Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS01-06 会場:202 時間:5 月 23 日 15:30-15:45

連続記録広帯域干渉計を用いたニューメキシコにおける雷放電過程の観測的研究
Observation and Study on Lightning Processes Using Continuous VHF Broadband Digital Interferometer in New Mexico

秋田 学[1*], マイケルストック[2], 河崎善一郎[3], ポールクレベール[2], ウィリアムリゾン[2]
Manabu Akita[1*], Michael Stock[2], Zen-Ichiro Kawasaki[3], Paul Krehbiel[2], William Rison[2]

[1] 電気通信大学, [2] ニューメキシコ鉱工科大学, [3] 大阪大学
[1]The University of Electro-Communications, [2]New Mexico Institute of Mining and Technology, [3]Osaka University

We observed lightning discharges using the upgraded VHF broadband digital interferometer (DITF) at Langmuir Laboratory in New Mexico. The digitizer of the original VHF DITF has been upgraded to record the waveforms at 180 MS/s for 2 seconds continuously. In this study, we use the standard deviation of the distribution of slopes of phase difference versus frequency as the criteria to identify whether the signals are related to lightning processes. The signals that have slopes near the mode of the distribution are assumed to be coherent, have originated a single source, and have propagated directly to the antennas. Then we used the slopes to locate the radiation sources. As a result, both positive breakdown and negative breakdown are located, and recoil leaders are visualized in great detail. As recoil leaders cross the area of initiation, their development was slowed and their emissions were reduced. There are also recoil leaders that seems to start from one negative charge region and propagate to an adjacent negative charge region. Negative leaders and recoil leaders have emissions that can be 20-30 dB higher than the emissions from positive leaders, however the intensity of radiation is the same for the majority of emissions. We also identified the difference of frequency characteristics between lightning processes. The calculation method shown in this paper is a useful technique for locating all radiation types from lightning processes regardless of radiation amplitude using broadband interferometry, and is expected to clarify lightning processes with very low power signals that have not been discussed in the past.

キーワード: 雷放電, 干渉計
Keywords: lightning discharge, interferometer