THE EFFECTS OF GRAVITATIONAL FOCUSING ON RELATIVE CRATERING RATES OF SOLAR SYSTEM OBJECTS. M. J. Matney, NASA Johnson Space Center, Mail Code KX, 2101 NASA Parkway, Houston, TX 77058, mark.matney-1@nasa.gov.

In order to understand the geologic history of a planetary body, one must establish a chronology of important events that shaped the surface. The easiest and most common method is to use the cratering record of a particular surface to establish a relative chronology – with older surfaces having more craters and younger surfaces having fewer. Establishing an absolute chronology is much more difficult. Only for the Earth and Moon do we have sufficient *in situ* data (from returned samples) to establish the framework for an absolute chronology. For other terrestrial bodies, cratering rates must be extrapolated from those of the Moon using assumptions about the orbital dynamics of the populations that created craters on both the Moon and the other bodies.

There have been a number of attempts to use asteroid populations to simultaneously compute cratering rates on the Moon and bodies elsewhere in the Solar System to establish the cratering ratio (e.g., [1],[2]). These works use current asteroid orbit population databases combined with collision rate calculations based on orbit intersections alone. As recent work on meteoroid fluxes [3] have highlighted, however, collision rates alone are insufficient to describe the cratering rates on planetary surfaces – especially planets with stronger gravitational fields than the Moon, such as Earth and Mars. Such calculations also need to include the effects of gravitational focusing, whereby the spatial density of the slower-moving impactors is preferentially "focused" by the gravity of the body. This leads overall to higher fluxes and cratering rates, and is highly dependent on the detailed velocity distributions of the impactors.

In this paper, a comprehensive gravitational focusing algorithm originally developed to describe fluxes of interplanetary meteoroids [3] is applied to the collision rates and cratering rates of populations of asteroids and long-period comets to compute better cratering ratios for terrestrial bodies in the Solar System. These results are compared to the calculations of other researchers.

This presentation will be a further development of the methods presented by the author in the Brown-Vernadsky Microsymposium 43. Using these methods, it should be possible to compute relative Oort cloud comet impact cratering rates for all terrestrial bodies in the Solar System – including the Jovian moons and Venus and Mercury.

References: [1] Ivanov B. A. (2000) Chronology and Evolution of Mars, 87-104. [2] Neukum, G., Ivanov B. A., and Hartmann W. K. (2000) Chronology and Evolution of Mars, 55-86. [3] Matney M. J. (2002) Dust in the Solar System and Other Planetary Systems, 359-362.