Sprite Study Over the Mesoscale Convective System

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The study of sprites over the mesoscale convective systems (MCSs) has advanced rapidly during the past century and lots of efforts have been made towards the understanding of occurrence of sprites over the MCSs and also other associated phenomena such as elves, blue get etc. Even though, thunderstorms/lightning are well understood, but our knowledge on sprites and associated phenomena is limited. In this paper, we review the sprite and lightning observations made at two locations in France, namely Puy de Dôme (45° 46' 19.2"N; 02° 57' 44.64"E; 1.464 km altitude) Pic du Midi (42⁰ 56[']11^{''}N; 00⁰ 08['] 34^{''}E; 2.877 km altitude during the Eurosprite 2003-2007 observational campaign were analysed to study the electrical properties of MCSs producing sprites and association of sprites with precipitation. We have shown that most of the sprites producing +CG discharge have peak current in the range 40-190 kA. Further, discharge having minimum current less than 1 kA did not produce sprite. It is further shown that large numbers of sprites have their origin in +CG lightning having peak current less than 90 kA and charge moment change less than 1500 Ckm. Also the sprites observations analysed with the vertical structure of temperature observed by SABER (Sounding of Atmosphere using Broadband Emission Radiometry) aboard TIMED (Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics). It is observed that the vertical structure of temperature shows evidence for a Mesospheric Inversion Layer (MIL) on those days on which sprites were observed. A few events are also reported in which sprites were not recorded, although there is evidence of a MIL in the vertical structure of the temperature. It is proposed that breaking gravity waves produced by convective thunderstorms facilitate the production of (a) sprites by modulating the neutral airdensity and (b) MILs via the deposition of energy. The same proposition has been used to explain observations of lightings as well as both MILs and lightning arising out of deep convections. We will also discussed in this, the link of sprites with Global Electric Circuit, Schumann resonance, global lightning etc.