Ground-based telescopic observation of cloud motion on the Venus dayside

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In order to detect the cloud pattern in the dayside region of Venus, we have carried out imaging observations at wavelengths of 380 nm, 410 nm (violet), 900 nm and 1000 nm [near-infrared (NIR)] using the 60-cm telescope at Iitate observatory, Fukushima. The patterns in the violet images represent the features of the upper clouds at about 70 km altitude, while the NIR images represent the features of the lower clouds at about 50 km altitude. Note that there has been no observation at 1000 nm expect for the Galileo's observation [Belton et al, 1991]. Our goal is to monitor these patterns continuously and the global dynamics of the Venusian atmosphere.

We have used a fast imaging technique and models as a tool to remove the background run of brightness from the composite frames [Ishikawa, 2004]. To reduce the effect of atmospheric scintillation on the seeing, we adopted fast imaging technique. A high-speed CCD camera with an exposure time of 60 ms and an interval of about 200 ms was used for this purpose. Furthermore we have selected frames with the sharp outlines to make composite frame with high signal to noise ratio.

Since the Galileo data show that the contrast of cloud pattern to background brightness is about 3 % at a wavelength of 986 nm, it is essential to precisely remove the brightness gradient on the dayside from the composite frame. We have calculated the brightness gradient of Venus dayside and subtracted from the composite frame as a background. We have succeeded in derivation of the cloud patterns on the Venus dayside at the violet and NIR images from the above method. Moreover, from cross-correlation analysis of 900 nm images, we estimated the zonal velocity as about 60 m/s.

Images of the Venus dayside taken at the violet and NIR wavelengths represent vertical structure and give important information about the atmospheric dynamics of Venus.