



On the distribution and seasonal cycle of transient luminous events above Europe

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In the year 2000, the first sprites were observed over European thunderstorms using low-light cameras. Since then, Eurosprite campaigns have been conducted to observe sprites and other transient luminous events (TLEs), expanding into a network covering large parts of Europe and coastal areas. Over 2009 to 2011, the number of optical observations of TLEs exceeded 1000 per year. Because of this unprecedented number of observations, it was possible to construct a climatology of 3931 TLEs observed above 500 thunderstorms, and study for the first time their distribution and seasonal cycle above Europe. The number of TLEs per thunderstorm was found to follow a 10 power law, with less than 10 TLEs for 388 thunderstorms and up to 147 TLEs above the most prolific one. The vast majority of TLEs were classified as sprites, 145 as elves, 112 halos, 30 upward lightning, 2 blue jets and 1 gigantic jet. The climatology shows that TLE activity in Europe is intense during summer over continental areas, and in late autumn over coastal areas and sea. The largest number of TLEs per month is recorded 15 in November, whereas in March and April TLE activity is almost completely halted.

An active November is consistent with the larger +CGs/-CGs ratio in autumn/winter maritime thunderstorms as compared to summer continental ones, although the peak in observed TLEs is surprisingly large. Elve activity is almost exclusively limited over autumn/winter maritime thunderstorms. The overall behaviour is well consistent among 20 individual years, therefore making the observed seasonal cycle a robust general feature of TLE activity over Europe.