DENDROGEOMORPHOLOGY BIBLIOGRAPHY

DENDROGEOMORPHOLOGIC SURVEY OF LANDSLIDE ACTIVITY

FISHLAKE N.F.

December 2, 1980

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update

DENDROGEOMORPHOLOGY BIBLIOGRAPHY

Dendrogeomorphology

The following references include (1) studies on the use of trees and tree communities to date recent geomorphic events and (2) studies on the effect of geomorphic processes on the development of trees and tree communities. Also included are broader studies in which tree-ring analysis is used as a tool but is not the major emphasis.

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Fishlake N.F.

REPLY TO: 2880 Geologic Services December 2, 1980

SUBJECT: Geologic Survey of Landslide Activity Adjacent to the Proposed Mt. Terrill Park Development

TO: District Ranger, Richfield R.D.

ABSTRACT: Deposits formed by landslide and periglacial (frost-churn) action surround Pony Spring and adjacent slopes. Proposed construction for water development at this location could initiate or accelerate landslide activity. Potential for landslide movement was investigated by examining tree rings from trees scattered across the slope. Annual growth patterns will show the effect of landslide disturbance for trees chosen to avoid similar patterns that result from other environmental factors. Fourteen of the twenty trees sampled displayed evidence of past landslide disturbance. It has occurred as long ago as 1915 and as recently as 1979. Landsliding disturbed one or more of these trees in every year from 1946-1979. In some years, the disturbance was fairly widespread. The potential for man-induced landsliding is extreme. Ground disturbance such as excavation and removal of woody vegetation should be avoided or restricted to minimal levels and areas being affected.

REPORT: Past levels of landslide activity was evaluated for a slope near the head of Nioche Creek. Subdivision of ~~a privately owned~~ parcel of land at the toe of the slope is proposed. Water for the subdivision would be supplied from Pony Spring on adjacent Forest land. Excavation and ground disturbance for water collection and transmission has potential for initiating or accelerating landslide movement. Field work to evaluate this potential was conducted on July 11, August 6, and August 14, 1980 by Jerry DeGraff and Alan Gallegos. Laboratory analysis of the collected data required an additional 8 man-days.

Extensive landslide and periglacial (frost-churned) deposits mantle the slopes in and near Pony Spring (Williams and Hackman, 1971). Sag ponds and hummocky terrain are clear evidence of past mass movement. Indications of obvious recent movement is absent. Figure 1 shows the location of landslide and periglacial deposits on the slope above the proposed subdivision and around Pony Spring. The slope profile is suggestive of a slope affected by mass movement processes.

Tree-ring analysis was used to determine past (0-100 years) landslide activity. The technique was applied in the commonly accepted manner (Agard, 1979, 1980; Shroder, 1980). Trees exhibiting recurved form were samples along the lower slope (Fig. 2). Many sampled trees grew on the toe or upper slope of landslide lobes. Twenty trees adjacent to and upslope from the proposed subdivision boundary were sampled (Fig. 1). This involved a 16.25 acre area. Therefore, sample density was about one tree sampled per every 0.8 acre. Many trees were sampled near the proposed water development. Cores were extracted from near the base and at breast height from each tree sampled. Site data was recorded (Appendix 1). Care was taken to ensure that environmental conditions affecting growth pattern, other than landslide movement, were unlikely to have influenced sampled trees.

Each core was dried, mounted, and sanded into a cross-section for analysis. Annual growth rings were measured using a microscope with a built-in measurement scale. The percentage of difference in upslope and downslope width for each year was calculated and graphed from these measurements (Appendix 2).

Landslide activity was detected as far back as 1915 and as recently as 1979. A 35-year period was common to all twenty trees. Fourteen trees displayed evidence of landslide movement. Figure 3 shows that landslides affected sampled trees in every year from 1946-1979. The higher the percentage of trees affected in the same year, the more widespread landslide activity was at that time. These events represent only the most significant landslide disturbance of a sampled tree. The movement had to be substantial enough to cause a major growth change pattern in both the breast height and base cores for a particular year.

The slope around Pony Spring was and continues to be modified by the mass movement process. This area could be termed a meta-stable slope. The threshold for major landslide movement can easily be exceeded. Therefore, the potential for man-induced landsliding is considered extreme. Excavation, ground disturbance, and removal of trees would likely initiate or accelerate landslide activity. These man-related actions should be avoided or restricted to minimal levels and areas being affected.

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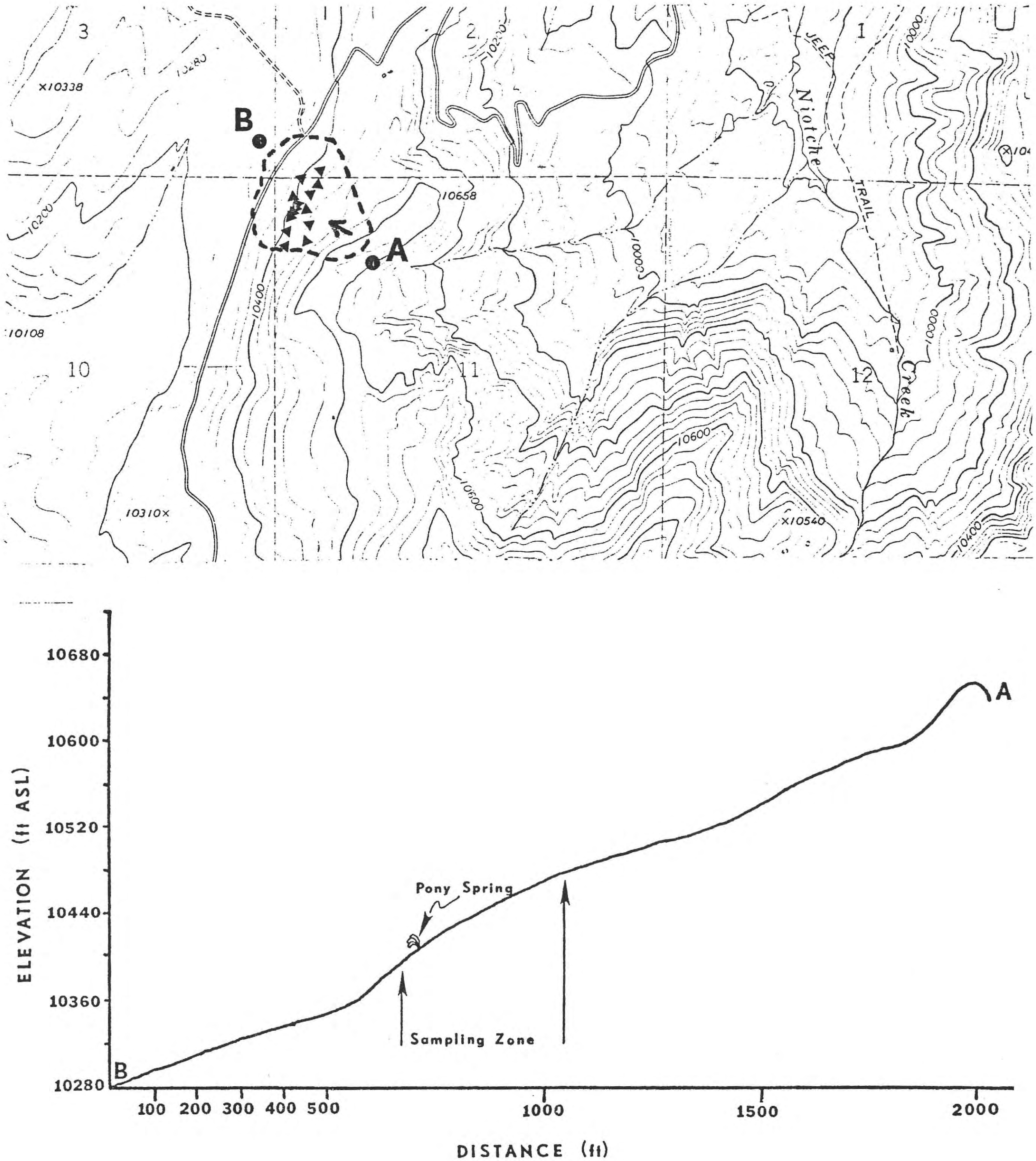


Figure 1. Part of Mt. Terrill 7.5-minute topographic map showing mass movement area (dashed line). Arrow indicates movement direction. Solid triangles show location of the fourteen trees displaying evidence of landslide disturbance. Slope profile of area (A to B) showing sampling zone near landslide toe.

Figure 2. Photographs of MT.P-6 (upper photo) and MTP-7 (lower photo). These two trees are representative of the twenty sampled for this study. Note the recurve form of the trunks.

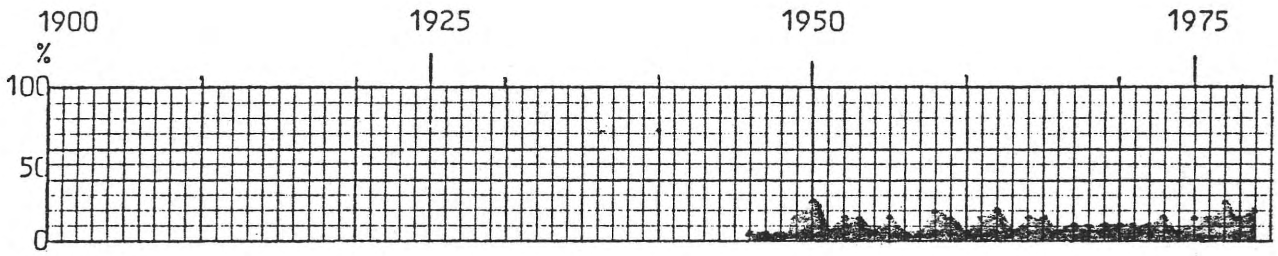


Figure 3. Graph showing landslide activity over the 35-year period common to the twenty trees sampled. Higher percentage values mean that more trees were affected by movement, i.e., landsliding was more widespread that year than another.

APPENDIX 1

Site Data for Sampled Trees

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-1 Date: 8/6/80 Collector: Alan G. + J. DeGraff

Species: Engleman Spruce Height: 30' DBH: 5.5"

Tilt: downslope Bend: simple recurve

Scarring/damage: none

Site location: On toe of slide lobe - refer to photo Stripe 35 5-18

Site description: there is boulders and fine mat. piled on upslope side, near edge of stand

Slope: 35% Orientation: N 47° W Drainage: well-drained, planar slope

Sample #:	1	2		
Sample ht:	49 cm (Base)	112 cm (BH)		
Direction:	N 69° W → thru	N 65° W → thru		
	Box 5-1	Box 5-2		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-2 Date: 8/6/80 Collector: J. D. + A. G.

Species: Englemann Spruce Height: 35' DBH: 6.9"

Tilt: downslope Bend: recurve

Scarring/damage: none

Site location: toe of Landslide lobe - refer to str. 35 #5-18

Site description: boulders + fine mat. piled on upslope side, in conifer stand

Slope: 52% Orientation: N 47° W Drainage: well-drained planar slope

Sample #:	1	2		
Sample ht:	(53cm) Base	137cm (BH)		
Direction:	N 47° W → thru	N 41° W → thru		
	Box 5-3	Box 5-4		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-3 Date: 8/6/80 Collector: J.V.D. + AJG.

Species: Englemann Spruce Height: 40' DBH: 9.1"

Tilt: downslope Bend: recurve

Scarring/damage: none

Site location: On toe of slide lobe. refer to photo 35 ~~I5~~ 18

Site description: fine grained mat.; no boulders visible on surface; in conifer stand; on slopebreak

Slope: 38% Orientation: N 37° W Drainage: well drained planer

Sample #:	1	2		
Sample ht:	46 cm (Base)	140 cm (BH)		
Direction:	N 46° W (thru)	N 52° W (thru)		
	Box 5-5	Box-5-6		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-4 Date: Aug. 6, 1980 Collector: AJG & JVD

Species: Engelemann Spruce Height: 40' DBH: 9.2"

Tilt: downslope Bend: simple recurve

Scarring/damage: scar on downslope side

Site location: on toe of slide lobe - refer photo Flt 35, S-18

Site description: fine material and boulder on upslope side; in sparse, conifer stand

Slope: 45% Orientation: N 70° W Drainage: Well-drained, planar

Sample #:	1	2		
Sample ht:	47 cm	140 cm		
Direction:	N 91 W → thru	N 97 W → thru		
	Box 5-8	Box 5-7		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-5 Date: Aug 6, 1980 Collector: AJG & JVD

Species: Englemann Spruce Height: 40' DBH: 6.1"

Tilt: downslope Bend: Simple recurve

Scarring/damage: none

Site location: on lower end of landslide lobe - refer photo FLt 35, # 5-18

Site Description: fine material and boulders on upslope side; in conifer Stand

Slope: 42 % Orientation: N 51° W Drainage: well-drained Planar slope

Sample #:	1	2		
Sample ht:	53 cm Base	130 cm (BH)		
Direction:	N 60 W → thru	N 70 W → thru		
	Box 5-10	Box 5-9		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-6 Date: Aug, 6, 1980 Collector: AJG & JVD

Species: Englemann Spruce Height: 45' DBH: 10.4"

Tilt: downslope Bend: Simple recurve

Scarring/damage: none

Site location: on middle slope of lower part of landslide lobe - Flt 35 # 5-18

Site Description: fine material accuml. on upslope side; in open meadow w/ other isolated conifers

Slope: 29 % Orientation: N 69° W Drainage: Well-drained, Convex Slope

Sample #:	1	2		
Sample ht:	85 cm (Base)	132 cm (BH)		
Direction:	N76°W → thru	N72°W → thru		
	Box 2-12	Box 5-11		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-7 Date: 8/6/80 Collector: J.V.D + A.J.G.

Species: Englemann Spruce Height: 30' DBH: 6.9"

Tilt: Bend: complex recurve

Scarring/damage: no scars

Site location: on toe of landslide lobe

Site Description: on edge of conifer stand; fine material and boulders on upslope

Slope: 45% Orientation: S80°W Drainage: well drain convex

Sample #:	1-(base dwnsl.)	2 (base acr. sl.)	3-(BH dwnsl.)	4-(BH acr.)
Sample ht:	69 cm	69 cm	149 cm	149 cm
Direction:	S81°W → thru	S14°E → thru	S74°W → thru	S12°E → thru
	Box 7-1	Box 7-2	Box 7-3	Box 7-4

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-8 Date: Aug. 6, 1980 Collector: AJG + JVD

Species: Subalpine fir Height: 30' DBH: 8.2"

Tilt: downslope Bend: simple recurve

Scarring/damage: none

Site location: on upper slope of landslide lobe;

Site Description: no soil or boulder accumulation; in meadow w/ isolated conifer stands

Slope: 29% Orientation: S 85° W Drainage: Well-drained, concave slope

Sample #:	1	2		
Sample ht:	60 cm base	149 cm (BH)		
Direction:	S70° W → thru	S 80° W → thru		
	Box 7-6	Box 7-5		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-9 Date: Aug. 6, 1980 Collector: J.V.D. + A.J.G.

Species: Engelmann Spruce Height: 35' DBH: 7"

Tilt: downslope Bend: recurve (simple)

Scarring/damage: none

Site location: on upperslope of landslide lobe

Site Description: accumulation of fine grained upslope; near edge of coniferstand

Slope: 25% Orientation: N 80°W Drainage: well-drained planar slope

Sample #:	1	2		
Sample ht:	43cm (base)	130cm (BH)		
Direction:	N44°W → thru	N36°W → thru		
	Box 7-7	Box 7-8		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-10 Date: Aug. 6, 1981 Collector: J.V.D. + A.J.G.

Species: S. Alpine Fir Height: 50' DBH: 10"

Tilt: downslope Bend: simple recurve ?

Scarring/damage: none

Site location: above toe on landslide lobe

Site Description: acc. of fine grained upslope and cobbles; in middle of conifer stand

Slope: 45% Orientation: N42°W Drainage: welldrained planar

Sample #:	1	2		
Sample ht:	56cm (Base)	129cm (BH)		
Direction:	N70°W → thru	N68°W → thru		
	Box 7-9	Box 7-10		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-11 Date: Aug. 6, 1980 Collector: J.V.D. + A.J.G.

Species: Englemann Spruce Height: 50' DBH: 12.3"

Tilt: downslope Bend: Simple recurve

Scarring/damage: ~~none~~ well-healed scar

Site location: on toe of landslide lobe - ref. F# 35, #5-18

Site description: boulder & fine-grained material accum. on upslope; isolated in opening

Slope: 41% Orientation: N 52 W Drainage: poorly drained (spring), convex slope

Sample #:	1	2		
Sample ht:	41 cm (base)	94 cm (BH)		
Direction:	N 79 W → thru	S 87 W → thru		
	Box 2-2	Box 2-3		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-12 Date: Aug. 6, 1980 Collector: J.V.D + A.J.G.

Species: Englemann Spruce Height: 55' DBH: 12.4"

Tilt: downslope Bend: simple recurve

Scarring/damage: well-healed scar

Site location: on toe of landslide lobe photo 35 #18

Site description: fine grained mat. + cobble on upslope; on edge of conifer stand

Slope: 40% Orientation: N56°W Drainage: well drained planar

Sample #:	1	2		
Sample ht:	57 cm (base)	117 cm (BH)		
Direction:	N65W → thru	N58W → thru		
	Box 2-4	Box 2-5		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-13 Date: Aug. 6, 1980 Collector: AJG & JVD

Species: Englemann Spruce Height: 30' DBH: 9.1"

Tilt: downslope Bend: Simple recurve

Scarring/damage: none

Site location: on toe of landslide lobe; ref. Flt 35, #5-18

Site description: accuml. of boulders & fine-grained material on upslope side; in conifer stand

Slope: 32% Orientation: N 50° W Drainage: well-drained, Convex slope

Sample #:	1	2		
Sample ht:	37 cm (Base)	125 cm (BH)		
Direction:	N 57° W → thru	N 50° W → thru		
	Box 2-7	Box 2-6		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP 14 Date: 8/13/80 Collector: J.V.D. + A.J.G.

Species: Subalpine Fir Height: 35 ft. DBH: 7.2 inches

Tilt: upslope Bend: simple recurve

Scarring/damage: none (mistletoe below Base sample)

Site location: Toe of landslide refer to line 35 photo 18

Site description: In middle of sparse conifer stand Fine grained + boulders on upslope side

Slope: 52% Orientation: S 46 W Drainage: well drained convex slope

Sample #:	1 - (Base)	2 - BH		
Sample ht:	65 cm	125 cm		
Direction:	S 47 W → thru	S 53 W → thru		
	Box 3-1	Box 3-2		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-15 Date: Aug. 13, 1980 Collector: AJG & JVD

Species: Subalpine fir Height: 25 ft DBH: 10.1"

Tilt: downslope Bend: simple recurve

Scarring/damage: None

Site location: on toe of landslide lobe; Ft 35, #5-18

Site description: near edge of sparse conifer stand; fine-grained material accumulated on upslope side

Slope: 55% Orientation: N. 60° W Drainage: well-drained; planar slope

Sample #:	1 (base)	2 BH		
Sample ht:	41 cm	94 cm		
Direction:	N 58 W → thru ~~Box 3-3~~	N 70 W → thru		
	Box 3-3	Box 3-4		

TREE-RING DATING---MASS MOVEMENTS

Specimen: MTP-16 Date: Aug 13, 1980 Collector: AJG & JVD

Species: Subalpine fir Height: 20' DBH: 8.2"

Tilt: downslope Bend: simple recurve

Scarring/damage: None

Site location: in middle slope of landslide lobe; Ft 35, #5-18

Site description: small accumulation of fine-grained material on upslope side; in sparse conifer stand

Slope: 37% Orientation: N 56 W Drainage: well-drained, planar slope

Sample #:	1 (base)	2 (BH)		
Sample ht:	39 cm	124 cm		
Direction:	N 55 W → thru	N 35 W → thru		
	Box 3-5	Box 3-6		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-17 Date: 8/13/80 Collector: J.U.D.+AJG.

Species: Subalpine Fir Height: 45 ft DBH: 8 inches

Tilt: upslope Bend: simple recurve

Scarring/damage: none

Site location: in conifer stand; refer to stripe 35 photo 18

Site Description: above toe of landslide lobe; fine grained + few cobbles piled on upslope side

Slope: 30% Orientation: N 80 W Drainage: well-drained convex slope

Sample #:	1 (base)	2 (BH)		
Sample ht:	36 cm	141 cm		
Direction:	N67W → thru	N57W → thru		
	Box 3-7	Box 3-8		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-18 Date: 8/13/80 Collector: J.U.D. + AJG.

Species: Englemann Spruce Height: 45' DBH: 7.7"

Tilt: upslope Bend: simple recurve

Scarring/damage: ~~none~~ scar near base

Site location: in middle of conifer stand; refer to Stripe 35, ph 18

Site Description: on toe of lobe of Landslide; fine grained material piled on upslope

Slope: 52% Orientation: N 67 W Drainage: Well-drained, concave slope

Sample #:	1 - base	2 (BH)		
Sample ht:	41 cm	106 cm		
Direction:	N23W → thru	N 47 W → thru		
	Box 3-9	Box 3-10		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: ~~East~~ MTP-19 Date: 8/13/80 Collector: JWD + AJG

Species: Engelmann Spruce Height: 30 ft DBH: 7 inches

Tilt: upslope Bend: simple recurve

Scarring/damage: near base

Site location: on edge of conifer stand; refer to Str. 35 - ph. 18

Site Description: on toe of landslide; fine grained, cobbles, + boulders on upslope

Slope: 30% Orientation: N85W Drainage: well-drained convex slope

Sample #:	1 (Base)	2 (BH)		
Sample ht:	39 cm	135 cm		
Direction:	N80W → thru	N67W → thru		
	Box 3-11	Box 3-12		

TREE-RING DATA---MASS MOVEMENTS

Specimen number: MTP-20 Date: 8/13/80 Collector: JWD + AJG.

Species: Englemann Spruce Height: 25' DBH: 7.0"

Tilt: downslope Bend: simple recurve

Scarring/damage: none

Site location: on toe of landslide lobe; Flt 35, # 5-18

Site Description: accumulation of boulders and fine-grained material on upslope side; one of scattered conifers in open meadow

Slope: Orientation: S 82° W Drainage: well-drained concave slope

Sample #:	1 (base)	2 (BH)		
Sample ht:	53 cm	90 cm		
Direction:	N85W	N 85° W		
	Box 3-13	Box 3-14		

APPENDIX 2

Tree-ring Measurements and Graphs

MTP/1/1

YEAR	UPSLOPE WIDTH mm	PATTERN	OTHER	DOWNSLOPE WIDTH mm	PATTERN	OTHER	RATIOS ANNUAL	MEAN
1980	–			–			–	
79	2.0			2.3			47	
78	1.7			2.5			40	
77	1.7			2.5			40	
76	2.0			2.7			43	
1975	2.0			3.3			38	
74	2.3			3.3			41	
73	2.5			2.5			50	
72	2.3			1.7			58	
71	2.3			1.0			70	
1970	3.0			0.5			86	
69	3.3			1.3		false ring	72	
68	3.0			1.0			75	
67	3.0		false ring	0.7			81	
66	2.3			0.7			77	
1965	3.0			0.7			81	
64	3.0			1.0			75	
63	3.0			1.0			75	
62	3.0			1.5			67	
61	2.3			1.7		false ring	58	
1960	1.7			2.7			39	
59	1.5			2.7			36	
58	1.7		false ring	3.0			36	
57	2.0			2.3			47	
56	2.0			2.5			44	
1955	1.5			3.0			33	
54	1.3			4.0			25	
53	1.5			3.5			30	
52	1.5			2.3			39	
51	1.0			2.0			33	
1950	1.0			2.5			29	
49	1.5			2.5			38	
48	1.3			2.5			34	
47	1.3			2.0			39	
46	1.5			2.5			38	
1945	1.7			2.7			39	
44	2.5			2.0			56	
43	1.5			1.7			47	
42	1.5			2.5			38	
41	2.0			3.5			36	
1940	0.7			2.0			26	

MTP 1/1

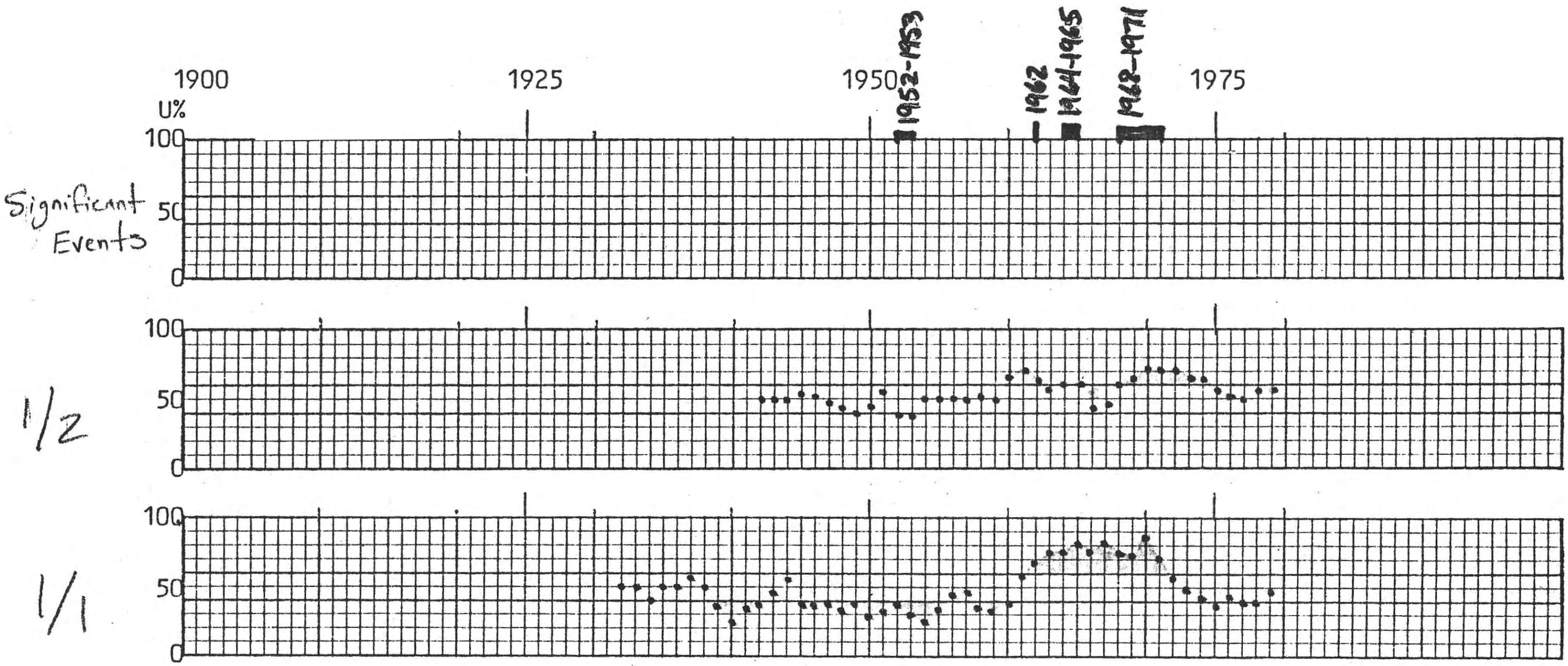
(2)

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.3			2.3			36	
38	1.0			1.0			50	
37	1.3			1.0			57	
36	1.0			1.0			50	
1935	1.0		false ring	1.0			50	
34	0.7			1.0			41	
33	0.5			0.5			50	
32	0.5			0.5			50	
31	—			—			—	
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								

MTP - 1/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.0			1.5			57	
78	2.0			1.5			57	
77	1.5			1.5			50	
76	1.7			1.5			53	
1975	2.0			1.5			57	
74	2.7			1.5			64	
73	2.7			1.5			64	
72	2.3			1.0			70	
71	2.0			1.0			70	
1970	2.5			1.0			71	
69	2.5			1.5			63	
68	2.5			1.7			60	
67	1.7			2.0			46	
66	1.0			1.3			43	
1965	2.5			1.7			60	
64	2.5			1.7			60	
63	2.0			1.5			57	
62	2.3			1.3			64	
61	3.0			1.3			70	
1960	2.5			1.3			66	
59	1.7			1.7			50	
58	1.7			1.7			50	
57	2.0			2.0			50	
56	2.0			2.0			50	
1955	2.3			2.3			50	
54	1.7			1.7			50	
53	1.7			2.7			39	
52	1.7			2.7			39	
51	2.7			1.5			64	
1950	2.0			1.7			54	
49	1.7			2.5			40	
48	1.7		Frst rng	2.3		Frst. rng	43	
47	2.0			2.3			47	
46	2.5			2.3			52	
1945	2.3			2.0			53	
44	2.0			2.0			50	
43	2.3			2.3			50	
42	1.7			1.7			50	
41	—			—			—	
1940								

MTP-1



37 year common period
9 events

p = 24%

1 ls per 4.1 years

MTP-2/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	1.0			1.0			50	
79	1.5			1.7			47	
78	1.5			2.0			43	
77	1.5			2.0			43	
76	2.0			2.0			50	
1975	2.0			2.0		rx wd	50	
74	2.7			3.0		rx wd	47	
73	2.7			3.0		rx wd	47	
72	2.3			2.3			50	
71	3.0			3.0			50	
1970	3.3			3.0			52	
69	4.0			3.7		rx wd	52	
68	3.0			3.3		rx wd	48	
67	3.0			3.3		rx wd	48	
66	3.5		False rng	3.7		false rng; rx wd	49	
1965	2.0			2.7		rx wd	43	
64	1.7			2.3		rx wd	43	
63	1.7			2.5		rx wd	40	
62	2.0			2.3			47	
61	2.0			2.3			47	
1960	1.7			2.3			43	
59	2.3			2.5			48	
58	2.5			2.5		darkened	50	
57	2.0			2.0			50	
56	2.0			2.5			44	
1955	2.0			2.5			44	
54	2.0			2.0			50	
53	2.0			2.3		darkened	47	
52	1.7			2.0			46	
51	1.0			1.3			43	
1950	1.0			2.0		darkened	33	
49	1.3			1.5			46	
48	1.3			2.0			39	
47	1.5			2.0			43	
46	1.3			1.7			43	
1945	1.0			1.3			43	
44	2.0			1.5			57	
43	1.7			1.7			50	
42	2.5			2.0			56	
41	1.7			2.0			46	
1940	1.3			1.0			57	

(2)

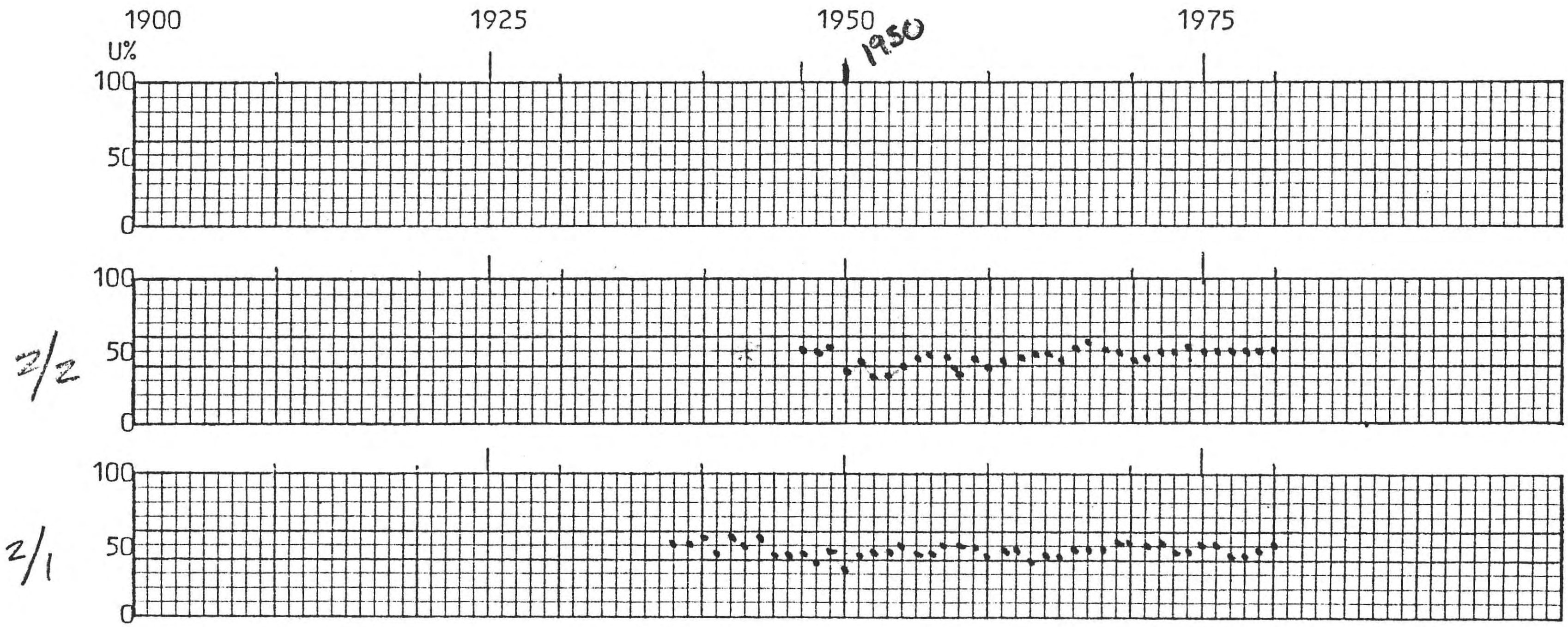
MTP-2/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
39	1.5				1.5		50	
38	2.0				2.0		50	
37								
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-2/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	1.0			1.0			50	
79	1.5			1.5			50	
78	1.7			1.7			50	
77	1.5			1.5			50	
76	2.0			2.0			50	
1975	1.7			1.7			50	
74	2.3			2.0			53	
73	2.5			2.5			50	
72	2.0			2.0			50	
71	2.0			2.5			44	
1970	2.5		rx wd	3.0			45	
69	3.3		(bracket continues)	3.5			49	
68	3.0		(bracket continues)	3.0			50	
67	4.0		(bracket continues)	3.0			57	
66	4.5		false rings	4.3	false ring		51	
1965	2.7		(bracket continues)	3.5	(bracket continues)		44	
64	2.3		(bracket continues)	2.5			48	
63	2.3		(bracket continues)	2.5			48	
62	2.3		(bracket continues)	2.7			46	
61	2.0		rx wd	2.7			43	
1960	1.7			2.5			40	
59	2.0			2.5			44	
58	2.0			3.5			36	
57	2.3			2.7			46	
56	3.0			3.3			48	
1955	2.5			3.0			45	
54	2.0			3.0			40	
53	1.5			2.7			36	
52	1.7			3.5			33	
51	1.5			2.0			43	
1950	1.5			2.3		darkened	39	
49	4.0		false ring	3.7		false ring	52	
48	1.5			1.5			50	
47	1.3			1.3			50	
46	—			—			—	
1945								
44								
43								
42								
41								
1940								

MTP- 2



32 years
1 event

p = 3%

1 ls per 32 years

MTP-3/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—				
79	2.5			1.7			60	
78	2.3			2.0			53	
77	2.3			2.0			53	
76	2.3			2.0			53	
1975	2.5			2.5			50	
74	2.7			2.7			50	
73	2.5			2.5			50	
72	2.3			2.3			50	
71	2.3			2.3			50	
1970	2.7			2.5			52	
69	3.5			3.7			49	
68	2.5			3.0			45	
67	3.0			2.7			53	
66	5.0		false ring	4.0		false ring	56	
1965	3.0			3.0			50	
64	2.5		false ring	3.0			45	
63	3.0			2.7			53	
62	3.0			2.0			60	
61	3.0			1.7		false ring	64	
1960	3.3			2.7			55	
59	2.3			3.0			43	
58	2.0			3.0			40	
57	1.7			2.0			46	
56	2.0			2.5			44	
1955	2.3			3.3			41	
54	3.0			3.5			46	
53	2.5			3.3			43	
52	1.5		false ring	2.5			38	
51	1.3			2.3			36	
1950	1.3			2.5			38	
49	2.0			2.5			44	
48	1.5			2.3			39	
47	1.3		false ring	2.5		false ring	34	
46	1.7			2.7			39	
1945	1.5		false ring	3.3			31	
44	1.5			2.7			36	
43	1.0			2.3			30	
42	1.0			2.0			33	
41	1.0			1.7			37	
1940	0.5			1.5			25	

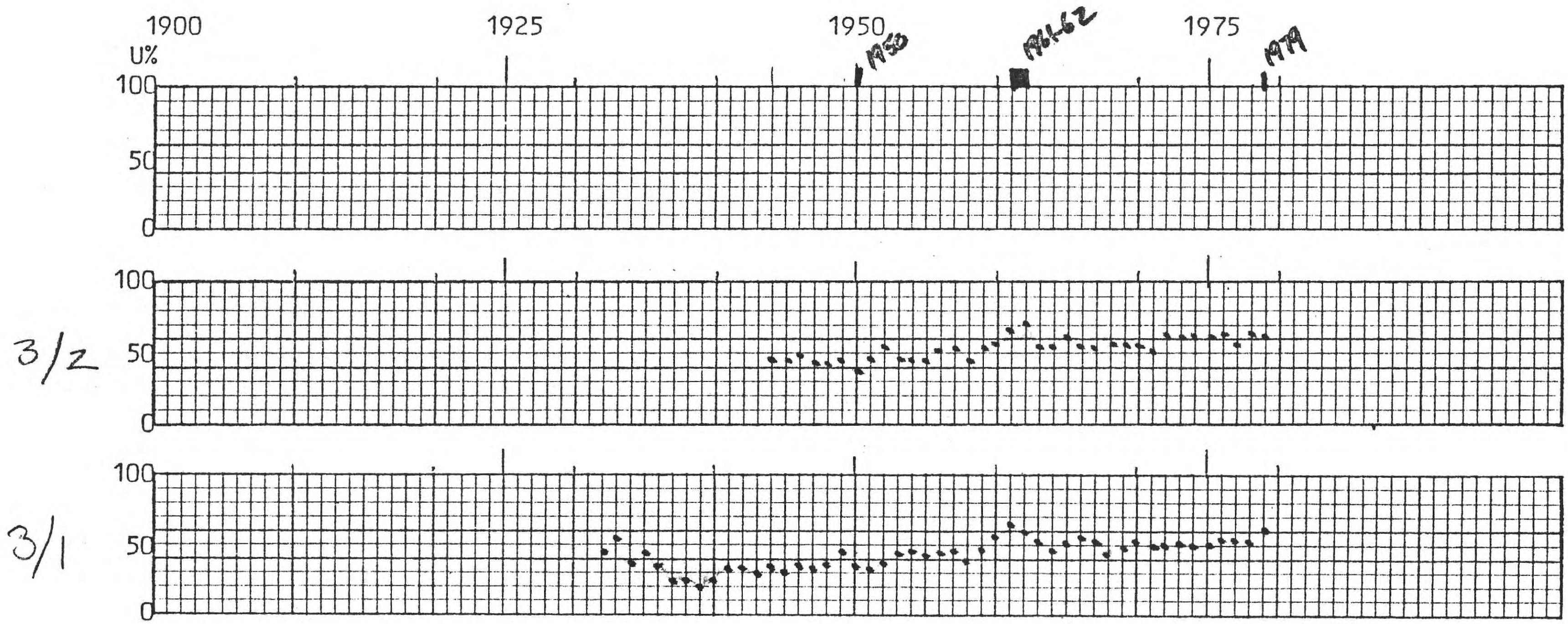
(2)
MTP-3/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
39	0.5			2,0		darkened	20	
38	0,7			2,0			26	
37	0,7			2,0			26	
36	0,7			1,3			35	
1935	1,0			1,3			43	
34	1,3			2,0			39	
33	1,7			1,5			53	
32	1,0			1,3			43	
31	—			—			—	
1930								
29								
28								
27								
26								
1925								

MTP - 3/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	2,3			1.5			61	
78	2,5			1,5			63	
77	2,3			1,7			58	
76	2,3			1,5			61	
1975	2,5			1,5			61	
74	2,7			1,7			61	
73	2,5			1,7			60	
72	2,0			1,3			61	
71	2,3			2,0			53	
1970	2,5			2,0			56	
69	3,3			2,5			57	
68	3,0			2,3			57	
67	2,7			2,5			52	
66	4,5		false ring	3,7		false ring	55	
1965	3,0			2,0			60	
64	2,5			2,0			56	
63	2,5			2,0			56	
62	3,0			1,3			70	
61	2,7			1,3			68	
1960	3,0			2,3			57	
59	2,7			2,5			52	
58	2,5			3,0			45	
57	2,3			2,0			53	
56	2,5			2,3			52	
1955	2,3			2,7			46	
54	2,5			3,0			45	
53	2,5			2,7		rx wd ?	48	
52	3,0			2,5			55	
51	2,3		rx wd	2,5			48	
1950	1,7		false ring	2,7			39	
49	2,7			3,5			44	
48	2,5			3,5			42	
47	2,3			3,0		↑	43	
46	3,3			3,5			49	
1945	2,7			3,3		rx wd	45	
44	2,0			2,5			44	
43	—		—	—			—	
42								
41								
1940								

MTP-3



35 years

4 events

$p = 11\%$

1 ls per 8.75 years

MTP-4/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	3.5			3.5			50	
78	4.5			3.7			55	
77	5.0			3.3			60	
76	5.0			3.5			59	
1975	4.5			3.3			58	
74	4.3			3.7			54	
73	3.5			4.3			45	
72	3.0			3.5			46	
71	2.5			3.0			45	
1970	2.7			4.0			40	
69	3.7			4.7			44	
68	3.3			4.0			45	
67	3.0			4.0			43	
66	4.0		false ring	2.3			63	
1965	3.0			2.7			53	
64	3.0			2.3			57	
63	3.0			2.0			60	
62	3.3			2.0			62	
61	2.5			2.0			56	
1960	2.3			1.7			58	
59	2.0			2.0			50	
58	2.0			3.7			35	
57	1.3			3.0			30	
56	1.3			1.3			50	
1955	1.5			1.3			54	
54	2.0			2.0			50	
53	2.7			3.0			47	
52	1.7			3.3			34	
51	1.0			1.7			37	
1950	1.0			1.5			40	
49	1.5			1.5			50	
48	1.3			1.7			43	
47	1.0			2.0			33	
46	1.3			1.5			46	
1945	1.5			2.0			43	
44	1.0			1.0			50	
43	1.5			1.0			60	
42	4.0		false ring	5.0		false ring	44	
41	2.5		false ring	2.5		false ring	50	
1940	1.7			1.5			53	

(2)

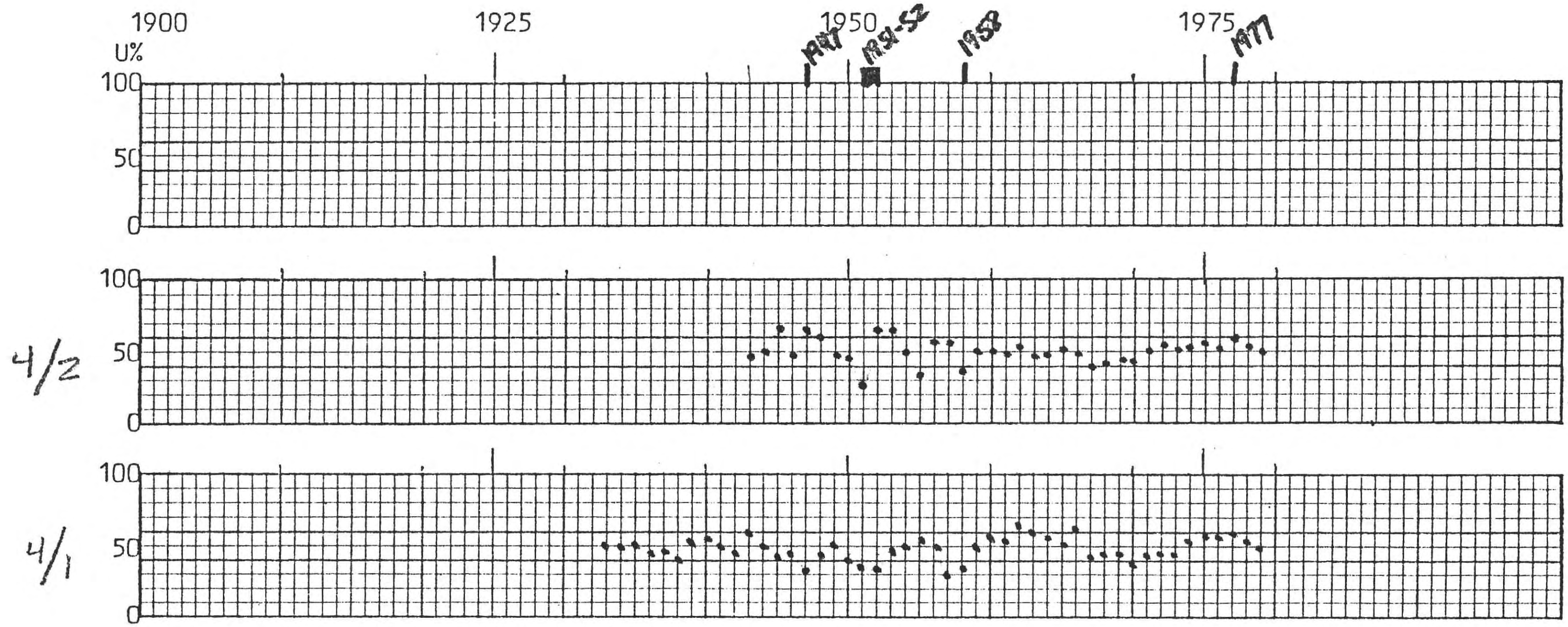
MTP-4/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	2.3		false ring	2.0		false ring	53	
38	0.7			1.0			41	
37	1.3			1.5			46	
36	1.3			1.5			46	
1935	1.0			1.0			50	
34	1.5			1.5			50	
33	0.5			0.5			50	
32	—			—			—	
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-4/2

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	3.3			3.3			50	
78	3.7			3.3			53	
77	3.3			2.3			59	
76	3.5			3.0			54	
1975	4.0			3.0			57	
74	3.5			3.0			54	
73	3.5			3.3			51	
72	3.0			2.7			53	
71	1.7			1.7			50	
1970	2.5			3.5			42	
69	3.5			4.7			43	
68	3.0			4.3			41	
67	3.0			4.5			40	
66	5.0		false ring	5.5		false ring	48	
1965	3.0			3.0			50	
64	2.5			2.7			48	
63	2.3			2.5			48	
62	2.5			2.3			52	
61	2.0			2.0			50	
1960	1.7			1.7			50	
59	1.7			1.7			50	
58	1.5			2.3		rx wd	39	
57	1.5			1.3			54	
56	2.3			1.7			58	
1955	2.5		rx wd	4.3			37	
54	3.0		rx wd	3.0		rx wd	50	
53	2.3			1.3			64	
52	2.5			1.3			66	
51	1.3			4.0			25	
1950	3.0		false ring	3.7		false ring	45	
49	4.0		false ring	4.3		false ring	48	
48	2.5		false ring	1.7		false ring	60	
47	2.5			1.3			66	
46	3.0		false ring	3.3		false ring	48	
1945	2.0			1.0			67	
44	1.3			1.3			50	
43	2.0			2.3			47	
42	—			—			—	
41								
1940								

MTP-4



36 years

5 events

$p = 14\,\%$

1 ls per 7.2 years

MTP-5/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	1.3			1.0			57	
78	1.0			0.7			59	
77	1.0			0.5			67	
76	1.3			1.3			50	
1975	1.3			1.3			50	
74	1.5			1.5			50	
73	1.5			1.5			50	
72	1.3			1.5			46	
71	1.3			1.7			43	
1970	1.5			1.7			47	
69	2.0			2.3			47	
68	1.3			1.7			43	
67	0.7			1.5			32	
66	0.5			0.5			50	
1965	0.5			1.3			28	
64	0.7			1.3			35	
63	1.0			1.0			50	
62	1.0			1.0			50	
61	0.7			1.0			41	
1960	0.7			1.3			35	
59	0.7			1.5			32	
58	1.0			2.5		rx wd	29	
57	0.7			2.3		rx wd	23	
56	0.5			1.0			33	
1955	1.0			1.0			50	
54	1.0			1.3			43	
53	0.7			1.3			35	
52	1.0			1.5			40	
51	1.0			1.3			43	
1950	1.3			1.5			46	
49	1.0			1.5			40	
48	1.0			1.5		rx wd	40	
47	1.0			1.3			43	
46	1.0			1.0			50	
1945	1.3			1.3			50	
44	0.7			1.0			41	
43	0.7			1.0			41	
42	1.0			1.7			37	
41	1.0			2.3			30	
1940	1.0			2.7		rx wd	27	

(2)

MTP-5/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	0.7			1.5		rx wd	32	
38	0.5			1.5		↑	25	
37	0.5			1.0		|	33	
36	0.5			1.3		↓	28	
1935	0.7			1.0		rx wd	41	
34	0.5			1.0			33	
33	0.5			1.3			28	
32	0.5			1.7		rx wd	23	
31	0.5			1.0			33	
1930	0.5			1.3			28	
29	0.5			1.7		rx wd	23	
28	0.5			1.3			28	
27	0.3			1.0			23	
26	0.5			1.5			25	
1925	0.5			1.3		rx wd	28	
24	0.5			1.0			33	
23	0.5			1.0		rx wd	33	
22	0.5			1.5		rx wd	25	
21	0.5			1.7		rx wd	23	
1920	0.5			1.3			28	
19	0.5			1.0			33	
18	0.5			1.0		rx wd	33	
17	0.5			0.5			50	
16	0.5			1.0		rx wd	33	
1915	0.5			1.0			33	
14	0.7			1.5			32	
13	1.3			1.5			46	
12	1.3			1.3			50	
11	1.0			1.0			50	
1910	0.5			1.3			28	
09	0.5			0.7			42	
08	0.7			1.0			42	
07	0.5			0.5			50	
06	0.3			0.5			38	
1905	0.5			0.7			42	
04	0.7			0.7			50	
03	0.5			0.7			42	
02	0.5		false ring	0.7		false ring	42	
01	1.0			1.3			43	
1900	1.5			1.3			54	
	—			—			—	

MTP - 5/2

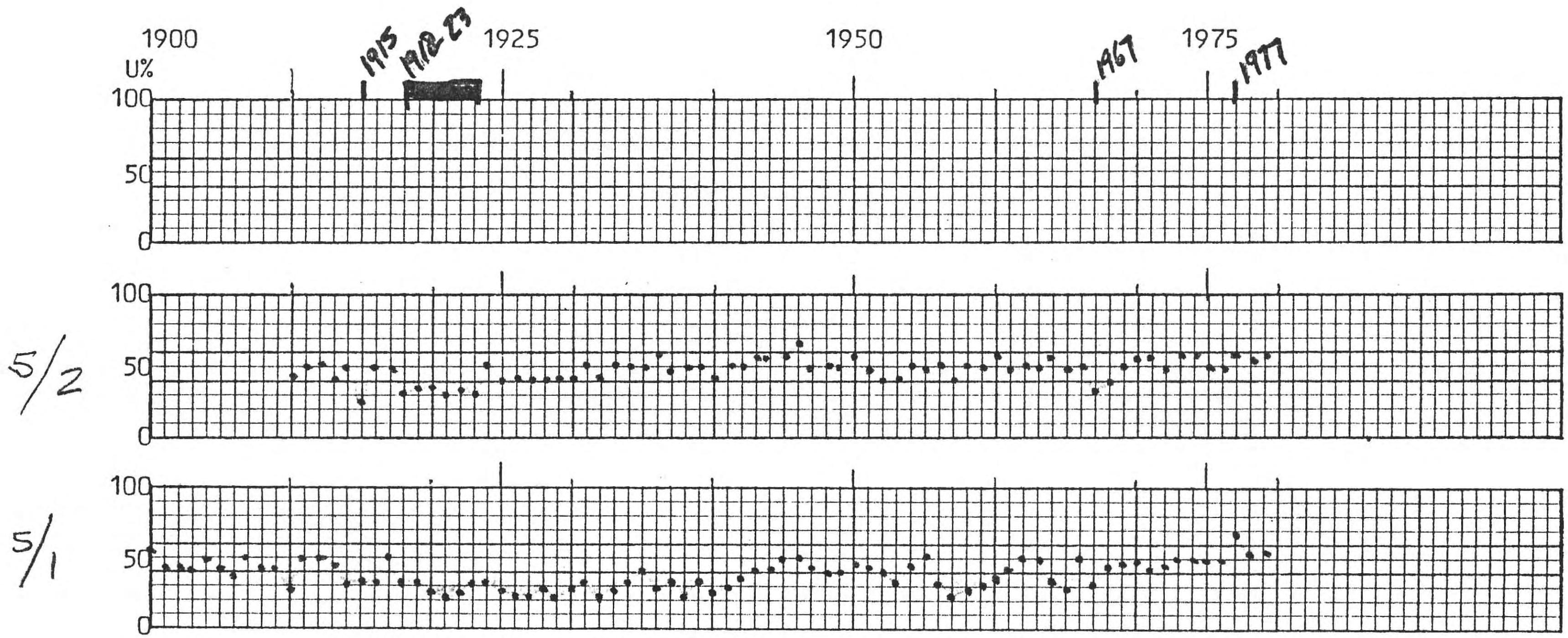
YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—				
79	1.3			1.0			57	
78	1.3			1.0			57	
77	1.0			0.7			59	
76	1.0			1.0			50	
1975	1.0			1.0			50	
74	1.3			1.0			57	
73	1.3			1.0			57	
72	1.0			1.0			50	
71	1.3			1.0			57	
1970	1.3			1.0			57	
69	1.5			1.5			50	
68	1.0			1.5			40	
67	0.7			1.3			35	
66	0.5			0.5			50	
1965	1.0			1.0			50	
64	1.0			0.7			59	
63	0.7			0.7			50	
62	0.7			0.7			50	
61	1.0			1.0			50	
1960	1.0			0.7			59	
59	0.7			0.7			50	
58	1.0			1.0			50	
57	0.7			1.0			41	
56	0.5			0.5			50	
1955	0.7			0.7			50	
54	1.0			1.0			50	
53	0.7			1.0			41	
52	0.7			1.0			41	
51	1.0			1.0			50	
1950	1.0			0.7			59	
49	1.0			1.0			50	
48	1.0			1.0			50	
47	1.0			1.0			50	
46	1.0			0.5			67	
1945	1.0			0.7			59	
44	1.0			0.7			59	
43	0.7			0.5			58	
42	1.0			1.0			50	
41	1.0			1.0			50	
1940	1.3			1.7			43	

(2)

MTP-5/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.0			1.0			50	
38	1.3			1.3			56	
37	1.0			1.0			50	
36	1.0			0.7			59	
1935	1.0			1.0			50	
34	0.7			0.7			50	
33	0.7			0.7			50	
32	1.0			1.3			43	
31	1.0			1.0			50	
1930	0.7			1.0			41	
29	0.7			1.0			41	
28	0.7			1.0			41	
27	0.7			1.0			41	
26	0.7			1.0			41	
1925	0.7			1.0		rx wd ?	41	
24	0.7			0.7			50	
23	0.5			1.0			33	
22	0.7			1.3			35	
21	0.5			1.0		rx wd	33	
1920	1.0			1.7		↑	37	
19	0.7			1.3		↕	35	
18	0.5			1.0		↓	33	
17	1.0			1.0		rx wd	50	
16	0.7			0.7			50	
1915	0.5			1.5			25	
14	1.0			1.0			50	
13	0.7			1.0			41	
12	1.0			1.0			50	
11	1.0			1.0			50	
1910	0.7			1.0			41	
09	—			—			—	
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-5



69 years

9 events

r = 13%

1 Is per 7.6 years

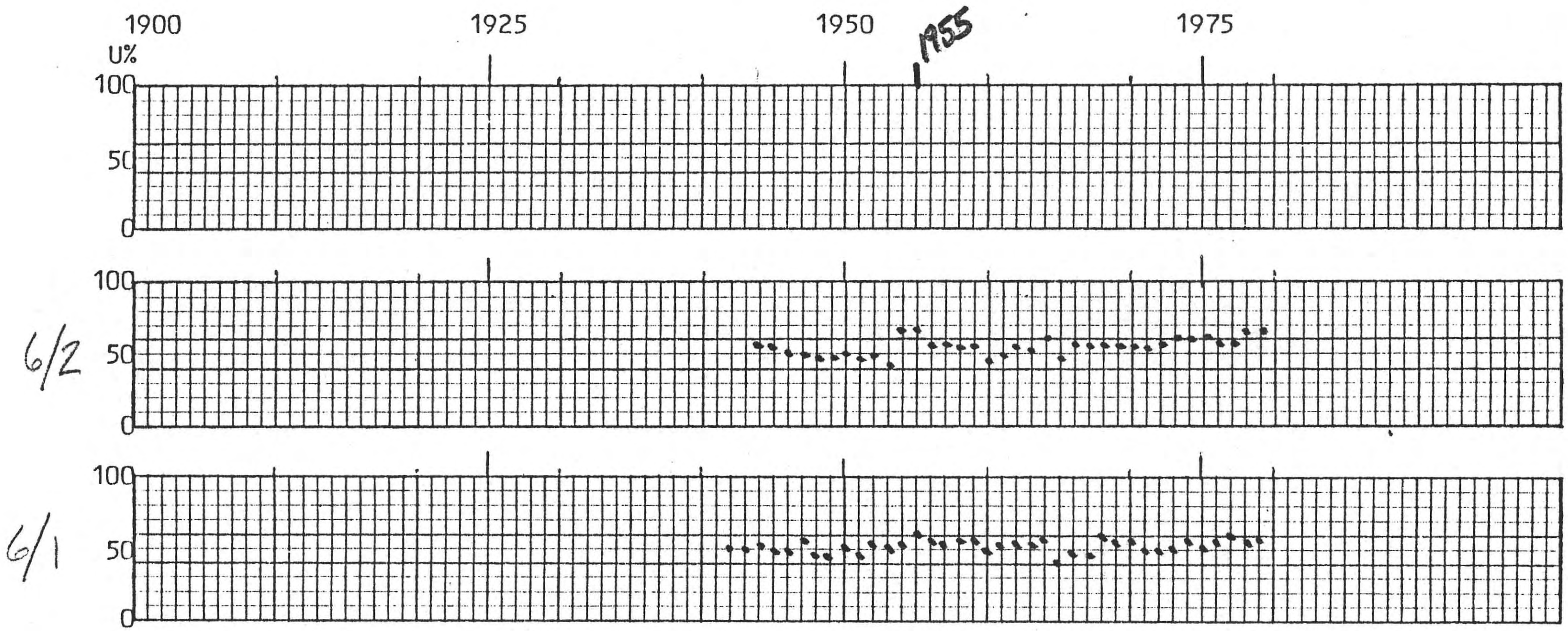
MTP - 6/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	3.3			2.3			59	
78	3.5			2.5			58	
77	3.5			2.3			60	
76	3.5			2.5			58	
1975	3.3			3.0			52	
74	3.5			2.5			58	
73	3.3			3.0			52	
72	2.3		false ring	2.3			50	
71	2.3			2.3			50	
1970	3.5			2.7			56	
69	4.5			3.5			56	
68	3.7			2.5			60	
67	2.5			2.7			48	
66	4.5		false ring	4.7		false ring	49	
1965	2.0			3.0			40	
64	3.3			2.5			57	
63	2.7			2.3			54	
62	3.0			2.5			55	
61	3.0			2.7			53	
1960	2.7			2.7			50	
59	3.3			2.5			57	
58	4.0			3.0			57	
57	3.0			2.5			55	
56	3.3			2.5			57	
1955	3.5			2.3			60	
54	3.5			3.0			54	
53	3.5			3.3			51	
52	3.5			3.0			54	
51	2.7			3.0			47	
1950	3.0			3.0			50	
49	2.7			3.0			47	
48	2.7			3.0			47	
47	3.0			2.3			57	
46	2.3			2.3			50	
1945	2.5			2.5			50	
44	2.5			2.3			52	
43	2.3			2.3			50	
42	2.5			2.5			50	
41	—			—			—	
1940								

MTP - 6/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	3.5			2.0			64	
78	3.5			2.0			64	
77	3.3			2.3			59	
76	3.3			2.3			59	
1975	3.5			2.3			60	
74	3.5			2.3			60	
73	4.5			3.0			60	
72	2.7			2.0			57	
71	3.0			2.5			55	
1970	3.7			3.0			55	
69	4.7			3.5			57	
68	3.5			2.5			58	
67	3.5			2.5			58	
66	6.3		false ring	4.7		false ring	57	
1965	2.7			3.0			47	
64	3.7			2.5			60	
63	2.7			2.5			52	
62	3.0			2.5			55	
61	3.0			3.0			50	
1960	2.7			3.0			47	
59	3.3			2.5			57	
58	4.5			3.5			56	
57	3.5			2.5			58	
56	3.5			2.5			58	
1955	3.5			1.7			67	
54	3.7			2.0			65	
53	2.7			3.7			42	
52	3.5			3.7			49	
51	2.7			3.0			47	
1950	3.5			3.5			50	
49	3.0			3.3			48	
48	2.7			3.0			47	
47	2.7			2.7			50	
46	2.5			2.3			52	
1945	3.0			2.5			55	
44	3.3			2.5			57	
43	—			—			—	
42								
41								
1940								

MTP-6



35 years

1 event

p = 3%

1 ls per 35 years

MTP - 7/1

dwslp

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	1.3			0.5			72	
78	1.3			0.3			81	
77	1.5			0.5			75	
76	1.3			0.5			72	
1975	1.5			0.5			75	
74	1.5			0.5			75	
73	2.0			0.7			74	
72	1.7			0.5			77	
71	2.0			1.0			67	
1970	3.5			1.5			70	
69	3.5			1.7			67	
68	2.3			1.3			64	
67	2.5			1.7			60	
66	1.7			1.5		YY un?	53	
1965	2.0			1.3			61	
64	2.0			1.3			61	
63	1.5			0.7			68	
62	1.5			1.0			60	
61	1.5			0.7			68	
1960	1.3			0.5			72	
59	1.5			0.7			68	
58	1.5			1.0			60	
57	1.5			0.7			68	
56	0.7			0.5			58	
1955	1.3			0.7			65	
54	1.5			1.0			60	
53	2.0			1.0			67	
52	2.0			0.7			74	
51	2.3			1.0			70	
1950	1.7			1.0			63	
49	1.7			0.7			71	
48	2.0			1.5			57	
47	2.5			2.3			52	
46	2.3			1.5			61	
1945	2.3			1.5			61	
44	2.0			1.5			57	
43	1.5			1.5			50	
42	2.0			1.7			54	
41	1.5		false ring	2.3		false ring	39	
1940	2.0			2.0			50	

MTP- 7/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.3		rx wd	1.3			50	
38	2.0		↑	1.7			54	
37	2.3			2.3			50	
36	2.3			2.0		rx wd	53	
1935	1.0		↓	1.3			43	
34	1.0		rx wd	1.0		rx wd	50	
33	2.3			2.3			50	
32	1.7			1.7			50	
31	1.5			1.5			50	
1930	—			—			—	
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP - 7/3

dwnslp

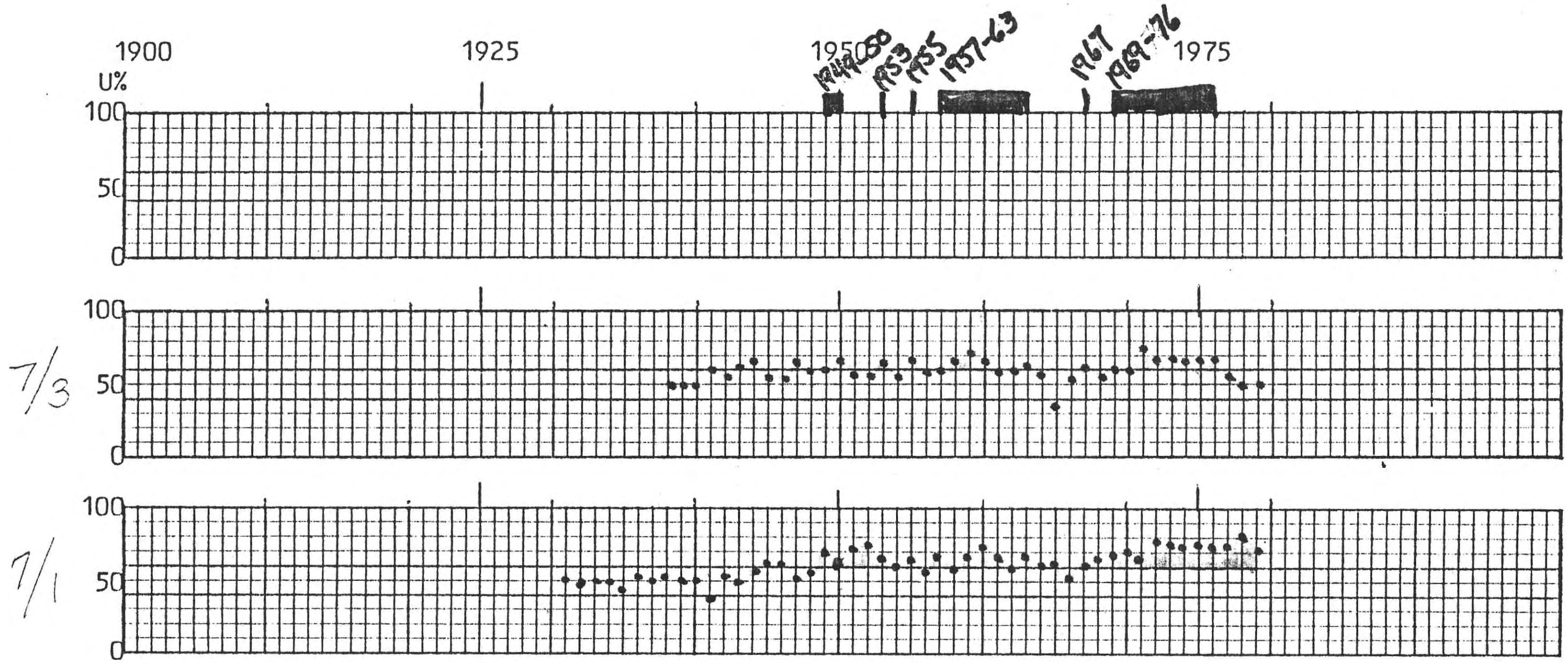
	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	0.5			0.5			50	
78	0.7			0.7			50	
77	0.7			0.5			58	
76	1.0			0.5			67	
1975	1.0			0.5			67	
74	1.3			0.7			65	
73	1.0			0.5			67	
72	2.0			1.0			67	
71	1.5			0.5			75	
1970	1.5			1.0			60	
69	3.5			2.3			60	
68	3.7			2.7			58	
67	2.5			1.7			60	
66	3.0			2.5			55	
1965	1.5			2.5			38	
64	2.3			1.7			58	
63	2.3			1.5			61	
62	1.5			1.0			60	
61	1.5			1.0			60	
1960	1.5			0.7			68	
59	1.3			0.5			72	
58	1.5			0.7			68	
57	1.5			1.0			60	
56	1.5			1.0			60	
1955	1.0			0.5			67	
54	1.3			1.0			57	
53	1.3			0.7			65	
52	1.3			1.0			57	
51	1.7			1.3			57	
1950	2.0			1.0			67	
49	1.5			1.0			60	
48	1.5			1.0			60	
47	2.0			1.0			67	
46	2.5			2.0			56	
1945	2.3			1.7			58	
44	2.0			1.0			67	
43	2.0			1.3			61	
42	1.7			1.3			57	
41	3.0			2.0			60	
1940	2.0			2.0			50	

(2)

MTP- 7/3

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	2.0			2.0			50	
38	1.3			1.3			50	
37	—			—			—	
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-7



1900
1925
1950
1975
U%
1949-50
1953
1955
1957-63
1967
1969-76
100
50
0
7/3
7/1

MTP - 7/4

Xslp

	UPSLOPE			DOWNSLOPE				
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	RATIOS ANNUAL	MEAN
1980	—			—			—	
79	0.5			1.3			28	
78	0.3			1.0			23	
77	0.3			1.0			23	
76	0.3			1.0			23	
1975	0.5			1.0			33	
74	0.5			1.0			33	
73	0.7			1.5			32	
72	0.5			1.0			33	
71	0.7			1.5			32	
1970	1.5			3.0			33	
69	2.0			2.7			43	
68	1.0			1.7			37	
67	2.3			2.5			48	
66	3.0		false ring	4.7		false ring	39	
1965	1.3			2.7			33	
64	0.7			2.0			26	
63	1.0			1.7			37	
62	0.7			1.5			32	
61	0.5			1.3			28	
1960	1.0			1.5			40	
59	1.0			1.7			37	
58	1.0			1.7			37	
57	0.5			1.0			33	
56	1.0			1.5			40	
1955	1.0			1.5			40	
54	1.0			2.0			33	
53	1.0			2.0			33	
52	0.7			1.7			29	
51	0.5			1.5			25	
1950	0.5			1.5			25	
49	1.3			1.7			43	
48	2.0			2.0			50	
47	2.0			2.0			50	
46	1.5			1.7			47	
1945	1.5			1.7			47	
44	3.0		false ring	3.5		false ring	46	
43	1.3			1.7			43	
42	1.0			2.0			33	
41	1.0			1.5			40	
1940	1.5			2.3			39	

(2)

MTP-7/4

Xslp

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.5			1.7				
38	1.3			1.5				
37	1.0			0.7				
36	1.0			1.0				
1935	2.3			2.3				
34	2.0			1.5				
33	—			—				
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP - 7/2

Xslp

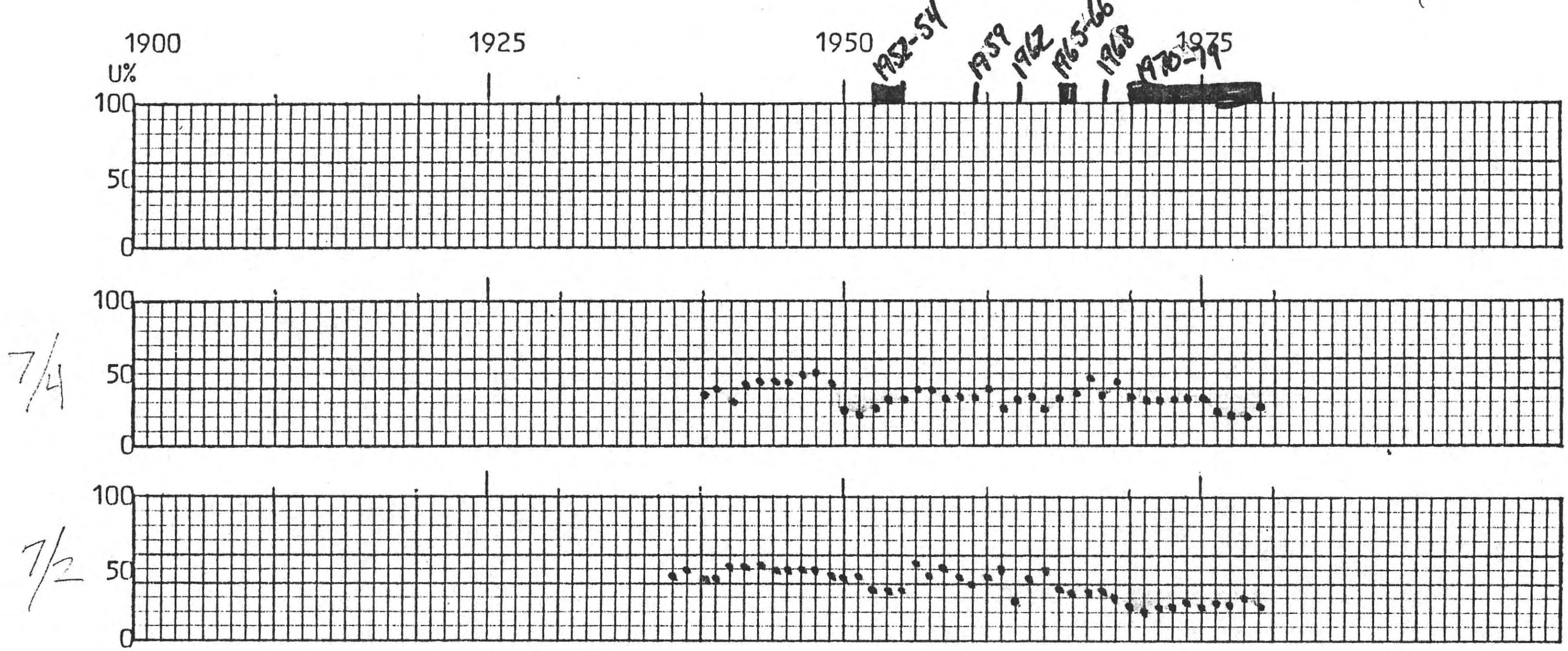
	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	0.5			1.3			28	
78	0.5			1.0			33	
77	0.5			1.3			28	
76	0.5			1.3			28	
1975	0.5			1.5			25	
74	0.5			1.3			28	
73	0.7			2.0			26	
72	0.5			1.5			25	
71	0.7			2.5			22	
1970	1.3			4.0		rx wd	25	
69	1.7			3.5		rxwd	33	
68	1.3			2.0		↕	39	
67	1.5			2.3		rx wd	39	
66	2.5		false ring	4.0		false ring	38	
1965	1.3			2.0			39	
64	1.0			1.0			50	
63	1.0			1.3			43	
62	0.5			1.3			28	
61	1.0			1.0			50	
1960	1.0			1.3			43	
59	1.0			1.5			40	
58	1.0			1.3			43	
57	0.5			0.5			50	
56	1.0			1.3			43	
1955	1.5			1.5			50	
54	1.5			2.3			39	
53	1.5			2.3			39	
52	1.5			2.3			39	
51	1.5			1.7			47	
1950	1.3			1.5			46	
49	1.5			1.7			47	
48	2.3			2.3			50	
47	2.3			2.3			50	
46	2.0			2.0			50	
1945	2.0			2.0			50	
44	1.5			1.3			54	
43	2.5			2.3			52	
42	1.7			1.5			53	
41	1.7			2.0			46	
1940	1.0			1.3			43	

(2)

MTP- 7/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	2.0			2.0			50	
38	2.0			2.3			47	
37	—			—			—	
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

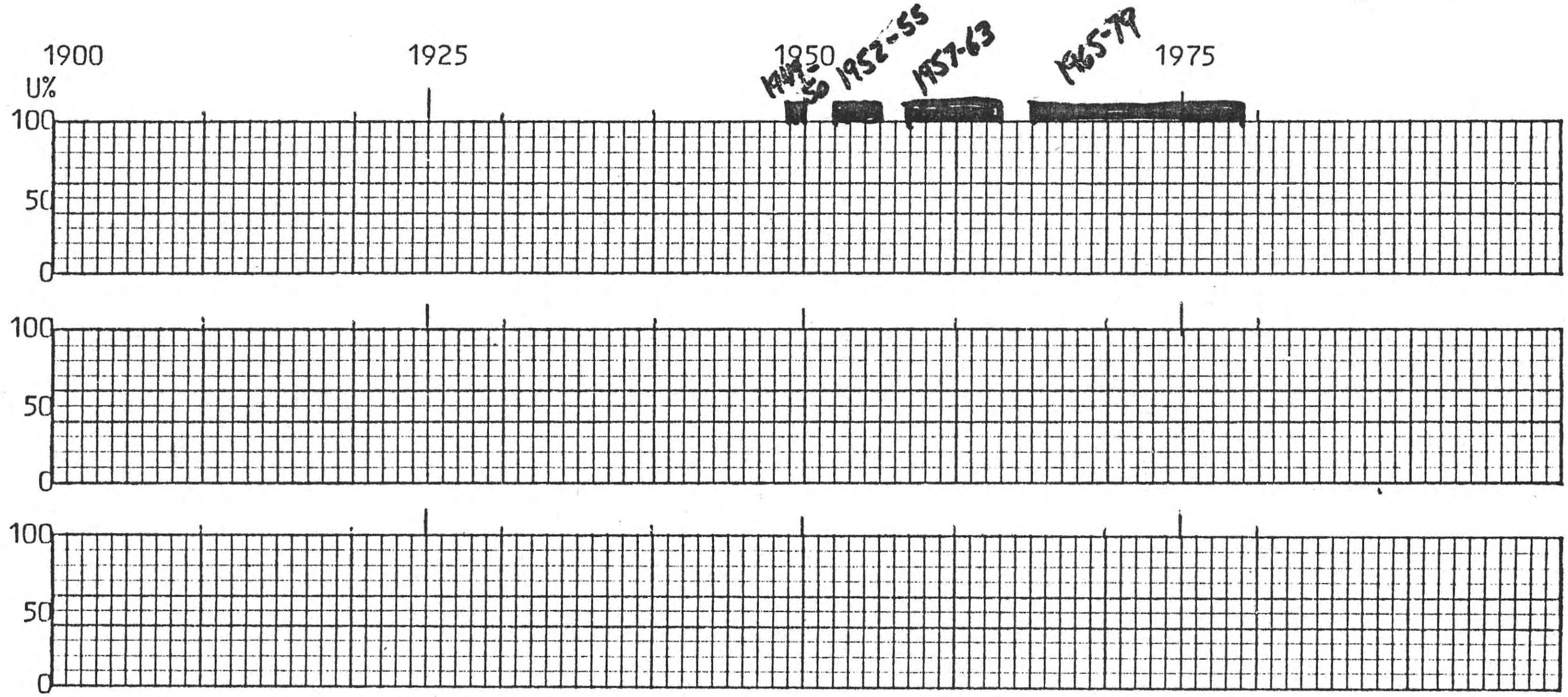
MTP-7
X5|ρ



1900
1925
1950
1975
U%
1952-54
1959
1962
1965-66
1968
1970-79
100
50
0
7/4
7/2

MTP- 7

Composite



40 years

28 events

$p = 70\%$

1 ls per 1.4 years

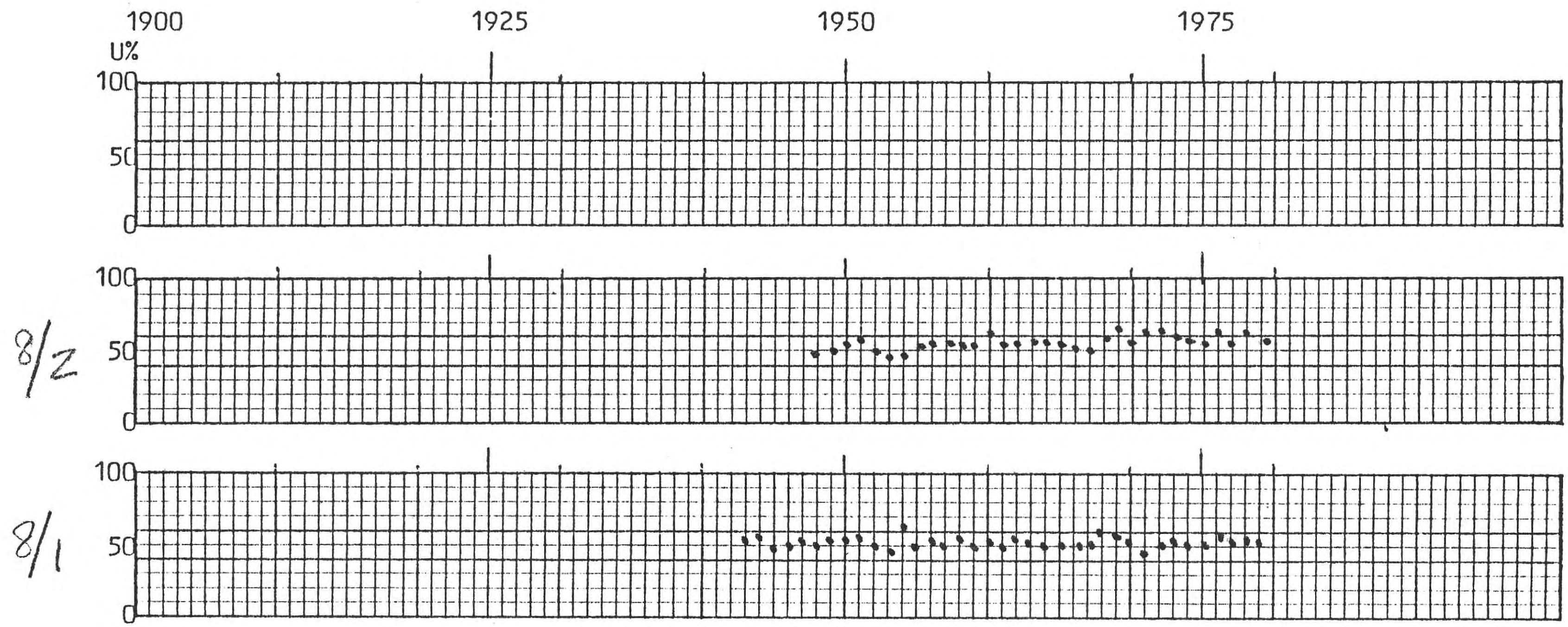
MTP- 8/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	2.5			2.0			56	
78	2.0			1.7			54	
77	3.3			2.7			55	
76	3.5			2.5			58	
1975	2.7			2.5			52	
74	3.5			3.3			51	
73	3.7			3.0			55	
72	3.0			3.0			50	
71	2.0			2.5			44	
1970	3.7			3.0			55	
69	4.7			3.5			57	
68	3.5			2.3			60	
67	2.7			2.7			50	
66	4.7		false ring	4.7		false ring	50	
1965	3.3		rx wd ↑	3.3			50	
64	3.0			3.0			50	
63	2.5			2.3			52	
62	2.7			2.3			54	
61	2.7			2.7			50	
1960	2.5		↓	2.3			52	
59	2.5		rx wd	2.5			50	
58	2.7			2.3			54	
57	1.7			1.7			50	
56	1.7			1.5			53	
1955	1.5			1.5			50	
54	2.0			1.3			61	
53	1.5			1.7			47	
52	1.5			1.5			50	
51	1.3			1.0			57	
1950	1.7			1.5			53	
49	2.0			1.5			57	
48	2.0			2.0			50	
47	1.7			1.5			53	
46	1.7			1.7			50	
1945	1.5			1.5			50	
44	1.7			1.3			57	
43	1.5			1.3			54	
42	—			—			—	
41								
1940								

MTP - 8/2

	UPSLOPE			DOWNSLOPE				
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	RATIOS ANNUAL	MEAN
1980	—			—			—	
79	2.7			2.0			57	
78	2.5			1.7			60	
77	3.3			2.5			57	
76	3.0			2.0			60	
1975	3.7			3.0			55	
74	3.5			2.5			58	
73	4.0		rx wd	2.7			60	
72	4.0			2.3			63	
71	2.5			1.5			63	
1970	4.0			3.0			57	
69	4.5			2.5			64	
68	3.5			2.5			58	
67	3.0			3.0			50	
66	5.5		false ring	5.0		false ring	52	
1965	3.7			3.0			55	
64	3.3			2.5			57	
63	3.0			2.3			57	
62	3.0			2.5			55	
61	3.0			2.5			55	
1960	2.5			1.7			60	
59	2.5			2.3			52	
58	3.0			2.7			53	
57	2.0			1.7			54	
56	2.5			2.0			56	
1955	1.7			1.5			53	
54	2.0			2.3			47	
53	2.0			2.3			47	
52	2.5			2.5			50	
51	2.3			1.7			58	
1950	2.5			2.0			56	
49	1.7			1.7			50	
48	2.3			2.5			48	
47	—			—			—	
46								
1945								
44								
43								
42								
41								
1940								

MTP-8



MTP - 9/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	2.0			1.3			61	
78	2.3			1.3			64	
77	1.7			1.0			63	
76	2.5			1.5			63	
1975	2.3			1.5			61	
74	2.0			1.7			54	
73	2.3			1.5			61	
72	1.7			1.5			53	
71	2.0			1.7			54	
1970	2.5			2.3			58	
69	3.5			3.0			54	
68	3.0			3.3			48	
67	2.0			2.5			44	
66	3.5		false ring	3.5		false ring	50	
1965	2.5			2.0			56	
64	2.0			1.5			57	
63	2.0			1.7			54	
62	2.3			2.0			53	
61	2.3			2.3			50	
1960	2.3			2.0			53	
59	2.3			2.3			50	
58	2.5			2.5			50	
57	2.3			2.0			53	
56	2.0			2.0			50	
1955	2.5			2.0			56	
54	2.7			2.3			54	
53	2.5			2.5			50	
52	2.3			2.3			50	
51	2.0			2.5			44	
1950	2.0			2.5			44	
49	1.5			1.5			50	
48	2.0			2.0			50	
47	1.7			1.7			50	
46	1.5			2.0			43	
1945	1.5			1.7			47	
44	1.5			1.3			54	
43	1.5			1.5			50	
42	1.5			1.7			47	
41	1.5			2.0			43	
1940	2.3		false ring	3.0		false ring	43	

(2)

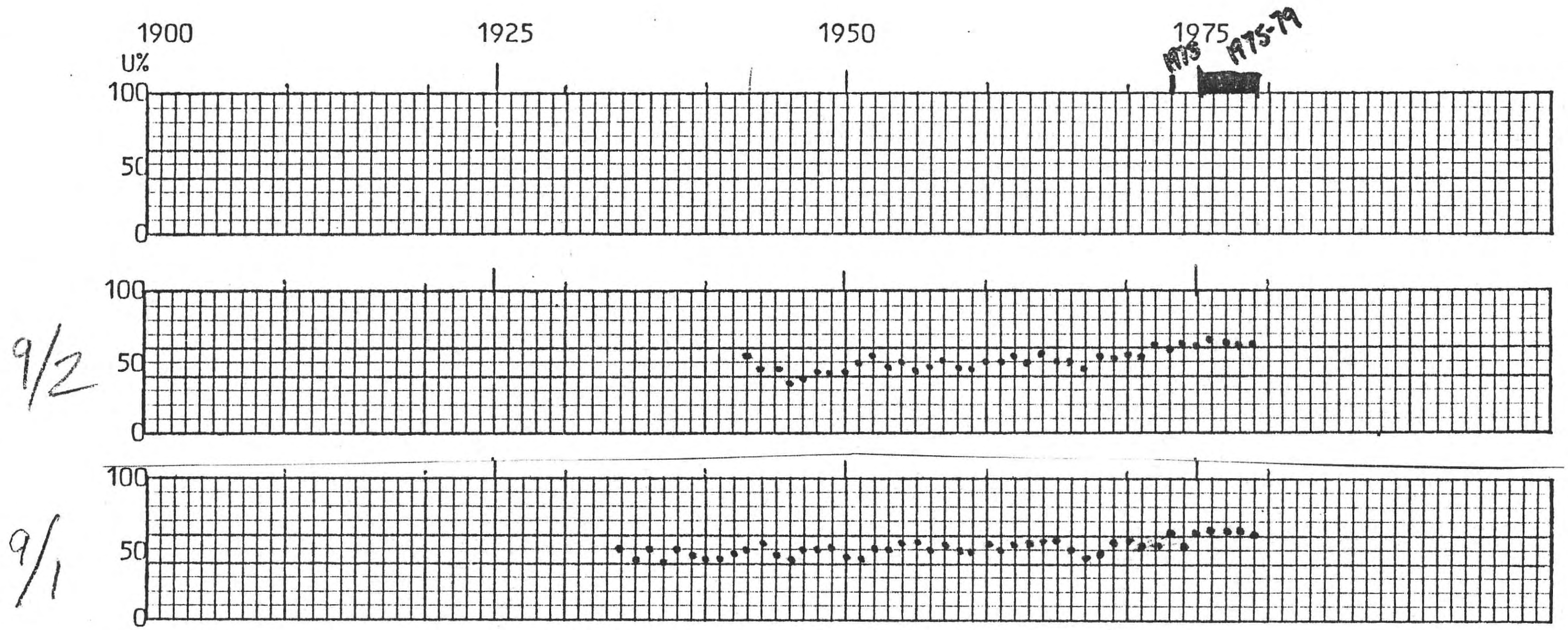
MTP- 9/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.3			1.5			46	
38	1.3			1.3			50	
37	0.7			1.0			41	
36	0.7			0.7			50	
1935	0.7			1.0			41	
34	0.5			0.5			50	
33	—			—			—	
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP - 9/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—				
79	2.0			1.3			61	
78	2.3			1.5			61	
77	1.7			1.0			63	
76	2.3			1.3			64	
1975	2.3			1.5			61	
74	2.3			1.5			61	
73	2.5			1.7			60	
72	2.0			1.3			61	
71	2.0			1.7			54	
1970	2.5			2.0			56	
69	3.3			3.0			52	
68	3.0			2.7			53	
67	2.5			3.0			45	
66	4.3		false ring	4.3		false ring	50	
1965	2.7			2.7			50	
64	2.5			2.0			56	
63	2.5			2.5			50	
62	2.0			1.7			54	
61	2.0			2.0			50	
1960	2.0			2.0			50	
59	1.7			2.0			46	
58	2.3			2.5			48	
57	2.0			2.0			50	
56	2.3			2.5			48	
1955	1.7			2.0			46	
54	2.5			2.5			50	
53	2.0			2.3			47	
52	2.5			2.0			56	
51	2.5			2.5			50	
1950	2.3			3.0			43	
49	3.7		false ring	5.0		falsering	43	
48	1.5			2.0			43	
47	2.3			3.5			40	
46	2.0			3.3			38	
1945	1.7			2.0			46	
44	1.5			1.7			47	
43	1.5			1.3			54	
42	—			—			—	
41								
1940								

MTP-9



36 years
6 events
p = 17%
1 ls per 6 years

MTP-10/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	0.5			0.7			42	
78	0.5			0.5			50	
77	0.5			0.5			50	
76	0.7			0.7			50	
1975	0.5			0.5			50	
74	0.3			0.7			30	
73	0.5			0.7			42	
72	0.5			0.5			50	
71	0.5			0.5			50	
1970	0.7			0.7			50	
69	1.0			0.7			59	
68	0.7			0.7			50	
67	0.5			0.5			50	
66	0.7			0.7			50	
1965	0.5			0.7			42	
64	0.7			0.7			50	
63	0.5			0.5			50	
62	0.5			0.5			50	
61	0.5			0.5			50	
1960	0.5			0.5			50	
59	0.5			0.5			50	
58	0.5			0.5			50	
57	0.5			0.5			50	
56	0.5			0.5			50	
1955	0.7			0.7			50	
54	0.7			0.5			58	
53	0.7			0.7			50	
52	0.5			0.5			50	
51	0.7			0.5			58	
1950	1.0			0.7			59	
49	1.0			0.7			59	
48	1.0			1.0			50	
47	1.0			1.0			50	
46	1.0			1.0			50	
1945	1.3			1.3			50	
44	1.0			1.0			50	
43	1.3			1.0			57	
42	1.0			1.3			43	
41	0.7			1.3			35	
1940	1.0			1.3			43	

(2)

MTP- 10/1

YEAR	UPSLOPE WIDTH mm	PATTERN	OTHER	DOWNSLOPE WIDTH mm	PATTERN	OTHER	RATIOS ANNUAL	MEAN
39	1.0			1.0			50	
38	1.0			1.3			43	
37	1.0			1.3			43	
36	1.0			1.3			43	
1935	1.0			1.3			43	
34	1.0			1.3			43	
33	1.3			1.3			50	
32	1.3			1.3			50	
31	1.3			1.3			50	
1930	1.5			1.5			50	
29	1.5			1.5			50	
28	1.5			1.5			50	
27	1.5			1.5			50	
26	1.7			2.0			46	
1925	1.5			2.0			43	
24	1.5			2.3			39	
23	1.3			2.0			39	
22	1.5			2.0			43	
21	1.3			1.5			46	
1920	1.5			1.5			50	
19	1.5			1.5			50	
18	2.0			2.0			50	
17	2.3			2.0			53	
16	1.7			2.0			46	
1915	1.5			2.0			43	
14	2.0			1.5			57	
13	1.5			1.7			47	
12	1.5			2.3			39	
11	1.7			2.5			40	
1910	1.5			2.5			38	
09	2.0			2.3			47	
08	2.5			2.5			50	
07	—			—			—	
06								
1905								
04								
03								
02								
01								
1900								

MTP - 10/2

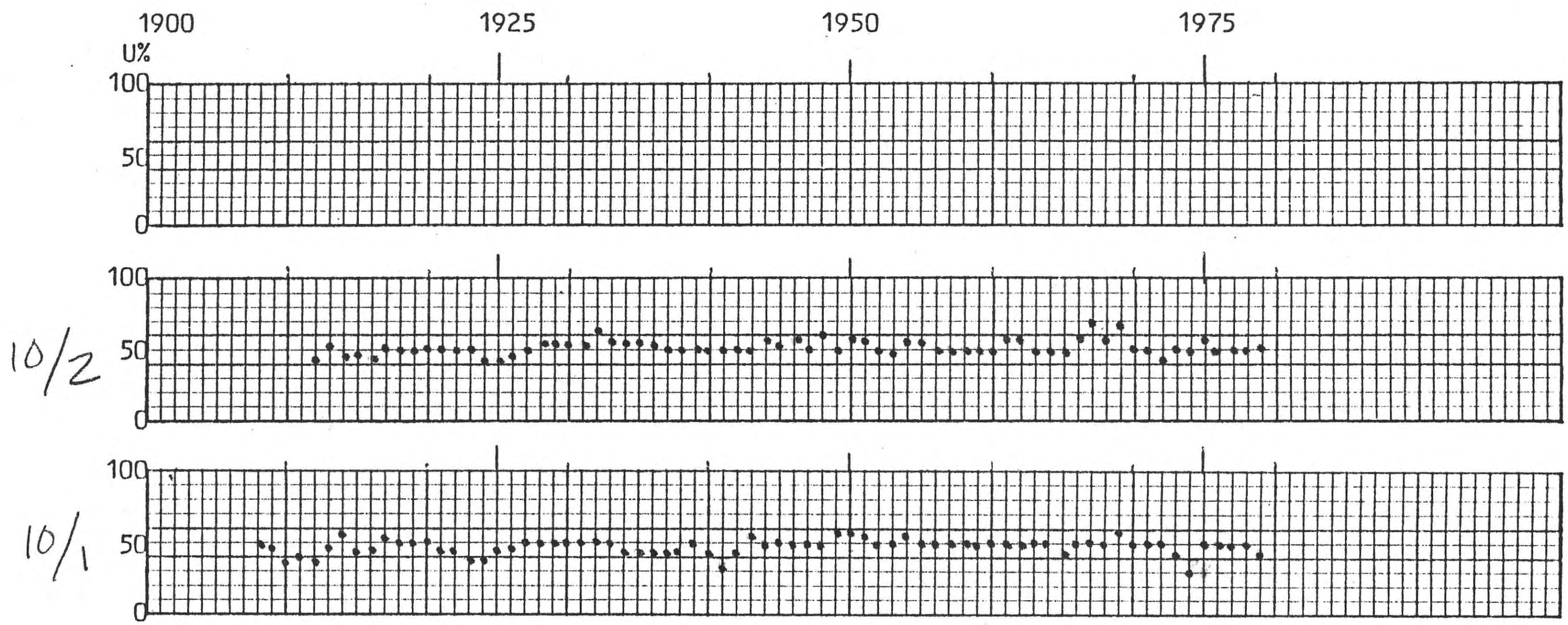
	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	0.7			0.7			50	
78	0.5			0.5			50	
77	0.5			0.5			50	
76	0.7			0.7			50	
1975	0.7			0.5			58	
74	0.7			0.7			50	
73	0.7			0.7			50	
72	0.5			0.7			42	
71	0.7			0.7			50	
1970	1.0			1.0			50	
69	1.3			0.7			65	
68	1.0			0.7			59	
67	1.0			0.5			67	
66	1.0			0.7			59	
1965	0.7			0.7			50	
64	0.7			0.7			50	
63	0.5			0.5			50	
62	0.7			0.5			58	
61	0.7			0.5			58	
1960	0.5			0.5			50	
59	0.5			0.5			50	
58	0.5			0.5			50	
57	0.5			0.5			50	
56	0.5			0.5			50	
1955	0.7			0.5			58	
54	0.7			0.5			58	
53	0.7			0.7			50	
52	0.7			0.7			50	
51	1.0			0.7			59	
1950	1.0			0.7			59	
49	1.0			1.0			50	
48	1.5			1.0			60	
47	1.3			1.3			50	
46	1.3			1.0			57	
1945	1.5			1.3			54	
44	1.3			1.0			57	
43	1.0			1.0			50	
42	1.3			1.3			50	
41	1.3			1.3			50	
1940	1.5			1.5			60	

(2)

MTP- 10/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.0			1.0			50	
38	1.3			1.3			50	
37	1.5			1.5			50	
36	1.5			1.3			54	
1935	1.7			1.3			57	
34	1.3			1.0			57	
33	1.7			1.3			57	
32	2.0			1.3			61	
31	1.5			1.3			54	
1930	2.0			1.7			54	
29	2.0			1.7			54	
28	2.0			1.7			54	
27	1.7			1.7			50	
26	1.7			2.0			46	
1925	1.5			2.0			43	
24	1.5			2.0			43	
23	1.5			1.5			50	
22	1.5			1.5			50	
21	1.3			1.3			50	
1920	1.3			1.3			50	
19	1.3			1.3			50	
18	1.7			1.7			50	
17	2.0			2.0			50	
16	1.7			2.0			46	
1915	2.3			2.5			48	
14	2.3			2.5			48	
13	2.3			2.0			53	
12	2.0			2.7			43	
11	—			—			—	
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-10



MTP - 11/1

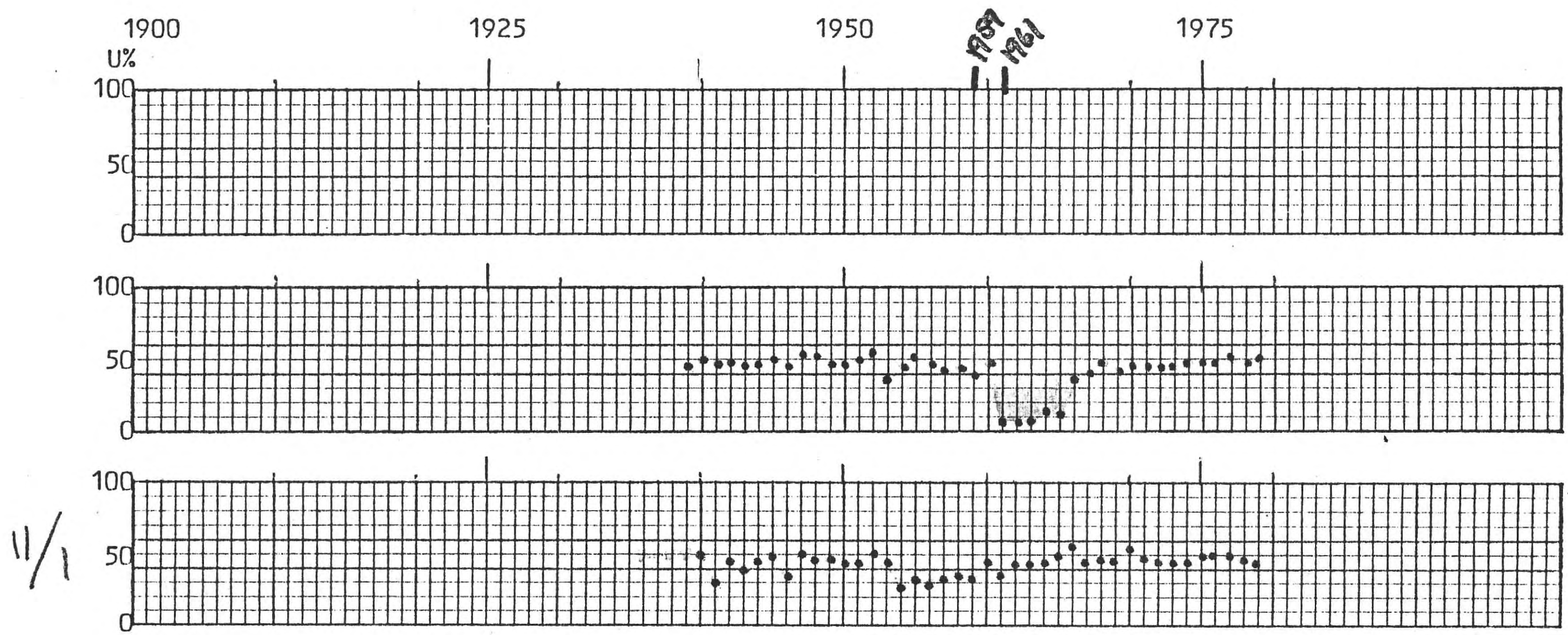
	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	3.7			4.3			46	
78	3.5			4.0			47	
77	4.5			4.5			50	
76	4.3			4.3			50	
1975	3.7			3.7			50	
74	3.5			4.3			45	
73	3.7			4.5			45	
72	3.0			3.5			46	
71	3.3			3.5			49	
1970	4.3			3.7			54	
69	4.7			5.3		rx wd	47	
68	3.5			4.0		↓	47	
67	3.5			4.3		false ring	45	
66	5.0		false ring	4.0		false ring	56	
1965	4.5			4.5		rx wd	50	
64	3.0			3.7			45	
63	2.5			3.5		↓	42	
62	2.5			3.5			42	
61	2.3			4.0			37	
1960	3.7			4.3			46	
59	2.5			4.5		rx wd	36	
58	2.3			4.0		rx wd	37	
57	1.3			2.7			33	
56	1.3		false ring	3.0			30	
1955	1.5			3.0			33	
54	1.0		false ring	2.7			27	
53	2.5			3.0		rx wd ?	45	
52	2.5			2.5			50	
51	2.0		rx wd ?	2.5			44	
1950	2.0			2.5			44	
49	2.3			2.5			48	
48	2.5			2.7			48	
47	2.3			2.3			50	
46	1.5		false ring ↓	2.7			36	
1945	2.0			2.0		↓	50	
44	1.7			2.0			46	
43	1.7			2.5			40	
42	2.0			2.5			44	
41	1.5		rx wd	3.3		rx wd	31	
1940	3.0		false ring	3.0		↓	50	

4 more ring distorted by ? branch ?

MTP- 11/2

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	3.7			3.7			50	
78	3.5			3.7			49	
77	3.5			3.5			50	
76	3.5			3.7			49	
1975	3.3			3.5			49	
74	3.3			3.5			49	
73	3.5			4.5			44	
72	2.7			3.5			44	
71	2.7			3.5			44	
1970	3.7			4.7			44	
69	3.7			5.3			41	
68	3.3			3.7			47	
67	3.0			4.5		rx wd	40	
66	3.0		false ring	5.0		false ring	38	
1965	0.5		false ring	4.0			11	
64	0.5			2.7			16	
63	0.3			3.3			8	
62	0.3		false ring	3.3			8	
61	0.3			3.7			8	
1960	3.3			3.7			47	
59	2.7			4.0		rx wd	40	
58	3.5			4.5		rx wd	44	
57	2.5			3.3			43	
56	2.7			3.0			47	
1955	2.3			2.3			50	
54	1.7			2.0			46	
53	1.5			2.5			38	
52	3.0			2.5			55	
51	2.5			2.5			50	
1950	2.7			3.0			47	
49	2.7			3.0		rx wd	47	
48	3.5			3.3			51	
47	2.7			2.5			52	
46	3.0			3.5		rx wd	46	
1945	2.5			2.5			50	
44	2.3			2.5			48	
43	2.5			3.0			45	
42	3.3			3.5			49	
41	3.0			3.3			48	
1940	6.0		false ring	6.0		false ring	50	
39	3.0			3.7			45	
38	—			—				

MTP-11



39 years
2 events

$p = 5\%$

1 ds per every 19.5 years

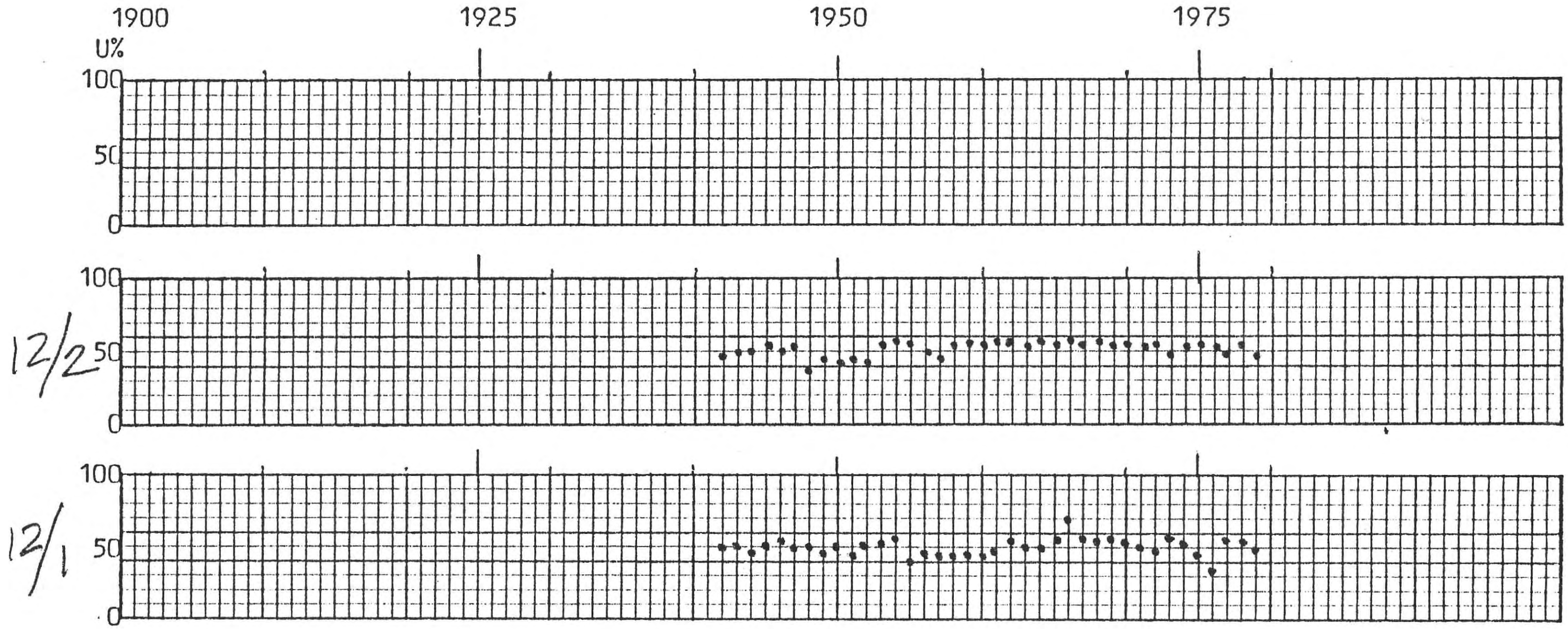
MTP- 12/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.7			2.7			50	
78	3.0			2.7			53	
77	3.0			2.7			53	
76	3.0			5.5		false ring	35	
1975	2.7			3.3			45	
74	3.5			3.3			51	
73	3.7			2.7			58	
72	3.3			3.5			49	
71	3.5			3.5			50	
1970	4.7			4.0			54	
69	4.7			3.3			59	
68	3.7			3.0			55	
67	3.7			2.7			58	
66	5.7		false ring	2.5			70	
1965	3.5			3.0			54	
64	3.5			3.5			50	
63	3.0			3.0			50	
62	3.5			3.0			54	
61	2.5			2.7			48	
1960	2.5			3.5			42	
59	2.5			3.0			45	
58	2.5			3.3			43	
57	2.5			3.5			42	
56	2.7			3.0			47	
1955	2.5			3.7			40	
54	4.0			3.0			57	
53	3.0			3.0			50	
52	3.0			3.0			50	
51	2.5			3.0			45	
1950	2.7			2.7		rx wd	50	
49	3.0			3.5			46	
48	3.3			3.3			50	
47	3.0			3.0			50	
46	3.0			2.5			55	
1945	3.0			3.0			50	
44	2.7			3.0			47	
43	3.0			3.0			50	
42	3.5			3.5			50	
41	—			—			—	
1940								

MTP - 12/2

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—				
79	2.3			2.5			48	
78	3.0			2.5			55	
77	2.5			2.5			50	
76	2.7			2.5			52	
1975	3.0			2.5			55	
74	3.3			3.0			52	
73	3.5			3.5			50	
72	3.0			2.5			55	
71	3.0			2.7			53	
1970	4.0			3.3			55	
69	4.5			3.7			55	
68	3.5			2.7			56	
67	3.5			3.0			54	
66	6.3		false ring	4.5		false ring	58	
1965	3.5			3.0			54	
64	3.7			2.7			58	
63	3.5			3.0			54	
62	4.3			3.0			59	
61	3.5			2.5			58	
1960	3.5			2.7			56	
59	3.5			3.0			54	
58	3.5			3.0			54	
57	3.3		rx wd	3.7			47	
56	3.5		↑	3.5			50	
1955	4.7			4.0		rx wd	54	
54	4.7			3.3		↑	59	
53	4.7		↓	4.0		↓	54	
52	3.3		rx wd	4.3		rx wd	43	
51	2.5			3.0			45	
1950	2.7			3.7			42	
49	3.0			3.7			45	
48	3.3			5.5			38	
47	3.3			3.0			52	
46	3.0			3.0			50	
1945	3.0			2.5			55	
44	3.3			3.3			50	
43	3.5			3.5			50	
42	3.0			3.3			48	
41	—			—			—	
1940								

MTP-12



MTP-13/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	2.5			2.5			50	
78	2.3			2.5			48	
77	2.5			2.5			50	
76	2.7			2.7			50	
1975	2.5			2.5			50	
74	2.7			3.0			47	
73	3.0			2.7			53	
72	2.5			2.5			50	
71	2.5			2.7			48	
1970	3.0			3.5			46	
69	3.5			4.0			47	
68	2.7			3.5			44	
67	3.5			3.5			50	
66	4.5		false ring	4.3		false ring	51	
1965	2.7			3.3			45	
64	2.3			2.5			48	
63	2.5			2.7			48	
62	2.5			2.5			50	
61	2.3			2.5			48	
1960	2.3			2.5			48	
59	2.5			3.0			45	
58	2.5			3.0			45	
57	2.0			2.3			47	
56	1.7			2.0			46	
1955	2.3			3.0			43	
54	1.7			2.3			43	
53	2.3			2.5			48	
52	2.5			2.7			48	
51	2.3			2.3			50	
1950	2.5			2.5			50	
49	2.0			2.7		rx wd	43	
48	2.0			2.5			44	
47	2.0			2.5			44	
46	2.0			2.3			47	
1945	2.3			2.5			48	
44	2.0			2.0			50	
43	2.0			2.3			47	
42	2.0			2.0			50	
41	2.0			2.5			44	
1940	3.0		false ring	3.5			46	

(2)

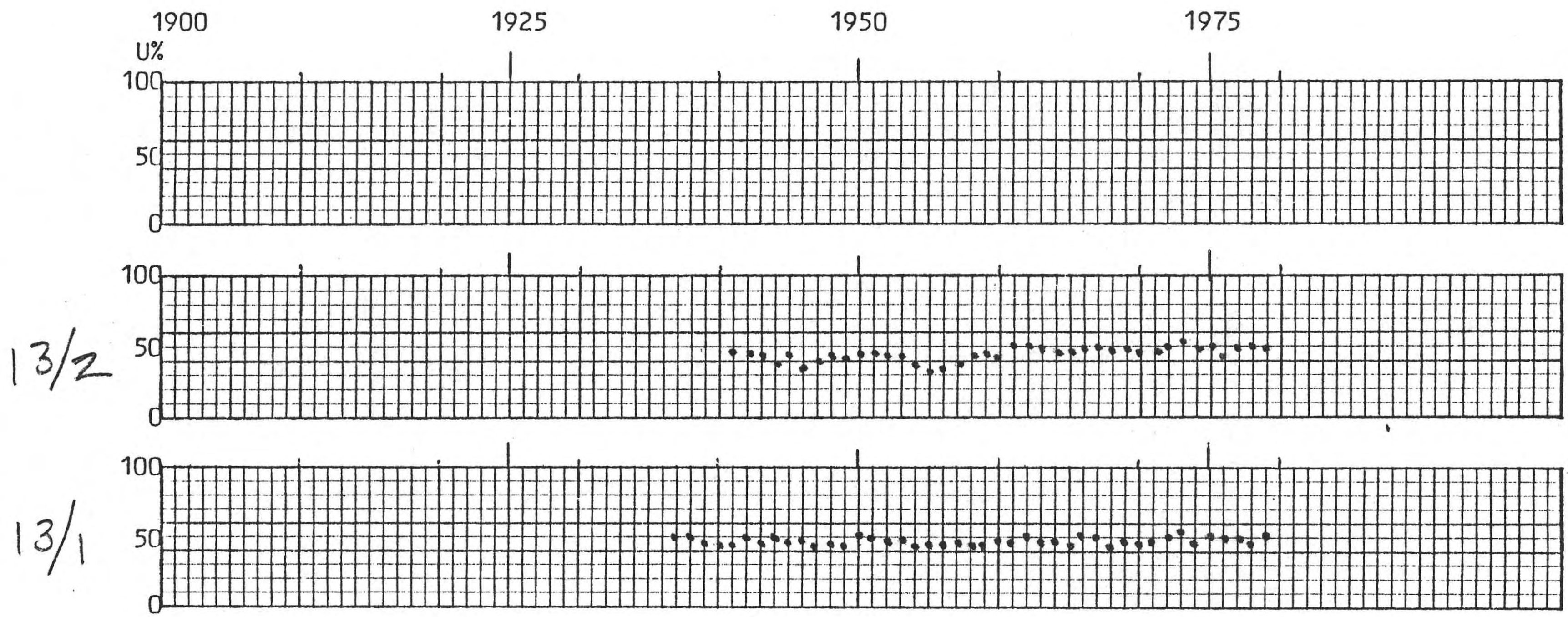
MTP- 13/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
39	1.7			2.0			46	
38	2.5			2.5			50	
37	2.0			2.0			50	
36	—			—			—	
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP- 13/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.3			2.3			50	
78	2.3			2.3			50	
77	2.3			2.3			50	
76	1.7			2.3			43	
1975	2.3			2.3			50	
74	2.5			2.5			50	
73	2.7			2.5			52	
72	2.0			2.0			50	
71	2.0			2.3			47	
1970	2.5			2.7			48	
69	3.3			3.5			49	
68	3.0			3.3			48	
67	3.0			3.0			50	
66	4.5		false ring	4.7		false ring	49	
1965	2.3			2.5			48	
64	2.0			2.3			47	
63	2.3			2.3			50	
62	2.3			2.3			50	
61	2.3			2.3			50	
1960	1.7			2.3			43	
59	2.3			2.7			46	
58	2.3			3.0			43	
57	1.7			2.7			39	
56	1.3			2.5			34	
1955	1.3			2.7			33	
54	1.5			2.5			38	
53	2.0			2.7			43	
52	2.3			2.7			46	
51	2.0			2.3			47	
1950	2.3			2.7			46	
49	2.3			3.3			41	
48	2.5			3.3			43	
47	2.0			3.0			40	
46	2.0			3.5			36	
1945	2.0			2.5			44	
44	2.0			3.0			40	
43	2.5			3.0			45	
42	2.0			2.3			47	
41	2.3			2.5			48	
1940	—			—			—	

MTP - 13



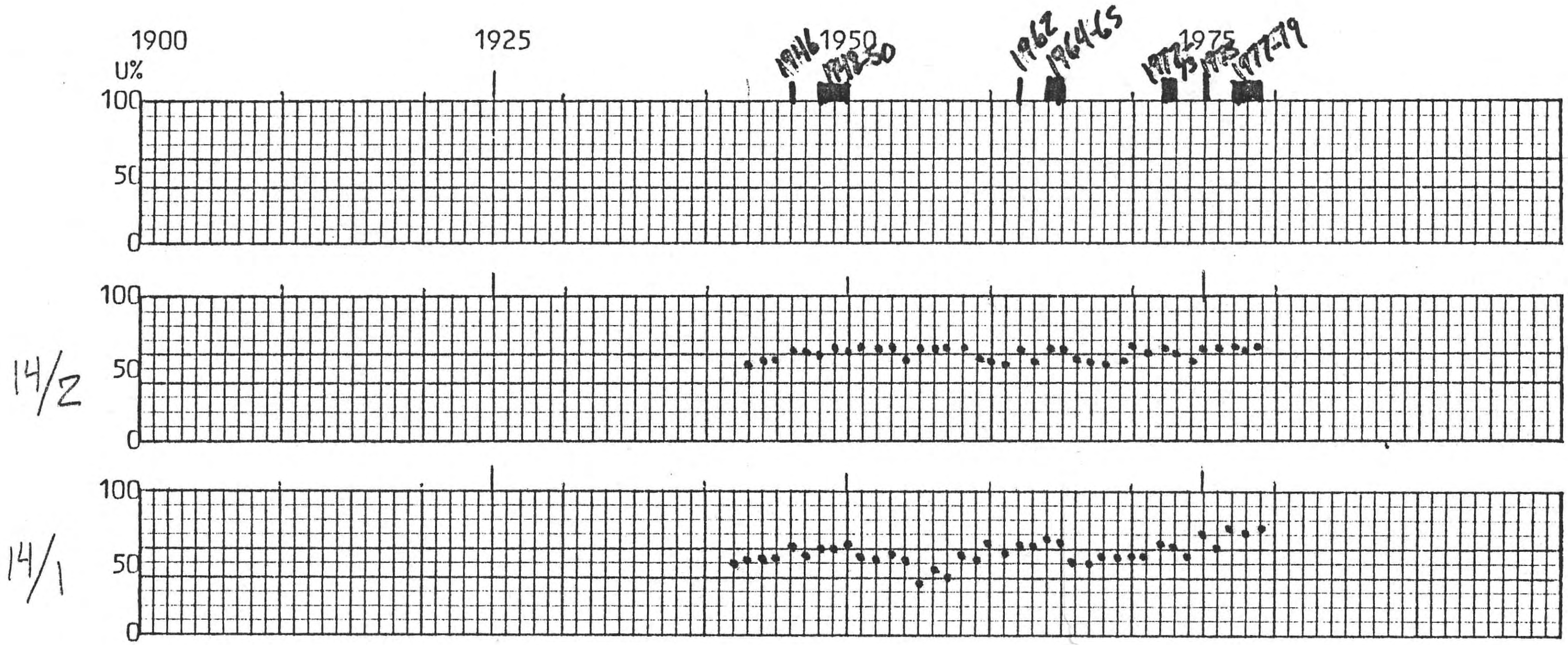
MTP-14/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	2.0			0.7			74	
78	1.7			0.7			71	
77	2.0			0.7			74	
76	1.5			1.0			60	
1975	2.3			1.0			70	
74	1.7			1.3			57	
73	2.3			1.5			61	
72	2.5			1.5			63	
71	2.0			1.5			57	
1970	3.0			2.5			55	
69	2.5			2.0			56	
68	2.0			1.7			54	
67	1.7			1.7			50	
66	3.5		false ring	3.5		false ring	50	
1965	2.3			1.3			64	
64	2.0			1.0			67	
63	2.0			1.3			61	
62	2.0			1.3			61	
61	2.3			1.7			58	
1960	2.3			1.3			64	
59	1.7			1.5			53	
58	2.3			1.7			58	
57	1.0			1.5			40	
56	1.7			2.0			46	
1955	1.3			2.0			39	
54	2.3			2.0			53	
53	2.3			1.7			58	
52	1.7			1.5			53	
51	1.5			1.3			54	
1950	2.3			1.5			61	
49	3.0			2.0			60	
48	3.0			2.0			60	
47	2.3			1.7			58	
46	2.3			1.5			61	
1945	2.0			1.7			54	
44	2.0			1.7			54	
43	1.7			1.5			53	
42	1.7			1.7			50	
41	—			—			—	
1940								

MTP-14/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.0			1.0			67	
78	1.7			1.0			63	
77	2.0			1.0			67	
76	1.7			1.0			63	
1975	2.3			1.3			64	
74	1.7			1.3			57	
73	2.0			1.3			61	
72	2.3			1.3			64	
71	2.0			1.3			61	
1970	3.0			1.5			67	
69	2.5			2.0			56	
68	2.0			1.7			54	
67	2.0			1.7			54	
66	5.3		false ring	3.7		false ring	59	
1965	2.7			1.5			64	
64	2.0			1.3			61	
63	2.0			1.5			57	
62	2.0			1.3			61	
61	1.7			1.5			53	
1960	1.7			1.3			57	
59	2.3			1.7			58	
58	3.0			1.7			64	
57	2.5		rx wd	1.3			66	
56	2.7			1.5			64	
1955	2.5			1.5			63	
54	2.3			1.7			58	
53	3.0			1.7			64	
52	2.5			1.3			66	
51	2.0			1.0			67	
1950	2.0			1.3			61	
49	2.5			1.5			63	
48	2.5			1.7			60	
47	2.3			1.5			61	
46	2.0			1.3			61	
1945	2.0			1.5			57	
44	2.0			1.5			57	
43	2.0			1.7			54	
42	—			—			—	
41								
1940								

MTP-14



36 years
13 events

$p = 36\%$

1 landslide per 2.8 years

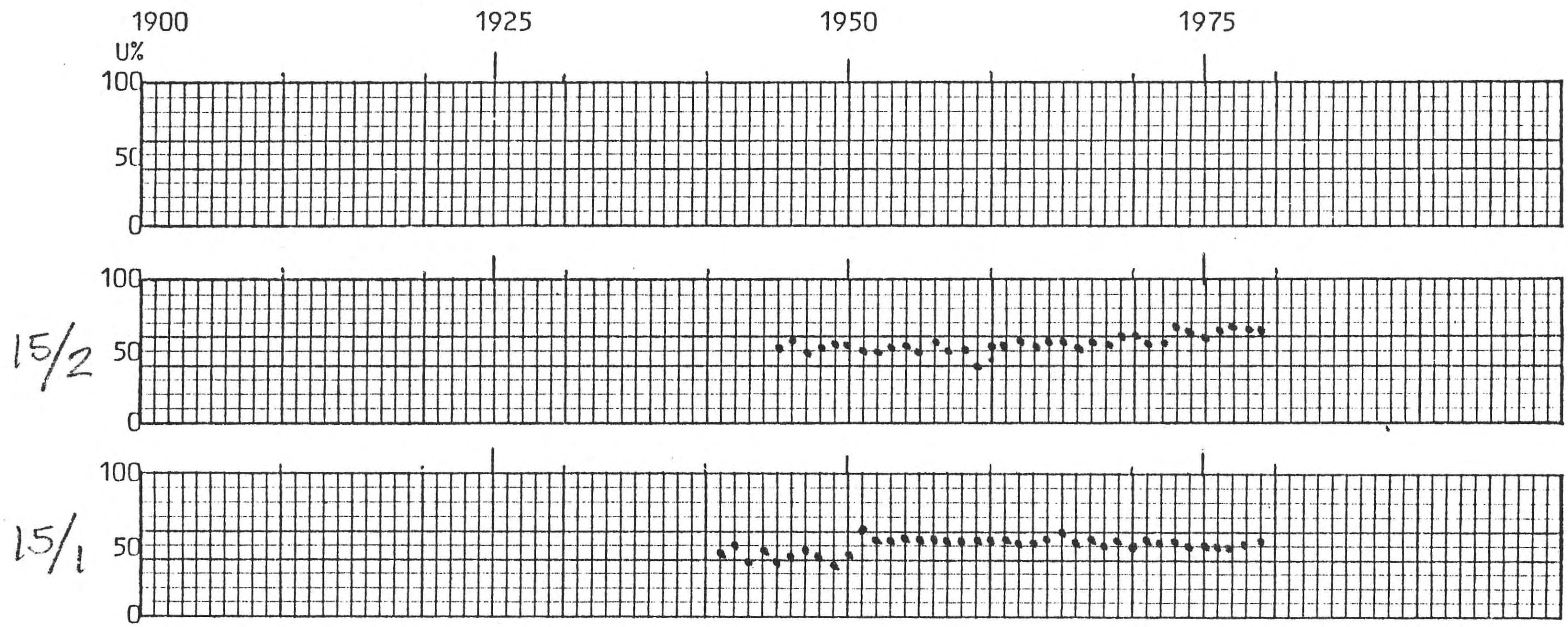
MTP - 15/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.5			2.0			56	
78	2.5			2.3			52	
77	2.5			2.5			50	
76	2.5			2.5			50	
1975	2.7			2.7			50	
74	2.5			2.5			50	
73	2.3			3.0			43	
72	2.3			3.0			43	
71	2.0			2.3			47	
1970	3.0			3.0			50	
69	3.7			3.3			53	
68	2.7			2.7			50	
67	2.7			2.0			57	
66	2.3			2.0			53	
1965	3.0			2.0			60	
64	3.3			2.5			57	
63	2.7			2.5			52	
62	2.7			2.5			52	
61	2.7			2.3			54	
1960	3.0			2.5			55	
59	3.0			2.5			55	
58	3.3			2.7			55	
57	3.5			3.0			54	
56	2.5			2.0			56	
1955	2.5			2.0			56	
54	3.3			2.5			57	
53	3.0			2.5			55	
52	3.0			2.5			55	
51	2.5			1.7			60	
1950	1.5			2.0			43	
49	1.5			2.5			38	
48	2.5			3.5			42	
47	2.0			2.3			47	
46	2.0			2.7			43	
1945	1.7			2.5			40	
44	2.0			2.3			47	
43	1.7			2.5			40	
42	1.5			1.5			50	
41	1.7			2.0			46	
1940	—			—			—	

MTP-15/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.7			1.5			64	
78	2.7			1.5			64	
77	3.5			1.7			67	
76	3.5			2.0			64	
1975	3.5			2.3			60	
74	3.5			2.0			64	
73	4.0			2.0			67	
72	3.5			2.5			58	
71	2.7			2.0			57	
1970	4.0			2.7			60	
69	4.5			3.0			60	
68	3.5			2.7			56	
67	3.5			2.5			58	
66	5.5		false ring	5.0		false ring	52	
1965	4.0			3.0			57	
64	3.5			2.5			58	
63	3.0			2.5			55	
62	3.3			2.3			59	
61	3.0			2.5			55	
1960	2.7			2.5			52	
59	1.7			2.5			40	
58	2.5			2.5			50	
57	3.0			3.0			50	
56	3.5			2.7			56	
1955	2.7			2.7			50	
54	3.5			3.0			54	
53	3.3			3.0			52	
52	3.0			3.0			50	
51	2.3			2.3			50	
1950	2.5			2.0			56	
49	3.0			2.5			55	
48	2.5			2.3			52	
47	2.5			2.5			50	
46	2.7			2.0			57	
1945	2.3			2.0			53	
44	—			—			—	
43								
42								
41								
1940								

MTP-15



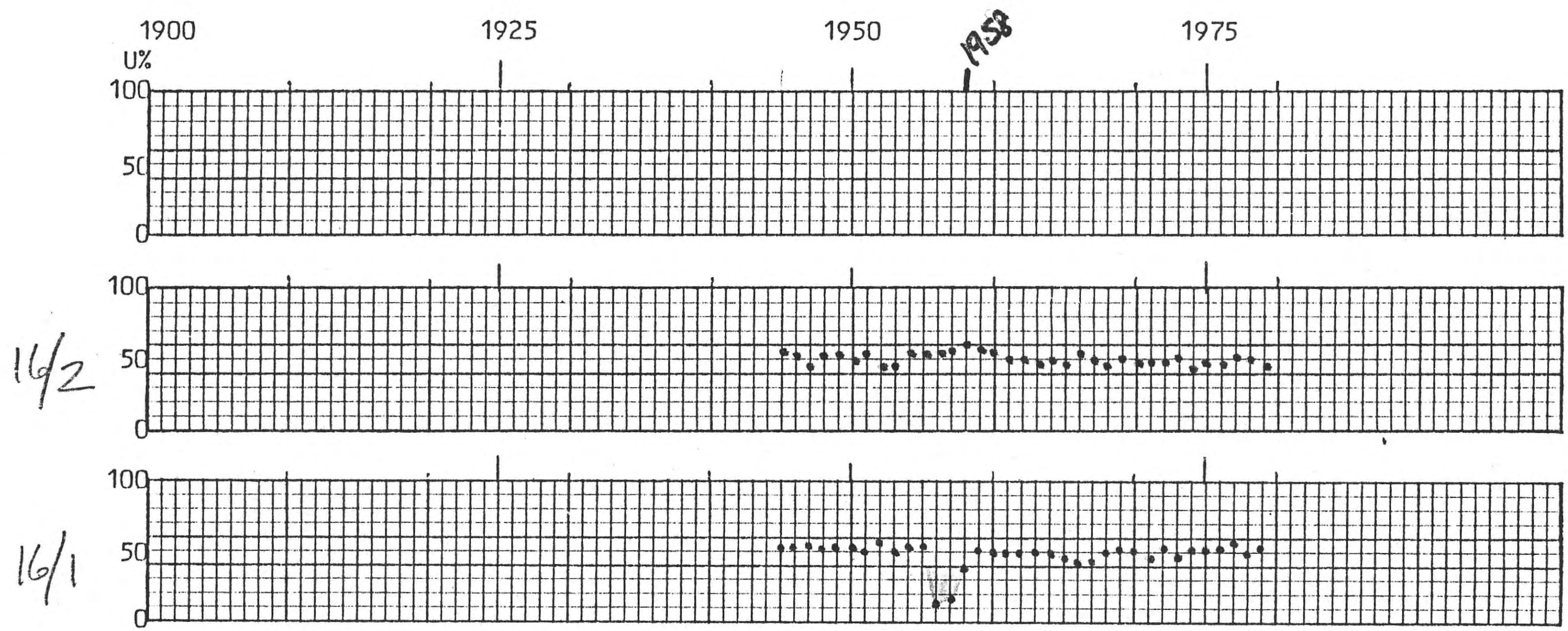
MTP-16/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	1.7			1.5			53	
78	1.5			1.5			50	
77	2.3			1.7			58	
76	2.5			2.3			52	
1975	2.5			2.3			52	
74	2.5			2.5			50	
73	2.5			2.7			48	
72	2.7			2.5			52	
71	2.3			2.5			48	
1970	3.3			3.3			50	
69	3.7			3.5			51	
68	2.5			2.5			50	
67	2.0			2.5			44	
66	2.5			3.3			43	
1965	2.5			2.7			48	
64	2.5			2.5			50	
63	2.3			2.3			50	
62	2.3			2.3			50	
61	2.3			2.3			50	
1960	2.0			2.0			50	
59	2.0			2.0			50	
58	1.5			2.3			39	
57	0.5			2.3			18	
56	0.3			2.0			13	
1955	2.3			2.0			53	
54	2.3			2.0			53	
53	2.0			2.0			50	
52	2.3			1.7			58	
51	2.0			2.0			50	
1950	1.7			1.5			53	
49	1.7			1.5			53	
48	2.5			2.3			52	
47	3.0			2.5			55	
46	2.7			2.3			54	
1945	2.5			2.3			52	
44	—			—			—	
43								
42								
41								
1940								

MTP-16/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	1.7			2.0			46	
78	1.5			1.5			50	
77	1.7			1.7			50	
76	2.0			2.3			47	
1975	2.3			2.5			48	
74	2.5			3.0			45	
73	3.0			3.0			50	
72	2.5			2.7			48	
71	2.3			2.5			48	
1970	3.0			3.3			48	
69	3.5			3.5			50	
68	3.0			3.3			48	
67	3.0			3.0			50	
66	2.7			2.5			52	
1965	2.7			3.0			47	
64	3.0			3.0			50	
63	2.7			3.0			47	
62	3.0			3.0			50	
61	2.5			2.5			50	
1960	2.5			2.0			56	
59	2.3			1.7			58	
58	3.0			2.0			60	
57	2.3			1.7			58	
56	2.5			2.0			56	
1955	2.5			2.3			52	
54	2.0			1.7			54	
53	2.0			2.3			47	
52	1.7			2.0			46	
51	2.3			2.0			53	
1950	1.7			1.7			50	
49	1.7			1.5			53	
48	2.3			2.0			53	
47	2.5			3.0			45	
46	2.3			2.0			53	
1945	2.5			2.0			56	
44	—			—			—	
43								
42								
41								
1940								

MTP-16



34 years
1 event

p = 3 %

1 ls per every 34 years

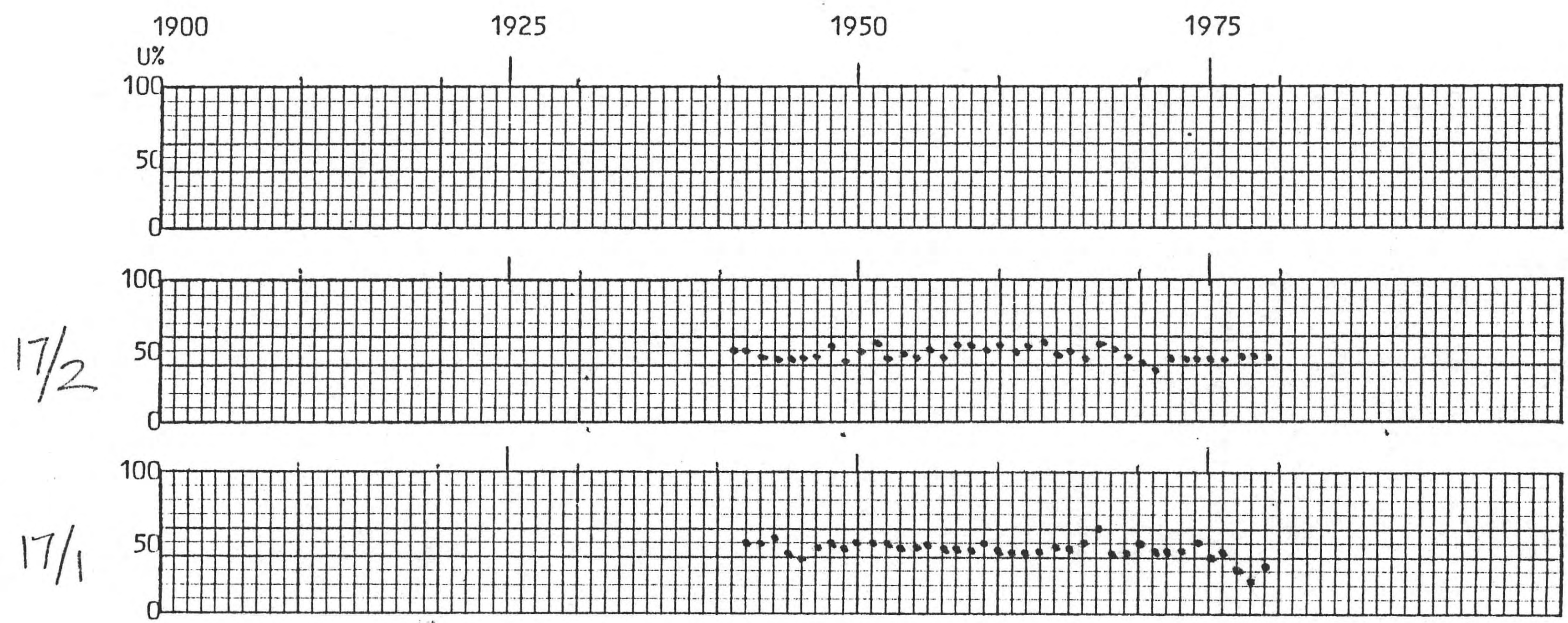
MTP - 17/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	1.0			2.0			33	
78	0.7			2.0			26	
77	1.3			2.3			36	
76	2.0			2.5			44	
1975	1.7			2.5			40	
74	2.0			2.0			50	
73	2.0			2.7			43	
72	2.0			2.5			44	
71	1.7			2.3			43	
1970	2.7			2.7			50	
69	3.7			3.3			53	
68	2.7			2.5			52	
67	3.0			2.0			60	
66	5.5		False ring	5.5		False ring	50	
1965	2.7			3.0			47	
64	2.5			2.7			48	
63	1.7			2.3			43	
62	1.7			2.3			43	
61	2.0			2.5			44	
1960	2.0			2.5			44	
59	2.5			2.5			50	
58	2.5			3.0			45	
57	2.0			2.3			47	
56	2.0			2.3			47	
1955	2.5			2.5			50	
54	2.3			2.5			48	
53	2.0			2.3			47	
52	2.0			2.0			50	
51	1.5			1.5			50	
1950	1.7			1.7			50	
49	3.0			3.3			48	
48	2.5			2.5			50	
47	2.0			2.3			47	
46	2.0			3.0			40	
1945	2.0			2.5			44	
44	2.0			1.8			53	
43	1.5			1.5			50	
42	1.5			1.5			50	
41	—			—			—	
1940								

MTP - 17/2

	UPSLOPE			DOWNSLOPE				
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	RATIOS ANNUAL	MEAN
1980	—			—			—	
79	1.3			1.5			46	
78	1.3			1.5			46	
77	1.5			1.7			47	
76	1.5			2.0			43	
1975	2.0			2.5			44	
74	2.0			2.5			44	
73	2.3			2.7			46	
72	1.7			2.3			43	
71	1.5			2.3			39	
1970	2.3			3.3			41	
69	3.0			3.5			46	
68	2.5			2.5			50	
67	2.3			2.0			53	
66	2.0			2.3			47	
1965	2.5			2.5			50	
64	2.3			2.5			48	
63	2.3			1.7			58	
62	2.0			1.7			54	
61	1.7			1.7			50	
1960	2.3			2.0			53	
59	1.7			1.7			50	
58	2.5			2.3			52	
57	2.5			2.3			52	
56	2.0			2.3			47	
1955	2.0			2.0			50	
54	2.0			2.3			47	
53	2.0			2.3			47	
52	2.0			2.5			44	
51	2.3			1.7			58	
1950	1.7			1.7			50	
49	1.7			2.3			43	
48	3.0			2.7			53	
47	2.7			3.0			47	
46	2.3			2.7			46	
1945	2.5			3.0			45	
44	2.5			3.0			45	
43	2.5			3.0			45	
42	2.7		false ring	2.7		false ring	50	
41	2.5			2.5			50	
1940	—			—			—	

MTP- 17



MTP- 18/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	2.7			2.7			50	
78	2.5			2.5			50	
77	2.3			2.7			46	
76	3.0			2.5			55	
1975	3.0			3.0			50	
74	4.0			4.0			50	
73	4.3			3.5			55	
72	3.5			3.0			54	
71	2.5			2.7			48	
1970	2.7			3.3			45	
69	4.5			4.5			50	
68	3.5			2.5			58	
67	2.6		false ring	1.7		false ring	54	
66	1.7			4.0		false ring	30	
1965	1.3			2.7			33	
64	1.0			2.5			29	
63	0.7			2.5			22	
62	0.5			2.5			17	
61	0.5			2.7			16	
1960	0.5			3.0			14	
59	0.7			3.3			18	
58	1.0		false ring	2.5			29	
57	1.0			1.7			37	
56	1.0			2.5			29	
1955	1.3			2.5			34	
54	1.7			2.5			40	
53	2.5			2.5		rx wd	50	
52	1.3			1.3			50	
51	0.7			1.5		rx wd	32	
1950	1.3			2.0		↑	39	
49	1.3			2.0				39	
48	1.3			2.0				39	
47	1.3			2.0		↓	39	
46	1.5			2.0		rx wd	43	
1945	1.7			1.7			50	
44	2.0			2.3			47	
43	1.3			1.5			46	
42	1.0			1.7			37	
41	1.3			2.3			36	
1940	1.7		false ring	3.0		false ring	36	

(2)

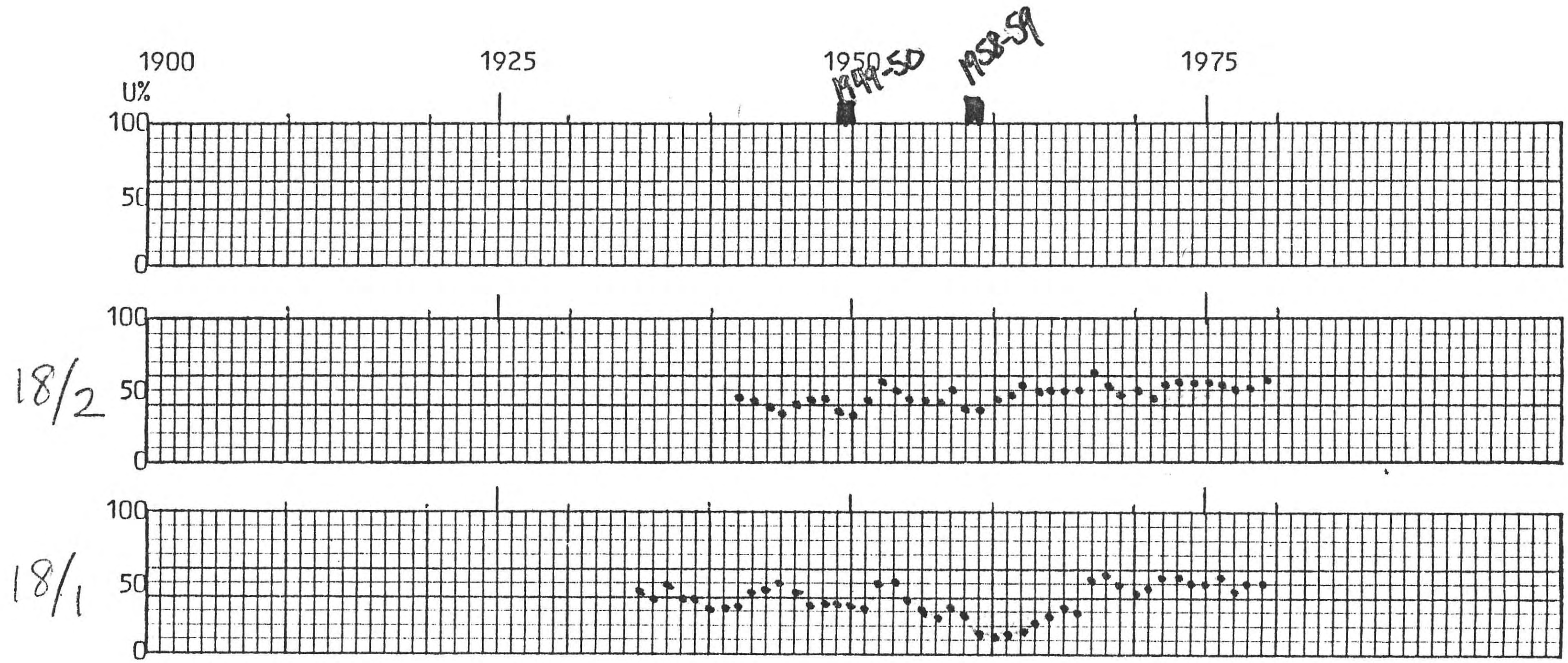
MTP- 18/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.0			1.5			40	
38	1.0			1.5			40	
37	1.0			1.0			50	
36	2.0		false ring	3.0		false ring	40	
1935	1.0			1.3		—	43	
34	—			—		—	—	
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-18/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.3			1.7			58	
78	2.5			2.3			52	
77	2.5			2.3			52	
76	3.0			2.5			55	
1975	3.3			2.5			57	
74	3.5			3.0			54	
73	3.7			2.7			58	
72	2.7			2.3			54	
71	2.0			2.3			47	
1970	2.5			2.5			50	
69	3.3			3.5			49	
68	3.0			2.5			55	
67	2.0			1.3			61	
66	3.5		false ring	3.5		false ring	50	
1965	2.3		false ring?	2.3			50	
64	2.0			2.0			50	
63	2.0			2.0			50	
62	2.3			2.0			53	
61	1.5			1.7			47	
1960	1.5			2.0			43	
59	1.5			2.5			38	
58	1.3		false ring?	2.0			39	
57	1.7			1.7			50	
56	1.5			2.0			43	
1955	1.7			2.3			43	
54	1.7			2.0			46	
53	2.5			2.5			50	
52	2.3			1.7			58	
51	1.3			1.5			46	
1950	1.5			2.7			36	
49	1.7			2.7			39	
48	2.0			2.5			44	
47	2.0			2.5			44	
46	1.7			2.5			40	
1945	1.5			2.5			38	
44	1.7			2.5			40	
43	1.5			2.0			43	
42	1.7			2.0			46	
41	—			—			—	
1940								

MTP-18



37 years

4 events

$p = 11\%$

1 ls per 9.25 years

MTP- 19/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	2.7			2.3			54	
78	2.7			2.3			54	
77	2.0			2.3			47	
76	2.5			2.7			48	
1975	2.3			2.5			48	
74	3.5			3.3			51	
73	3.3			3.0			52	
72	2.7			2.5			52	
71	2.5			2.5			50	
1970	1.7			2.5			40	
69	2.7			3.0			47	
68	2.5			2.5			50	
67	2.3			2.5			48	
66	4.3		false ring	4.5		false ring	49	
1965	2.7			2.5			52	
64	2.3			1.5			61	
63	2.3			2.3			50	
62	1.7			2.0			57	
61	1.0		false ring	1.7			37	
1960	1.3			1.3			50	
59	1.0			2.0			33	
58	0.7			1.5			32	
57	0.7		false ring	1.3			35	
56	0.7		false ring	1.3			35	
1955	1.5			1.5			50	
54	1.5		false ring	1.7		false ring	47	
53	1.5			1.7			47	
52	1.5			1.5			50	
51	1.3			1.3			50	
1950	1.5			1.5			50	
49	1.5			2.3			39	
48	1.5			2.0			43	
47	1.5			1.5			50	
46	1.5			1.5		false ring	50	
1945	1.5			1.5			50	
44	1.5			1.5			50	
43	1.3			1.7			43	
42	1.5			1.5			50	
41	1.3			1.7			43	
1940	1.7		false ring	2.0		false ring	46	

MTP- 19/1

②

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.7			1.7			50	
38	1.0			1.3			43	
37	—			—			—	
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
18								
17								
16								
1915								
14								
13								
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP- 19/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
1980	—			—			—	
79	2.5			2.0			56	
78	2.3			2.3			50	
77	1.7			1.7			50	
76	2.3			2.0			53	
1975	2.3			2.0			53	
74	2.0			2.0			50	
73	2.5			2.3			52	
72	2.3			2.0			53	
71	2.0			1.5			57	
1970	1.7			1.5			53	
69	2.5			2.0			56	
68	2.5			1.7			60	
67	1.7			2.3			43	
66	3.5		false ring	4.0		false ring	47	
1965	1.7			1.5			53	
64	1.7			1.0			63	
63	1.7			1.3			57	
62	1.7			1.5			53	
61	1.7			1.7			50	
1960	1.5			1.3			54	
59	1.5			1.5			50	
58	1.7			2.0			46	
57	1.7			1.5			53	
56	1.5			1.5			50	
1955	1.3			1.0			57	
54	1.7			1.3			57	
53	1.7			1.5			53	
52	1.7			1.3			57	
51	1.5			1.5			50	
1950	1.7			2.5			40	
49	1.7			1.7			50	
48	2.0			2.3			47	
47	1.5			2.0			43	
46	1.3			2.0			39	
1945	1.5			2.0			43	
44	1.3			2.0			39	
43	1.5			2.0			43	
42	1.5			2.0			43	
41	1.5			1.5			50	
1940	2.7		false ring	2.7		false ring	50	

(2)

MTP- 19/2

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.3			1.5			46	
38	1.0			1.0			50	
37	—			—			—	
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
21								
1920								
19								
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16								
1915								
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1910								
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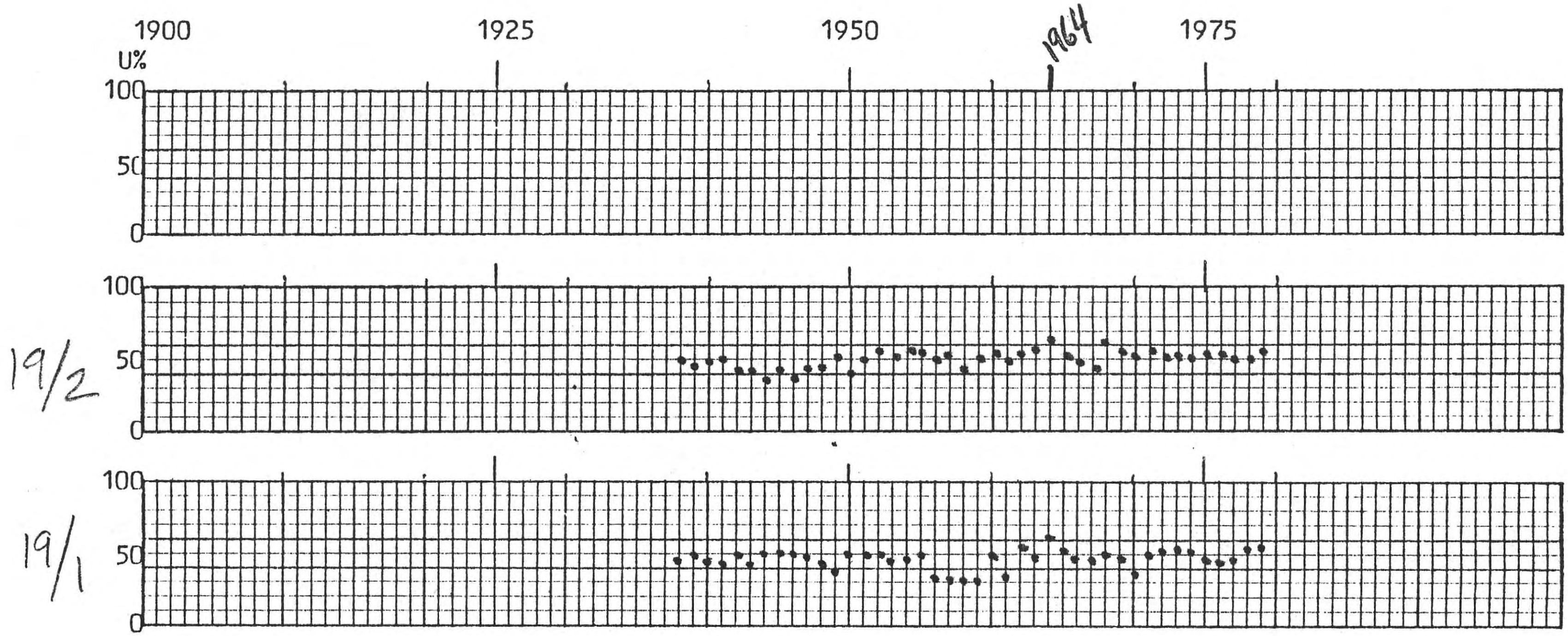
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-19



41 years
1

p = 2 %

1 ls per 41 years

MTP-20/1

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	1.7			1.5			53	
78	1.7			1.3			57	
77	2.0			1.5			57	
76	2.5			1.5			63	
1975	2.3			1.5			61	
74	2.5			1.7			60	
73	3.0			2.5			55	
72	2.3			2.0			53	
71	2.3			2.0			53	
1970	3.3			3.0			52	
69	4.3			3.5			55	
68	2.5			2.0			56	
67	2.7			2.7			50	
66	4.7		false ring	3.3		false ring	59	
1965	3.0			2.5			55	
64	3.7		false ring	3.5		false ring	51	
63	2.0			1.7			54	
62	1.7			1.3			57	
61	2.3			2.0			53	
1960	1.7			2.3			43	
59	2.5			2.5			50	
58	1.3			0.7			65	
57	2.0			1.3			61	
56	1.5			0.7			68	
1955	1.5			1.0			60	
54	1.5			1.0			60	
53	1.3			0.7			65	
52	1.5			1.0			60	
51	3.7		false ring	3.5		false ring	51	
1950	1.7			1.5			53	
49	1.0			1.3			43	
48	1.0			1.7			37	
47	1.7			1.5			53	
46	1.5			1.0			60	
1945	1.7			1.5			53	
44	2.5			2.5			50	
43	1.7			2.0			46	
42	3.3		false ring	3.5		false ring	49	
41	2.3			1.7			58	
1940	1.7			2.0			46	

(2)

MTP-20/1

	UPSLOPE			DOWNSLOPE			RATIOS	
YEAR	WIDTH mm	PATTERN	OTHER	WIDTH mm	PATTERN	OTHER	ANNUAL	MEAN
39	1.0			1.0			50	
38	—			—			—	
37								
36								
1935								
34								
33								
32								
31								
1930								
29								
28								
27								
26								
1925								
24								
23								
22								
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1920								
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1915								
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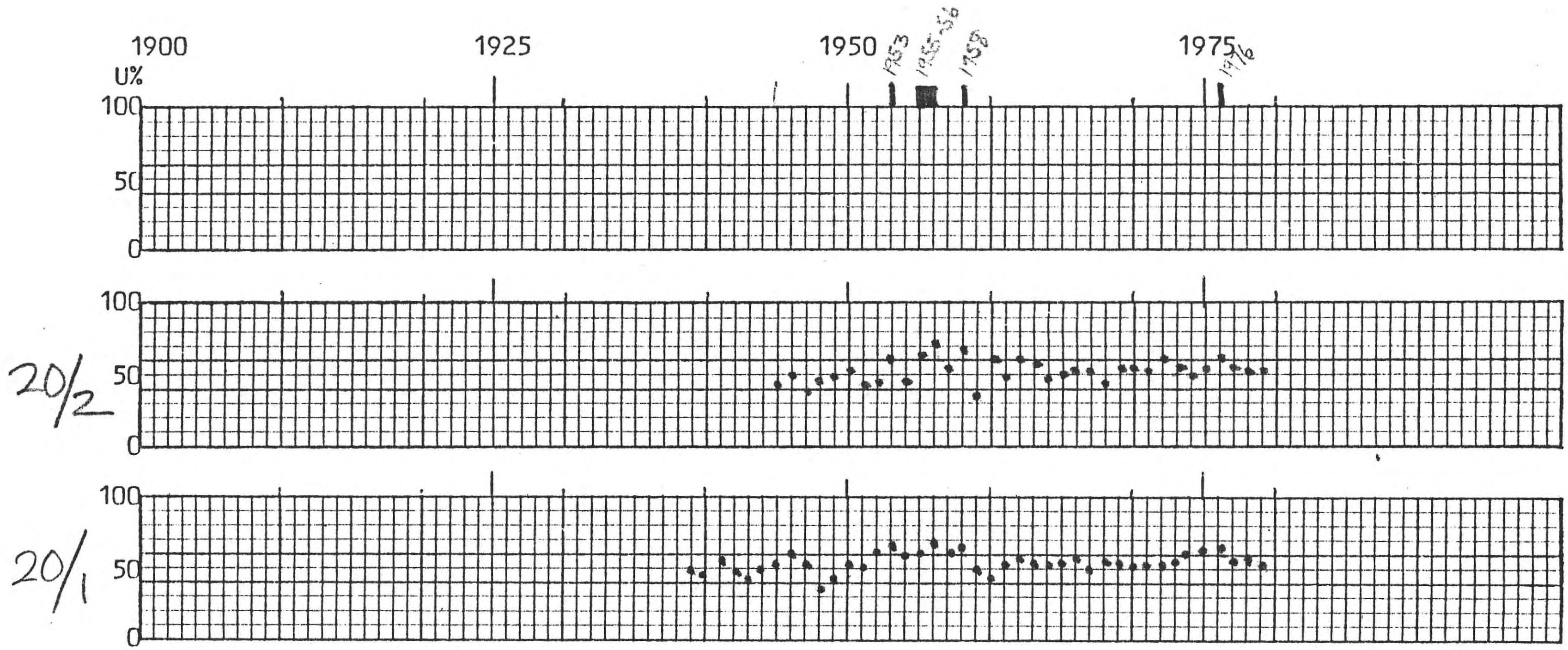
12								
11								
1910								
09								
08								
07								
06								
1905								
04								
03								
02								
01								
1900								

MTP-20/2

YEAR	UPSLOPE WIDTH mm	UPSLOPE PATTERN	UPSLOPE OTHER	DOWNSLOPE WIDTH mm	DOWNSLOPE PATTERN	DOWNSLOPE OTHER	RATIOS ANNUAL	RATIOS MEAN
1980	—			—			—	
79	1.7			1.5			53	
78	1.7			1.5			53	
77	2.0			1.5			57	
76	2.3			1.5			61	
1975	2.3			2.0			53	
74	2.0			2.0			50	
73	3.0			2.5			55	
72	2.5			1.7			60	
71	2.3			2.0			53	
1970	3.5			2.7			56	
69	4.3			3.5			55	
68	2.0			2.5			44	
67	2.7			2.5			52	
66	4.5		false ring	3.7		false ring	55	
1965	2.5			2.5			50	
64	2.7		false ring	3.5		false ring	44	
63	2.3			1.7			58	
62	2.3			1.5			61	
61	2.0			2.0			50	
1960	3.0			2.0			60	
59	1.3			2.3			36	
58	2.0			1.0			67	
57	1.5			1.3			54	
56	2.5			1.0			71	
1955	2.3			1.5			61	
54	1.3			1.5			46	
53	2.0			1.3			61	
52	1.3			1.5			46	
51	2.5			3.3			43	
1950	2.5			2.0			56	
49	1.5			1.5			50	
48	2.0			2.3			47	
47	1.7			2.5			40	
46	1.3			1.3			50	
1945	1.5			2.0			43	
44	—			—			—	
43								
42								
41								
1940								

$p = \frac{1}{T}$ T = recurrence = 100

MTP - 20



34 years

5 events

$p = 15\%$

1 ls per 6.8 years