An independent identification method applied to EDMOND and SonotaCo databases

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Here we report our initial results derived by applying an independent identification method (Rudawska et al., 2014, 2015) to the EDMOND database (Kornos et al., 2014a, 2014b), to the SonotaCo database (SonotaCo, 2009), and to both datasets combined, in order to identify existing meteor showers in both databases. The final clusters (meteor showers) found have been compared with the recently updated IAU MDC list of meteor showers.

1 Introduction

Recently in Rudawska et al. (2014, 2015) the authors introduced an independent identification method. In this paper, we have applied it to the EDMOND database (Kornos et al., 2013, 2014a, 2014b) together with the SonotaCo database (SonotaCo, 2009), in order to identify existing meteor showers in both databases. As the first step of the method we use a criterion based on orbital parameters to find groups around each meteoroid within the similarity threshold. Weighted mean parameters for the groups are calculated and are compared using a new function based on geocentric parameters. Similar groups are merged into final clusters (meteor showers), and compared with the IAU MDC list of meteor showers (Jopek and Kanuchova, 2014). Here we report the initial results obtained after applying the independent identification method.

2 Methodology

Our method consists of the following steps:

Step 1: We probe the database using the D criterion based on orbital elements with a low threshold value. In this way, we have independent groups around each reference meteoroid orbit. For each group a weighted mean of parameters is calculated.

Step 2: Using criterion based on geocentric parameters we merge groups into clusters of similar weighted means of geocentric parameters found in Step 1. The new weighted mean of the parameters for clusters found in Step 2 is calculated. We repeat Step 2 using new means until groups are no longer linked into clusters.

Step 3: We compare parameters of known meteor showers in the IAU MDC with the final mean values of the same parameters for the found clusters.

In Step 1 we used the D_{SH} criterion (Southworth and Hawkins, 1963) with $D_c = 0.05$, while in Step 2 we applied the D_X function (Rudawska et al., 2014, 2015) with $D'_c = 0.15$. To identify clusters in Step 3 we used the D_{SH} criterion with $D''_c = 0.15$ or the D_X criterion with $D''_c = 0.15$, depending whether or not orbital parameters were provided in the IAU MDC for a given meteor shower.

In addition, our search is restricted to find meteor showers that have been observed in a given year and have included 5 or more members. Thus, we should be aware that due to this restriction, our procedure may not find meteor showers that were not significantly active in a given year.

3 Summary

We carried out a search of meteoroid streams within the EDMOND database, SonotaCo database, and with a merged set of these two databases. Analyzing each database separately, our method confirmed 296 of the previously reported meteoroid streams in the EDMOND database and 297 in the SonotaCo database (*Figure 1*). However, although the numbers of identified showers were similar, the set of showers are not identical.

When we applied our procedure to the merged set of EDMOND and SonotaCo databases, we confirmed 382 meteor showers from the recently updated list of 643 showers listed at the IAU MDC, of which:

- 20% of identified showers are established showers, 79% are from the working list, and 1% are pre-tempore meteor showers.
- 70% of identified showers match those found in EDMOND and SonotaCo independently.
- those that were identified only in EDMOND account for 8%, while
- those that were identified only in SonotaCo account for another 9%.
- Leaving us with 13% of meteor showers which were identified due to merging the two databases.

Additionally, some of the meteor showers listed at the IAU MDC do not have orbital parameters provided. Thanks to our method, not only we were able to provide

updated orbits for known streams, we could also provide orbits for 37 cases for which only a set of radiant data is available at the IAU MDC.

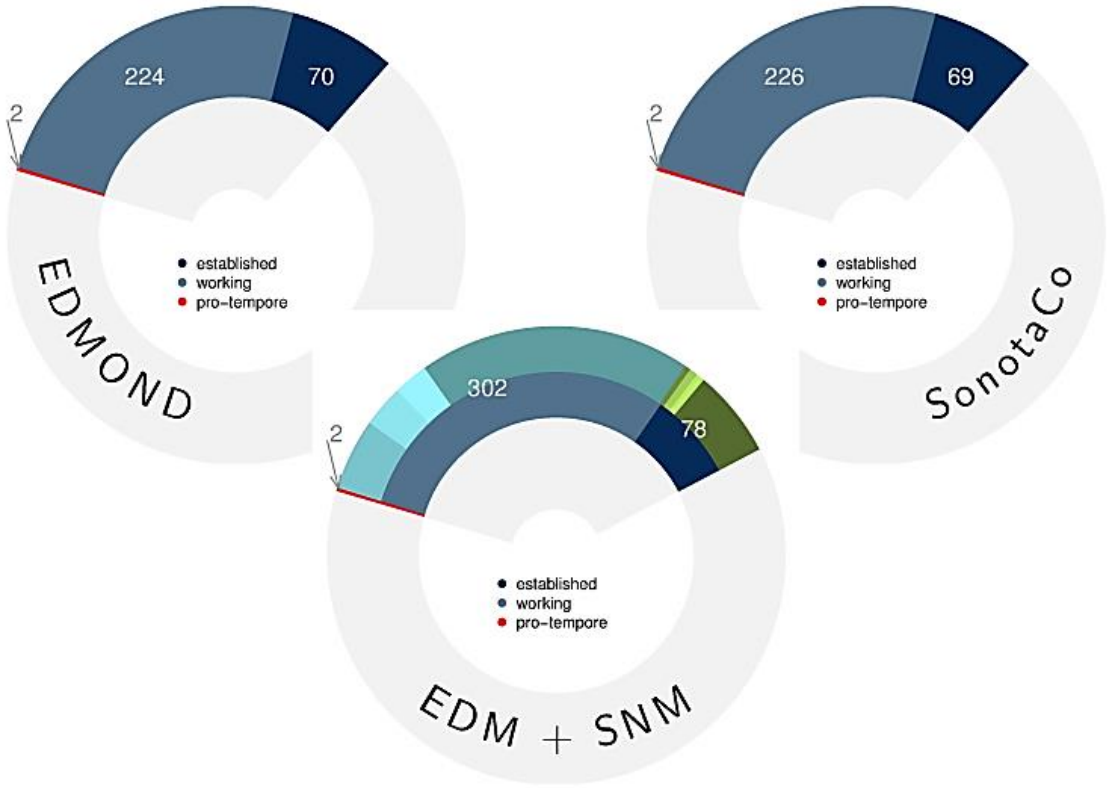

Figure 1 – Summary of identified meteor showers in EDMOND, SonotaCo, and merged set of EDMOND and SonotaCo databases.

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