The availability of large data set of asteroids proper elements made possible in recent years a deeper and deeper analysis of the structure of the asteroid dynamical families in the Main Belt (Milani et al., 2014). At the same time the Yarkovsky effect, the importance of which has been largely recognized, has imposed a new data interpretation paradigm. Precisely the Yarkovsky effect is the basis of one estimation method of the age of the asteroid families analyzing the shape of the family members distribution in the plane diameter versus proper semimajor axes, the so called V-shape (Spoto et al., 2015).

This very important goal has been achieved under the assumption that the post-formation evolution of the semimajor axes producing the V-shape structure was linear in time and dominates their present dispersion. In particular the impact of the initial values of the fragments ejection velocities, determining the initial dispersion of the semimajor axes, is supposed to be marginal, assumption probably correct for old enough families. If this is not the case, the initial ejection velocity field introduces a more or less large bias in the age determination. We conducted a series of numerical experiments simulating the formation and dynamical evolution of the asteroid families in order to evaluate the extent of this bias.

Moreover in our model we included a series of mechanisms concerning the initial break-up outcomes. In particular two aspects have been taken into account: the effect of the initial gravitational re-accumulation on the structure of the V-shape and the effect of possible correlations between spin direction and ejection velocity direction (Milani et al., 2019). We show how the former effect could be responsible of some systematic features of the V-shape structure, while the second can in some cases mitigate the bias in the age determination introduced by the initial ejection field.
Finally we discuss the role of the family members spin axes evolution due to non destructive collisions, affecting the efficiency of the Yarkovsky-driven semimajor axis mobility. We show how this latter mechanism modifies the determination of the age.

References:

