Results of the IMO Video Meteor Network – November 2018

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The period of excellent weather, which persisted in central Europe for several months in a row, was finally over in November. The observing statistics shows large gaps, and in particular in the second half of the month the observers had to accept longer interruptions. Only 37 out of the 83 active video cameras obtained observations in twenty or more nights. The total effective observing time dropped to nearly 9,300 hours – less than in the last three years. In that time, we recorded over 41,000 meteors, which is of the same order as in the two years before. The average of 4.4 meteors per hour is higher than last year, but lower than the long-term average (5.0).

Almost twenty years have passed since the major outbursts of the Leonids at the begin of the millennium, which is more than half of the time to the next perihelion passage of parent comet 55P/Tempel-Tuttle. Activity of the shower has still not completely vanished – on the contrary: As figure 1 shows, the Leonid activity of 2018 was clearly higher than in the average of the years since 2011.

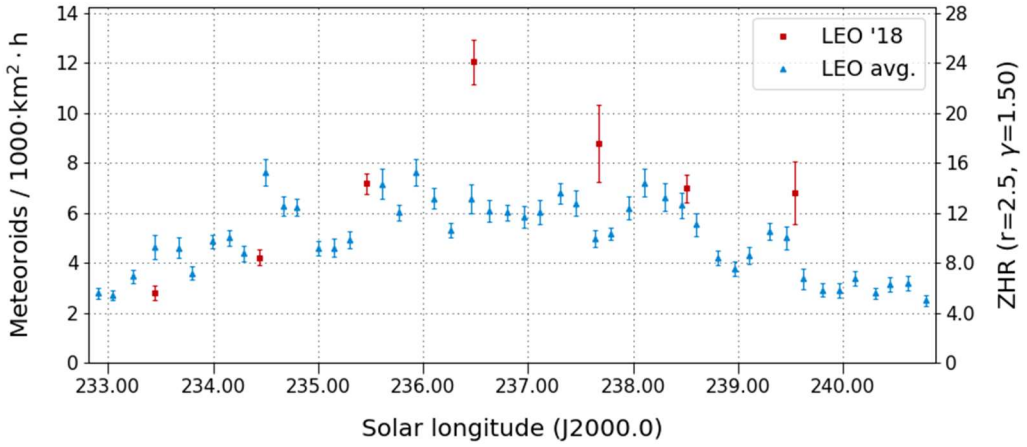

Figure 1: *Comparison of the flux density profile of the Leonids in 2018 (red) and in the average of 2011-2017 (blue), derived from video data of the IMO Network.*

In the night of November 18/19, the average flux density was 12 meteoroids per 1,000 km^2 and hour, which is twice as high as on average. We have to be cautious, because we could collect only 150 hours of effective observing time that night. However, if we look at the sporadic meteors (figure 2) in that night we see no anomalies. In fact, the rate in 2018 was even a bit lower than in the long-term average, so the enhanced Leonid activity was real.

The IMO Meteor Shower Calendar of 2018 lists different predictions of increased Leonid activity. There is an encounter with a dust trail on November 18 at 23:27 UT and on November 19, 23:59 UT (Vaubaillon) resp. 22:20 UT (Sato). Further predicted dust trail encounters fell outside the European observing window.

The small data set does not allow for a detailed analysis, when exactly rates were highest, in particular since the radiant reaches only after local midnight sufficient heights to allow for Leonid observations. There is, however, a trend than the flux density was higher right after the radiant rise at midnight UT of November 18/19 than in the following hours. We can infer that the first listed dust trail caused the activity increase.

The population index of the Leonids was about r=1.8 in the whole activity interval and, thus, much smaller than the sporadic population index (r=2.6).

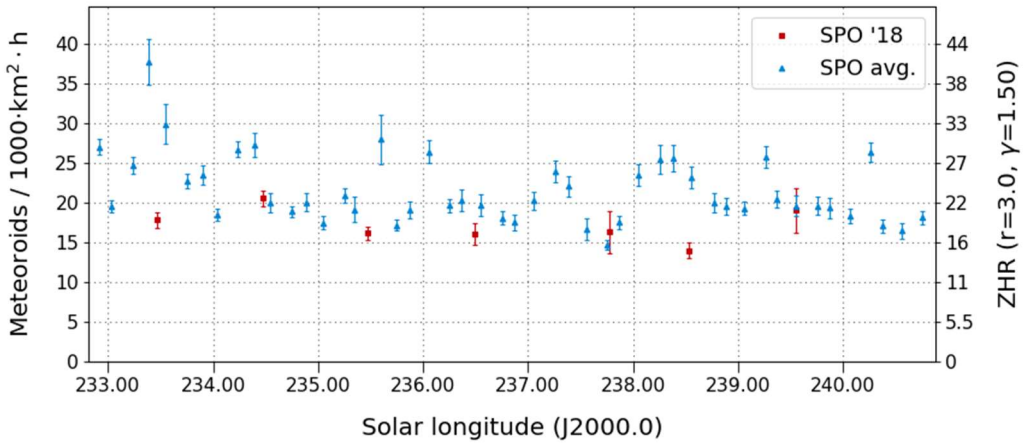

Figure 2: *Comparison of the flux density profile of the sporadic meteors at the time of the Leonids 2018 (red) and in the average of 2011-2017 (blue), derived from video data of the IMO Network.*

We cannot judge on the activity of the alpha Monocerotids or the November Orionids, since the gaps in the data collection are simply too large in the last November decade. However, we can have a look at the Taurids of 2018 (Figure 3), which are active from September to November. We see the typical trend that the southern branch dominates until the end of October. Thereafter the northern Taurids become stronger, but the scatter in the data is increasing as well. Small activity spikes in October (e.g. at 193° and 203° solar longitude) are visible in both curves, so we can assume that they are not real but rather the result from some external effect.

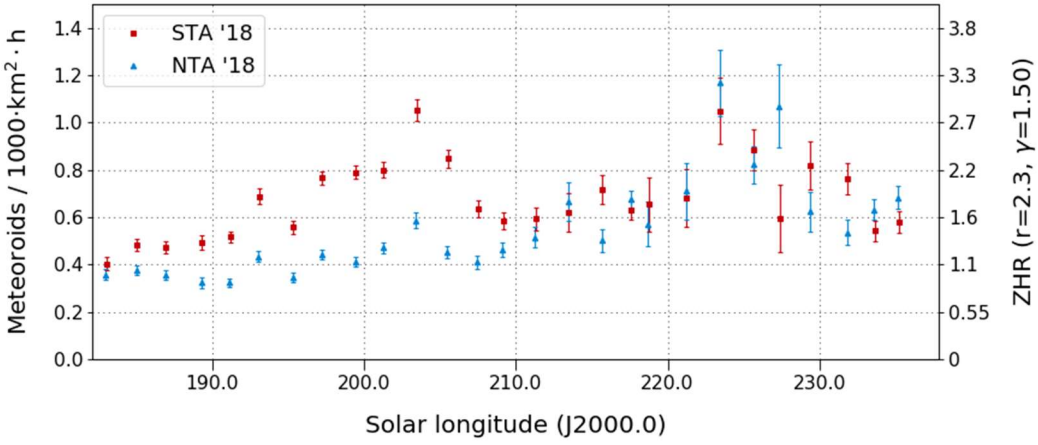

Figure 3: *Comparison of the flux density profile of the northern (blue) and southern (red) Taurids in 2018, derived from video data of the IMO Network.*

1. Observers

Code	Name	Place	Camera	FOV [°²]	St.LM [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG2 (0.8/8)	1483	6.2	3812	21	142.3	859
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5524	4.8	3829	14	130.4	736
BIATO	Bianchi	Mt. San Lorenzo/IT	OMSL1 (1.2/4)	6422	4.0	1699	20	51.9	195
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5779	3.3	644	22	96.1	454
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	641	14	118.0	318
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2369	4.2	674	24	154.7	684
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2374	4.6	1123	22	142.9	579
CARMA	Carli	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	20	187.5	1376
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2402	5.0	1633	19	165.9	545
CINFR	Cineglosso	Faenza/IT	JENNI (1.2/4)	5995	3.9	1240	23	105.3	333
CRIST	Crivello	Valbrevenna/IT	ARCI (0.8/3.8)	5566	4.6	2571	22	113.8	623
			BILBO (0.8/3.8)	5441	4.2	1764	23	129.1	829
			C3P8 (0.8/3.8)	5489	4.2	1603	20	135.0	617
			STG38 (0.8/3.8)	5574	4.4	1905	21	72.4	559
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5607	4.3	2381	18	98.0	462
FORKE	Förster	Carlsfeld/DE	AKM3 (0.75/6)	2387	5.1	2145	21	138.4	825
GONRU	Goncalves	Foz do Arelho/PT	FARELHO1 (0.75/4.5)	2260	3.0	206	8	9.9	37
		Tomar/PT	TEMPLAR1 (0.8/6)	2212	5.3	1873	22	146.1	555
			TEMPLAR2 (0.8/6)	2341	5.0	1718	22	147.7	424
			TEMPLAR3 (0.8/8)	1438	4.3	542	19	113.7	188
			TEMPLAR4 (0.8/3.8)	5180	3.0	497	20	139.4	407
			TEMPLAR5 (0.75/6)	2309	5.0	2248	23	113.3	357
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1471	5.5	2170	17	121.1	333
			ORION3 (0.95/5)	3152	4.9	2130	17	97.3	152
			ORION4 (0.95/5)	3818	4.3	1634	13	94.2	131
HERCA	Hergenrother	Tucson/US	SALSA3 (0.8/3.8)	2336	4.1	538	29	266.2	835
HINWO	Hinz	Schwarzenberg/DE	HINWO1 (0.75/6)	2375	5.1	1889	25	195.1	863
IGAAN	Igaz	Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	11	68.5	192
		Budapest/HU	HUPOL (1.2/4)	2414	3.6	409	17	113.3	98
JONKA	Jonas	Budapest/HU	HUSOR2 (0.95/3.5)	2468	3.9	716	20	166.3	306
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	5334	4.3	2028	5	30.7	210
		Kamnik/SI	REZIKA (0.8/6)	2269	4.4	863	5	30.5	200
		Ljubljana/SI	SRAKA (0.8/6)*	2348	4.8	1595	8	35.0	124
		Kamnik/SI	STEFKA (0.8/3.8)	5458	3.6	911	4	29.2	140
KOSDE	Koschny	La Palma / ES	ICC9 (0.85/25)*	660	6.7	2835	13	121.3	1329
			LIC2 (3.2/50)*	1933	6.5	6554	16	101.4	1161
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5329	4.0	1530	14	114.3	487
			PAV36 (0.8/3.8)*	5484	4.0	1501	14	111.6	438
			PAV43 (0.75/4.5)*	2251	4.7	1484	19	125.2	622
			PAV60 (0.75/4.5)	2302	5.1	1803	11	71.2	189
MARRU	Marques	Lisbon/PT	RAN1 (1.4/4.5)	4395	4.0	1330	27	142.5	558
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5559	3.6	827	2	14.0	64
MISST	Missiaggia	Nove/IT	TOALDO (1.2/4.5)	4329	4.6	2049	22	125.8	468
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1204	6.9	5982	16	91.6	806
			DIMCAM1 (0.8/8)	1553	6.8	10447	13	83.5	1041
			ESCIMO2 (0.85/25)	154	8.1	3828	13	100.2	209
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5459	23	151.7	1199
			REMO2 (0.8/8)	1479	6.4	5037	22	155.5	1180
			REMO3 (0.8/8)	1422	6.4	4207	23	176.8	1016
			REMO4 (0.8/8)	1478	6.5	5355	25	174.3	1318
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	3666	3.8	805	18	117.9	312
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3868	4.2	1240	17	99.7	280
NAGHE	Nagy	Budapest/HU	HUKON (0.8/3.8)	5475	4.0	1583	22	167.2	732
		Piszkestetö/HU	HUPIS (0.8/3.8)	5622	4.0	1539	14	136.9	630
		Zamardi/HU	HUZAM (0.8/6)	2359	4.7	1340	17	137.9	313
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	3013	4.3	886	3	1.5	8
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	2317	3.8	373	6	9.7	35
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5557	2.9	470	14	138.8	588
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2359	4.5	907	18	132.3	276
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2354	4.0	536	21	93.6	245
			RO2 (0.75/6)	2365	4.1	635	15	51.6	169
			RO3 (0.8/12)	720	5.7	1126	14	63.5	207
			RO4 (1.0/8)	1568	4.2	546	14	55.9	65
			SOFIA (0.8/12)	726	4.8	516	22	124.5	317
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4170	4.5	2044	18	83.8	184
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	5522	4.7	3184	24	156.3	528
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	1074	5.7	2642	9	38.9	85
			KAYAK2 (0.8/12)	742	5.7	1052	9	42.9	56
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5587	4.5	2362	22	126.0	1003
			NOA38 (0.8/3.8)	5612	4.2	1889	22	139.2	930
			SCO38 (0.8/3.8)	5583	4.8	3304	21	104.7	757
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2355	5.6	3423	22	160.8	1224
			MINCAM3 (0.8/6)	2302	4.5	1150	20	154.6	583
			MINCAM4 (0.8/6)	2274	4.7	1001	21	148.8	322
			MINCAM5 (0.8/6)	1481	6.0	3200	20	157.3	615
			MINCAM6 (0.8/6)	2396	5.3	2748	21	154.6	648
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2428	4.6	1247	16	118.0	530
			HUMOB (0.8/6)	2388	4.6	1225	18	168.5	522
WEGWA	Wegrzyk	Nieznaszyn/PL	PAV78 (0.8/6)	2376	4.4	1264	19	137.7	427
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2315	5.5	2769	14	90.3	315
ZAKJU	Zakrajšek	Petkovec/SI	PETKA (0.8/8)	1431	5.6	1956	15	65.1	337
			TACKA (0.8/12)	715	5.3	784	13	54.2	88
Sum							30	9282.2	41305

* active field of view smaller than video frame

2. Observing Times (h)

November	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	8.2	2.4	5.9	-	9.1	10.4	10.5	1.5	8.1	7.0	6.1	5.0	9.8	8.4	11.1
BERER	-	-	-	9.5	10.5	12.5	12.0	12.2	-	8.3	-	3.3	7.4	9.1	9.3
BIATO	0.2	-	0.2	1.2	-	0.7	1.8	0.6	0.3	2.1	6.8	12.5	7.6	9.1	2.1
BOMMA	2.5	-	0.9	0.3	3.7	3.4	5.4	12.5	1.9	4.2	8.4	-	4.7	-	5.1
BREMA	-	6.4	12.9	-	6.5	10.8	4.0	8.9	-	-	-	-	12.1	5.6	13.6
BRIBE	0.4	-	11.4	7.5	5.5	9.3	2.9	6.1	6.5	0.2	-	-	12.8	13.0	12.9
	2.5	11.0	8.9	3.7	7.4	7.1	1.7	6.3	4.3	0.9	-	-	10.0	6.3	1.3
CARMA	6.5	-	8.7	-	-	-	1.1	3.9	8.8	-	8.0	6.0	12.8	12.7	12.5
CASFL	5.6	-	7.6	-	-	-	1.1	3.4	6.8	-	2.0	6.4	12.6	12.8	12.3
CINFR	3.3	-	1.5	0.8	5.0	4.9	6.2	12.6	2.0	5.5	8.5	-	5.0	1.9	7.2
CRIST	4.6	-	0.2	2.4	-	-	-	-	0.4	-	0.5	0.4	3.2	1.9	8.4
	4.4	-	2.6	2.4	0.3	-	-	-	0.3	-	0.8	0.5	4.8	12.5	7.7
	3.9	-	1.4	3.7	-	-	-	-	-	-	0.2	-	0.8	12.5	9.3
	0.7	-	0.2	0.5	-	-	-	-	0.3	-	0.8	0.2	0.3	1.8	0.6
ELTMA	0.3	1.6	7.4	-	0.7	3.6	4.9	-	-	-	8.8	2.2	-	11.9	10.5
FORKE	9.3	-	-	6.8	10.9	10.3	6.8	-	9.5	7.3	7.4	6.1	4.4	7.5	9.9
GONRU	-	-	0.6	-	-	-	1.7	-	-	-	2.1	-	-	-	-
	3.1	2.4	-	-	8.3	-	5.3	10.2	-	-	-	12.3	12.3	9.1	11.8
	3.1	2.0	-	-	7.7	-	5.1	9.3	-	-	-	12.4	12.4	8.5	12.1
	-	-	-	-	5.8	-	2.6	10.1	-	-	2.2	4.3	12.2	7.8	5.5
	1.6	-	-	-	7.5	-	4.2	8.9	-	-	-	12.2	12.4	8.5	12.0
	1.3	-	-	-	6.8	-	2.6	10.5	-	-	1.9	5.0	11.0	8.3	5.8
GOVMI	1.4	0.2	-	-	3.5	8.1	12.1	2.2	1.7	12.5	12.5	12.5	-	8.3	8.2
	3.3	-	0.2	-	-	6.6	0.5	1.0	2.0	12.6	12.6	7.1	1.0	-	8.7
	3.1	-	-	-	1.6	3.7	6.4	-	0.5	12.3	12.3	11.6	-	-	7.1
HERCA	10.4	10.4	10.1	10.9	9.7	10.1	10.7	10.9	10.6	10.4	10.6	11.1	7.1	3.6	-
HINWO	9.3	-	1.2	11.4	10.7	12.5	9.7	0.3	12.8	9.6	12.1	5.6	7.4	11.9	13.1
IGAAN	-	-	-	-	-	5.0	-	-	-	-	6.4	10.8	-	9.4	7.6
	0.8	-	7.5	10.5	10.7	10.8	9.8	8.2	5.9	-	3.3	4.0	6.9	4.6	7.3
JONKA	1.4	-	7.4	10.9	12.5	12.4	10.8	12.5	11.8	8.4	10.3	4.3	7.2	9.8	8.5
KACJA	-	-	-	-	-	-	-	-	-	-	0.4	-	-	-	8.4
	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	7.9
	-	-	-	-	-	-	-	3.9	-	-	-	-	2.1	2.8	6.1
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1
KOSDE	8.6	9.5	10.5	11.1	-	11.1	11.2	11.2	11.2	11.2	3.5	3.4	8.4	10.4	-
	8.8	8.2	7.4	8.3	-	8.7	7.9	7.6	7.3	7.8	1.7	2.0	5.8	6.5	7.7
MACMA	2.5	2.3	-	-	11.9	-	11.3	9.8	2.6	3.1	6.3	-	0.4	-	-
	-	4.3	-	-	12.4	-	12.5	10.9	-	3.9	8.8	-	1.0	-	-
	1.3	2.2	-	-	12.3	-	12.4	11.0	-	3.4	8.4	-	-	-	-
	2.7	6.1	-	-	12.4	1.6	12.5	11.1	-	3.8	8.8	0.3	1.2	0.2	-
MARRU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	6.2	5.7	10.3	1.1	1.3	10.9	-	-	3.0	12.2	12.2	7.1	7.9
MASMI	-	-	-	-	-	-	-	-	8.7	5.3	-	-	-	-	-
MISST	0.5	0.8	7.1	-	0.5	3.9	4.7	3.8	-	-	1.9	-	8.3	9.4	7.1
MOLSI	8.3	1.1	-	0.2	9.3	9.8	6.4	3.2	-	-	8.8	4.7	5.9	-	6.5
	7.8	-	-	-	9.5	9.5	4.6	2.2	-	-	7.8	2.8	4.6	-	5.6
	8.9	-	-	-	9.6	10.0	6.8	3.0	-	-	8.9	3.6	5.9	-	8.3
	5.4	2.3	7.5	-	10.5	11.4	10.6	5.2	9.8	1.8	2.2	3.7	10.8	9.1	11.9
	5.7	2.7	7.7	-	11.6	12.1	11.5	5.4	10.2	2.2	3.1	4.8	11.2	9.0	12.5
	6.0	3.6	8.6	-	12.8	12.8	12.0	6.1	11.3	2.4	3.3	4.4	12.0	10.8	13.3
	6.0	3.7	8.4	-	11.9	12.7	11.7	6.4	11.4	2.7	3.7	4.4	12.0	10.6	13.3
MORJO	0.2	-	1.8	2.1	4.0	3.6	1.8	2.6	1.3	10.5	9.9	12.7	5.8	11.2	7.5
MOSFA	5.0	-	4.7	-	0.2	-	-	2.5	-	-	0.4	-	11.4	7.2	8.2
NAGHE	2.4	0.6	9.7	11.4	12.3	12.4	10.6	12.6	11.4	12.6	10.6	4.2	5.3	10.2	8.6
	-	-	-	-	-	6.8	11.3	12.5	11.6	12.6	12.0	12.7	6.2	9.2	10.2
	-	-	7.7	4.0	12.6	5.7	5.7	12.5	8.3	11.1	12.7	12.9	8.6	-	6.2
OCHPA	-	-	0.5	-	-	-	-	-	-	-	-	-	0.8	-	-
OTTMI	-	0.5	-	-	-	-	-	-	0.8	-	0.2	-	5.1	2.9	0.2
PERZS	-	-	-	-	11.0	11.8	12.3	10.1	-	12.5	12.6	12.5	6.0	12.4	8.6
ROTEC	8.6	1.9	7.5	-	11.0	12.6	10.4	2.7	4.6	6.4	-	-	9.8	-	13.0
SARAN	2.5	-	5.8	-	7.9	1.5	0.6	-	-	-	3.2	11.7	12.3	6.9	9.1
	0.9	-	5.2	-	4.3	1.5	-	4.3	-	-	3.2	-	-	-	0.4
	2.2	-	6.2	-	10.2	1.0	-	4.1	-	-	3.7	-	-	-	0.8
	1.0	-	4.7	-	7.8	1.8	-	4.2	-	-	0.3	-	-	-	0.7
	-	-	-	-	9.7	1.0	2.0	11.8	0.7	-	5.2	12.3	11.9	6.0	8.7
SCALE	-	0.9	-	-	1.0	2.9	3.1	-	-	-	6.3	2.7	0.8	8.4	9.3
SCHHA	1.2	12.3	12.7	12.1	7.6	6.3	5.2	6.6	8.3	2.1	0.2	1.0	13.1	9.4	7.1
SLAST	-	-	-	-	-	-	-	-	2.6	2.5	0.8	9.5	2.1	4.1	6.8
	-	-	-	-	-	-	-	3.2	0.5	2.6	-	8.7	0.1	6.2	8.5
STOEN	2.9	3.0	7.6	-	0.6	4.0	5.4	2.2	-	-	4.8	-	3.4	10.8	12.4
	2.2	2.7	9.0	-	1.4	5.2	7.8	2.8	-	-	5.6	2.5	4.4	10.7	12.5
	1.5	2.9	8.4	-	0.8	4.0	7.0	-	-	-	5.6	1.6	3.8	10.9	10.3
STRJO	3.1	10.1	12.2	-	11.2	11.7	4.6	5.8	6.0	3.3	0.2	-	11.6	11.8	13.2
	1.7	10.2	11.6	-	11.9	8.5	2.4	5.9	6.7	2.7	-	-	11.4	12.3	13.2
	2.0	10.4	12.0	-	11.1	9.3	2.4	5.3	5.2	3.2	-	-	12.2	11.7	10.3
	2.5	10.1	11.7	-	11.3	10.4	4.2	5.9	5.8	3.3	-	-	11.7	12.0	13.1
	2.0	10.5	12.3	-	10.8	9.1	4.8	5.9	5.6	3.2	-	-	10.8	12.0	13.1
TEPIS	2.7	-	-	-	0.2	-	-	-	6.4	12.5	12.4	5.5	7.6	12.4	8.1
	-	-	-	10.3	12.3	12.0	10.4	12.4	11.2	12.5	12.5	5.3	7.3	12.4	7.9
WEGWA	2.5	-	-	-	8.6	12.5	4.9	2.4	2.4	5.0	12.8	9.8	5.3	-	7.1
YRJIL	1.6	-	7.5	10.2	-	-	-	-	-	-	-	-	-	-	-
ZAKJU	0.9	-	-	0.4	-	-	5.2	6.1	4.8	1.3	1.1	2.3	5.3	6.7	6.9
	-	-	-	0.3	-	-	-	5.5	2.7	1.2	-	3.0	3.2	6.4	7.7
Sum	215.1	159.3	319.0	158.6	459.2	402.5	399.4	413.7	273.9	270.0	362.0	333.0	497.3	516.9	616.8

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	7.3	10.9	0.7	1.4	-	-	-	-	-	-	2.6	-	10.2	5.7	-
BERER	12.9	7.6	-	-	-	-	-	-	-	-	-	-	13.4	-	2.4
BIATO	0.7	0.2	4.4	-	-	-	0.3	-	-	0.2	-	0.6	0.3	-	-
BOMMA	1.7	4.4	4.4	-	0.5	-	2.3	-	-	0.4	6.3	0.2	13.1	9.8	-
BREMA	13.6	13.4	3.2	-	-	-	3.6	3.4	-	-	-	-	-	-	-
BRIBE	13.1	13.2	5.4	3.5	1.6	0.8	4.8	4.4	-	-	0.2	10.0	-	0.3	8.9
	13.0	13.1	11.7	1.8	6.7	-	8.7	2.2	-	-	-	9.9	-	-	4.4
CARMA	13.0	13.1	3.3	-	13.1	-	5.6	-	11.7	-	-	11.9	13.4	10.4	11.0
CASFL	12.7	13.0	-	-	13.1	-	4.3	-	9.4	-	-	9.1	13.4	9.7	10.6
CINFR	3.2	4.5	5.0	-	0.4	0.2	4.0	-	-	0.8	3.0	-	9.3	10.5	-
CRIST	12.6	11.4	12.7	3.6	6.0	2.6	-	-	0.7	0.2	3.4	12.8	12.5	10.3	3.0
	12.6	12.6	12.7	3.0	6.5	2.8	-	-	1.7	0.5	4.2	12.9	12.2	9.2	1.9
	12.4	12.6	12.7	2.2	11.8	0.7	-	-	7.0	1.2	7.7	12.6	12.4	8.0	1.9
	2.9	3.4	5.0	1.7	10.9	2.6	-	-	1.9	-	2.2	10.3	12.7	9.9	3.5
ELTMA	9.2	12.8	3.2	-	-	0.2	0.2	-	-	-	-	1.4	12.9	6.2	-
FORKE	5.8	9.7	2.1	0.3	-	-	-	1.0	-	5.2	-	4.0	10.6	3.5	-
GONRU	1.8	0.5	0.7	1.5	1.0	-	-	-	-	-	-	-	-	-	-
	11.4	1.4	-	4.9	5.0	5.9	2.0	1.6	-	5.6	4.6	8.1	10.0	1.4	9.4
	11.1	0.7	-	4.4	3.8	7.9	3.3	3.3	-	8.5	4.4	7.8	10.0	1.4	8.5
	4.4	-	1.2	2.5	2.8	7.7	3.4	-	-	6.9	4.1	10.2	9.5	-	10.5
	10.0	-	-	3.7	4.0	8.3	4.0	3.1	-	7.3	3.8	8.0	10.0	1.4	8.5
	6.1	0.3	0.9	1.7	1.7	6.0	1.5	1.8	-	5.0	3.6	9.7	8.8	1.2	11.8
GOVMI	12.5	0.8	-	-	-	-	-	-	-	-	-	-	12.8	7.6	4.2
	12.5	1.5	-	-	-	-	0.2	-	-	-	-	-	12.7	8.2	6.6
	12.5	-	-	-	-	-	-	-	-	-	-	-	12.6	7.9	2.6
HERCA	10.1	9.5	11.0	11.9	9.5	10.7	7.6	5.0	6.6	8.9	5.9	9.8	10.7	9.2	3.2
HINWO	12.3	13.2	2.0	0.3	0.5	-	-	3.8	4.7	5.4	-	6.9	13.5	4.9	-
IGAAN	10.9	2.1	-	-	-	-	-	3.6	0.3	-	-	-	-	1.1	11.3
	9.4	1.6	-	-	-	-	-	-	-	-	-	2.0	10.0	-	-
JONKA	12.6	1.2	-	-	-	-	-	-	-	-	-	0.3	13.3	1.6	9.1
KACJA	6.5	4.6	-	-	-	-	-	-	-	-	-	-	-	10.8	-
	7.0	4.7	-	-	-	-	-	-	-	-	-	-	-	10.4	-
	8.9	6.0	-	-	-	-	-	-	-	-	-	-	3.5	1.7	-
	7.0	3.2	-	-	-	-	-	-	-	-	-	-	-	9.9	-
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.6	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-
MACMA	11.1	6.1	-	-	3.2	2.2	-	-	-	-	-	2.4	1.0	8.8	4.4
	12.6	12.6	-	-	3.3	2.6	-	-	-	-	-	4.6	-	13.0	11.8
	12.5	12.6	-	-	3.4	3.0	-	-	-	-	-	4.0	-	12.9	12.2
	11.9	12.7	-	-	3.5	3.1	-	-	-	-	-	6.0	1.9	13.0	12.4
MARRU	-	-	-	4.2	2.4	2.9	6.2	7.1	-	7.5	4.8	12.5	12.4	0.5	10.7
	2.0	0.5	1.9	5.9	2.4	1.2	5.2	0.2	0.2	1.9	3.5	9.9	5.7	11.2	11.1
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MISST	11.9	12.7	7.2	-	4.5	0.3	0.9	-	4.7	-	-	7.8	9.3	7.2	11.3
MOLSI	12.4	6.9	-	3.3	4.6	-	-	-	-	-	-	-	-	0.2	-
	12.7	12.5	-	1.0	2.9	-	-	-	-	-	-	-	-	-	-
	12.8	12.6	-	5.1	4.7	-	-	-	-	-	-	-	-	-	-
	10.5	11.9	3.4	2.2	-	-	-	1.4	-	1.6	5.5	-	9.7	3.3	-
	10.1	11.9	2.7	-	-	-	-	1.2	-	1.2	5.2	-	10.4	3.1	-
	12.0	13.4	5.5	2.8	-	-	-	1.9	-	2.3	7.6	-	11.6	-	0.3
	11.5	13.2	3.2	2.9	-	-	-	1.9	-	1.5	6.2	0.2	11.1	3.4	0.3
MORJO	12.9	-	-	-	-	-	-	-	-	-	-	-	13.3	7.4	9.3
MOSFA	6.4	9.6	4.2	-	9.2	-	0.2	-	3.1	-	-	-	12.9	5.0	9.5
NAGHE	12.8	1.7	0.3	-	-	-	-	-	-	-	-	1.6	13.1	1.0	1.8
	12.9	4.9	-	-	-	-	-	-	-	-	-	-	7.9	-	6.1
	3.3	0.2	-	-	-	-	-	-	-	-	-	-	13.2	11.9	1.3
OCHPA	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PERZS	1.9	-	-	-	-	-	-	-	-	-	-	-	13.3	10.2	3.6
ROTEC	7.8	12.8	1.5	-	-	-	-	-	-	-	4.9	2.8	10.5	3.5	-
SARAN	-	-	0.5	3.5	1.3	-	3.7	1.2	-	3.5	1.4	4.0	4.6	3.2	5.2
	-	-	-	0.1	3.9	3.7	9.2	0.7	-	-	0.5	8.4	5.3	-	-
	-	-	-	-	3.7	3.4	9.4	0.2	-	-	1.0	11.6	6.0	-	-
	-	-	0.6	-	4.6	3.2	9.4	1.0	-	-	-	10.8	5.8	-	-
	3.3	0.5	1.4	9.6	3.2	-	7.9	1.6	-	3.1	0.6	6.1	5.6	-	12.3
SCALE	9.1	12.4	3.3	-	3.3	-	1.7	-	-	-	-	1.6	9.5	6.1	1.4
SCHHA	9.9	7.3	11.1	5.9	0.8	-	6.4	3.7	-	-	-	-	-	0.7	5.3
SLAST	3.6	6.9	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.2	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	12.8	13.0	6.9	-	3.7	0.2	0.6	-	0.2	-	-	2.7	13.2	7.2	8.4
	12.8	13.0	8.4	-	3.4	0.9	0.4	-	-	-	-	3.2	13.3	7.8	9.2
	12.7	8.8	1.4	-	3.0	-	1.5	-	0.2	-	0.3	2.9	-	6.6	10.5
STRJO	13.3	13.3	0.4	-	-	-	3.0	5.9	-	-	-	12.6	0.9	0.5	6.1
	13.2	13.2	-	-	-	-	3.2	6.0	-	-	-	13.6	0.5	0.3	6.1
	13.3	13.0	1.0	0.9	-	-	3.6	2.5	-	-	-	11.9	0.5	-	7.0
	13.1	13.1	0.7	-	-	-	3.2	3.9	-	-	-	13.4	-	1.7	6.2
	13.1	13.3	0.9	0.4	-	-	0.6	6.0	-	-	-	12.6	-	1.5	6.1
TEPIS	12.8	4.9	-	-	-	-	-	0.4	-	-	-	2.9	13.2	8.4	7.6
	12.7	3.2	0.5	-	-	-	-	-	-	-	-	-	11.5	6.8	7.3
WEGWA	10.3	12.5	-	-	-	-	-	-	0.9	0.2	-	5.4	13.2	12.0	9.9
YRJIL	1.4	8.2	-	14.0	-	5.5	2.1	1.4	8.1	8.3	7.5	-	7.6	-	6.9
ZAKJU	4.6	8.0	-	-	-	-	-	-	-	-	-	-	9.2	-	2.3
	4.8	7.8	-	-	-	-	-	-	-	-	-	0.8	9.0	-	1.8
Sum	702.3	556.5	169.3	111.3	173.9	88.6	134.2	81.4	61.4	87.2	105.0	334.8	570.0	350.6	359.0

3. Results (Meteors)

November	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	63	6	30	-	38	74	62	3	32	26	39	18	80	32	111
BERER	-	-	-	20	68	79	33	27	-	24	-	21	85	39	99
BIATO	1	-	1	10	-	4	12	4	2	13	46	38	4	20	6
BOMMA	4	-	5	1	25	7	49	98	2	22	23	-	5	-	13
BREMA	-	6	26	-	31	21	21	23	-	-	-	-	29	16	44
BRIBE	2	-	69	27	31	27	13	10	21	2	-	-	50	81	71
	15	45	41	6	37	24	6	12	11	2	-	-	35	8	5
CARMA	21	-	48	-	-	-	6	5	56	-	39	39	112	106	97
CASFL	6	-	17	-	-	-	6	4	28	-	3	22	42	54	41
CINFR	2	-	5	4	18	8	46	65	2	21	17	-	9	4	19
CRIST	12	-	1	12	-	-	-	-	2	-	4	2	16	12	32
	19	-	14	22	2	-	-	-	2	-	4	1	37	70	41
	17	-	8	25	-	-	-	-	-	-	1	-	5	52	40
	4	-	1	4	-	-	-	-	2	-	6	1	2	11	4
ELTMA	1	11	16	-	6	9	23	-	-	-	27	2	-	59	43
FORKE	49	-	-	49	70	57	35	-	79	28	57	16	29	40	80
GONRU	-	-	1	-	-	-	3	-	-	-	9	-	-	-	-
	7	12	-	-	41	-	13	50	-	-	-	64	78	52	47
	2	8	-	-	25	-	6	25	-	-	-	58	46	27	36
	-	-	-	-	6	-	5	17	-	-	3	5	21	18	3
	1	-	-	-	21	-	8	25	-	-	-	53	50	40	32
	1	-	-	-	20	-	4	47	-	-	9	8	22	35	7
GOVMI	10	1	-	-	1	13	10	1	3	44	64	39	-	18	22
	7	-	1	-	-	5	1	1	2	19	22	17	1	-	15
	4	-	-	-	1	8	2	-	2	20	18	17	-	-	6
HERCA	34	24	38	34	32	41	38	41	34	37	30	43	25	15	-
HINWO	47	-	3	55	78	48	31	1	67	46	64	16	37	50	70
IGAAN	-	-	-	-	-	20	-	-	-	-	13	27	-	28	26
	1	-	2	7	6	2	3	6	3	-	5	9	10	9	8
JONKA	3	-	18	19	24	21	10	21	13	9	20	7	23	11	28
KACJA	-	-	-	-	-	-	-	-	-	-	1	-	-	-	64
	-	-	-	-	-	-	-	-	-	-	2	-	-	-	63
	-	-	-	-	-	-	-	11	-	-	-	-	9	18	18
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49
KOSDE	89	110	135	143	-	125	121	119	135	125	17	18	95	97	-
	96	89	95	107	-	99	89	106	83	97	15	16	63	62	91
MACMA	2	5	-	-	54	-	32	25	3	4	32	-	1	-	-
	-	16	-	-	59	-	50	31	-	5	36	-	7	-	-
	1	9	-	-	46	-	64	22	-	3	32	-	-	-	-
	4	17	-	-	82	2	83	37	-	10	44	1	6	1	-
MARRU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	-	19	21	34	8	3	40	-	-	20	47	38	24	30
MASMI	-	-	-	-	-	-	-	-	39	25	-	-	-	-	-
MISST	2	13	22	-	2	14	24	8	-	-	5	-	38	15	17
MOLSI	59	4	-	1	136	76	33	12	-	-	34	18	26	-	97
	69	-	-	-	213	96	23	9	-	-	51	13	30	-	63
	17	-	-	-	41	19	4	3	-	-	9	4	6	-	14
	104	9	60	-	57	130	83	12	67	6	9	7	111	37	123
	96	10	43	-	79	111	80	15	63	6	14	7	128	28	148
	70	6	47	-	56	94	69	27	53	3	18	8	96	35	106
	67	12	64	-	80	118	83	12	79	5	13	9	132	68	146
MORJO	1	-	13	12	27	30	12	15	7	19	23	26	25	21	19
MOSFA	4	-	9	-	1	-	-	7	-	-	3	-	27	36	27
NAGHE	13	3	41	24	50	44	35	63	45	39	54	40	34	29	60
	-	-	-	-	-	47	33	74	18	59	59	59	41	37	54
	-	-	14	2	21	17	11	33	6	16	36	33	21	-	25
OCHPA	-	-	2	-	-	-	-	-	-	-	-	-	5	-	-
OTTMI	-	3	-	-	-	-	-	-	4	-	1	-	16	10	1
PERZS	-	-	-	-	47	32	33	32	-	57	70	48	27	72	47
ROTEC	16	3	11	-	20	33	8	2	5	11	-	-	19	-	39
SARAN	4	-	11	-	11	3	1	-	-	-	12	29	21	13	13
	2	-	15	-	19	6	-	21	-	-	11	-	-	-	2
	5	-	28	-	34	6	-	33	-	-	15	-	-	-	1
	1	-	5	-	10	1	-	7	-	-	2	-	-	-	3
	-	-	-	-	16	3	2	27	1	-	21	33	21	10	18
SCALE	-	1	-	-	3	4	1	-	-	-	11	3	2	23	19
SCHHA	10	48	57	45	35	20	27	15	19	11	1	7	54	24	10
SLAST	-	-	-	-	-	-	-	-	7	6	3	24	5	4	16
	-	-	-	-	-	-	-	4	3	4	-	10	2	3	11
STOEN	8	27	52	-	2	30	53	3	-	-	28	-	5	65	110
	8	19	49	-	4	26	68	3	-	-	27	3	9	67	85
	2	25	62	-	3	21	79	-	-	-	41	5	9	60	92
STRJO	22	107	131	-	90	33	10	23	44	25	1	-	68	136	116
	6	52	53	-	60	12	5	9	24	21	-	-	29	46	53
	4	23	26	-	28	16	5	8	7	10	-	-	26	18	26
	8	71	63	-	62	26	6	10	18	15	-	-	45	50	57
	14	55	59	-	54	25	12	13	20	20	-	-	39	46	67
TEPIS	13	-	-	-	1	-	-	-	30	66	51	29	43	60	61
	-	-	-	15	41	31	22	30	35	37	37	29	33	46	35
WEGWA	6	-	-	-	40	48	19	6	6	4	40	34	23	-	12
YRJIL	1	-	22	42	-	-	-	-	-	-	-	-	-	-	-
ZAKJU	7	-	-	2	-	-	14	28	34	6	1	3	27	35	49
	-	-	-	1	-	-	-	8	5	7	-	4	4	7	17
Sum	1170	850	1553	710	2199	1874	1743	1449	1223	1035	1423	1090	2319	2210	3220

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	73	103	2	1	-	-	-	-	-	-	2	-	52	12	-
BERER	100	25	-	-	-	-	-	-	-	-	-	-	108	-	8
BIATO	4	1	20	-	-	-	2	-	-	1	-	4	2	-	-
BOMMA	13	17	14	-	5	-	12	-	-	3	20	1	75	40	-
BREMA	37	42	9	-	-	-	10	3	-	-	-	-	-	-	-
BRIBE	76	73	23	14	8	1	10	16	-	-	1	31	-	1	26
	77	67	64	5	32	-	31	5	-	-	-	30	-	-	21
CARMA	125	112	9	-	123	-	38	-	86	-	-	100	95	68	91
CASFL	40	41	-	-	53	-	20	-	34	-	-	42	33	24	35
CINFR	15	17	10	-	1	1	17	-	-	2	3	-	13	34	-
CRIST	73	85	88	15	39	24	-	-	4	1	21	66	72	33	9
	81	77	116	17	63	23	-	-	6	4	18	91	75	32	14
	63	59	80	14	52	6	-	-	30	7	39	46	47	13	13
	10	18	50	14	77	37	-	-	15	-	15	89	110	51	38
ELTMA	42	100	24	-	-	1	1	-	-	-	-	10	61	26	-
FORKE	69	97	4	1	-	-	-	3	-	12	-	14	34	2	-
GONRU	3	4	4	9	4	-	-	-	-	-	-	-	-	-	-
	45	1	-	21	13	33	1	3	-	14	10	14	24	4	8
	35	3	-	17	14	19	2	10	-	21	8	11	37	2	12
	13	-	5	4	5	18	3	-	-	11	3	14	16	-	18
	32	-	-	22	15	28	6	4	-	24	3	15	19	2	7
	31	1	2	15	9	29	2	4	-	22	6	33	24	2	24
GOVMI	55	1	-	-	-	-	-	-	-	-	-	-	37	8	6
	17	2	-	-	-	-	1	-	-	-	-	-	26	9	6
	21	-	-	-	-	-	-	-	-	-	-	-	16	12	4
HERCA	46	41	20	24	15	30	25	20	14	17	27	27	29	30	4
HINWO	59	90	2	1	4	-	-	8	12	14	-	23	36	1	-
IGAAN	34	10	-	-	-	-	-	6	2	-	-	-	-	1	25
	11	1	-	-	-	-	-	-	-	-	-	3	12	-	-
JONKA	32	1	-	-	-	-	-	-	-	-	-	1	28	3	14
KACJA	70	29	-	-	-	-	-	-	-	-	-	-	-	46	-
	66	36	-	-	-	-	-	-	-	-	-	-	-	33	-
	36	17	-	-	-	-	-	-	-	-	-	-	11	4	-
	50	14	-	-	-	-	-	-	-	-	-	-	-	27	-
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46	-	-	7	-	-	-	-	-	-	-	-	-	-	-
MACMA	54	36	-	-	5	16	-	-	-	-	-	10	1	37	26
	58	77	-	-	1	31	-	-	-	-	-	28	-	50	38
	62	75	-	-	3	22	-	-	-	-	-	13	-	52	34
	48	77	-	-	6	29	-	-	-	-	-	39	2	74	60
MARRU	-	-	-	1	25	3	4	6	-	30	5	44	49	2	20
	3	3	17	40	25	7	31	1	1	15	9	29	13	37	37
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MISST	19	48	12	-	51	2	8	-	23	-	-	30	29	32	54
MOLSI	149	143	-	9	8	-	-	-	-	-	-	-	-	1	-
	237	220	-	6	11	-	-	-	-	-	-	-	-	-	-
	43	43	-	2	4	-	-	-	-	-	-	-	-	-	-
	113	139	28	5	-	-	-	3	-	25	22	-	41	8	-
	124	139	25	-	-	-	-	1	-	9	11	-	41	2	-
	94	109	32	4	-	-	-	4	-	9	21	-	54	-	1
	134	175	24	8	-	-	-	4	-	8	14	1	58	2	2
MORJO	35	-	-	-	-	-	-	-	-	-	-	-	16	5	6
MOSFA	14	33	3	-	25	-	2	-	10	-	-	-	43	15	21
NAGHE	62	2	2	-	-	-	-	-	-	-	-	12	67	2	11
	85	15	-	-	-	-	-	-	-	-	-	-	40	-	9
	27	1	-	-	-	-	-	-	-	-	-	-	37	10	3
OCHPA	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PERZS	5	-	-	-	-	-	-	-	-	-	-	-	64	43	11
ROTEC	37	44	5	-	-	-	-	-	-	-	1	3	16	3	-
SARAN	-	-	5	25	8	-	9	1	-	8	4	13	6	14	34
	-	-	-	1	17	7	27	2	-	-	1	34	4	-	-
	-	-	-	-	17	6	24	1	-	-	2	32	3	-	-
	-	-	3	-	8	2	9	3	-	-	-	10	1	-	-
	3	3	8	36	19	-	20	6	-	9	3	21	10	-	27
SCALE	19	28	10	-	14	-	2	-	-	-	-	4	19	18	3
SCHHA	20	23	41	32	2	-	10	6	-	-	-	-	-	1	10
SLAST	12	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	13	6	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	92	158	81	-	49	1	5	-	1	-	-	25	89	50	69
	96	153	80	-	37	1	1	-	-	-	-	29	86	33	46
	117	60	6	-	31	-	9	-	2	-	2	37	-	36	58
STRJO	121	120	2	-	-	-	22	30	-	-	-	79	1	1	42
	54	76	-	-	-	-	13	10	-	-	-	44	1	2	13
	30	38	3	2	-	-	8	2	-	-	-	31	1	-	10
	64	57	2	-	-	-	17	2	-	-	-	26	-	1	15
	70	63	3	1	-	-	2	12	-	-	-	43	-	2	28
TEPIS	63	7	-	-	-	-	-	2	-	-	-	16	53	25	10
	48	8	1	-	-	-	-	-	-	-	-	-	48	18	8
WEGWA	34	58	-	-	-	-	-	-	6	1	-	13	34	31	12
YRJIL	7	20	-	88	-	10	8	5	24	13	30	-	27	-	18
ZAKJU	49	39	-	-	-	-	-	-	-	-	-	-	38	-	5
	7	9	-	-	-	-	-	-	-	-	-	1	16	-	2
Sum	3922	3499	939	461	898	387	412	183	270	280	301	1332	2100	1127	1126