# Evaluation of the atmospheric turbulent energy at the cloud top region of Venus in the data of Akatsuki IR2 with LIR and UVI

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In Venusian atmosphere, there are many waves and vortices of various spatial scales and they compose turbulence in wide wavenumber ranges. Energy and momentum is transported by these waves and vortices. Using wind velocity (kinetic energy) and temperature potential, that have direct connections to the energy and momentum, is a proper way to evaluate the planetary atmospheric turbulence. Nastrom et al. (1985) derived energy spectra from distributions of 2 parameters, wind velocity and temperature at troposphere of Earth, and found that both spectra had 2 regions where spectra were proportional to $k^{-3}$ and $k^{-5/3}$ (k expresses wavenumber). Also, a good correlation between turbulent energy spectra and power spectra (PSD) of UV cloud brightness distributions was shown in Earth's case (Travis et al., 1978). In this way, PSDs derived from UV cloud brightness distributions have been alternatively used in the study of atmospheric turbulent of Venus, where direct observations of wind velocity and temperature are hard to carry out.
As a preceding research, Rossow et al. (1980) and Del Genio et al. (1982) derived PSDs in the range of planetary wavenumber K=5˜30 (λ=1,300˜7,500 km) from UV images of Pioneer Venus Orbiter (PVO) and found it had a 'bending' around the wavenumber 10. Peralta et al. (2007) obtained PSDs in the range of K=1˜50 (λ=760˜38,400 km) from the UV images of the Galileo flyby and found their significant temporal variations. Teraguchi et al. (2010 in AGU, 2011 in EPSC) showed temporal / spatial variations of PSDs from UV images of Venus Monitoring Camera (VMC) onboard of Venus Express (VEx) in the range K=3.6˜360 (λ=100˜10,000 km). However, it is necessary for these studies to confirm the relation of minor atmospheric component at cloud-top and dynamic parameters such as temperature or wind-velocity in order to evaluate the Venusian atmospheric turbulent energy.
Akatsuki satellite is available of simultaneous multi-wavelength imaging. IR2 (near infrared) observes altitude distributions of cloud on dayside and cloud-thickness distributions on night-side. UVI (UV) targets distributions of unknown absorber and SO2 and LIR (mid-IR) for temperature distributions at cloud top. IR2・UVI can also provide wind velocity field. Using these datasets, it is possible to provide new baseline for previous studies, that is, the direct comparison of relations of PSDs derived from dynamic parameters and that from UV images. The comparison has already done in Jupiter's case, using 3-wavelength images (near-infrared, blue, near-ultraviolet) observed by HST in 1995 and Cassini in 2000 (Barrado et al. 2009). Relations will become clear for the first time between PSDs of temperature and wind velocity information (LIR and IR2・UVI) and PSDs of physical quantity of IR2・UVI. In addition to it, Akatsuki's nearly equatorial orbit and high resolution-full-disk images have a potential to widen coverage of the wavenumber range of PSDs (K=1˜3840, λ=10˜38,400 km)
In this talk, we show the first results of PSDs derived from Akatsuki's datasets together with analytical method and evaluation of quality of data for this study.

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