R006-13
C 会場 ：11/5　PM2 （15:45-18:15）
17:15〜17:30

LAMP ロケット搭載多波長オーロラカメラ AIC2 による脈動オーロラの観測

#坂野井　健 [1)], 浅村　和史 [2)], 三好　由純 [3)], 細川　敬祐 [4)], 滑川　拓 [2)], 三谷　烈史 [2)], 能勢　正仁 [3)], 野村　麗子 [5)], 寺本　万里子 [6)],Lessard　Marc[7)],Halford　Alexa[8)]
([1] 東北大学・理・PPARC,[(2]JAXA 宇宙研,[(3] 名古屋大学 ISEE,[(4] 電気通信大学,[(5]JAXA 国際宇宙探査センター,[(6] 九州工業大学,[(7] ニューハンプシャー大学,[(8]NASA ゴダード宇宙飛行センター

Observation of pulsating auroras with a multi-spectral auroral camera AIC2 on the LAMP rocket

#Takeshi Sakanoi[1)], Kazushi Asamura[2)], Yoshizumi Miyoshi[3)], Keisuke Hosokawa[4)], Taku Namekawa[2)], Takefumi Mitani[2)], Masahito Nose[3)], Reiko Nomura[5)], Mariko Teramoto[6)], Marc Lessard[7)], Alexa Halford[8)]
([1]PPARC, Grad. School of Science, Tohoku Univ.,[(2]ISAS/JAXA,[(3]ISEE, Nagoya Univ.,[(4]The University of Electro-Communications,[(5]JAXA Space Exploration Center,[(6]Kyushu Institute of Technology,[(7]University of New Hampshire,[(8]NASA/GSFC

We report the results of a multi-spectral auroral camera AIC2 installed on the LAMP rocket which was successfully launched from Poker Flat at 11:27:30 UT on March 5, 2022. We also give the results on coordinated observation between AIC2 and other instruments on the rocket and ground-based all-sky imagers. The purpose of the LAMP rocket mission is to clarify the relationship between pulsating aurora (PsA) and microbursts with simultaneous particle, magnetic field, and and imaging measurements. AIC2 is one of the Japanese PARM2 instrument package. AIC2 measures two auroral emissions mainly in the E-region at 670 nm (N2 1PG) and in the F-region at 844.6 nm (OI) using 2 CMOS cameras called AIC-S1 and AIC-S2. AIC2 is characterized by a low noise (1.6 e-RMS) and wide dynamic range sampling capability (16-bit ADC) using the consumer CMOS sensors. Two cameras take images simultaneously with a time resolution of ˜10 frame/s. AIC-S1 is pointed to the magnetic footprint with a FOV of 29 deg x 29 deg which covered 180 km x 180 km with a resolution of 3 km x 3 km at the apex altitude (˜430 km altitude). FOV of AIC-S2 is 106 deg diameter circle which covered the wide range from the nadir to the limb of the Earth. AIC2 is mounted on the despun table to cancel the rocket spin and obtain stable line-of-sight directions of FOVs. The dynamic ranges of AIC-S1 and S2 are 1.1 - 860 kR, and 0.4 - 5800 kR, respectively. Two set of NanoPi M4V2 board computer and FPGA are used to handle a large amount of image data generated in two cameras. Total weight and power of AIC2 are 3.0 kg and 20 W, respectively.

At ˜10:30 UT on March 5, 2022, a typical auroral break up with a negative excursion of geomagnetic east-west component of ˜500 nT (Kp=4-) happened at Poker Flat, and afterward significant pulsating auroral patches with several Hz internal modulations appeared in the northward sky of Pokar Flat. The LAMP rocket was successfully launched into and flew over the pulsating auroral patches. AIC2 worked satisfactorily as expected throughout the flight. For the flight time after the launch from ˜90 s to the end of flight (˜620 s), the despun table worked correctly and small-scale auroral images were continuously obtained by AIC2 above the auroral emission layer for the first time. On the other hand, AIC-S1 and S2 observed the in-situ auroral intensities when the rocket was in the emission layers in E- and F-region, respectively. The auroral image data taken by AIC2 were analyzed as follows: 1) subtraction of background count using a dark frame, 2) field flattering applying the image data of integrating sphere obtained at ground testing, 3) unit conversion from count to Rayleigh using calibration data obtained at ground testing. From AIC-S1 data, we found significant pulsating auroral patches with sub-second modulations during the period of flight time of ˜160-200 s, ˜450-500s, and black arcs at 600s. From AIC-S2 data, we identified the limb and large-scale 844.6 nm auroral emission in the equatorward of auroral oval. Other PARM instruments and ground-based high-speed imagers at Poker Flat, Venetie, and Fort Yukon succeeded to observe during the flight. We compared auroral images taken by AIC2 with high-energy electrons (>100keV), low-energy electrons (several to 10 keV) and ground auroral images and found that they showed good correspondence on the main pulsating aurora (˜5s) and even on the sub-second variations which is probably microbursts.