

Regarding the parent bodies in the Meteor Data Center

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Currently, the only known database containing both meteor shower parameters and the parent bodies associated with them is the IAU Meteor Data Center (MDC) Shower database (SD). But only about 16% out of all the listed showers have a parent body linked to them. As part of the ongoing modification of the SD, we aim to identify as many scientific sources suggesting shower parent bodies as feasible and enhance the database by including this information, along with method of investigation and the corresponding references.

1 Introduction

The Meteor Data Center¹ (MDC) of the International Astronomical Union (IAU) comprises of two databases. The Orbital Database catalogues individual meteoroid orbits and the Shower Database (SD) archive the parameters of the meteor showers and are also responsible for the assignment and maintenance of the unique shower designations (Neslušan et al., 2020; Jenniskens et al., 2020). One of the information available in the SD is the name of the parent body associated with the shower and its meteoroid stream. But only about 16% of all 931 meteor showers in the SD have such information available.

Parent body information from Jenniskens (2006) was used upon the creation of the database, including the generally known and accepted parent bodies. New parent body suggestions were possible to submit to the database only together with new shower parameters. But for the showers with multiple proposed solutions the note regarding the parent body does not specify the paper in which it was originally suggested. This resulted in some inconsistencies or lacking information about the parent bodies when the database was quoted as a reference.

To remove the deficiencies and update the database, we performed an additional search in the available articles using the NASA's Astrophysics Data System Bibliographic Services. Once processed, a new update of the database will provide additional lacking information. This task is a part of the continuous process of modifying the IAU MDC (Rudawska et al., 2021; Haj-

duková et al., 2023; Jopek et al., 2023; Neslušan et al., 2023).

2 Parent body search

Taking a look at the sample of 110 established meteor showers in MDC SD, only 13% of them have any kind of parent body information. If we were to also include the meteor showers that are currently nominated to be established, the percentage would raise to 14%. The SD offers a flag "?" to mark uncertain associations and this flag is used for two of the established meteor showers and their parent body suggestions. Currently, most of the parent body suggestions in the SD are comets, although two of the established meteor showers have asteroids associated with them.

After the preliminary article search, we may rise the percentage of the established meteor showers with parent body association from 13 to 48% (Figure 1). However, the number of unclear asteroid parent body suggestions also increases. If we look at the method used for creating the association, most of the new possible suggestions come from simple orbital similarity determination (mainly by the usage of so-called D-criteria, e.g. Southworth & Hawkins, 1963; Drummond, 1981) rather than any type of stream or evolution modelling. But due to perturbation inside the solar system the meteoroid stream responsible for the meteor shower might not be in the vicinity of its parent body. On the other hand, random association might be made between the stream and a comet or an asteroid. These cases can only be revealed by stream modelling and tracking the dynamical evolution of the meteoroids, comets and asteroids (e.g. Neslušan et al., 2013; Rudawska & Vaubaillon,

¹see <https://www.iaumeteordatacenter.org/>

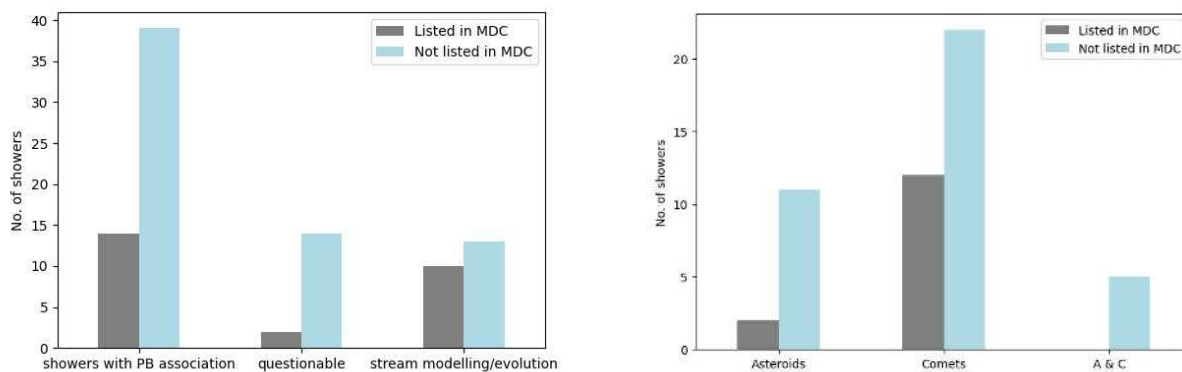


Figure 1 – Comparison of the number of the suggested parent bodies in the sample of established meteor showers in the MDC – listed and not listed associations in the MDC (left). Comparison of the number of the suggested cometary and asteroidal parent bodies in the sample of established meteor showers in the MDC – listed and not listed associations in the MDC (right).

2015). Because of this for a number of the associations revealed by our search, additional investigation and confirmation of the information is needed to be done before the update is available.

3 Conclusion

We performed the search in the academic literature to identify parent body associations not included in the MDC SD. After the preliminary search, we found that the percentage of established meteor shower with a parent body association in the MDC might increase from 13 to 48%. Additional search, confirmation and processing of the information is needed before the update of the database. Once finished, the update will include new information for the parent bodies, valid references, method used for obtaining the association and a new submission possibilities for the parent body suggestions. These data is of great importance because a known parent body of a meteor shower is included in the new set of criteria for achieving established status that was approved by the IAU Commission F1 in July 2022 (Hajduková et al., 2023).

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