

The aim of this thesis is to ascertain if main-belt asteroid families are compatible with the existence of the Late Heavy Bombardment (LHB), which occurred in the Solar System approximately 4.1 to 3.8 billion years ago. At first, we have newly identified families in the „pristine” zone between 2.83 and 2.96 AU, using data from catalogues AstDyS and WISE. We found clumps of bodies (19 in total) in the orbital data and calculated their statistical significance by a Monte–Carlo method. We selected members of 918 Itha, 709 Fringilla and 15477 families using the hierarchical clustering method. These three families form a representative sample in the proper element space and with respect to their taxonomic type.

We performed simulations of the long-term orbital evolution using the numerical integrator Swift. We used the Kolmogorov–Smirnov test to compare the distributions of proper elements of the simulated and observed families. We also compared the numbers of bodies scattered by gravitational resonances to determine likely ages of the families: Itha $t > 2,5$ Gyr, Fringilla $t > 3,0$ Gyr and 15477 $t \sim 0,8$ Gyr.

We simulated also their collisional evolution using the Boulder code. The initial size-frequency distributions were selected according to the results of SPH simulations of disruptions. By comparing the simulated distributions with the observed ones we obtained independent estimates of the ages: Itha $t > 2,3$ Gyr, Fringilla $t > 3,3$ Gyr and 15477 approximately $t \in [0,47; 0,61]$ Gyr. The results of our simulations indicate that the Itha and Fringilla families are indeed very old and their origin during the LHB is still possible.