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Impact Basin Formation on Mars: From Borealis to the Late Heavy Bombardment[1] ERIK DAVIES, SARAH STEWART, Univ of California - Davis, ROBERT LILLIS, Space Sciences Laboratory, Univ of California - Berkeley
— The Martian crust preserves the imprint of 20 large (>1000 km) impact basins and a global dichotomy that is hypothesized to have formed via a planetary-scale impact event. The impact basin record spans the end of the Martian dynamo magnetic field, and the youngest impact basins have the cleanest shock-demagnetization signatures. The youngest basins are also the least degraded and have more pronounced crustal thinning within the structure compared to older basins. Here, we consider the mechanics of impact basin formation under a range of crustal thickness and thermal gradients on Mars. This work will help constrain the possible impact energies and impactor sizes that produced the observed basins. Basin formation is modeled using the CTH shock physics code with a fixed central gravity field in 2D and self-gravity in 3D. Previous numerical models of a Borealis-scale impact did not include the crust or a rock rheology model, however, some important differences arise from the inclusion of strength. Heating of the mantle is significantly higher in the impacted hemisphere when strength is included. Our simulations with material strength provide new insights about the viability of the impact formation hypothesis for the global crustal dichotomy.

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