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Climate Change on Venus

Abstract

The present climate of Venus is controlled by an efficient CO₂-H₂O atmospheric greenhouse and by the radiative properties of its global cloud system. Windows in the pressure-broadened thermal spectrum of CO₂ are effectively blocked by high temperature transitions of H₂O and SO₂, even though these gases exist as trace species in Venus' atmosphere. Both the greenhouse effect and clouds are sensitive to perturbations in the abundance of atmospheric H₂O and sulfur gases. Interpretations of the geologic history of Venus from the Magellan mission point to an epoch of widespread global volcanism about 1 billion years ago. At this time, the atmosphere of Venus was almost certainly perturbed by the injection of large quantities of radiatively active gases, altering its energy balance and driving climate change.

In this talk I will first discuss the growing geological evidence for climate change on Venus. I will then report on detailed evolutionary climate models that predict how the climate of Venus must have changed due to volcanically-induced alterations in the atmospheric abundances of H₂O and SO₂.