

Development of a Radiative Transfer Code of Venus Atmosphere in UV Region

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The clouds on Venus cover the entire planet and have a significant effect on the Venus system. The clouds are thought to be composed of sulfuric acid aerosols and produced photochemically from SO₂ (Mills et al., 2007), which is abundant below the cloud top (Bertaux et al., 1996). The mechanism of the transport of SO₂ to the cloud tops needs to be known to understand the atmospheric chemistry leading to cloud formation.

To obtain the spatial and temporal distribution of SO₂, Akatsuki has been taking 283-nm UV images since December 2015 at intervals of typically two hours. The wavelength of 283 nm corresponds to a strong absorption band of SO₂. From these images, we can retrieve the amount of SO₂ and its spatial and temporal variation to study the formation mechanism of clouds.

Here we would like to determine the variation of the mixing ratio of SO₂ at the cloud top from the 283-nm images with the aid of radiation transfer calculations with various sets of parameters. To calculate the radiative transfer in the UV region where scattering is dominant, we are developing a radiative transport code for a plane parallel atmosphere using the Adding-Doubling method. When discretizing the direction of radiation, the resolution in the parallel direction is much worse than that in the zenith direction on a latitude-longitude grid. In our code, we use the Lebedev quadrature to calculate the spherical integrals, which allows for a more uniform distribution of sample points on the sphere (Lebedev, 1975).

In this presentation, we show a comparison of the calculation results between several methods for solid angle integrals. We will also compare the calculation results with the observed dependences on the emission angle, incidence angle, and phase angle.

Keywords: Akatsuki, Venus atmosphere, radiative transfer