Supplementary Materials for Formation of Lunar Basins from Impacts of Leftover Planetesimals

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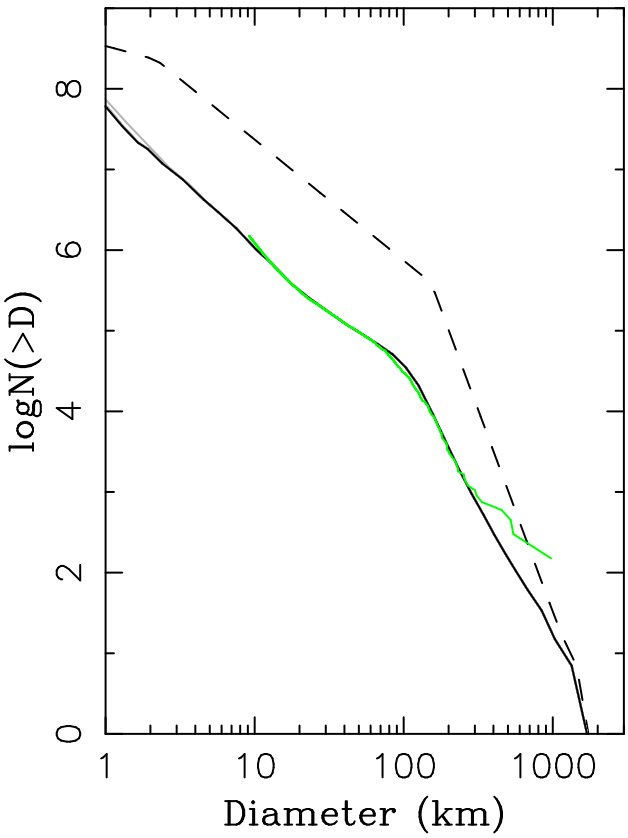

Fig. 1.— Collisional evolution of leftover planetesimals. Initially, the planetesimal disk at 0.5–1.5 au was assumed to have the mass $M_0 = 1\ M_{\rm Earth}$, and a broken power-law distribution with a steeper slope for $d > 140$ km and a shallower slope for $d < 140$ km (dashed line). The black solid line shows the size distribution after 20 Myr of collisional grinding. The collisional evolution for $t > 20$ Myr is negligible. For reference, we also show the size distribution of the main asteroid belt (green line) that was vertically shifted to plot near the black solid line.

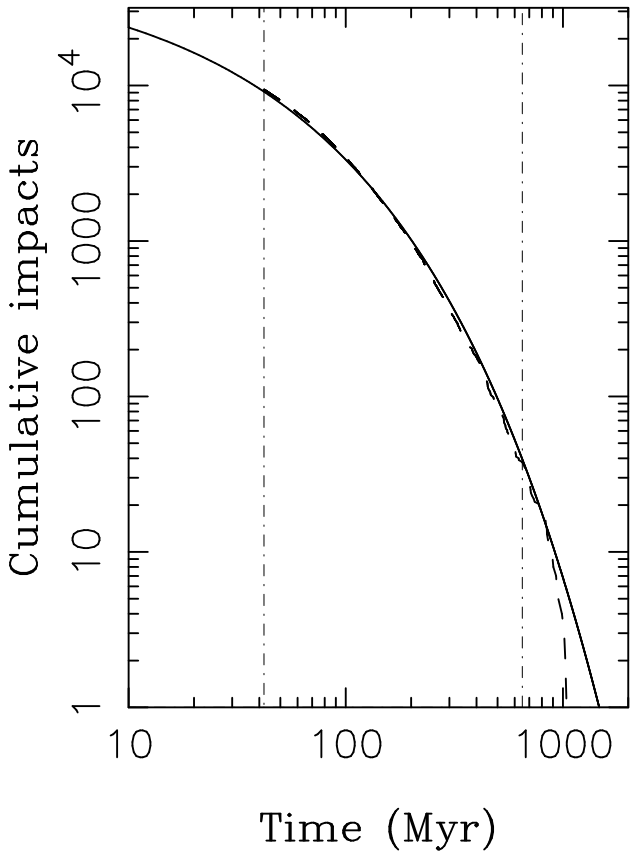

Fig. 2.— The (uncalibrated) impact flux of leftover planetesimals on the Earth. The dashed line is the profile for all impacts on the Earth, 9,418 in total, recorded in the highlighted simulation (see Methods) after the Moon-forming impact. The solid line shows the analytic fit with a stretched exponential function. The model profile drops more steeply for $t = 0.8$–1 Gyr than the analytic fit, because the simulation ended at $t = 1$ Gyr, and no impacts were recorded for $t > 1$ Gyr.

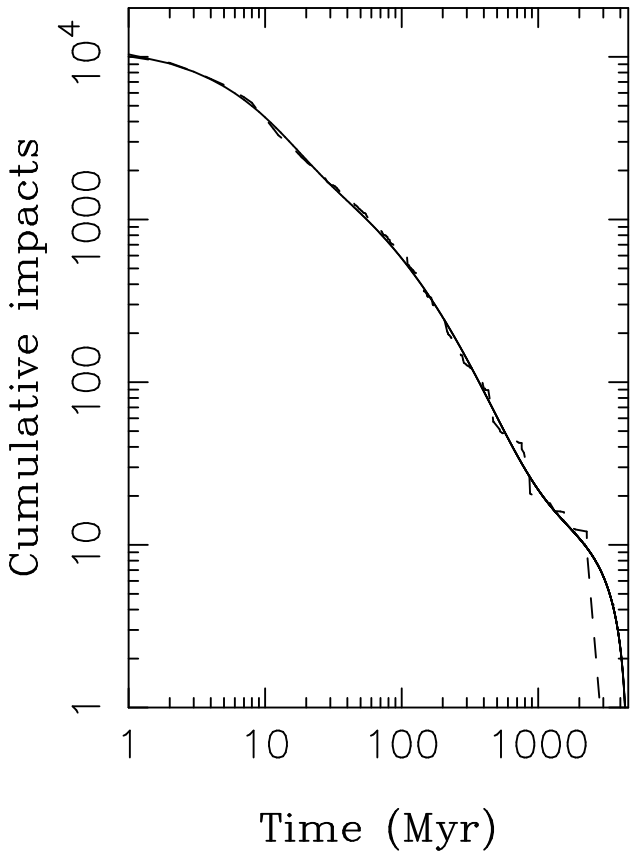

Fig. 3.— The impact flux of $d > 10$ km comets on the Earth. The impact profile shown by the dashed line was obtained from the model results in ref. [49]. The solid line shows the analytic fit given in Methods. The fits for Venus and Mars are equally good. Disregarding comet disruptions, ~ 4 impacts of $d > 10$-km comets would happen on the Earth in the last Gyr.