

U002-02

Room: IC

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"Akatsuki" Venus Exploration Mission: Probing Venus Atmosphere in 2-micron Near-Infrared Region.

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The near-infrared camera IR2, the heaviest of 5 cameras on board "Akatsuki", observes dynamics in Venusian middle-to-lower atmosphere through so-called "windows". IR2 utilizes the windows at 1.74 and 2.26 microns, where CO₂ absorption is relatively weak and thermal radiation from deep and hot atmosphere is "visible" on the night (unilluminated) hemisphere. Spatial inhomogeneity of cloud opacity modulates the intensity of such infrared radiation and dynamics in middle-to-lower atmosphere can be studied by tracking motions of cloud features. Adjacent to 2.26 micron, IR2 also observes Venus at 2.32 micron, a CO absorption band. By differentiating 2.26 and 2.32 micron images, it is possible to globally map CO abundance and to monitor its temporal variability. CO is photochemically produced in the upper atmosphere and is thought to be transported to the lower atmosphere through unknown sinks. Therefore, CO can be a good tracer to understand the meridional circulation of Venusian atmosphere.

IR2 also has a filter (2.02 micron) to observe the day-side disk. This wavelength is within a strong CO₂ absorption band. The incident sunlight is attenuated by CO₂ absorption with strength proportional to path length within the atmosphere before escaping to the space. The intensity variation in this wavelength, therefore, reflects variation of cloud-top altitude. Another camera on board PLANET-C, LIR, detects variation of cloud-top altitude as variation of temperature. LIR works on Venus disk regardless it is night or day with moderate spatial resolution, while IR2 (2.02 micron) with higher spatial variation works only on the day-side disk.

Another important science objective of IR2 is the zodiacal light. For this observation, IR2 is equipped with an astronomical H-band (1.65 micron) broad-band filter and will observe how dust is distributed in the inner part of the solar system.

IR2, together with IR1 and control electronics (IR-AE), has been manufactured by Sumitomo Heavy Industries, Co. Ltd. with the optical elements made by Nikon, the PtSi detector by Mitsubishi Electronic, Co., and the hood by Magoshi. As the VIRTIS-M-IR on board ESA's Venus Express has lost its cryo-cooler, after 3 years of service, IR2 on board "Akatsuki" will be the only imager that produces the data regarding the dynamics in Venusian middle-to-lower atmosphere for coming years.

Keywords: Venus, cloud, atmospheric dynamics, infrared, zodiacal light