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ANALYSIS OF SUITABLE PAYLOAD INSTRUMENTS FOR CUBESAT INTENDED TO DETECT
AND INVESTIGATE THE TRANSIENT LUMINOUS EVENTS (TLES)

Abstract

The lightning is the natural source of electromagnetic radiation. It is an atmospheric electrical discharge. However, since recent times, it was discovered that there are other types of lightning besides those that are visible to the naked eye. They are called TLEs (Transient Luminous Event) and take place above the clouds during thunderstorms. Distinct classification is applied to the various existing TLEs in compliance with their shapes, size, color, altitude, origin and duration. Thus, all Transient Luminous Events are categorized to the following types: elves, spites, halos, blue jets, blue starters, gigantic jets, trolls, gnomes, pixies and ghosts. TLE investigation missions are important for several scientific purposes. They allow to gain better understanding of the lightning nature, contribution on global electric circuits as well as chemical influence on the Earth's climate like concentration of greenhouse gases lying on the higher altitudes.

This paper represents an overview of TLE observations that can be performed by lightning detection systems which differs according to their location. They can be ground-based, space-based as well as carried on aircraft or balloon. Lightning location systems in space are usually conducted on large-, medium- or micro-sized satellites.

The main scope of this paper is to explore and describe all possible and known methods and techniques of TLE investigation as well as discussions of gained observation results for better understanding and further analysis to recommend proper instruments to be carried on CubeSat type satellite for TLE detection from LEO orbit. Analysis of suitable equipment is done according to the conclusion made from considered lightning detection systems with similar missions and pursuant to CubeSat technical requirements.