

# Sprites in relation to their parent thunderstorm system and lightning activity: Results from the 2003 campaign

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We investigated two large Mesoscale Convective Systems that passed through or close to the SAFIR total lightning detection interferometer system in south-eastern France on July 23-24<sup>th</sup> 2003 and on August 28-29<sup>th</sup>. This system is capable of mapping VHF sources, generated by the leader phases of any lightning flashes, in two dimensions.

In both nights, many sprites appeared over the same confined region within the stratiform precipitation region about 30-120 km downstream of the convective core region of a mature MCS. Remnants of convective cells embedded in the stratiform region were producing +CG flashes that closely preceded sprites. It was found that many sprites of the August case, especially the longer lasting events, had considerable cloud-to-ground lightning activity of both polarities happening in the second just after the sprite, in the same part of the storm. This area may be several tens of km to more than 100 km wide. The CGs might have been the result of large horizontal flashes (spider lightning) that connect the ground flashes, which still continue after a ground flash caused a sprite. However, these intracloud flashes were not detected by the SAFIR system. Alternatively, they may have been the result of separate reactions to charge removal from different areas of the stratiform region. Superposition of all sprite-associated ground flashes revealed that there were clearly defined regions of positive and negative charge in the stratiform region.

We found indications that the position of some sprites (July 23<sup>rd</sup>) could have been influenced by the electric fields that existed before the actual cloud-to-ground activity after these sprites. Interesting behaviour of intracloud lightning was observed in association with sprites. One flash (July 23<sup>rd</sup> 21:34 UT) apparently had no cloud-to-ground lightning stroke detected, so it may somehow have been generated by the intense intracloud discharge. Carrot sprites in the July 23<sup>rd</sup> case seemed to be especially corresponding to the location of VHF activity rather than the location of lightning strikes to the ground.