Geophysical Research Abstracts
Vol. 15, EGU2013-8377, 2013
EGU General Assembly 2013

Measurement of electromagnetic waves in ELF and VLF bands to monitor lightning activity in the Maritime Continent

Kozo Yamashita (1), Yukihiro Takahashi (2), Hiroyo Ohya (3), Fuminori Tsuchiya (4), Mitsuteru Sato (2), and Jun Matsumoto (5)

(1) Dept. of Electrical Engineering, Salesian Polytechnic, Tokyo, Japan (k-yamashita@salesio-sp.ac.jp), (2) Dept. Cosmosciences, Hokkaido University, Sapporo, Japan (spriteselves@gmail.com), (3) Dept. of Cosmosciences, Chiba University, Chiba-shi, Japan (ohya@faculty.chiba-u.jp), (4) Planetary plasma & atmospheric research center, Tohoku University, Sendai, Japan (tsuchiya@pparc.gp.tohoku.ac.jp), (5) Dept. of Geography, Tokyo Metropolitan University, Tokyo, Japan (jun@center.tmu.ac.jp)

Data of lightning discharge has been focused on as an effective way for monitoring and nowcasting of thunderstorm activity which causes extreme weather. Spatial distribution of lightning discharge has been used as a proxy of the presence or absence of deep convection. Latest observation shows that there is extremely huge lightning whose scale is more than hundreds times bigger than that of averaged event. This result indicates that lightning observation should be carried out to estimate not only existence but also scale for quantitative evaluation of atmospheric convection.

In this study, lightning observation network in the Maritime Continent is introduced. This network is consisted of the sensors which make possible to measure electromagnetic wave radiated from lightning discharges. Observation frequency is 0.1 – 40 kHz for the measurement of magnetic field and 1 - 40 kHz for that of electric field. Sampling frequency is 100 kHz. Waveform of electromagnetic wave is recorded by personal computer. We have already constructed observation stations at Tainan in Taiwan (23.1N, 121.1E), Saraburi in Thailand (14.5N, 101.0E), and Pontianak in Indonesia (0.0N, 109.4E). Furthermore, we plan to install the monitoring system at Los Banos in Philippines (14.18, 121.25E) and Hanoi in Viet Nam. Data obtained by multipoint observation is synchronized by GPS receiver installed at each station.

By using data obtained by this network, location and scale of lightning discharge can be estimated. Location of lightning is determined based on time of arrival method. Accuracy of geolocation could be less than 10km. Furthermore, charge moment is evaluated as a scale of each lightning discharge. It is calculated from electromagnetic waveform in ELF range (3-30 kHz).

At the presentation, we will show the initial result about geolocation for source of electromagnetic wave and derivation of charge moment value based on the measurement of ELF and VLF sferics.