7
	12	81		5.9
Sum		736		
Weighted Mean				5.7 (100.0%)

\* 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

Station : 041103

Latitude: 27 35S

Longitude: 151 56E

Altitude: 675.0 m

Year	Month	Precipitation (a)	Type	TU (b)
1979	01	128	rain	3.9
	02	86		5.7
	03	164		8.0
	04	14		7.0
	05	56		6.3
	06	92		2.8
	07	51		7.3
	08	11		11.2
	09	27		13.9
	10	110		6.6
	11	120		7.1
	12	61		6.8
Sum		920		
Weighted Mean				6.4 (100.0%)
1980	01	95	rain	7.3
	02	97		4.9
	03	39		4.7
	04	14		6.8
	05	117		3.3
	06	12		5.9
	07	67		9.0
	08	30		7.5
	09	3		8.6
	10	154		8.5
	11	55		8.7
	12	271		6.7
Sum		954		
Weighted Mean				6.7 (100.0%)



