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Observation of Transient Luminous Events with the Mini-EUSO telescope on board the ISS

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Mini-EUSO is a detector observing the Earth in the ultraviolet band from the International Space Station,from a nadir-facing window, transparent to the UV radiation in the Russian Zvezda module.
The instrument, launched in 2019 as part of the Italian Beyond mission, has a field of view of 44◦, a spatial resolution on the ionosphere of 4.7 km and a sampling rate of 2.5 microseconds.
Mini-EUSO main detector consists in an optical system with two Fresnel lenses and a focal surface composed of an array of 36 Hamamatsu multi-anode photo-multiplier tubes, for a total of 2304 pixels. The telescope also contains two ancillary cameras, in the near infrared and visible ranges, to complement measurements in these bandwidths.
The telescope detects UV emissions of cosmic, atmospheric and terrestrial origin on different time scales, from a few microseconds upwards. On the fastest timescale of 2.5 microseconds, Mini-EUSO is able to observe atmospheric phenomena as Transient Luminous Events and in particular the ELVES, apparently superluminal rings produced by the interaction with the ionosphere of spherical electromagnetic waves generated by lightning. These highly energetic fast events has been observed to be produced in conjunction with Terrestrial Gamma-Ray Flashes and therefore a detailed study of their characteristics (speed, radius, energy ...) is of crucial importance for the understanding of these phenomena.
In this work we will present the measurements of Transient Luminous Events and specifically the reconstruction and study of ELVE characteristics with Mini-EUSO.

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