

Minor Planet Center Updates



Federica Spoto
MPC

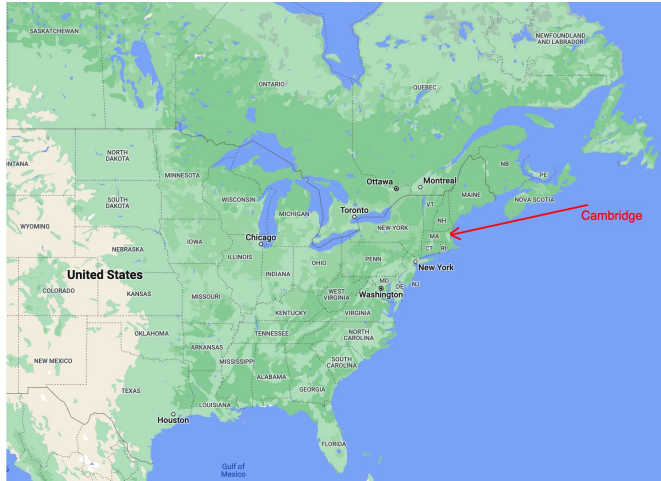
Center for Astrophysics, Harvard and Smithsonian

CENTER FOR **ASTROPHYSICS**
HARVARD & SMITHSONIAN

September 10th, 2025, SBN User Group Meeting

Credit: NASA
Planetary Defenders Documentary

What is the Minor Planet



The MPC is the single worldwide location for receipt and distribution of positional measurements of minor planets, comets and outer irregular natural satellites of the major planets.

The MPC is responsible for the identification, designation and orbit computation of all of these objects.



We are **physically located in Cambridge (MA)** as part of the Center for Astrophysics (Harvard & Smithsonian), **but we serve the small body community worldwide** under the auspices of the International Astronomical Union (IAU).

MPC staff members



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Minor Planet Center

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ABOUT

CONTACT

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Search MPC

<https://data.minorplanetcenter.net/about>



Currently 14 people & 2 job posting being filled

Communications



- **Monthly Newsletter**

- Updates on MPC processing
- Description of new services
- Updates on existing services
- General communications or requests for feedback



- **Dedicated mailing list: MPC-ml**

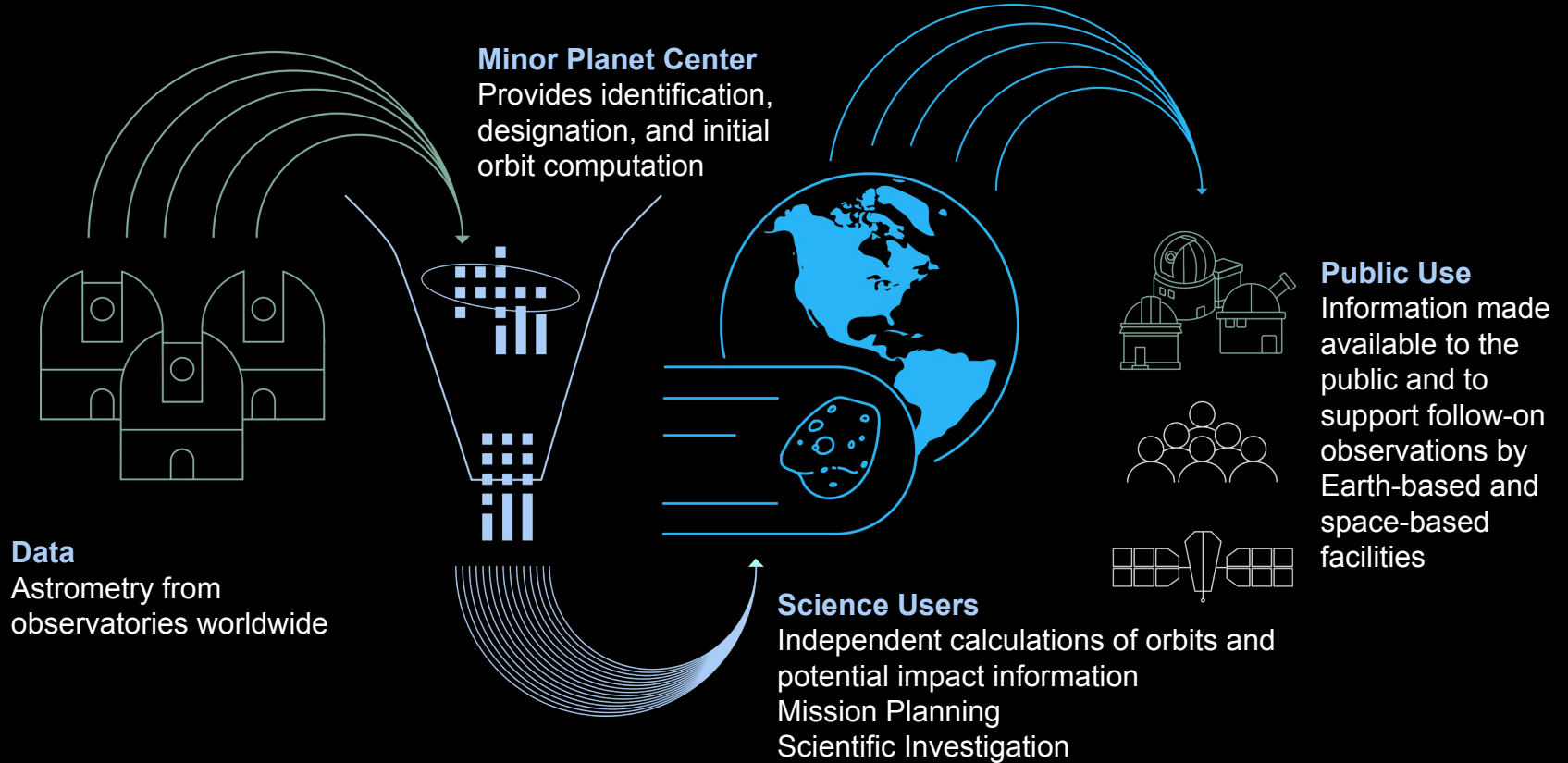
- Mailing list used by the MPC for important and timely communications, e.g. broken services, power outages, etc.
- The same information is also usually available on the Status Page from the website

- **Jira Helpdesk**

- For users' concerns, feedback, problem reports, etc.
- <https://mpc-service.atlassian.net/servicedesk/customer/portals>

This is a screenshot of the IAU Minor Planet Center website. The header shows the IAU logo and the text 'The International Astronomical Union Minor Planet Center'. Below the header is a navigation bar with four tabs: 'OBSERVERS', 'DATA', 'NEW', and 'STATUS'. The 'NEW' tab is currently selected. The main content area is titled 'What's New?' and 'Newsletters'. It contains a paragraph stating the goal of the newsletters is to communicate recent developments to users. Below this, there is a list of newsletters for the year 2025, with entries for January, February, March, April, May, June, July, and August. Each entry includes a brief description of the content, such as 'ADES submissions, WAMO tool updates' for January or 'New interstellar comet 3I/ATLAS' for June.

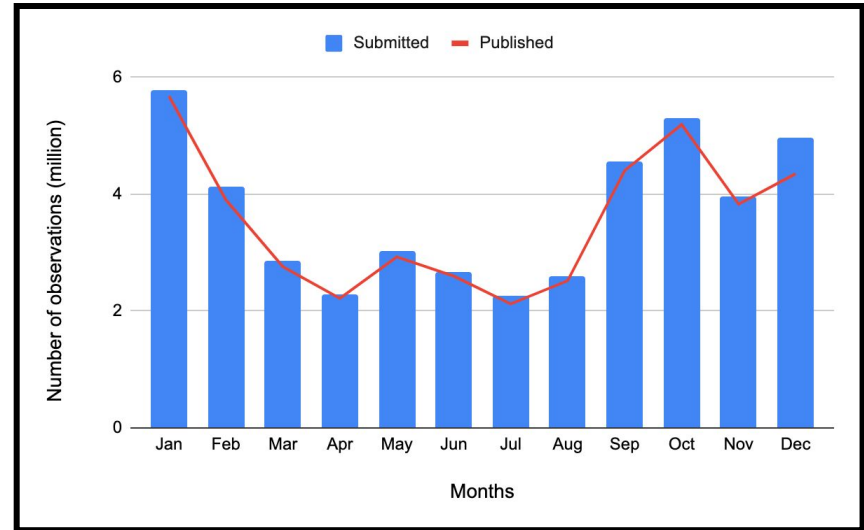
MPC Data Flow



Data Volumes

- The MPC currently receives ~40M - 50M observations per year.
- The majority of the data come from planetary-defense funded surveys (PanSTARRS, Catalina, ATLAS, ...)
- The MPC expects to receive **~250M** obs/year from Rubin:
Factor of ~5 increase.
- Starting 2028, a further ~200M obs/year from NEO Surveyor mission.
- Order-of-magnitude increase in data volume has driven MPC development activity over the past couple of years

2024 Submissions



Observations Ingest



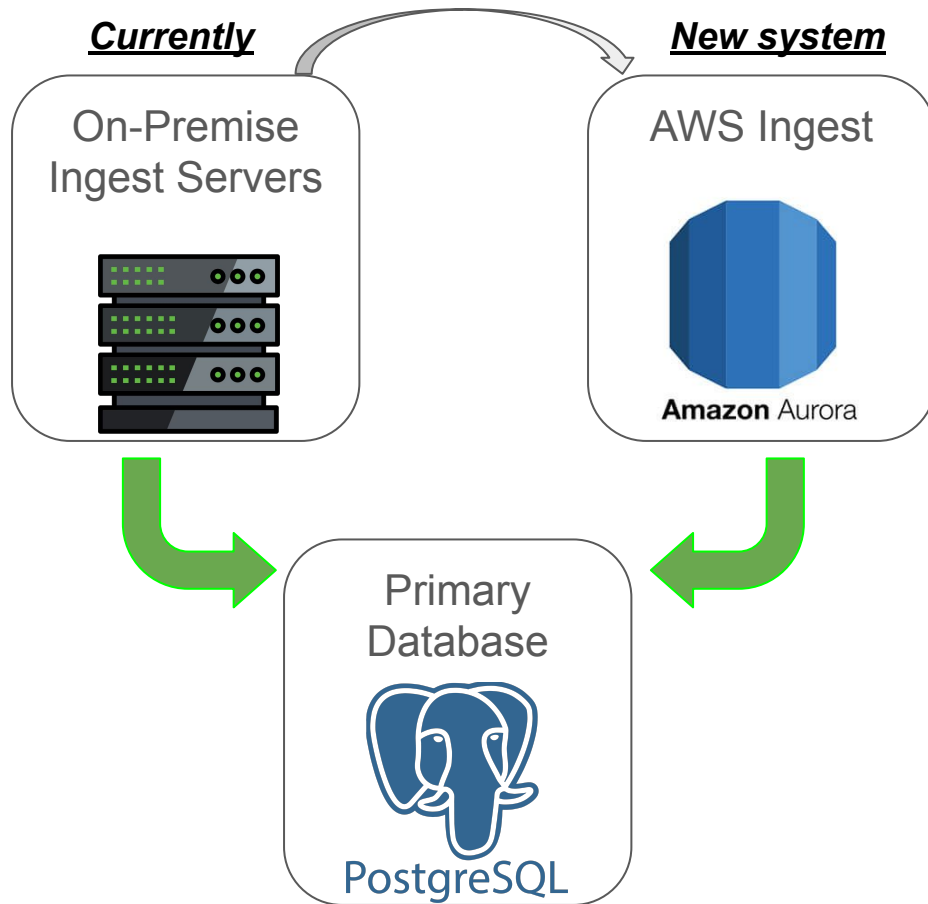
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Migrate Ingest Route

- Migrate to AWS Aurora-based system
- Increased resilience against power outages
- Submission routes will be repointed
- Submitters/Observers unaffected.

Status

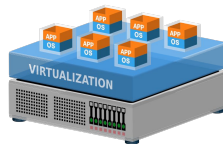
- Test version of AWS -to- Primary-DB is flowing
- On-premise server is current ingest route
- Switch-over: next months



Pipeline (OD) processing

Infrastructure

- Local Hardware
- Virtual Machine Cluster
- Docker Swarm
- RabbitMQ Job-Queue Management
- PostgreSQL Databases
- Key Functionalities Containerized and deployed as microservices:
 - IOD
 - Orbit Fitting
 - Attribution
 - Precovery Search
 - Designation
 - Publication
- Failover Infrastructure
- **Sandbox system** used for testing (LSST / NEO Surveyor)



- **Currently deployed pipelines:**
 - Orbit extensions, i.e. adding new tracklets to already existing orbits
 - Working on NEAs, MBAs, TNOs, both numbered and unnumbered
 - Worked on the LSST first light (IOD) for new objects, but we are in the process of adding more checks
 - Bug fixing



New extended packed provid



New definition of extended packed provisional designation

The first column MUST contain an underscore '_'

Slide from the DPS in 2023

The character in the second column must be a capital letter, indicating the last two digits of the year of discovery (e.g. P=25, Q=26, ...)

The third character is the capital letter for the half month

Columns from four to seven will contain four alphanumeric character [0-9A-Za-z] used as base62 representation of the order of designation after 15,500

The new extended packed provisional designation WILL NOT be used before June 2024.

Year	Half month	Order of designation within half month	Unpacked provisional designation	Packed provisional designation
2023	B	0	2023 BA	K23B00A
2025	D	15500	2025 DZ619	K25Dz9Z
2025	D	15501	2025 DA620	_PD0000
2026	D	15524	2026 DY620	_QD000N

Newsletter - October 2023

2023 OCTOBER 01

In this month's issue:

[New packed provisional designations](#) | [What's new?](#) | [Meetings](#) | [Did you know?](#)

New packed provisional designations

https://minorplanetcenter.net/media/newsletters/MPC_Newsletter_Oct2023.pdf

New extended packed provid



In June 2025 we finally designated one object using the new packed scheme: the object is `_FB0000` = 2-15 BA620

https://minorplanetcenter.net/media/newsletters/MPC_Newsletter_Jul2025.pdf

https://minorplanetcenter.net/media/newsletters/MPC_Newsletter_Jun2025.pdf

New extended packed provisional designation

Following what was already presented in our [October 2023](#) and [June 2025](#) Newsletters, the MPC has now designated the first object using the new extended packed provisional designation. The first designated object using the new scheme is *2015 BA620*, and its packed provisional designation is `_FB0000`.

We are planning to designate a few more objects in the next weeks and to publish a new monthly Minor Planet Circular in August to test all downstream services. Some bugs have already been discovered and fixed. We always appreciate your feedback.

LSST first public submission



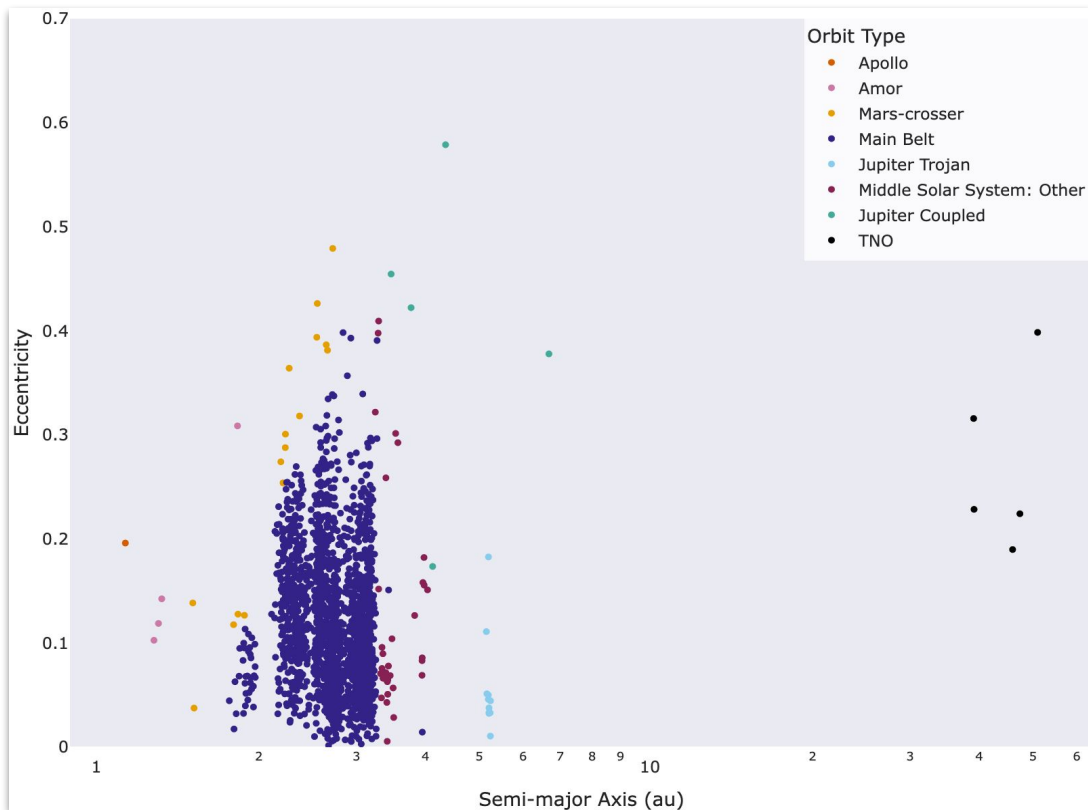
IAU

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June 23rd

- Observatory Code X05
- 343,760 Submitted Observations
- 2,103 unique objects

<u>Orbit type</u>	Number of objects
NEOs	7
Mars-crossers	16
Main Belt	1830
Jupiter Trojans	11
Jupiter Coupled	5
Middle Solar System: Other	35
TNOs	5



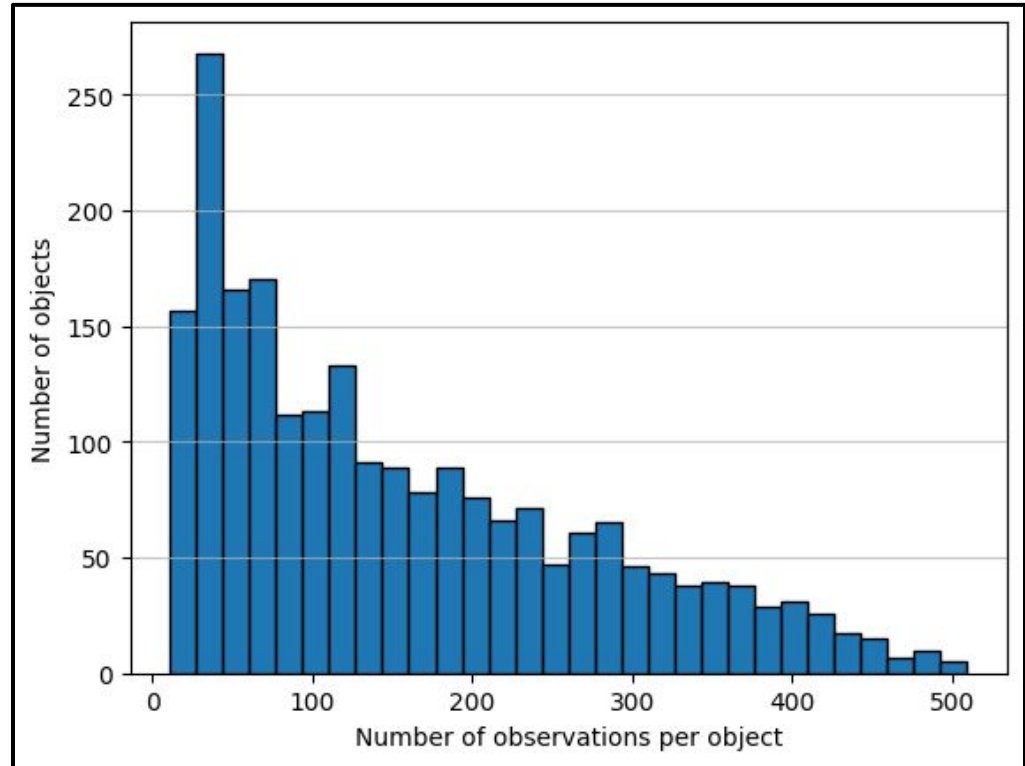


<i>Unpacked provisional designation</i>	<i>Semi- major axis (au)</i>	<i>Eccentrici ty</i>	<i>Inclination (deg)</i>	<i>Perihelion distance (au)</i>	<i>Absolute magnitude</i>	<i><u>Orbit type</u></i>	<i>Linked designation</i>
2025 MO19	1.317569	0.118909	3.372177	1.160917	24.9	Amor	
2025 MR32	1.335582	0.142547	9.871866	1.145199	24.7	Amor	
2025 MU34	1.147983	0.196136	4.569041	0.922889	24.4	Apollo	
2025 MK42	1.830205	0.308730	6.560963	1.265166	20.2	Amor	
2025 MJ71	2.060241	0.371350	6.761553	1.295170	22.7	Amor	2022 CJ2
2025 ME74	1.293032	0.102718	23.75032	1.160214	23.8	Amor	
2025 MU85	2.050721	0.560998	2.445224	0.900272	23.3	Apollo	2022 SM20

LSST first public submission

June 23rd

- Observatory Code X05
- 343,760 Submitted Observations
- 2,103 unique objects
- Median: 132 observations per object (not a typical submission)



LSST first public submission



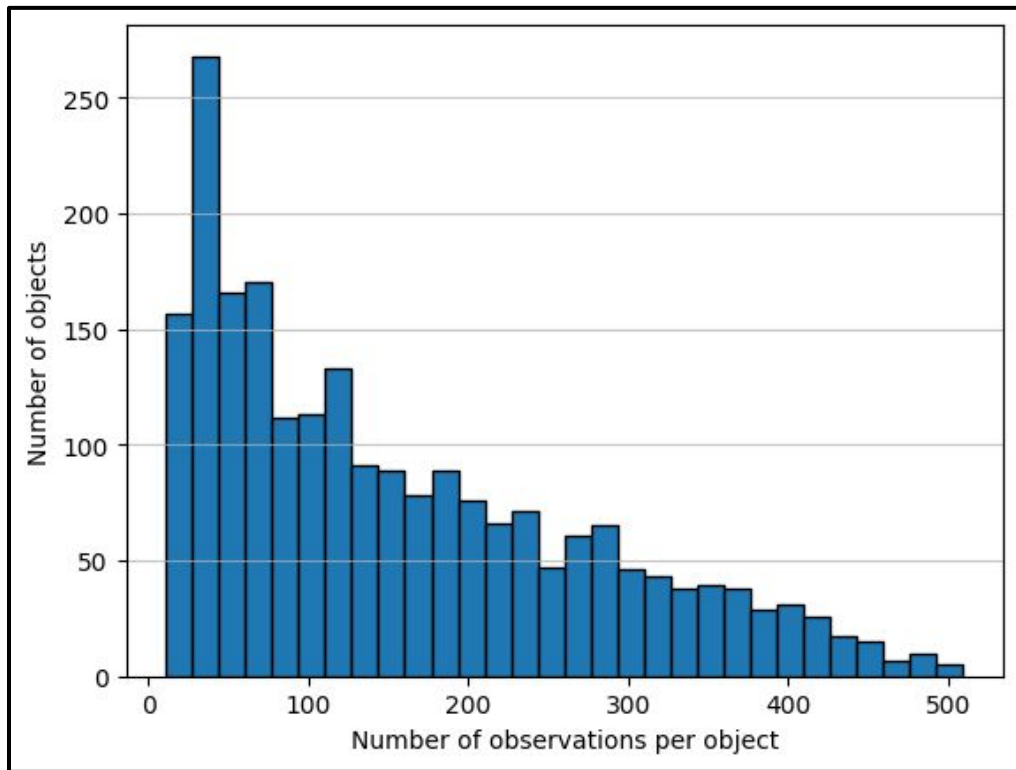
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June 23rd

- Observatory Code X05
- 343,760 Submitted Observations
- 2,103 unique objects
- Median: 132 observations per object (not a typical submission)

June 27th

- ComCam data from ~November DP1
- 2,229 observations
- 93 new objects



Archival Submissions

Concerns

- Potential for inaccurate extraction of archival data by community members



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Minor Planet Center

OBSERVERS	DATA	NEW	STATUS	DOC
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Singleton and archival observations committee (SARC)

In recent years there has been an increase in the scale and accessibility of public data archives, as well as in the availability of new software tools to search and extract data from said archives. This has significantly lowered the barriers to finding, extracting and submitting archival data to the MPC.

While this represents a huge opportunity for the community to better utilize extant data, and for the MPC to improve the orbit catalog, it also presents the MPC and the community with some challenges related to ensuring that the quality of the submitted measurements remains high.

One concern is that occasional erroneous measurements of images from public archives might be submitted by third party users. Single measurements can be especially problematic when reported for an opposition for which no other observations are available. These single observations have the power to change the orbits and, especially in the case of objects that are already on the [Sentry risk list](#), they can influence the impact probability computation.

Archival submissions



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Proposal

- MPC & MPC User Group: Established “*Singleton and Archival Observation Committee*”
- Require program-codes for all archival submissions
- Assign program-codes only after third-party users have been verified by survey experts:
 - A list of experts has been established
 - The goal for the experts is to verify the currently assigned program codes and to validate new submission
- Additional validation will be required in the case of the submission of singletons

https://minorplanetcenter.net/media/newsletters/MPC_Newsletter_Jul2025.pdf

Towards a New Approach for Program Codes

The Minor Planet Center (MPC) has historically used program codes to identify different observers observing from the same telescope (see [our program codes page](#) for further documentation).

The MPC continuously monitors the astrometric quality of all submitted observations. In particular, we perform a careful verification of the astrometry provided by users requesting a new observatory code before assigning it (see [these instructions](#) for further documentation).

Program-code assignments, on the other hand, have not been subject to the same scrutiny, until now.

To start, as of Monday August 18th, a program code will be assigned by default to all the new observatory codes.

In addition to that, we are also in the process of refining how program codes are assigned for the submission of archival observations and non-historical stations. More details will come in the next newsletter.

Starting with the submission of archival data, everyone who wishes to submit observations from public archives will need to go through a verification process. The purpose of this change in policy is to try to ensure consistently that high standards of astrometric and photometric measurement are adopted by the community in an era when archival data is becoming increasingly easy to access.

Once users have been confirmed to have satisfied the required training standards, they will be assigned a program-code (specific to that observatory-code), and will be able to freely submit observations from that observatory-code's archive. The MPC will apply that program code to all observations from that user.



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Publications

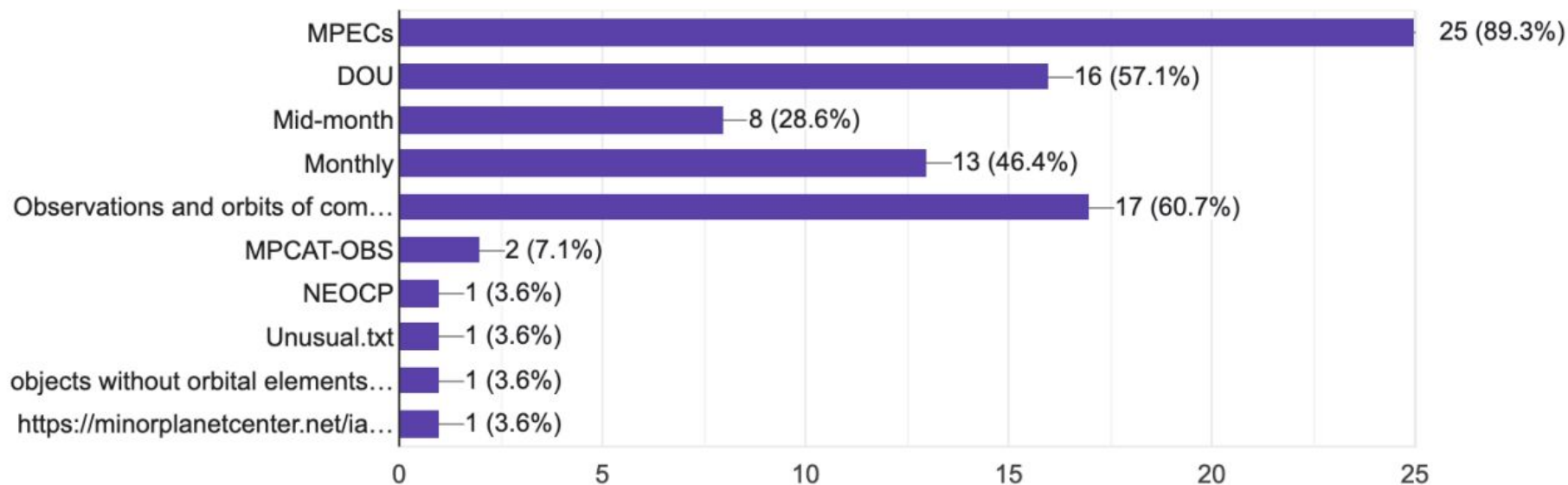
Publications

- The MPC's official publications comprise five main products:
 1. Minor Planet Electronic Circulars (MPECs);
 2. Daily Orbit Update (DOU);
 3. Mid-month Minor Planet Supplements (MPS);
 4. Monthly Minor Planet Circulars (MPCs);
 5. Observations and orbits of comets
- **There is an ongoing effort at the MPC to improve the current publications schema**
- In May 2025 we asked for feedback from our users to better understand which MPC products are most valuable to the community and to ensure that key information is accessible through our replicated MPC database tables or related APIs on the MPC website.

New publication model



- We received 36 responses
 - 82.4% of the users use our publication products, mostly MPECs, DOU and Obs&orbs of comets
 - Users mostly look for observations, identifications and orbits
 - The majority of our users doesn't have and won't have a replicated copy of our postgresSQL tables





- We received 36 responses
 - We are also working towards creating more APIs
 - Improving our documentation
 - Improving our current services and deprecating our old ones, e.g. db_search and search_db will be deprecated

