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ОТДЕЛЕНИЕ ФИЗИКО-МАТЕМАТИЧЕСКИХ, ХИМИЧЕСКИХ,
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IAU METEOR DATA CENTER: THE SHOWER DATABASE

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The IAU Working Group on Meteor Shower Nomenclature was established in 2006 to regulate the nomenclature of meteor showers reported in the scientific literature. One year later the International Astronomical Union Meteor Data Center shower database was implemented (IAU MDC). The database does not contain all information about the meteor showers. Its purpose is to give each new meteoroid stream, published in the scientific literature, a unique name and codes.

During the "Meteoroids 2019" conference held in Bratislava, the IAU Working Group on Meteor Shower Nomenclature established new rules for the introduction and removal of meteor showers from the MDC. In this paper, we present a concise description of the meteor shower database, its origin, and structure and, in particular, the current requirements for the introduction of new data, and unknown as well as known meteor showers.

Key words: meteoroid stream, meteor shower, IAU MDC shower database, meteor shower nomenclature rules, new meteor shower submission rules.

Introduction

A phenomenon of meteoroid shower or meteoroid stream has been correctly interpreted by astronomers in the half of the IXX century. It was realized that in the Earth nearby space a compact group of tiny bodies is orbiting around Sun like a swarm of bees or in the form of the

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extended stream of small particles. What these particles of matter had in common was that they orbited Sun in very similar orbits.

Today, many meteoroid stream are known, to date (December 2020), 835 meteoroid showers (streams) are registered at the IAU MDC database[1], among them 112 were officially named by the International Astronomical Union [1-3].

However as to the ~700 showers included in the Working List of the Meteor Data Center, there is no consensus among all meteor astronomers. Many researchers have identified different numbers of the meteoroid streams, e.g.: among the photographic meteoroids orbits Lindblad [4] found 78 streams; Jopek [5] provides a list of 88 streams; Terentjeva [6] among the visual and photographic data identified 168 streams; Sekanina [7] found 275 radio-meteoroid streams and Lebedinets et al. [8] found 819 radio-meteoroid streams. More recently, Brown et al. [9] identified 45 meteoroid streams; Kornos et al. [10] found 267 meteor showers; Rudawska and Jenniskens [11] identified 88 showers among the video data; by an automated search Brown et al. [12] identified 117 showers; results for 320 showers and shower-components are presented in Jenniskens et al. [13-15]; using automated meteor shower search methodology Pokorny et al. [16] identified 58 showers.

The differences in these results can be easily explained by different sets of the orbital data used for meteoroid streams searching. But not only, it is known that even on the same data set, it is possible to identify a different number of streams [4,17]. The main difficulty in determining the number of actually existing streams is due to the lack of the precise definition of a meteoroid stream (shower). In 1961, Commission 22 of the IAU (currently Commission F1) defined a meteor shower as a number of meteors with approximately parallel trajectories and a meteoroid stream as a number of meteoroids with nearly identical orbits [18,19]. In 2018, the problem was revisited by Commission F1. New definitions were partly published by Borovicka [20] and will be published in the IAU Transactions.[2] According to this report: "*A meteoroid stream is a group of meteoroids which have similar orbits and a common origin. A Meteor shower is a group of meteors produced by meteoroids of the same meteoroid stream*". However, what one should understand by "*similar orbits*" was not specified and so the new definitions are still of a general nature [21].

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[1]The meteor showers database is available at the address http://www.ta3.sk/IAUC22DB/MDC2007/ or at http://pallas.astro.amu.edu.pl/~jopek/MDC2007/. The second component of the IAU Meteor Data Center, containing the orbits of individual meteoroids, is available at the address https://www.astro.sk/iaumdcDB/, see [34,35].

[2] So far, the full text of these definitions is posted on the Web: https://www.iau.org/static/science/scientific_bodies/commissions/f1/meteordefinitions_approved.pdf.

In the past, additional confusion resulted from inaccurate rules on the names of meteoroid streams. Despite the nomenclature rules were widely discussed, the problem was not settled by the community of meteor astronomers before AD 2006. As a result, in the scientific literature, meteor showers and meteoroid streams were named in a subjective way, which sometimes led to confusion, e.g. some showers had multiple names, e.g. like Draconids, which also were named as gamma Draconids, October Draconids, Giacobinids-Zinerids and Giacobinids [22].

The naming conventions for celestial objects, and the method of announcement of their discovery, has been the prerogative of the IAU since years. However, until 2009, the IAU has never approved an official name of a meteor shower. To make up for these shortcomings, during the IAU General Assembly in Prague in 2006, Commission 22 established a Task Group for Meteor Shower Nomenclature (later transformed into the Working Group on Meteor Shower Nomenclature, hereafter WG) [23,24]. The task of this group was to formulate a meteor shower nomenclature rules, and in particular, a list of established meteor showers that could receive official names during the next IAU General Assembly in Rio de Janeiro. Since 2006, the Working Groups are established for periods of three years, and serve until the next General Assembly of the IAU.[1]

As a result, in August of 2009, for the first time in the history of meteor astronomy, 64 meteor showers were officially named by the IAU [25,26]. During the next GA IAU in Bejing in 2012, the next group of 31 meteor showers obtained official names. In 2015, at the XXIX GA IAU in Honolulu, the names of 18 showers were officially accepted. At the same time, one shower already officially named (3/SIA the Southern iota Aquariids) was removed from the list of established showers, hence, to date the list contains 112 established showers, officially named by the IAU [27]. All these showers are listed in Table, in Appendix (see also in [1-3]).

The IAU MDC shower database

In 2007, the meteor shower database was implemented as a part of the IAU MDC and was posted on the website at the addresses: https://www.ta3.sk/IAUC22DB/MDC2007/ [1-3].

As intended by the Working Group, the IAU MDC database was not to contain full information on meteoroid streams or meteor showers. The purpose of the database is to give an unique names to the meteoroid streams or showers, the discovery of which has been documented in the scientific literature. For already known 'old' showers, the Working Group accepted traditional names, e.g.: Ursids, alpha Monocerotids or November Hydrids etc. However, in the case of streams identified after 2007, new nomenclature rules were applied.

[1]The names of the current staff of the WG are available at the address: https://www.ta3.sk/IAUC22DB/MDC2007/Dokumenty/task_group.php .

Meteor showers nomenclature rules

Peter Jenniskens [22,23,28] proposed to clarify the existing traditional rules for naming meteoroid streams and showers. The general rule was that a meteor shower should be named after the constellation of stars that contains the radiant. And to distinguish among showers from the same constellation the shower may be named after the nearest (brightest) star. Over time, these rules have been slightly modified and extended to be more precise and to cope with the difficulties encountered as a result of the sharp increase in the number of new streams identified. An example of the difficulty is illustrated in Fig. 1.

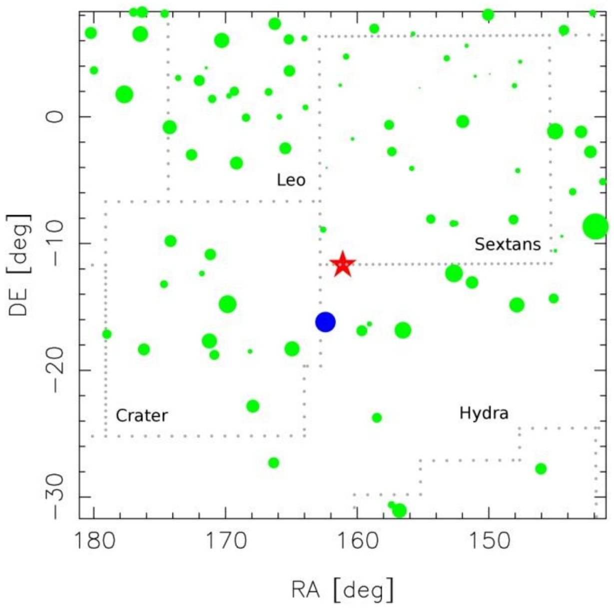

Figure 1. The difficult case of the radiant placement (marked by a star symbol) of January nu Hydrids (544/JNH). The nearest star is in blue color. The radiant of the shower lies almost at the border of two constellations.

As one can see the radiant point of January nu Hydrids is placed very close to the border between the Hydra and Sextans constellations. With a "naked eye" it is not possible to decide which constellation this radiant lies in. In another case the radiant clearly may lies in a given constellation, but the nearest stars belongs to another one.

To solve these types of problems numerically, constellation boundary software and a star catalog are needed.

To define the boundaries of the constellations the approach given by Roman [29] was applied and as the star catalogue, the Yale Bright Star Catalogue (BSC) 5th Revised Edition was chosen [30]. From the BSC a subset of 3141 stars was drawn, for which Bayer and/or Flamsteed names were available. The subset contains 1561 Bayer's stars and 2552 stars designed by Flamsteed. 972 stars have both Bayer and Flamsteed designations. Fig. 2 illustrates distribution of Bayer and Flamsteed stars on the whole celestial sphere. Together with the software defining the borders of the constellations, these stars are used to fix a unique name of the new meteor shower submitted to the MDC database.

The current meteor shower and meteoroid stream naming rules are available on the Web at the address https://www.ta3.sk/IAUC22DB/MDC2007/Dokumenty/shower_nomenclature.php. See also [1-3].

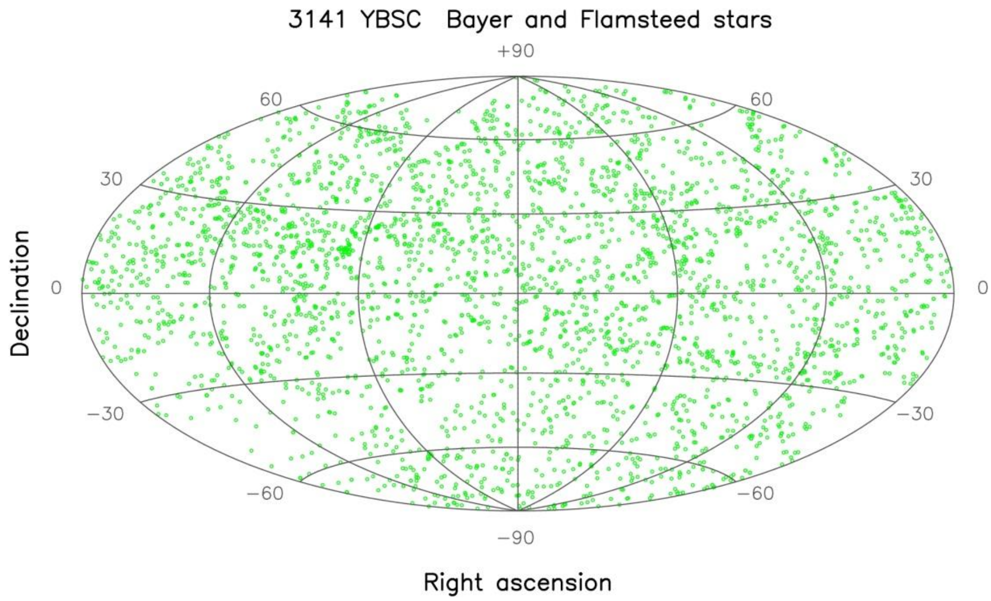

Figure 2. The Hammer-Aitoff diagram of 3141 Bayer and Flamsteed stars selected from the Yale Bright Star Catalogue. Together with the software defining the borders of the constellations, these stars are used to fix a unique name of the new meteor shower submitted to the MDC database. On this diagram the sky coverage is not perfect, still one can see a few regions less populated by stars.

The database structure

Presently, the IAU MDC database includes five lists of meteor showers:

- List of All Showers actually registered in the database, to date 829 showers.
- List of Established Showers, 112 showers approved and officially named by the IAU.
- The Working List; 693 showers that were already, or will be published in the scientific literature.
- List of Meteor Shower Groups, actually it contains 24 shower complexes.
- List of Removed Showers, it contains 157 showers.

All data from these lists may be displayed by the Web browser, or, except of the List of Remove Showers, can be downloaded as ASCII files.

The new showers discussed in literature are first added to the Working List, each being assigned a number, a three letter code and a unique name, e.g. 26 NDA Northern delta Aquarids; 1038 SND 69 Draconids; 1049 DIU December iota Ursae Majorids. To avoid confusion, it is a good idea to write the codes and names of these streams as, e.g. #26/NDA Northern delta-Aquarids; #1038/SND 69-Draconids; #1049/DIU December iota-Ursae Majorids.

Upon review of the collected data in the Working List, the WG can nominate a shower to become an established one. The list of nominated candidates is discussed and completed shortly before the next GA IAU and it is proposed for the approval by the F1 Commission during the GA IAU. Once the official names have been obtained, the approved streams are moved to the List of Established streams. Henceforth, each established stream has the status of the object whose members come from the same parent body.

Rules for delivering and removing data

Since 2007, the MDC has been collecting data from known and newly discovered meteoroid streams. In each case, new data should be sent to the persons responsible for maintaining the shower part of the MDC, the current contact details are given on the website of the database.

In the MDC database, the heliocentric elements of meteoroid orbits are given, as well as geocentric radiant coordinates and geocentric velocities. The basic reference planes of the system are the mean equator and the ecliptic on the epoch J2000. Moment of time is represented by the ecliptic longitude of the sun. The format of the data sent to the MDC includes a number of geocentric, heliocentric and other additional information:

1. *Activity* – annual activity, or year of observed activity.
2. *S. Lon* – solar ecliptic longitude at peak of shower, or the mean solar ecliptic longitude at the moment of observation of meteors included in the shower (degrees, epoch J2000).
3. *RA* – mean Right Ascension of the shower radiant (degrees, epoch J2000).
4. *DE* – mean Declination of the shower radiant (degrees, epoch J2000).
5. *dRA* – Radiant drift in Right Ascension (not obligatory, degrees RA per degree Lon, epoch J2000).
6. *dDE* – Radiant drift in Declination (not obligatory, degrees DE per degree Lon, epoch J2000).
7. V_G – mean Geocentric Speed (km/s).
8. *a* – mean semi-major axis (AU) (not obligatory).
9. *q* – mean perihelion distance (AU).
10. *e* – mean eccentricity.
11. *Peri* – mean argument of perihelion (degrees, epoch J2000).
12. *Node* – mean longitude of ascending node (degrees, epoch J2000).
13. *Incl* – mean inclination of the orbital plane (degrees, epoch J2000).
14. *N* – number of meteors used for calculating the mean radiant and orbit.

Since 2019, a table containing data on individual members of a shower is required.

15. *OT* – code of the technique used to observe the meteor shower: *P* – photo, *R* – radar, *T* – TV, video, *V* – visual.
16. Web link to publication describing the identification of a given shower.

All meteoroid stream data should be sent to the MDC as an ASCII file, according to the template available on the MDC website.

New rules and the lookup tables

Since 2019, during the "Meteoroids 2019" conference, the WG established new rules for the introduction and removal of meteoroid streams from the MDC [31]. Before publishing each new meteoroid stream (meteor shower) must receive a unique name from the MDC, as well as numeric and 3-letter code. The discovery of a new shower or the redetermination of the parameters of a known shower must be published in a scientific journal. In order to facilitate the introduction into the MDC of streams discovered by amateur astronomers, papers published in the WGN (the Journal of the IMO), MeteorNews and e-Radiant are also accepted. In order to avoid deletion, a submitted manuscript must be sent to the Meteor Data Center within half a year of requesting the shower names and numbers.

Another problem discussed at the Meteoroids 2019 conference was the need to establish a procedure for removing unnecessary data from the MDC Working List. The Working List included duplicates and clusters of meteoroid orbits of very low statistical significance to claim that they originated from the same parent body. As a result, it was concluded that any stream would be removed from the Working List if a work recommending such a decision was published. In difficult cases, the MDC will consult the Working Group on Meteor Shower Nomenclature to confirm that proposed decision. Finally, the MDC will move the shower to the List of Removed Showers and add a note giving the reason for the removal on the MDC Web site.

However, it should be noted that, an incomplete record (e.g. no orbital data) is not a reason for removal, as long as the proposed shower is uniquely identified. Any removed shower can eventually be moved back to the Working List after such a recommendation has been published.

Concerning the proposed shower data that were not published within a half of a year in a peer-reviewed article that describes the detection, it was decided that these shower names should be deleted from the Working List altogether, and not be added to the Removed List. As a result of these new rules, 157 streams were removed from the MDC Working List.

Additionally, during the WG business meeting during the Meteoroids 2019 conference it was decided that future submissions for new names to the MDC (as well as for known streams) should be accompanied by a “lookup table” that gives shower members parameters. The table in ASCII data format must contain the following information of each meteor on which the new identification is based:

1. *CurNum* – current number of the meteor in the look-up table.
2. *SolLon* – ecliptic longitude of Sun at the meteor instant (J2000).
3. *SCELoG* – Sun centered ecliptic longitude of the geocentric radiant.
4. *ELaG* – ecliptic latitude of the geocentric radiant.
5. V_G – geocentric velocity.
6. *IAUNo* – IAU numerical code of the shower.
7. *IAUCod* – IAU 3 letter code of the shower, (not obligatory).
8. *CatCod* – code of the source catalogue of the meteor, (not obligatory).
9. *MetCod* – meteor code given in the source catalogue, (not obligatory).

The required data format is given on the MDC website.

To convert the equatorial coordinates of the radiant to the ecliptic coordinates (both given in the J2000 epoch), it is sufficient to make a simple rotation from the equatorial system to the ecliptic one, see e.g. [32,33]. To transform the ecliptic coordinates of the radiant into a system that rotates with the Sun (Sun centered system), it is enough to subtract the ecliptic longitude of the Sun from the ecliptic longitude of the radiant. Both values must correspond to the moment of meteor observation.

The lookup tables provided to the MDC will allow a more complete insight into future meteoroid streams submitted to the database. They contain information about shower duration, as well as radiant and speed dispersions. The MDC user, by comparing the contents of the tables, will therefore be able to assess whether an identified 'new' stream is already in the MDC.

Conclusions

It would have been recalled that before publishing, each new meteoroids stream must receive a unique name from the MDC, and the IAU numeric and 3-letter code. The new entry to the MDC must be published in a scientific journal or in the WGN (the Journal of the IMO), MeteorNews and e-Radiant. In order to avoid deletion from the MDC, a manuscript describing the study must be sent to the MDC within half a year of requesting the shower names and codes. To each new submission to the MDC should be accompanied by a “lookup table” that gives shower members parameters.

As a result of the changes in the mode of operation of the MDC shower base, 157 streams were transferred from the Working List to the List of Removed Showers. These were mostly duplicates, and their removal reduced the number of streams on the Working List to 693.

The introduced changes, a critical assessment of the database content and the way it functions, lead to an improvement in the quality of data contained in the MDC, and make the lists more valuable for the users, for their efforts to better understand meteoroid streams.

However, despite our recent efforts, the MDC database is not perfect. Surely it still contains incorrect data, mistakes and errors that we have overlooked. Therefore with a view to continuous improvement of the database we appreciate every critical remark related with the information archived in the MDC.

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Appendix

Since 2009, for the first time in the history of meteor astronomy, 64 meteor showers were officially named by the IAU [1]. During the GA IAU in Bejing in 2012, the next group of 31 meteor showers obtained official names. In 2015, at the XXIX GA IAU in Honolulu, the names of 18 showers were officially accepted. At the same time, one shower already officially named (3/SIA the Southern iota Aquariids) was removed from the list of established showers [3].

Hence, to date, the MDC contains the list of 112 established showers, officially named by the IAU. All these showers are listed in Table. For each stream, only one set of data is given, the full list can be downloaded from the MDC Web site 'https://www.ta3.sk/IAUC22DB/MDC2007/Roje/roje_lista.php? corobic_roje=1&sort_roje=0'.

Table

Geocentric radiants and heliocentric orbital data of 112 meteor showers (streams) officially named by the GA IAU. The solar ecliptic longitude *S.Lon* at the time of shower maximum activity, the geocentric radiant right ascension and declination *RA*, *DE* and the values of the angular orbital elements *Peri*, *Node, Incl* are given for the epoch J2000.0. In the first two columns the IAU numerical and three letters code are provided.

No	Code	Shower Name	S.Lon	RA	DE	VG	a	q	e	Peri	Node	Incl
1	CAP	alpha Capricornids	128.9	306.6	-8.2	22.2	2.618	0.602	-	266.67	128.9	7.68
2	STA	Southern Taurids	224.0	49.4	13	28	2.07	0.352	-	115.4	37.3	5.4
4	GEM	Geminids	262.1	113.2	32.5	34.58	1.372	0.141	-	324.42	261.5	24.02
5	SDA	Southern delta Aquariids	125.6	342.1	-15.4	40.5	3.107	0.087	-	148.9	312.2	26.4
6	LYR	April Lyrids	32.4	272	33.3	46.6	45.7	0.921	-	214.3	31.8	79.6
7	PER	Perseids	140.2	46.8	57.8	59.49	24	0.949	0.96	150.4	139.7	113
8	ORI	Orionids	208.6	95.4	15.9	66.2	9.68	0.571	-	82.8	28.6	164.2
9	DRA	October Draconids	203.9	274.7	52.4	16.7	2.392	0.995	0.584	178.2	203.9	25.5
10	QUA	Quadrantids	283.3	230	49.5	41.36	3.14	0.979	-	172	283.3	72
11	EVI	eta Virginids	354.0	182.1	2.6	29.2	2.562	0.382	-	349.1	280.5	3.5
12	KCG	kappa Cygnids	145.2	286.2	59.1	24.8	3.09	0.99	-	194	145	38
13	LEO	Leonids	235.1	154.2	21.6	70.66	10.1	0.9853	-	173.5	236.1	162.36
15	URS	Ursids	271.0	219.3	75.3	33	4.62	0.944	-	204.9	270.7	51.5
16	HYD	sigma Hydrids	265.5	131.9	0.2	58	12.3	0.224	-	124	84.8	124.9
17	NTA	Northern Taurids	224	58.6	21.6	28.3	2.12	0.35	-	294.9	226.2	3.1
18	AND	Andromedids	232	24.2	32.5	17.2	2.76	0.789	-	238.9	231	10
19	MON	December Monocerotids	260.9	101.8	8.1	42	50.7	0.193	-	128.1	80.2	35.2
20	COM	Comae Berenicids	274	175.2	22.2	63.7	14.4	0.541	-	265	283.3	139.4
21	AVB	alpha Virginids	32.0	203.5	2.9	18.8	2.55	0.744	0.716	247.9	30.0	7.0
22	LMI	Leonis Minorids	209	159.5	36.7	61.9	286	0.616	-	102.73	208.4	125.32
23	EGE	epsilon Geminids	206	101.6	26.7	68.8	10	0.731	-	241.7	209	172.9
26	NDA	Northern delta Aquariids	139	344.7	0.4	40.5	2.536	0.071	-	332.6	139	23
27	KSE	kappa Serpentids	15.7	230.6	17.8	45	-	0.45	-	275	15.7	65
31	ETA	eta Aquariids	46.9	336.9	-1.5	65.9	16.16	0.581	-	97.9	44.44	163.9
33	NIA	Northern iota Aquariids	147.7	328.4	-5.6	31.2	1.625	0.26	-	308	147.7	5
61	TAH	tau Herculids	72	228.5	39.8	15	2.695	0.97	-	204.2	72.6	18.6
63	COR	Corvids	86.0	205.8	0.2	8.7	2.35	0.999	0.571	193.7	91.8	2.6
69	SSG	Southern mu Sagittariids	78	276.4	-27.5	19.6	2.142	0.65	-	84.3	279.4	2.6

No	Code	Shower Name	S.Lon	RA	DE	VG	a	q	e	Peri	Node	Incl
96	NCC	Northern delta Cancrids	296.0	127.6	21.5	27.2	2.23	0.410	0.814	286.6	290.0	2.7
97	SCC	Southern delta Cancrids	296.3	134.1	10.1	(26.8)	2.114	0.475	0.761	100.7	126.9	6.3
100	XSA	Daytime xi Sagittariids	304.9	284.8	-18.6	26.3	1.744	0.383	-	66.6	296	4.3
102	ACE	alpha Centaurids	319.4	212.1	-59.4	58.2	-	0.977	-	348.9	138.9	107.0
110	AAN	alpha Antliids	313.1	162.1	-13.3	42.7	-	0.143	0.920	141.9	133.1	64.3
128	MKA	Daytime kappa Aquariids	359.7	338.7	-7.7	33.2	-	0.18	0.89	42	359.7	1.8
137	PPU	pi Puppids	33.6	110.4	-45.1	15	2.97	1	-	359	33.64	21
144	APS	Daytime April Piscids	30.3	7.6	3.3	28.9	1.32	0.22	-	45	30.7	0.5
145	ELY	eta Lyrids	49.1	292.5	39.7	45.3	6.03	0.995	-	190	45.7	79.4
151	EAU	epsilon Aquilids	59	284.9	15.6	30.8	0.873	0.354	-	318.3	59.5	59.6
152	NOC	Northern Daytime omega Cetids	47.8	2.3	17.8	33	0.967	0.108	-	25.6	47.8	42
153	OCE	Southern Daytime omega Cetids	48.6	22.5	-3.6	36.6	1.623	0.122	-	213.9	228.6	32.6
156	SMA	Southern Daytime May Arietids	52.7	33.7	9.2	28.9	1.68	0.27	-	233	232.7	5
164	NZC	Northern June Aquilids	86	298.3	-7.1	36.3	1.348	0.114	-	329.5	86.5	39.3
165	SZC	Southern June Aquilids	80	297.8	-33.9	33.2	1.15	0.11	-	152	259.7	33.5
170	JBO	June Bootids	96.3	222.9	47.9	14.1	-	-	-	-	-	-
171	ARI	Daytime Arietids	76.7	40.2	23.8	35.7	1.376	0.085	-	25.9	77.6	25
172	ZPE	Daytime zeta Perseids	78.6	64.5	27.5	25.1	1.492	0.365	-	60.5	81.5	6.5
173	BTA	Daytime beta Taurids	96.7	84.9	23.5	29	1.653	0.274	-	52.3	102.7	0.3
175	JPE	July Pegasids	107.5	340	15	61.3	(44)	0.536	-	267.2	107.5	131.6
183	PAU	Piscis Austrinids	123.7	340.7	-25.7	40.5	4.31	0.17	-	114	303.7	45
184	GDR	July gamma Draconids	125.3	280.1	51.1	27.4	-	-	-	-	-	-
187	PCA	psi Cassiopeiids	114.4	29.4	71.5	40.3	2.481	0.821	-	121.2	114.4	72.1
188	XRI	Daytime xi Orionids	121.9	94.4	15	44	8.33	0.08	-	211.6	301.9	32.8
191	ERI	eta Eridanids	137.5	45	-12.9	64	20.26	0.961	-	26.6	317.5	130.4
197	AUD	August Draconids	142	272.5	65.1	17.3	1.515	1.007	0.335	185.6	141.9	30.4
198	BHY	beta Hydrusids	143.8	36.3	-74.5	22.8	(3.25)	0.966	-	27.3	323.8	35
202	ZCA	Daytime zeta Cancrids	147	119.7	19	43.8	5	0.05	-	206.5	326.9	21.1
206	AUR	Aurigids	158.7	89.8	38.7	65.7		0.683	-	110.2	158.7	148.5
208	SPE	September epsilon Perseids	170	50.2	39.4	64.5	31.1	0.742	-	241.9	171.3	138.9
212	KLE	Daytime kappa Leonids	180.7	162.7	15.7	43.6	48	0.11	-	39	180.7	26
221	DSX	Daytime Sextantids	186.1	154.5	-1.5	31.2		0.151	0.855	212.5	6.1	23.1
233	OCC	October Capricornids	189.3	301.5	-8.7	(15)	3.65	0.99	0.730	193.2	189.3	2.8
242	XDR	xi Draconids	210.8	170.3	73.3	35.8	1.279	0.988	-	175.3	210.8	69
246	AMO	alpha Monocerotids	239.3	117.1	0.8	63	500	0.488	-	90.66	59.32	134.13
250	NOO	November Orionids	245	90.6	15.7	43.7		0.113	-	140.5	67	24.8
252	ALY	alpha Lyncids	268.9	138.8	43.8	50.4	(25.4)	0.281	-	295.9	268.8	84.4
254	PHO	Phoenicids	253	15.6	-44.7	11.7	2.96	0.99	0.670	359	74	13
257	ORS	Southern chi Orionids	260	78.7	15.7	21.5	2.23	0.594	-	86.4	80.1	5.2
281	OCT	October Camelopardalids	193	166	79.1	46.6	368	0.993	-	170.6	192.6	78.6
319	JLE	January Leonids	282.5	148.3	23.9	52.7	6.3	0.055	0.991	333.7	282	109.3

No	Code	Shower Name	S.Lon	RA	DE	VG	a	q	e	Peri	Node	Incl
320	OSE	omega Serpentids	275.5	242.7	0.5	38.9	1.37	0.164	0.880	38.8	275.9	56.5
321	TCB	theta Coronae Borealids	296.5	232.3	35.8	38.66	1.108	0.924	0.166	124.9	296.5	77
322	LBO	lambda Bootids	295.5	219.6	43.2	41.75	1.49	0.956	0.358	206.6	295.4	79.3
323	XCB	xi Coronae Borealids	294.5	244.8	31.1	44.25	2.34	0.817	0.651	124.7	294.5	79.6
324	EPR	epsilon Perseids	95.5	58.2	37.9	44.8	4.55	0.13	0.971	39.7	96	63
325	DLT	Daytime lambda Taurids	85.5	56.7	11.5	36.4	1.57	0.104	0.934	210.8	1.7	23.2
326	EPG	epsilon Pegasids	105.5	326.3	14.7	29.9	0.757	0.173	0.771	334.9	105.2	55.4
327	BEQ	beta Equuleids	106.5	321.5	8.7	31.6	0.887	0.163	0.816	330.3	106.2	49.7
328	ALA	alpha Lacertids	105.5	343	49.6	38.9	1.089	1.002	0.080	217.1	105.3	81.1
330	SSE	sigma Serpentids	275.5	242.8	-0.1	42.3	1.92	0.16	0.917	41.3	275.9	64
331	AHY	alpha Hydrids	285.5	127.6	-7.9	43.6	12.7	0.287	0.977	115.6	105	57.1
333	OCU	October Ursae Majorids	202	144.8	64.5	54.1	5.9	0.979	0.875	163.7	202.1	99.7
334	DAD	December alpha Draconids	256.0	210.8	58.6	40.8	2.48	0.983	0.603	177.4	254.8	71.8
335	XVI	December chi Virginids	267.0	194.3	-12.0	69.1	6.24	0.663	0.985	290.3	86.5	169.1
336	DKD	December kappa Draconids	252.0	187.2	70.2	43.8	10.31	0.929	0.914	208.5	251.5	73.1
337	NUE	nu Eridanids	163.0	61.5	4.3	67.1	7.04	0.867	0.916	43.7	53.2	150.7
338	OER	omicron Eridanids	232.0	59.9	0.1	28.5	3.92	0.497	0.875	94.1	49.2	19.6
339	PSU	psi Ursae Majorids	253.0	169.8	42.4	61.7	9.13	0.928	0.901	208.9	253.8	119.4
341	XUM	January xi Ursae Majorids	298.0	168.7	33	40.9	1.5	0.217	0.857	313.2	298.0	66.8
343	HVI	h Virginids	38.3	202.8	-10.8	18.5	2.92	0.753	0.742	65.5	218.7	0.6
346	XHE	x Herculids	350.0	253.0	49.2	35.2	2.99	0.975	0.673	196.7	350.0	59.8
348	ARC	April rho Cygnids	37	324.5	45.9	41.8	6.51	0.810	0.875	125.55	37	69.9
362	JMC	June mu Cassiopeiids	74	17.5	53.9	43.6	57.24	0.577	0.990	97.68	74	68.3
372	PPS	phi Piscids	106	20.1	24.1	62.9	2.09	0.856	0.590	125.02	106	152.6
388	CTA	chi Taurids	220	63.2	24.7	42.1	4.97	0.081	0.984	328.49	220	12.3
390	THA	November theta Aurigids	237	89	34.7	33.8	1.13	0.116	0.897	330.07	237	27.8
404	GUM	gamma Ursae Minorids	299	231.8	66.8	31.8	4.2	0.959	0.772	199.54	299	51.1
411	CAN	c Andromedids	107.0	29.1	47.3	57.5	8.40	0.687	0.938	109.1	107.4	112.9
427	FED	February eta Draconids	315.1	239.9	62.5	35.6	-250	0.971	-	194.09	315.1	55.2
428	DSV	December sigma Virginids	267.4	205.5	5.47	66	-	0.605	0.974	102.66	267.4	149.64
431	JIP	June iota Pegasids	94.5	332.6	29.2	59	-	0.9015	0.988	219.57	94.46	113.39
445	KUM	kappa Ursae Majorids	225	147.2	45	65.7	-19.54	0.988	1	185.9	224	129.6
446	DPC	December phi Cassiopeiids	252	19.5	57.7	16.5	3.1	0.896	0.714	218.7	252.1	18
506	FEV	February epsilon Virginids	315.3	201.7	10.4	63		0.488	0.958	271.2	315.3	138.1
510	JRC	June rho Cygnids	84	321.8	43.9	50.2	21	1.007	0.931	190	84.2	90
512	RPU	rho Puppids	223	120	-24	57.5	13	0.985	0.913	9	43	106.4
524	LUM	lambda Ursae Majorids	215	158.2	49.4	60.3	13	0.917	0.931	147	215	115
526	SLD	Southern lambda Draconids	221.6	163	68.1	48.7	4	0.986	0.744	189	221.6	88
529	EHY	eta Hydrids	256.9	132.9	2.3	62.5	15	0.383	0.974	103.8	76.9	142.8
530	ECV	eta Corvids	304.9	192.0	-18.1	68.1	5.29	0.820	0.847	50.1	122.2	50.1
533	JXA	July xi Arietids	119	40.1	10.6	69.4	-	0.883	0.965	318	299	171.6
549	FAN	49 Andromedids	114	20.9	46.7	60.1	-	0.918	0.925	143.1	114	118.2
569	OHY	omicron Hydrids	309	176.3	-34.1	59.1	-	0.684	0.931	68.6	128.9	114.3

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ЦЕНТР МЕТЕОРНЫХ ДАННЫХ МЕЖДУНАРОДНОГО АСТРОНОМИЧЕСКОГО СОЮЗА: БАНК ДАННЫХ МЕТЕОРНЫХ ПОТОКОВ

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Рабочая группа Международного астрономического союза (МАС) по Номенклатуре метеорных потоков создана в 2006 г. с целью регулирования наименований метеорных потоков, опубликованных в научной литературе. Банк данных Центра метеорных данных МАС (ЦМД МАС) был внедрен годом позже. Банк данных не содержит всей информации о метеорных потоках, его цель – дать каждому новому метеороидному рою, опубликованному в научной литературе, уникальное имя и код.

Во время международной научной конференции “Метеороиды 2019”, прошедшей в Братиславе, Рабочая группа МАС по Номенклатуре метеорных потоков установила новые правила для включения и исключения метеорных потоков в/из банка данных ЦМД МАС. В этой статье мы даем краткое описание банка данных метеорных потоков, его происхождение и структуру и, в частности, приведены текущие требования к включению новых данных о неизвестных, а также известных метеорных потоках.

Ключевые слова: метеороидный рой, метеорный поток, банк данных потоков ЦМД МАС, номенклатурные правила метеорного потока, правила регистрации нового метеорного потока.

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МАРКАЗИ МАЪЛУМОТҲОИ МЕТЕОРИИ ИТТИҲОДИ БАЙНАЛМИЛАЛИИ АСТРОНОМӢ: МАҲЗАНИ МАЪЛУМОТҲОИ СЕЛҲОИ МЕТЕОРӢ

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Гурӯҳи кории Иттиҳоди Байналмилалии Астрономӣ (ИБА) оид ба Феҳрасти селҳои метеорӣ бо мақсади ба танзим даровардани номҳои селҳои метеорие, ки дар адабиёти илмӣ нашр шудаанд, соли 2006 таъсис дода шудааст. Маҳзани маълумотҳои Маркази маълумотҳои метеории ИБА (МММ ИБА) пас аз як сол татбиқ гардидааст. Маҳзани мазкур кулли маълумотҳои селҳои метеориро дар бар намегирад, мақсади ӯ – ба ҳар як тӯдаи нави метеороидӣ, ки дар адабиёти илмӣ нашр шудааст, ном ва рамзи беназир гузоштан аст.

Ҳангоми конференсияи байналмилалии илмии «Метеороидҳо 2019», ки дар шаҳри Братислава баргузор гардидааст, Гурӯҳи кории ИБА оид ба феҳрасти селҳои метеорӣ қоидаҳои нав барои ворид ва хориҷ кардани селҳои метеориро ба/аз маҳзани маълумотҳои МММ ИБА муқаррар кардааст. Дар ин мақола, мо тавсифи мухтасари маҳзани маълумотҳои селҳои метеорӣ, пайдоиш ва сохтори он ва инчунин талаботҳои ҷорӣ барои ворид кардани маълумоти нав дар бораи селҳои номаълум ва маълумро пешниҳод менамоем.

Калимаҳои калидӣ: тудаи метеороидӣ, селҳои метеорӣ, маҳзани маълумотҳои селҳои МММ ИБА, қоидаҳои феҳрастии селҳои метеорӣ, қоидаи қайди сели метеории нав.