The Martian subsurface could be the last refuge for a hypothetical Martian biosphere with caves or vugs as a possible repository of such organisms (Boston et al., 1992, 2001). The question arises, do caves exist on Mars? How are these caves formed? We suggest a mechanism for such cave formation (“catastrophic speleogenesis”) involving an impact event and rapid melting/volatilization of subsurface ice (Boston et al., 2006). We are quantitatively constraining this theory through modeling of impactors into relevant rock types. Different aspects are being considered, including subsurface and surface composition, amount and spatial distribution of energy imparted and associated heat, properties of the impactor, and possible biological implications. We are using computer modeling to simulate impacts into different lithologies representing various locations on Mars. We are also incorporating basic physical concepts and using Martian surface material data from MER and other orbital and lander missions. Atmospheric effects associated with an impact event must also be considered. Based on the modeling results, we will be able to determine what materials vaporize and are subsequently released into the surrounding atmosphere. An impact event could also possibly release subsurface organisms into a transient surface geothermal habitat. We will apply modeling results to interpretation of orbiter and MER imaging and identify possible sites of subsurface cavity formation.

Bibliographical Sketch

Erin Kay was born in Pismo Beach, CA. Her father was in the military and her family moved countless times. When Erin was 5 years old her family moved to Germany where she began her rock collection with “sparkly rocks”. Over the years this rock collection grew and ultimately led her to the University of Massachusetts, Amherst, where she earned her BS in Geology in December 2004. She then took a semester off to marry her husband, Dave. Erin and Dave then moved to New Mexico in July 2005 so she could pursue her Masters in Geology under Dr. Penny Boston, which she hopes to have completed by May 2008.