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**Lunar basin formation - a numerical modeling study constrained by gravity data.**

Lompa\*, T., Wünnemann, K., \*Museum für Naturkunde Berlin, Invalidenstr. 43, 10115 Berlin, [tomke.lompa@mfn.berlin](mailto:tomke.lompa@mfn.berlin)

We investigate the formation of large lunar impact basins. Basin size and morphology depend on impactor (velocity, mass) and target properties (e.g. composition, thermal state). Previous studies (e.g. [1],[2]) revealed that thermal conditions of the target affect the material behavior and, thus, the crater formation processes, significantly. For our numerical modeling study we use the iSALE shock physics code and investigate how varying target conditions as a consequence of different thermal profiles affect observable parameters of the basins such as morphometry, morphology and the gravity signature. We use gravity data from the GRAIL mission ([3]) to constrain our models. Our models show that the shape and amplitude of the gravity signature is influenced by the pre-impact thermal structure and the distribution of dense mantle material. These findings lead to a much better understanding on how the thermal evolution of the Moon is related to changes in the formation of basins.

[1] Miljkovic, K. et al. (2016) JGR: Planets 121, 1695-1712. [2] Zhu, M.-H. et al. (2015) JGR: Planets 120, 2118-2134. [3] Zuber, M. T. et al. (2013) Science 339, 668-671.

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