Injection of Oort Cloud Comets: The Fundamental Role of Stellar Perturbations. H. Rickman[1,2] and M. Fouchard[3] and Ch. Froeschlé[4] and G.B. Valsecchi[5],[1]APAN Space Research Center, Bartycka 18A, PL-00-716, Warszawa, Poland, [2] Uppsala Astronomical Observatory, Box 515, SE-75120 Uppsala, Sweden (hans@astro.uu.se), [3] LAL-IMCCE/USTL, 1 Impasse de l'observatoire, F-59000 Lille, France (fouchard@imcce.fr), [4] Observatoire de la Côte d'Azur, UMR 6202, Bv. de l'Observatoire, B.P. 4229, F-06304 Nice cedex 4, France (froesch@obs-nice.fr), [5] INAF-IASF, via Fosso del Cavaliere 100, I-00133 Roma, Italy (giovanni@iasf-roma.inaf.it)

Abstract: We present Monte Carlo simulations of the dynamical evolution of the Oort cloud over the age of the Solar System, using three different models of the perturbing forces. One includes only the Galactic tide (radial and vertical), another includes passing stars (modelled as 13 categories with separate masses, kinematic parameters and encounter frequencies) while neglecting the tide, and the third combines both perturbers in parallel. For each model we use an initial sample of one million test comets and integrate them without any cloning.

We analyze the injection mechanism of new comets into observable orbits by comparing the three models with respect to injection flux vs time and the distribution of orbital elements (inverse semi-major axis and Galactic latitude of perihelion) of the injected comets during a quiescent period and a comet shower. Our results show a new feature of comet injection, namely, that it is essentially a team work where the Galactic tide and the stars act in concert to produce an enhanced rate of injections, both during the quiescent periods and the showers.