Updates on the point-spread function of Akatsuki IR2 for improvement of night-side photometry

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The 2-um infrared camera (IR2) onboard Akatsuki Venus orbiter utilizes a 1040x1040 pixels PtSi array sensor. When IR2 started imaging night-side emission of Venus (1.735, 2.26, and 2.32 um wavelengths), it was realized that intense light from the day crescent spread over a unexpectedly great extent. The cause of the large point-spread function (PSF) is thought to be multiple light reflection in the 400-um thick Si substrate of the sensor (Satoh et al., 2017). Photometric works with the IR2 night-side data were not possible, due to this PSF problem, until Satoh et al. (2021) introduced a method to remove (or reduce) the contamination from the day-side crescent. Their method is called "Restoration by Simple Subtraction (RSS)" which does NOT require precise knowledge about the PSF. Another possible method is to apply deconvolution to the night-side data so that the spread light is sucked back to the original position (the day-side) but this obviously require the knowledge about the PSF. We approximated the PSF with mathematical functions (Satoh et al., 2017; Sato et al., 2020) to successfully deconvolve the day-side data. The night-side data are more sensitive to subtle differences in PSF than the day-side data. We report updates of the IR2 PSF as obtained from the deconvolution experiments of the night-side data as well as some laboratory measurements.

Keywords: Akatsuki, sensor, point-spread function, multiple reflection

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