Impact Processing of Heterogeneous Meteorite Parent Bodies in the Early Solar System. TM Davison[1], GS Collins[1], FJ Ciesla[2] and DP O'Brien[3]. [1]Impacts and Astromaterials Research Centre, Dept. of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom. [2]Department of the Geophysical Sciences, The University of Chicago, 5734 South Ellis Avenue, Chicago, IL 60430, U.S.A. [3]Planetary Science Institute, 1700 E. Ft. Lowell, Suite 106, Tucson, AZ 85719, U.S.A. (E-mail: thomas.davison@imperial.ac.uk).

We have developed a statistical framework to determine the range of plausible collisional histories for individual meteorite parent bodies [1]. This framework uses dynamical and collisional evolution models [2,3], shock physics modeling [4] and impact scaling laws [e.g. 5] to evaluate the consequences of the many impacts all meteorite parent bodies were subjected to in the early Solar System. First results show that parent bodies would have experienced hundreds to thousands of impacts during the first 100 million years of Solar System evolution [1], and perhaps two to three times as many impacts over the age of the Solar System; these impacts can cause significant localized heating and compaction.

The model has been extended to include impacts on differentiated bodies (a dunite mantle surrounding an iron core), and on bodies composed of a mixture of dunite and ice (by creating a mixed material equation of state [6,7]), to examine the influence of material properties and parent body structure on the collateral effects of impact processing. We are quantifying how impacts disrupt the cooling histories of the parent bodies compared to previous "undisturbed" models and exploring the effect that impacts have on the volatile inventories of these bodies.

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