

## Lightning Hunt in Venus with LAC onboard Akatsuki Spacecraft

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LAC, lightning and airglow camera, on board Akatsuki spacecraft, a Japanese Venus climate orbiter, is the first sensor optimized for the lightning flash detection in planets other than the Earth so that it can identify the optical flash caused by electrical discharge in the atmosphere of Venus. It is expected that LAC could conclude the 30-year discussion on the existence of lightning in Venus. Unique performance of LAC compared to other equipments used in the previous studies of Venus is the high-speed sampling rate at 30 kHz with 32 pixels of Avalanche Photo Diode (APD) matrix, enabling us to distinguish the optical lightning flash from other pulsing noises, including cosmic ray. We selected OI 777 nm line for lightning detection, which is expected to be the most prominent emission in CO<sub>2</sub>-dominant atmosphere based on the laboratory experiments.

After checking the sound condition of high-voltage system for the APD detector after the second attempt of the insertion of Akatsuki into the orbit around Venus on December 7, 2015, the regular operation of LAC at nominal high-voltage of 300 V for lightning hunt was started on December 1, 2016. Due to the elongated orbit than that planned originally, we have an umbra for approximately 30 min to observe the lightning flash in the night side of Venus every 10 days, which is almost 1/20 rate of the original one.

Until July 9, 2017, we have examined 13 times observations with total observation time about 4 hours, but couldn't find any lightning signals. If the spacecraft is located at a distance of 5,500 km from Venus surface, the threshold of triggering is 1/20 of the average of the Earth lightning flash and the instant field-of-view is 1/500 of the whole globe. Here we discuss the upper limit of the lightning occurrence rate in Venus, assuming homogeneous occurrence over whole globe, which might be compared with the estimations by previous studies. However, in order to confirm the occurrence ratio reported by Hansell et al. (1995), one of the representative estimation, we need to accumulate total observation period by 3 times than we had carried out already. Also we will discuss the triggering logic and parameters, on which the possibility of lightning detection depends.