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A Comparison of Oceanic and Continental Asteroid Impacts

PAUL S. DE CARLI, SRI International/University College London, ADRIAN P. JONES, G. DAVID PRICE, University College London — Ever since the recognition that Lunar craters are impact craters rather than volcanos, it has been possible to seriously consider the role of comet or asteroid impacts as possible drivers of geologic events on the Earth. For example, the Chicxulub impact event is widely accepted as a cause of the mass extinction at the end of the Cretaceous. Currently, the subject of impact-induced volcanism is fiercely debated. In the absence of compelling field evidence, the debate is centered on the results of computational modeling of large impacts and on the estimated frequency of such large impacts. Both sides of the debate agree that a sufficiently large impact would excavate to such a depth that decompression melting of the Earth's mantle would be triggered. The anti-impact volcanism faction argues that the impact event would have to be so large that it is unlikely to have occurred during the past 3.5 billion years. The pro-impact volcanism faction argues that an event comparable to or slightly larger than the Chicxulub impact would be sufficient, provided that the impact were oceanic. Here we present detailed calculations to address the systematic differences between oceanic and continental impacts. In particular, we incorporate the hysteretic phase transition behavior of granite in our material model.

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