

Venus Lightning Detection by Venus Climate Orbiter

YUKIHIRO TAKAHASHI¹, JUN YOSHIDA¹, SHINYA UEDA¹,
TOMOO USHIO², MASAKI TSUTSUMI³

¹*Tohoku University*

²*Osaka Prefectural University*

³*National Institute of Polar Research*

It has been suggested the existence of lightning activity on Venus based on observations by both optical and radio wave measurements. However, the occurrence of Venus lightning discharge is still under controversy due to the ambiguity of these evidential measurements. A star sensor onboard Pioneer Venus Orbiter (PVO) detected signals coming from Venus disk, but the total observation time is only <100 sec and their information is only pulse without light curve. It is pointed out that the recorded plasma waves at PVO, whose source could be lightning discharge, can also be generated by plasma instabilities. High-speed imagery with a ground-based telescope by University of Arizona shows several flashes on the night side disk of Venus. But the occurrence rate is quite small, which may be caused by sensitivity of the observation system. In order to conclude this argumentation, we have been developing a new type of lightning detector, LAC (Lightning and Airglow Camera), which will be installed at Venus Climate Orbiter (Planet-C), the first Venus mission by Japan. To distinguish optical lightning flash from other pulsing noises, high-speed sampling at 50k/sec for each pixel, that enables us to investigate the time variation of each lightning flash phenomenon, is adopted. On the other hand, spatial resolution is not first priority. For this purpose we developed new type of APD (avalanche photo diode) array with a format of 8 by 8. The each pixel is 2mm square and the gap between pixels is 0.2mm. Narrow band interference filter at wavelength of 777.4 nm (OI), which is predicted to be the most intense emission line from laboratory experiments, will be used. LAC detects lightning flash with an optical intensity of average of Earth's lightning when VCO located at a distance of 3 R_v or those with 1/100 intensity of Earth's average at altitude of 1000 km.