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Analysis of convective systems associated to TGFs with the Meteosat Second Generation geostationary satellites

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Up to now, only few works focused on the meteorological context associated to the production of Terrestrial Gamma-ray Flashes (TGFs). Whether TGFs are related to particular types of convective systems or can be produced by any kind of "standard" thunderstorm is still matter of debate. Moreover, whether TGFs are produced in a specific moment of the thunderstorm evolution or are randomly distributed during its lifetime is another still open question.

In this study, we carried out a systematic characterization of some properties of convective systems associated to TGFs, by using data from the Meteosat Second Generation (MSG) geostationary satellites.

We considered the RHESSI, AGILE and Fermi data-set of TGFs detected in 7–10 years activity and selected a sub-sample of events occurring within the Meteosat geostationary satellite world coverage (i.e. longitude in the [-60;60] range). We only considered TGFs which are found in close time association with a WWLLN sferic wave, in order to achieve the most accurate available geographic localization of these events ($\sim$20 km according to the WWLLN spatial resolution), ending up with a sample of $\sim$300 TGFs.

For each of these events we studied the associated (within a $<1^\circ$ radius) meteorological context, by considering different quantities (e.g., GCD, infrared cloud top temperature, cloud extension, CTH, number of strokes, etc.) and evaluating their behavior in time, with respect to their local time and geographic position.