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METEOR SCATTER DATA AS OBSERVATIONAL MATERIAL FOR STUDYNG METEORS

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SUMMARY: On the basis of radioamateur reports on maintained radio links via meteor tracks the data concerning the Perseides streama in 1977 and 1978. are deduced. From here it follows that attention should be brought to this kind of amateur activity aimed at reorganizing and adjusting it for the needs of astronomers.

At the very beginning of radio - diffusion it was noticed that in the days of higher meteor activity the reach of short wave radiostations became much farther. In 1925 the Soviet radioamateur A. S. Astanov suggested that meteors could be used for maintaining radio contact over great distances (Astapovich, 1958). During the last 15 years, that is has been very popular field of work in radioamateur practice, and it has been developing very quickly. In favour of that, is the fact that the International Radio Amateur Union has improved the rules of communication via meteors a few times. (About maintaining radio links via meteors – the physics of the phenomenon and procedures of work, see f. e. (Ludlow, 1975; IARU 1981).)

From the data of the held links published in (DUBUS, 1977, 1978) for the period 7-15. VIII 1977 and 1978 the derivation of the data concerning the Perseides was attempted. Out of 957 reports from 1977 and 1186 reports from 1978 only the links for which both stations had sent reports were taken into account. In that way two groups were obtained, with 190 data complets for 1977 and 232 data complets for 1978. An example of such data is given in Tab. I, where succesively are given the date of work in TU, the calling signal of the first and second stations, and the codes of its positions, the numbers of registered pings (p) and bursts (b) by the first and the second stations and also the calculated horizontal height of the meteor track for the given link.

According to the nature of the track, it can be concluded that the used frequency (144 MHz) is near the ideal, because it enables a nearly mirror reflection of radio waves. To every ping (a reflection of duration shorter than 0.5 s) and to every burst (a reflection longer than 0.5 s) one meteor track corresponds. The correspondents alternatively emit and recept, so that the sum of the noted pings and bursts represents the number of registered meteors.

Table I: The examples of original data

Datum	TU	calling signal	position code	p	b	h (°)
1978 VIII 10	$06^h{:}00^m - 07^h{:}30^m$	F6EMT	ZH63a	13	20	10,8
		I1DMP	DF79j	13	0	
	06:00 – 08:00	I3LGP	GF24g	11	16	12,2
		DK3XT	FN31h	5	26	
	08:30 – 10:30	YU3TCD	GF39d	37	8	10,9
		OZ2GZ	FP10j	3	21	
	10:00 – 12:00	DL7WC	GM48g	4	1	4,6
		UA3TCF	*WQ14a*	*4*	*1*	
	18:00 – 19:15	SM7AED	GQ56b	20	19	5,6
		GW4FJK	XL16g	19	15	
	20:00 – 22:00	GW4FJK	XL16g	2	9	6,8
		DF1SC	EI27d	9	11	

In Table II are given the data concerning the number of links (N) and time of "observation" by dates (t), and also their entire number (n). The labels b2, b3, b4 and b5 represent bursts that last less than 5 s, 5 - 20 s, 20 - 120 s and those that last more than 120 s. Those are the basic data from which all other data are derived. The derived mean hour activities were 30.2 and 33.7 respectively. Here two maxima can be easily seen: 8-9. VIII and 12-13. VIII.

Table II: Distribution of the meteor scatter reflection toward its duration

Datum	N	t(h)	p	b2	b3	b4	b5	n	
1977 VIII 7	3	7.00	43	16	10	–	–	9.9	
8	3	6.25	143	70	20	–	–	37.3	
9	5	7.67	181	95	–	–	–	36.0	
10	13	23.67	488	260	48	–	–	33.6	
11	26	45.00	647	413	52	15	–	25.0	
12	24	37.30	793	325	138	38	–	34.7	
13	13	19.67	452	182	87	4	–	36.9	
14	8	14.42	166	143	22	–	–	23.0	
15	1	2.00	17	4	–	–	–	10.5	
			2930	1508	377	57	–	–	(4872)
1978 VIII 7	2	2.67	68	21	–	–	–	33.5	
8	1	1.25	36	28	–	–	–	51.5	
9	7	8.00	230	138	18	–	–	48.2	
10	26	44.08	945	468	55	4	–	34.3	
11	29	39.40	864	390	110	27	–	34.0	
12	26	25.28	551	259	89	43	2	35.4	
13	18	23.42	346	208	76	30	–	28.2	
14	3	4.17	80	59	–	–	–	33.3	
15	3	4.25	34	24	–	–	–	13.6	
			3154	1595	348	104	2	–	(5203)

The relation between the number of reflections for certain groups determining the coefficient of brightness is given in Table III. If an analogy is supposed between the groups p, b2,.. b5 and the stellar magnitudes of meteors from those groups, then the relation

Table III: The coefficient of brightness

	1977	1978
p/b2	1,94[1]	1,98[1]
b2/b3	2,00[2]	2,13[2]
b3/b4	1,88[3]	1,83[2]
b4/b5	–	1,93[6]
p/b	1,509	1,461
k	1,93 ± 0,06	2,09 ± 0,10

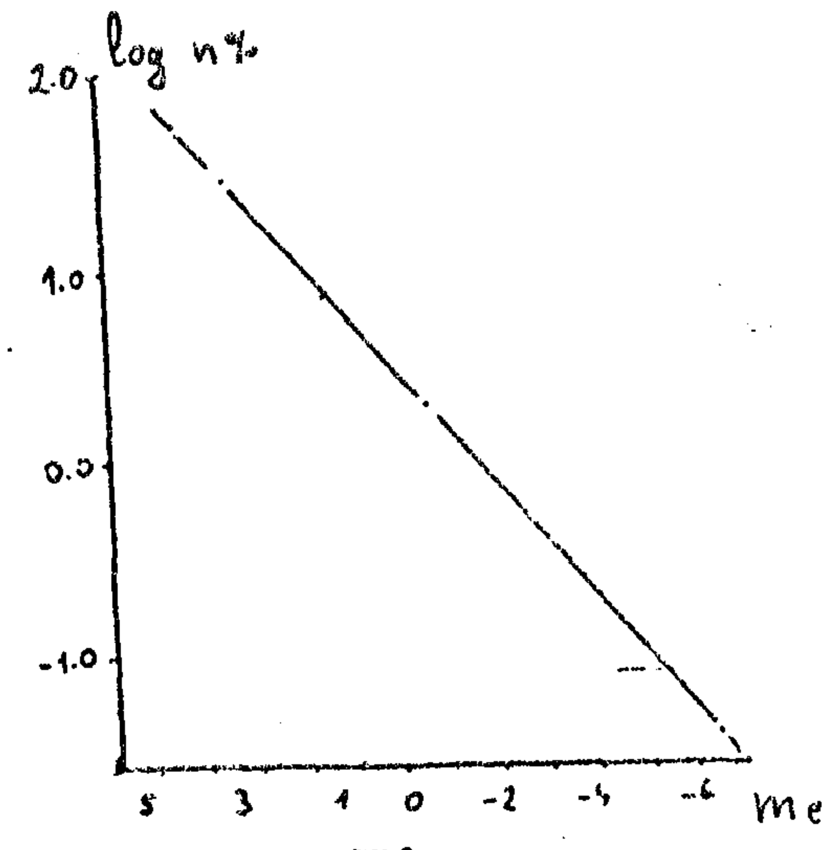

Fig. 1

$$k = N_{m+1}/N_m$$

is given here as: k = p/b2; b2/b3; b3/b4; b4/b5, were the exponent given in the table represent the difference between the mean stellar magnitude of the meteors from class p and b2, and so on. In that way was obtained:

$$k_{77} = 1.93 \pm 0.06$$

$$k_{78} = 2.09 \pm 0.10.$$

If it is taken into consideration that similar values were obtained earlier for visual observations (see f. e. /1/) confidence could be given to the obtained differences of the mean stellar magnitudes in the corresponding classes of reflection, that were obtained in this way by comparing the durations of visual and radio meteors, the stellar magnitude for pings $m_e = 4{,}5$ are proscribed. The scale for visual equivalent of radio-brightness on it are fixed, and using data from previous table are obtained the values of equivalent visual magnitude m_e (Table IV). In that case, it can be assumed that the graph in Fig. 1. "log n/m_e" in fact represents the light curve of the "observed" Perseides stream.

Table IV: The estimation of parametres for brightness-curve

	D(s)	m_e	n_{77}	n(%)	log n(%)	n_{78}	n(%)	log n(%)
p	0,1 – 0,5	4,5	2930	60,1	1,78	3154	60,1	1,78
b2	0,5 – 5	3,5	1508	31,0	1,49	1595	30,6	1,49
b3	5 – 20	1,5	377	7,7	0,89	348	6,6	0,82
b4	20 – 120	–0,5	57	1,2	0,08	104	2,0	0,30
b5	> 120	–6,5	–	–	–	2	0,04	–1,40

Table V: The daily distribution of activity

	1977					1978			
MET	t(h)	b	p	n		t(h)	b	p	n
1 – 3	20,90	240	517	11,5	24,7	6,58	109	242	53,4
3 – 5	4,67	58	95	32,8		9,50	114	260	39,4
5 – 7	9,77	151	245	40,6		4,58	107	153	56,7
7 – 9	20,07	321	467	39,2		17,47	286	292	33,1
9 – 11	25,25	231	321	21,8		25,50	447	640	42,6
11 – 13	8,75	61	110	19,6		18,92	180	296	25,1
13 – 15	7,00	69	100	24,2		16,58	160	150	18,6
15 – 17	6,50	91	77	25,8		8,97	99	148	27,5
17 – 19	2,90	26	15	13,7		4,25	64	54	27,8
19 – 21	12,50	159	118	20,1		13,78	173	272	32,3
21 – 23	15,75	205	321	33,4		20,42	266	340	29,7
23 – 1	26,25	306	542	32,2		7,17	86	151	23,1

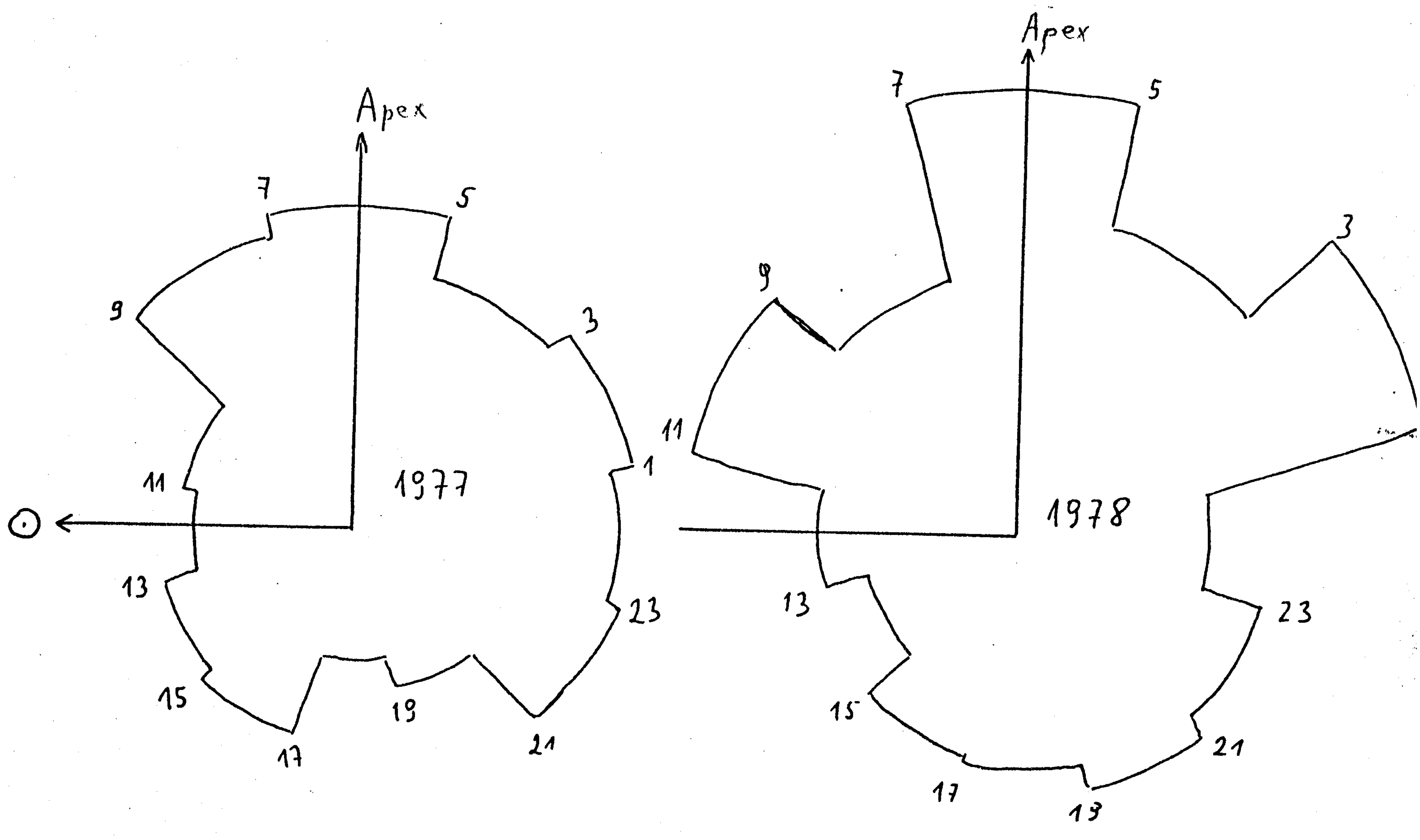

Fig. 2

Table VI: The distribution of the hourly number against horizontal hight

h(°)	p	b	t(h)	n	p	b	t(h)	n
	1977				1978			
2 – 3	27	18	1,00	45,0	16	58	2,00	37,0
3 – 4	117	134	7,67	32,7	59	62	3,83	31,6
4 – 5	252	279	29,42	18,1	139	178	18,33	17,3
5 – 6	279	341	19,58	31,6	381	327	42,11	16,8
6 – 7	373	633	33,08	30,4	339	574	29,95	35,2
7 – 8	135	228	13,00	27,9	274	416	13,75	50,2
8 – 9	286	358	16,33	39,4	321	540	16,51	52,1
9 – 10	194	452	16,08	40,2	268	462	13,93	52,4
10 – 11	87	116	6,17	32,9	142	119	5,67	46,1
11 – 12	37	53	6,00	15,00	63	114	5,25	33,7
12 – 13	9	10	0,92	17,4	77	123	4,92	40,7
13 – 14	19	24	2,00	21,5	47	86	2,00	66,5
14 – 15	28	57	2,00	42,5	–	–	–	–
17 – 18	12	11	1,23	18,6	2	3	0,33	15,0
20 – 21	37	36	1,33	54,8	–	–	–	–
30 – 31	26	83	1,25	87,2	–	–	–	–
42 – 43	14	35	1,92	25,6	22	12	2,00	17,0
61 – 62	19	60	1,83	43,3	–	–	–	–

The daily distribution of activity is presented in Table V. Here two maxima can be easily seen: 8-9. VIII and 12-13. VIII. In Table VI are given the data concerning the distribution of the hourly number n_h against the horizontal height h. A period of 6° can be seen, that can probably be attributed to the characteristic width of the "mean used antenna".

According to what has been said, the impression is that this kind of data, with further improvement of the technical conditions of work, as also an increase of the number and ways of presenting the data, can serve as a source of data for astronomical researcher of, before all, richer meteor streams. This, completely objectivized method of observation, together with the unification of the antenna system and other equipment could give a new stimulus for amateur contributions in astronomy.

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ПОДАЦИ О РАДИО ВЕЗАМА ПРЕМА МЕТЕОРСКИМ ТРАГОВИМА КАО ПОСМАТРАЧКИ МАТЕРИЈАЛ ЗА ПРОУЧАВАЊЕ МЕТЕОРА

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Стручни чланак

За одређивање параметара роја Персеида за 1977-1978 годину коришћени су подаци о одржаним везама радиоаматера преко метеорских трагова. За коефицијент сјаја и средњи часовни број у максимуму добијене су вредности

$$k_{77} = 1.93 \pm 0.06 \quad n_{77} = 36.9$$

$$k_{78} = 2.09 \pm 0.10 \quad n_{78} = 35.4.$$

Како је претходних година временски интервал одржавања веза скраћен са 1 – 2 часа на десетину, ова врста аматерске активности може постати поуздан извор података о метеорским ројевима.