Study of SO_2 transport in Venus atmosphere using Akatsuki UV images and radiative transfer calculation

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The distribution of H_2SO_4 clouds in the Venus atmosphere is an important factor that influences the solar energy absorbed by Venus. Understanding how SO_2, the precursor of cloud, is transported from the lower layers to the cloud top where the cloud is formed from SO_2 photochemically is essential for understanding the climate system of Venus. SO_2 is a major absorber in the near-UV region, and to observe the spatial distribution of SO_2, Akatsuki UVI takes UV images from the orbit around Venus. The 283- nm UV images taken by Akatsuki are thought to reflect the amount of SO_2 as an absorber, but they also include the effects of scattering by H_2SO_4 aerosols and CO_2, the main component of the atmosphere. That makes quantitative discussions difficult.
In this study, we developed a new method to estimate the SO_2 mixing ratio at the cloud top using a newly developed radiative transfer code from UV images taken by UVI under various conditions and estimated the SO_2 mixing ratio during the period from 2016 to 2020. We compared the local time-latitude distribution of the SO_2 mixing ratio with the atmospheric general circulation model by Takagi et al. (2018), and the dependence of the SO_2 mixing ratio to local time was consistent with that of the vertical wind and vertical movement of air calculated by the GCM.
In addition, we compared the vertical displacement of air estimated from the variation of the SO_2 mixing ratio with that calculated by the GCM. The results show that the SO_2 variations and the vertical air movements caused by the thermal tidal waves are on the same scale.
In this presentation, we will report these progresses.

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