COLLISIONAL DAMAGE OF ROCKY ASTEROIDS

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By virtue of its name, much of the discussion at the CD workshops has concentrated on the nature of catastrophic collisions. However, impacts at energies below the catastrophic threshold also have an important effect on an asteroids collisional evolution. For example, repeated subcatastrophic collisions affect an asteroids internal structure and strength. Each impact introduces damage in regions near the impact point and perhaps in distant regions due to tensile reflections of the shock from free surfaces. Experiments have shown that repeated low-energy impacts are about as effective in disrupting a target as a single collision of equal total energy. Calculated collisional lifetimes based on a single catastrophic event are therefore too long. Impact damage may have an even larger effect on the lifetimes of rapidly rotating asteroids. A rocky, strength dominated asteroid remains coherent only if its rotation rate is below the stability limit, where the tensile stresses due to rotation are smaller than its global tensile strength. Suppose that an asteroid, spinning well below its stability limit, experiences an impact that would be subcatastrophic to a similar, but nonrotating body. If the impact reduces the strength of the asteroid sufficiently, the spin state would then be above the stability limit and the asteroid would be disrupted. Consequently, it is important to understand not only how the mechanical properties of an asteroid affect its response to collisions, but also how collisions affect its mechanical properties. This talk will summarize the results of experiments that explore the effects of subcatastrophic events on the collisional history of rocky asteroids.