RELIABILITY OF METEOROID STREAMS IDENTIFICATION METHODS

Regina Rudawska, Astronomical Observatory of A. Mickiewicz University, ul. Słoneczna 36, 60-286 Poznań, Poland (reginka@amu.edu.pl)

Present knowledge: The meteoroid stream identification algorithms are based on apprioprate selected componets (meteoroid parameters, similarity function, threshold and cluster analysis method), which define the stream itself.

The most common and widely used similarity function is the orbital D-criterion introduced by Southworth and Hawkins, [10]. Meantime in the literature other criterions have been already presented ([1], [3], [4], or [2]), while the most recent one is defined in the domain of the vectorial heliocentric orbital elements, [5].

Additionaly we need to choose a suitable similarity threshold, D_c - a minimal value which allow us to explicitly say about the orbital similarity of compared objects. There are many cluster analysis algorithms, though most common is single neighbour linking technique ([10], [7]).

The aim of present work is an assessment of reliability of one of identification methods, [12]. For this purpose we use the artificially generated set of meteoroid streams mixed with the sporadic background.

Data preparation: The artificial streams are generated by numerical simulation. We choose 16 NEOs for which we create sets of orbits of genetically associated particles. Next the motion of all stream meteoroids is integrated numerically over 40ky with the Newtonian force model of the Planetary System. The results of orbital evolution is shown on Fig. 1. On the top panel are particles plotted a few revolutions after their ejection from some parent bodies. While on the second panel are the same meteoroids but near the final epoch of integration process.

Simultaneously, the set of sporadic meteoroids is created using equivalent distribution of background meteors of IAU MDC, [6].

With such prepared data we are ready to test any of the method for streams identification, in particular introduced by Welch, [12]. We focused on its slightly modified version (replacing D_D criterion on D_V).

Knowing exactly which particle belongs to which stream, we can verify the obtained results. In other words we are assessing the reliability of meteoroid streams identification method.

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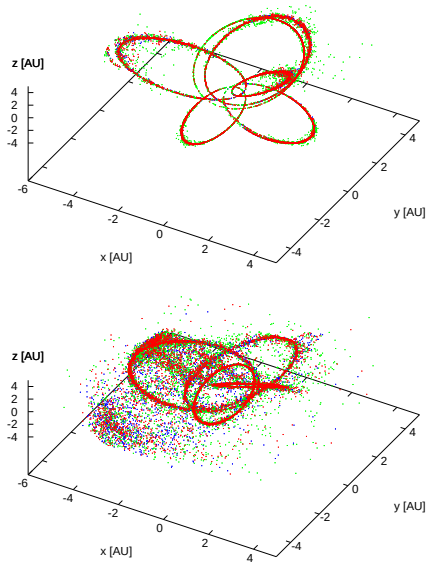

Figure 1: Evolution of six streams of asteroidal origin. Colours represents particle of equivalent of visual (red), photographic (blue) and radio (green) meteors of given stream.

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