CATASTROPHIC CLIMATE CHANGES FOLLOWING THE CHICXULUB IMPACT: THE K/T EXTINCTION

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The Chicxulub impact on the Yucatan Peninsula produced catastrophic changes in the atmospheric chemistry and climate 65 million years ago. The explosive release into the stratosphere of about 100 billion tons of aerosol and water vapor from the 3-kilometer thick evaporite layer sequence was calculated using a 2-D hydrocode model. Radiative transfer calculations, coupled with models of CO2 oxidation and diffusion, and sulfuric acid aerosol coagulation and sedimentation, show that global temperatures dropped to 10-20% of normal for the first year and about 50% for the next 5-10 years. Previous research has shown that the sulfate dust and dust produced by the impact caused dramatic land and sea surface cooling within weeks, but cooling beyond a couple of years was minimal. Our research indicates that the sulfuric acid aerosol caused a decade of near freezing conditions. Our model also predicts a massive release of CO2. However, our climate model shows only minor greenhouse warming. More recent geological investigations in the Yucatan have identified deposits of carbonate condensates (Cretaceous-Paleocene boundary) from the vapor phase. Such condensates released large amounts of CO2 from the phase, thereby further reducing the warming effect of CO2. We propose that this cooling event (of about 15 to 20 degrees C) was a major cause of the K/T mass extinction.