



## **Modeling the 511 keV background enhancement observed in thunderstorms.**

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In this paper, we investigate the mechanism described in [Zhou et al., 2016] about the effect of thunderstorms' electric fields on the fluxes of electrons and positrons coming from cosmic ray extensive air showers. Their work used the CORSIKA code and performed simulations at mountain tops (4.3 km). In this work, we study it using the GEANT4 toolkit, and we also investigate how the mechanism can change if it takes place at aircraft cruising altitude (12 km).

Then we discuss how the mechanism may be related to the recently reported observation of Kochkin et al. [2018], where an aircraft was flying inside a thunderstorm and detected strong enhancements of the 511 keV background line, together with an increase of the flux at all detectable energies, and in correlation with electrical activity.

### References:

1. X.X. Zhou et al., "Effect of near-earth thunderstorms electric field on the intensity of ground cosmic ray positrons/electrons in Tibet." *Astropart. Phys* 84, 107. (2016).
2. P. Kochkin, et al., "In-flight observation of positron annihilation by ILDAS" *JGR Atmospheres*. (2018).