

Characteristics of sprites and their parent thunderstorm systems in winter of Japan.

Toru Adachi[1], Hiroshi Fukunishi[2], Yukihiro Takahashi[3]

[1] Department of geophysics, Tohoku Univ, [2] Department of Geophysics, Tohoku Univ., [3] Dept. Geophysics, Tohoku University

Sprites are transient luminous events at the mesospheric altitude of 50 - 90 km induced by cloud-to-ground discharges. To investigate the relationship between the sprites and their parent thunderstorm systems in winter of Japan, we have carried out the wintertime sprite campaign for five winter seasons since 1998. During the periods from 1998 to 2002, we observed 55 sprites and 101 elves. In the campaign, we used an image intensified CCD camera (IICCD), two multi-anode array photometers (MAPs), and VLF sferics receivers. Each MAP has 16 channels arrayed in vertical and time resolution of 50 μ s, which enables us to detect the rapid vertical motion of sprites.

We have compared these sprite data with GMS-5 satellite infrared images, temperature profiles obtained from the observation of Rawinsonde or the MSISE-90 model and ground-based radar precipitation maps. From this comparison, we found that winter sprites can be classified into three categories based on their occurrence regions and meteorological conditions. The first category is the sprites caused by thunderstorms developed in cold front regions passing over the Sea of Japan. The second category is the sprites generated by thunderstorms consisting of shadow convective clouds over the Sea of Japan. The third category is the sprites generated over the Pacific Ocean and thunderstorms are not related to the passing of cold front.

Using the data obtained from 1998 to 2003, we will discuss about the characteristics of sprites and their parent thunderstorm systems in winter of Japan.