Signal recorded by LAC onboard Akatsuki

#Yukihiro Takahashi[1], Masataka Imai[2], Mitsuteru SATO[3], Tatsuharu Ohno[4], Ralph D. Lorenz[5]
[1]Faculty of Science,Hokkaido Univ.,[2]AIST,[3]Hokkaido Univ.,[4]Cosmosciences, Hokkaido Univ.,[5]Applied Physics Laboratory, Johns Hopkins University

The existence of lightning discharge in Venus has been controversial well over three decades, which might be attributed to the lack of conclusive observational evidence. There had been no satellite payload intentionally designed for the detection of lightning phenomena using radio wave or optical sensors. LAC, lightning and airglow camera, onboard Akatsuki spacecraft, is the first sensor optimized for the lightning optical flash measurement in planets other than the Earth. The unique performance of LAC compared to other equipment used in the previous exploration of Venus is the high-speed sampling rate at 20 kHz with 32 pixels of Avalanche Photo Diode (APD) matrix, enabling us to distinguish the natural optical lightning flash from other pulsing noises, including artificial electrical noise and cosmic rays. We selected OI 777 nm line for lightning detection, which is expected to be the most prominent emission in the CO_2-dominant atmosphere based on the laboratory experiments.

? ? We have been conducting a lightning search in about 40 passes of AKATSUKI with triggering parameter set optimized for the light curve similar to the normal lightning and also sprite type in the Earth. On March 1, 2020, LAC recorded a signal, which seems like a kind of optical flash. The total coverage of the LAC lightning hunt is now about 100 [million km2-hr]. If the flash is from lightning discharge, the occurrence rate could be equivalent to that with a ground-based telescope reported by Hansell et al. (1995). On the other hand, we are examining the possibility of bolide carefully. If it's bolide, the magnitude observed on the ground might be 10 times brighter than a full moon in the earth.