**Dynamical Ages of Long-Period Comets**

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In studying newly discovered long-period comets, we would like to know the number of perihelion passages the comet has previously made through the planetary system. "Dynamically new" comets, those on their first perihelion passage from the Oort cloud, are recognized by the fact that they have very small original inverse semi-major axes, $1/a_o < 10^{-4}$ $AU^{-1}$. More evolved comets are qualitatively classified as "young" or "old" based on whether their $1/a_o$ values are relatively small or large. We propose here a more quantitative measure of the dynamical ages of comets by simulating the orbital evolution of long-period comets originating in the Oort cloud and finding the distribution of ages, measured in number of perihelion passages, for a comet in a particular orbit with a particular semi-major axis. We use the Monte Carlo model of Weissman (In *Dynamics of the Solar System*, ed. R. L. Duncombe, D. Reidel, 1979) to simulate the evolution of $10^7$ hypothetical comets. As an example we use the orbit of comet Hale-Bopp (C/1995 O1) which has $a_o \approx 260.$ AU, q = 0.9210 AU, and i = 89.449°. We find a median number of 48 returns for Hale-Bopp to have evolved from the Oort cloud to its present orbit assuming a model that includes physical loss mechanisms (i.e., random disruption) and 73 returns for a model with no physical loss. The nominal ages for the 1st, 10th, 90th, and 99th percentiles are 5, 10, 441, and 1,259 returns for the model including physical loss, and 7, 16, 555, and 1,638 returns for the model with no physical loss mechanisms. Results will be reported for other recent long-period comets of interest. This work was funded by the NASA Planetary Geology & Geophysics Program and was performed at the Jet Propulsion Laboratory under contract with NASA.

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