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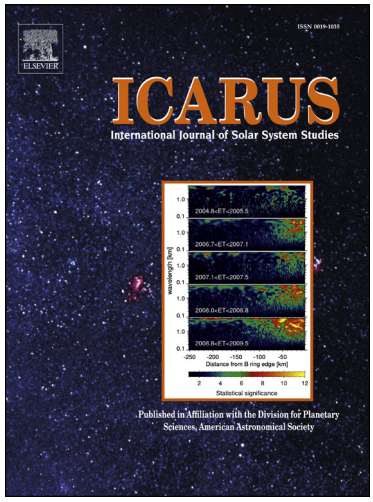

Asteroid families classification: Exploiting very large data sets

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Asteroid families classification: exploiting very large data sets

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Abstract

The number of asteroids with accurately determined orbits increases fast, and this increase is also accelerating. The catalogs of asteroid physical observations have also increased, although the number of objects is still smaller than in the orbital catalogs. Thus it becomes more and more challenging to perform, maintain and update a classification of asteroids into families. To cope with these challenges we developed a new approach to the asteroid family classification by combining the Hierarchical Clustering Method (HCM) with a method to add new members to existing families. This procedure makes use of the much larger amount of information contained in the proper elements catalogs, with respect to classifications using also physical observations for a smaller number of asteroids.

Our work is based on a large catalog of high accuracy synthetic proper elements (available from AstDyS), containing data for $> 330\,000$ numbered asteroids. By selecting from the catalog a much smaller number of large asteroids, we first identify a number of core families; to these we attribute the next layer of smaller objects. Then, we remove all the family members from the catalog, and reapply the HCM to the rest. This gives both satellite families which extend the core families and new independent families, consisting mainly of small asteroids. These two cases are discriminated by another step

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