

VHF observations on lightning discharges from the International Space Station

Hiroshi Kikuchi^{1*}, Takeshi Morimoto², Tomoo Ushio¹, Mitsuteru Sato³, Atsushi Yamazaki⁴, Makoto Suzuki⁵, Masayuki Kikuchi⁶, Ryohei Ishida⁷, Yukihiro Takahashi³, Umran Inan¹¹, Ivan Linscott¹¹, Yasuhide Hobara⁹, Yuji Sakamoto¹⁰

¹Osaka University, ²Faculty of Science and Engineering, Kinki University, ³Department of CosmoScience, Hokkaido University, ⁴Institute of Space and Astronautical Science / Japan Aerospace Exploration Agency, ⁵Institute for Space and Astronautical Sciences, Japan Aerospace Exploration Agency, ⁶NATIONAL INSTITUTE OF POLAR RESEARCH, ⁷Osaka Prefecture University, ⁸Department of CosmoSciences, Graduate School of Science, Hokkaido University, ⁹The University of Electro-Communications, ¹⁰Department of Aerospace Engineering, Graduate School of Engineering, Tohoku University, ¹¹Stanford University

We present the lightning observation missions from space using the electromagnetic waves.

In 2012, Global Lightning and sprItE MeaSurements (GLIMS) mission has been conducted on Exposed Facility of Japanese Experiment Module (JEM-EF) of the international space station (ISS) which is orbiting the earth at an altitude 400 km. The VHF broadband digital interferometer (VITF) attached on JEM-EF is designed to estimate the direction of arrival of electromagnetic waves. The VITF has the bandwidth from 70 MHz to 100 MHz. The VITF on GLIMS is developed on the heritage of a VHF sensor on Maito-1 satellite. The VITF consists of two antennas, band-pass filters, amplifiers, and 2-channel-AD-converter. The electromagnetic radiations from lightning discharges received by the antennas are digitized by the AD converter synchronizing with another channel through the filters and the amplifiers. The band-pass filter and the amplifier of the VITF are exactly the same as the ones of the VHF sensor on Maito-1 satellite. The basic specification and most of devices in the AD converter of VITF are proven by the one of VHF sensor on Maito-1 satellite.

We will introduce the outline of the mission and the VITF. The initial observational results with the VITF of the JEM- GLIMS mission will be presented. We discuss the results and the VHF wave propagation characteristics through the ionosphere.

Keywords: lightning, electromagnetic waves, radio observation