



Mass-depletion of the Asteroid Belt Estimated by Recent Chronology-Models Derived from Impact-Crater Investigations

O. Hartmann, G. Neukum, and N. Schmedemann

Freie Universität Berlin, Institute of Planetary Sciences and Remote Sensing, Department of Earth Sciences, Berlin, Germany
(ohartman@mail.zedat.fu-berlin.de)

The bombardment of the solar system by small bodies is well documented by image-investigations of cratering records on the surfaces of planetary bodies since the early 1960's. The well investigated cratering record of Earth's moon reveals a typical size-frequency distribution (SFD) leading to the well known lunar impact-chronology model. Comparisons of size-frequency distributions of the cratering-record on surfaces of planetary bodies of the inner solar system with the observed Near-Earth-Asteroid (NEA) population of the the asteroid belt has led to the conclusion that the asteroid belt acts as the major contributor to the impactor population for the planetary bodies of the inner solar system. This is, however, still in discussion for the outer solar system.

In order to support the conclusion that the asteroid belt acts as the major contributing source for impactors for both planetary bodies of the inner solar system and planetary bodies of the Jovian and Saturnian system, the total mass impacted on the surfaces of planetary bodies is estimated with impact-chronology models derived from measurements of the size-frequency distribution of the lunar-cratering record. An estimate of the total impacted mass on the surface of planetary bodies is performed under the assumption of a common time-invariant size-frequency distribution of impactors and the application of a suitable scaling law, by mapping crater size-frequency into impactor size-frequency distributions. With the simplification of an average impactor density, impact angle, impact velocity and spherical shape of the projectile the impactor-diameter can be approximated from those of the impact-crater and therefore the projectile's mass.

Integrating the impact chronology model for each planetary body of the inner solar system over the past 4.5 Ga with proper coefficient sets and mapping of the crater diameter size into projectile diameter gives the total accumulated mass and implicitly the SFD of the impactor population. This estimate will lead to the mass depletion of the projectile source which is considered to be the Asteroid Belt. In upcoming work, we will compare the impacted mass estimates of both the inner and outer solar system with recent mass estimates of the asteroid belt.