HYDROCODE SIMULATIONS OF CHICXULUBCRATER COLLAPSE

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The formation of central peaks andpeak-rings in complex craters appears torequire a sub-crater rheology closer tothat of a Bingham fluid than competentor unconsolidated rock. The currentparadigm for complex crater collapse,therefore, involves a mechanism forreducing the strength of the sub-craterregion, allowing it to flow,temporarily, as a fluid. One suchephemeral weakening mechanism isAcoustic Fluidization; where acousticnoise in a granular materialtemporarily relieves the overburdenpressure, abrogating the internalfriction, and hence, strength of thegranular material. We report on the results ofsimulations using a 2-dimensionalhydrocode (SALE) to examine the effectof acoustic fluidization on cratercollapse. Results from the modellingsuggest that both central peaks andpeak-rings can be explained withacoustic fluidization as the transientweakening mechanism. Whileobservational evidence shows that thetransition from central peak topeak-ring formation is a function ofcrater diameter, in the simulations thetransition depends most sensitively onthe decay rate of the acousticvibrations. This suggests that acousticenergy losses are less rapid in largercraters. As such losses are primarilythrough the free surface, this resultmay be explained simply by the greatervolume to surface-area ratio of largercraters. One result of particular significanceis that peak-ring formation appears toinvolve substantial lateral motion (c.a.20 percent transient crater diameter) ofmaterial directly beneath the crater. Although this observation has not beenpreviously associated with peak-ringdevelopment, evidence from the ChicxulubSeismic Experiment may support thesefindings.