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Nadir Observations of Lightning and TLEs by JEM-GLIMS

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JEM-GLIMS is a space mission to observe lightning and lightning-associated Transient Luminous Events (TLEs) from the Exposed Facility (EF) of the Japanese Experiment Module (JEM) at the International Space Station (ISS). The main purpose of this mission is to carry out the nadir observations of these phenomena and to identify temporal and spatial evolutions of lightning and TLEs and to clarify the occurrence conditions of TLEs and global occurrence locations and rates of TLEs.

JEM-GLIMS consists of two optical instruments, two radio receivers, and one onboard computer. The optical instruments are two CMOS cameras (LSI-1, LSI-2) and six-channel spectrophotometers (PH1 - PH6). The FOV of LSI is 28.3 deg. x 28.3 deg., and LSI-1 (LSI-2) equips a 766-832 nm wide band filter (a 762+/-7 nm narrow band filter). Each PH channel equips the optical band-pass filter, and these photometers measure the N_2 1P, N_2 2P, N_2 LBH, and N_2^+ 1N emissions of lightning and TLEs. The radio receivers consist of one VLF receiver (VLFR) and two sets of VHF receivers (VITF). In order to detect TLE-associated whistler waves, VLFR employs a nadir-directing monopole antenna and an electronics unit recording waveform data with a sampling frequency of 100 kHz with 14-bit resolution. VITF consists of two patch-type antennas separated by 1.5 m and an electronics unit, and VITF mainly observes VHF pulses in the frequency range of 70-100 MHz excited by lightning discharges with a sampling frequency of 200 MHz with 8-bit resolution.

JEM-GIMS was successfully launched and transported to the ISS by the H-II Transfer Vehicle (HTV) No.3 cargo transporter at the end of July 2012, and was installed at JEM-EF on August 9. For the period from September 15 to November 12 we have carried out the initial checkout operation and confirmed that the functions of all the instruments are normal and that the performance of all the science instruments is identical with that before launch. Finally, we have started the continuous observations of lightning and TLEs from November 20, 2012. Up to the end of December 2012, JEM-GLIMS has triggered and recorded 221 transient optical events in total, where strong lightning signatures are confirmed in LSI and PH channels. For some of these events, transient signatures of N_2 LBH are confirmed in the PH1 channel, which strongly implies the occurrence of TLEs. At the presentation we will report more detailed initial results derived from JEM-GLIMS data.