

Evolution of Comets into Asteroids

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Our understanding of the interrelationships between comets and asteroids has improved substantially since the Asteroids II meeting in 1988. Two of the key factors in this improvement are: 1) the increased discovery rate of asteroids (and comets) of all orbital classes as a result of systematic and automated ground-based searches for NEO's, and 2) the improved dynamical simulation codes and fast, inexpensive computers available, which now make it possible to directly integrate the orbits of thousands of test particles in the solar system. As a result of the improved searches we now have far more examples of the range of possible cometary and asteroidal orbits, and estimates of the relative populations in each orbital class. This has included such unusual discoveries as asteroids on long-period comet orbits (e.g. 1996 PW), and possible comets in the main asteroid belt (e.g. P/Elst-Pizarro). The improved dynamical simulations, using symplectic integrators and other advanced codes, have permitted careful studies of the detailed orbital evolution of objects originating in the various small body reservoirs, including the main asteroid belt, the Jupiter Trojan regions, the Kuiper belt, and the Oort cloud. Moreover, these integrations now allow us to take any small object in the solar system and to assign relative probabilities as to which dynamical reservoir it may have originated from. These dynamical probabilities can be tested by comparing the spectral properties (and hence, the deduced surface composition) of any asteroid or comet with those of its possible forebears in each reservoir. We will examine all of these issues and present the latest data and correlations regarding possible extinct or dormant cometary nuclei among the near-Earth asteroids. This work was supported in part by the NASA Origins and Planetary Geology and Geophysics Programs.