

Title: Sensitivity Test Specific to Venus of the Community Aerosol Radiation Model for Atmospheres (CARMA)

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Abstract:

The Community Aerosol Radiation Model for Atmospheres (CARMA) is used to model the growth and evolution of clouds and gases in an atmosphere. This model was originally created to model Earth's atmosphere in the 1970s. It has since been reconstructed by Dr. Erika Barth so that it can be applied to any planetary atmosphere. In this study, we are using this model on Venus to look specifically at the sulfuric acid clouds. We applied three main sensitivity tests to CARMA; we changed the sulfuric acid production peak from 61 km to 64 km above the surface, the eddy diffusion coefficient profile to better portray solar noon time mixing, and the rate at which the sulfuric acid was produced. From these tests we analyzed the distribution of sulfuric acid cloud particles and how this affected the optical extinction of the clouds. We found that shifting the production peak of the sulfuric acid gas causes the highest number density of the cloud particles to also shift up in altitude and the surrounding altitudes to have more particles. The change in eddy diffusion created even smaller particles at all altitudes of the atmosphere. Finally, changing the production rate of the sulfuric acid by decreasing it by a factor of three decreased the number of cloud particles. We set the imaginary index of refraction to only apply to particles smaller than 0.1 microns. The total cloud extinction is a function of both the cloud particle scattering and absorption. Both of these properties are defined based on the cloud particle composition. These sensitivity tests will allow scientists to put constraints on candidates for the unknown UV absorbers in Venus' atmosphere as well as the processes that would support the observed changes in the cloud top extinction relative to local solar time.