

New observation strategy for lightning hunt in Venus with Akatsuki/LAC

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Lightning and Airglow Camera, LAC, 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. It was expected that LAC could conclude the 30-year discussion on the existence of lightning in Venus, thanks to the unique performance of LAC compared to other equipments used in the previous studies of Venus, namely, the high-speed sampling rate at 20 kHz with 32 pixels of Avalanche Photo Diode (APD) matrix, which enables 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 CO₂-dominant atmosphere based on the laboratory experiments. The regular operation of LAC 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 plan. So far, LAC has not detected any evidence of lightning flash.

The triggering parameter was set so as to optimize for the light curve similar to the normal lightning in the Earth and data obtained totally for about 4 hours were examined. Adding to this triggering parameter set, we added one more set, optimized for sprite type emission with duration of up to 10s ms. Also for blue jets, meteor type emission with duration of about 100s ms, or fainter lightning emissions, we are conducting successive force triggering recordings without any threshold. These former two sets are in rotation at every 60 sec and force triggering recordings are conducted for several minutes per pass. Here we report the detailed strategy and the latest status of the LAC observation after the winter-spring campaign in 2018.

Keywords: Venus, Akatsuki, lightning, LAC