



Analysis of energetic radiation associated with thunderstorms in the Ebro delta region

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We have analysed increments of background radiation during thunderstorm in the energy range 0.1 – 2 MeV in the Ebro delta region in the northeast of Spain. We present 8 episodes, 3 summer cases and 5 winter cases. The increments of the measured high-energy radiation have been analysed and compared with measurements of electric field, precipitation, radar reflectivity, lightning activity a charge regions altitude. For the first time, measurements of high-energy radiation associated with thunderstorms are compared with radar reflectivity and lightning detected by a LMA network. The aim of this paper is to discern if the high-energy radiation increments measured are related with the storm electrification, like reported in previous publications, or other factors like precipitation.

As summary these are the main results:

- The comparative of energy spectra of 1 hour period with rain and 1 hour period without rain shows that radon-ion daughters are quite important in the increase of the measured high-energy radiation.
- The analysis of the time normalized cumulative curves of radiation counts, radar reflectivity and lightning activity (LINET and LMA detections) shows that that high-energy radiation increments are time related with radar reflectivity rather than lightning activity.
- The calculated altitude of the negative charge regions of the different thunderstorms analyzed is too high for the photons produced at those altitudes by Bremmstrahlung effect to overcome atmospheric attenuation and reach the scintillator placed at sea level.

These results lead us to conclude, as a contribution in addition to previous works, that the measured increments of high-energy analysed on this paper are associated with radon-ion daughters rather than storm electrification. However, the use of a detector in an energy from 0.1 MeV to 2 Mev does not allow to completely exclude the possibility that part of the high-energy radiation reported should be related storm electrification. In a future experiment we will use, together with the current detector, another one with a broader energy range.