

Gradual approach to realize lightning monitoring from space by means of RF observations

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Lightning Research Group of Osaka University (LRG-OU) has been developing VHF Broadband Digital Interferometer (DITF) to image precise lightning channels and monitor lightning activity widely. The feature of broadband DITF is its ultra-wide bandwidth (from 25MHz to 100MHz) and implicit redundancy for estimating VHF source location. LRG-OU considers an application of the broadband DITF to the spaceborne measurement system. The compactness and high-resolution are remarkable advantages to install a satellite. To discriminate between the active and non-active thunderclouds from a low altitude satellite about several hundred kilometers from the ground, the locations accuracy of 0.01 radian may be required.

To realize space-borne DITF, LRG-OU intends to have gradual approach for the development. In the SOHLA (Space Oriented Higashi-Osaka Leading Associate) satellite project, the feasibility of the DITF receiving VHF lightning impulses in space by their first satellite, SOHLA-1. To finalize the specifications of the VHF receiver on SOHLA-1, numerical analysis for propagation characteristic of wideband EM wave in the ionosphere is done. It has been ready and the integrated system test of SOHLA-1 is on going. LRG-OU will also conduct ground base measurements to evaluate the functions of the data by SOHLA-1. The major difficulties of the next step to realize DITF is expanding to multiple-sensor observations with separations of some meters such as synchronized operation of multi-channel analog-to-digital converter. Onboard data processing to reduce the quantity of data should also be taken into account. LRG-OU has designed and manufactured the experimental equipment for the space borne DITF based on their ground base system. The experimental model is now under various tests.

From the successful satellite observation like TRMM/LIS, the effectiveness and impact of satellite observations for lightning are obvious. The combination of optical and VHF lightning observations are complimentary each other. ISS/JEM is a candidate platform to realize the simplest DITF and synchronous observations with optical sensors.