あかつき搭載中間赤外カメラによる金星雲頂温度観測の初期結果
INITIAL RESULTS OF THE VENUSIAN CLOUD-TOP TEMPERATURE OBSERVATION BY AKATSUKI/LIR

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The Longwave Infrared Camera (LIR) onboard Akatsuki took Venus images just after the first challenge in Venus orbit insertion (VOI) in December 2010[1)]. They showed several interesting features in the brightness temperature distribution at the cloud top, however, quality and quantity of the data were far insufficient for studies in details. Akatsuki was finally thrown into a Venus orbit at the second attempt at VOI (VOI-R1) in December 2015 after the unwilling five year cruise around the Sun. It had been confirmed before VOI-R1 that LIR as well as the other cameras onboard Akatsuki was still very good in health. Observations of Venus were started immediately after the VOI-R1 operation. More than 20 Venus images in thermal infrared have been acquired by LIR so far, and observations are continuing to accumulate Venus images day by day.
This presentation will introduce initial results of observation of Venus by LIR, and also show a perspective in future studies in the atmospheric dynamics using brightness temperature and wind distributions derived from the LIR data.
LIR is a small light-weighted thermal infrared camera using an uncooled micro-bolometer array with 320 x 240 effective pixels as an image sensor, and acquires a snapshot of thermal radiation emitted from the cloud top of Venus in the wavelength region of 8 to 12 μm[2)]. The FOV of LIR is designed to fit the full Venus disk to it from the distance of 4.8 R_V from the center of Venus. Since Akatsuki is orbiting in a far elongated elliptical orbit compared to the originally planned orbit, LIR can capture the full Venus disk in most of an orbiting period. The pixel field-of-view is 0.05°, which is four times larger than those of UVI, IR1 and IR2.
LIR has an internal image accumulation function to improve noise-equivalent temperature difference (NETD). This function is called as primary accumulation, which is performed during each exposure. Image data are sent to DE, and up to 32 images can be accumulated. This is called as secondary accumulation. In the nominal observation sequences both primary and secondary accumulation numbers are set to be 32 which gives the best NETD according to the pre-launch test results, and an image acquisition sequence takes about two minutes. An image acquisition sequence without accumulation is also equipped to take an image with a very short exposure time of 1/30 sec, and used when the ground speed of spacecraft is large.
In the first orbiting period LIR took 19 images from Dec. 7 to Dec. 11. The shortest time separation between successive images was two hours. This is chosen so that a wind vector field can be properly derived by a cloud-tracking method. From Dec. 12 to Jan. 14 observation was suspended due to important operations on spacecraft which did not allow the observations in parallel. Observation restarted on Jan. 15.
As a matter of course data amount that can be transferred from spacecraft to ground is limited by

bit rate of telecommunication. In the nominal observation plan time interval of image acquisition by LIR is two hours, and it can be shortened to be one hour in a special observation period.
In the first shot by LIR after VOI-R1 several amazing features which have never been seen before are identified at a glance. A huge bow-shape high temperature region extending from the northern high-latitudes across the equator to the southern high-latitudes exists around the evening terminator. The temperature in the southern polar region seems to be the highest in the snapshot. Dark filament-like streaks aligned north-south direction are found in the low latitudes. They are also identified in the UV image. Interpretation of these interesting features will be discussed in the presentation.

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