

Analysis of the thunderstorm systems producing Sprites

Overview of the 2003 campaign

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A goal within the CAL project is to characterize the physics of the thundercloud which produces the TLEs. So, the aspects of meteorological environments, cloud system structure, and electrical activity are considered. Data from the French meteorological radar network ARAMIS provide reflectivity factor horizontal fields (PPI mode) at a 5-minute periodicity. Data from the Météosat satellite provide cloud top temperatures and therefore the height of the cloud systems. Data of detection and location of cloud-to-ground (CG) flashes issued from the French Météorage network are used. The CG lightning activity of the convective system producing the sprites in term of rate and location, can be analysed at several time scales, that of the system lifetime, that of the short period around each sprite. The intra-cloud (IC) activity can be considered when the thunderstorm is located in a zone covered by a SAFIR system, especially in the South-Eastern of France. Such a system detects and locates by interferometry VHF sources produced by the leader phases of any lightning flash. Two events of the 2003 summer campaign produced activity within the SAFIR area.

During 7 nights of the 2003 campaign, more than 100 sprites were observed from the Pic-du-Midi with the video camera. Several features of the convective systems producing them can be pointed out. The sprites observed seem to be produced by large convective systems in stratiform areas with high cloud top and with low flash rates. The sprite production rate can be high in some cases of these stratiform zones. Thus, in these generally locally restricted areas, the proportion of positive CG flash and that of CG parent flash are very high, which could implicate a generating charge process out of the main convective cell core of the system. The strong charge moments of the sprite parent positive CG flash determined in some cases could confirm this feature.