JEM-GLIMSにより観測されたスプライトとそれに伴うVHF帯電波の特徴

佐藤 光輝 [1]; 足立 透 [2]; 三原 正大 [1]; 牛尾 知雄 [3]; 森本 健志 [4]; 菊池 博史 [5]; 鈴木 睦 [6]; 山崎 敦 [7]; 高橋 幸弘 [8]
[1] 北大・理; [2] 早大・高等研; [3] 大阪大; [4] 近畿大学; [5] 阪大・工・環境電磁; [6] JAXA・宇宙研; [7] JAXA・宇宙研; [8] 北大・理・宇宙

Optical Characteristics of Sprites and Sprite-Associated VHF Signals Measured by JEM-GLIMS

Mitsuteru SATO[1]; Toru Adachi[2]; Masahiro Mihara[1]; Tomoo Ushio[3]; Takeshi Morimoto[4]; Hiroshi Kikuchi[5]; Makoto Suzuki[6]; Atsushi Yamazaki[7]; Yukihiro Takahashi[8]
[1] Hokkaido Univ.; [2] WIAS, Waseda Univ.; [3] Osaka Univ.; [4] Kinki University; [5] EMC, Osaka Univ.; [6] ISAS, JAXA; [7] ISAS/JAXA; [8] Cosmosciences, Hokkaido Univ.

JEM-GLIMS observes lightning and lightning-associated Transient Luminous Events (TLEs) from the International Space Station (ISS) using two optical instruments and two electromagnetic wave receivers. One of the main objectives of this mission is to estimate global occurrence distributions and rates of lightning and TLEs and to identify the relation between the horizontal distribution of sprites and the detailed current structure of the parent lightning discharges flowing in the thundercloud. For this purpose, we analyzed CMOS camera (LSI), spectrophotometer (PH), and VHF interferometer (VITF) data to estimate optical characteristics of lightning and identify the electrical properties of the parent lightning discharges. The global distribution of the detected lightning events clearly shows that most of the events were detected over continental regions, that is, over Africa, Southeast Asia, and North and South Americas. In addition, the global distributions of these lightning events show clear seasonal variations and were centered in the local summer hemisphere. These results are comparable to that derived from the MicroLab-1/OTD and TRMM/LIS measurements. To identify the sprite occurrences, it is necessary to perform the following data analysis: (1) an image subtraction of the wideband LSI-1 data from narrowband LSI-2 data; (2) a calculation of intensity ratio between different PH channels; and (3) an estimation of the polarization and charge moment changes for the parent CG discharges of the event using ground-based ELF measurement data. From a synthetic comparison of these results, we confirmed that JEM-GLISM succeeded in detecting sprite events. To clarify the source locations of VHF pulses excited by lightning currents flowing in the thundercloud, we analyzed VITF data. We have developed new interferometric technique to estimate the source locations of VHF pulses excited by lightning discharges. This direction-of-arrival estimation technique consists of two methods: (1) a calculation of phase difference between the VHF pulses simultaneously measured by two VHF antennas, and (2) a estimation of the group delay of VHF waves. Using this technique, we analyzed the VITF pulse data measured in the sprite events and estimated the source locations of these pulses. At the presentation, we will show the relation of the horizontal distribution of sprites and the spatial distribution of the source locations of VHF pulses excited by sprite-producing lightning discharges.