Horizontal difference between sprite-producing positive cloud-to-ground lightning and sprites during winter thunderstorm in Japan

*Sumire Onagi[1], Tomoyuki SUZUKI[1], Masashi Kamogawa[1]

1. Department of Physics, Tokyo Gakugei University

A number of papers have reported that a horizontal location difference between the sprite optically observed and the sprite-producing positive cloud-to-ground (+CG) lightning electromagnetically estimated often extended approximately 50 km. In order to elucidate the cause of the difference, we precisely measure the horizontal difference between sprites optically observed at three or four ground-based stations and the sprite-producing +CG lightning electromagnetically identified by several data sources, which might be expected to provide more accurate horizontal location. During two winter periods of 2012-2013 and 2015-2016 in Japan, seven events of sprites simultaneously observed at more than three optical stations in Japan were obtained. All events of sprites occurred within 5 - 10 km (7 ±3 km in average) horizontal distance from the largest luminescence of +CG lightning where the upper edge of +CG lightning return stroke was assumed. In the six of seven events and one, the horizontal distances between the center of sprites and the sprite-producing +CG lightning showed 14 - 22 and 7 km, respectively. In addition, column and carrot shapes of sprites could not be categorized by such horizontal difference.

Keywords: Sprite, Winter Lightning, Thunderstorm

