Climate Change on Venus Mark A. Bullock, Southwest Research Institute 9/17/99

The Magellan mission to Venus revealed a planet that has undergone near-global volcanic resurfacing in the past 1 billion years. The atmosphere of Venus has almost certainly been perturbed by the injection of gases from this epoch. Water and sulfur dioxide are important greenhouse gases in Venus' atmosphere, but they are also the chemical precursors of Venus' bright, globally extensive cloud decks.

I have modeled the climatic effects of volcanism in Venus' past by coupling detailed atmospheric radiative transfer calculations with models of volcanic outgassing, cloud formation, exospheric escape of hydrogen and reactions of carbon dioxide and sulfur dioxide with surface minerals. Volcanic injections of radiatively active gases to the atmosphere initially cool the surface due to the build up of massive sulfuric acid/water clouds and an increase in planetary albedo. In the absence of continuing volcanic outgassing, however, atmospheric sulfur dioxide is rapidly lost to reactions with surface carbonate and clouds dissipate in approximately 50 million years. This implies that the clouds of Venus today are being supplied by recently active volcanism.

I will present several scenarios from our climate evolution models that may represent the response of the Venus climate system to an epoch of widespread volcanism and subsequent evolution of greenhouse gases.