



Lightning charge-moment-change relationships with the physical and optical properties of column sprites

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Sprites are a well-known and researched phenomenon which occur in the upper atmosphere above thunderstorms, and are known to be triggered by intense positive CG lightning. These intense positive flashes can be detected globally in the ELF band due to their large charge moment change (CMC). We study the relationship between sprite radiance values and the CMC of the sprite's parent lightning that were obtained during the 2008 – 2009 winter season in the eastern Mediterranean. The radiance values were calculated using calibrated cameras and the technique described in Yaniv et al [2009]. CMC values were obtained from 3 stations – Syowa, Hokkaido and NCK Hungary. We found a positive correlation ($R^2 \sim 0.6$) between the value of the radiance of sprites and the value of the CMC. Additionally, we investigated the correlation between the CMC of the parent lightning and the mean length of column sprites and the number of column elements in a sprite event the same as it was found in Adachi et al. [2004]. We found a positive correlation ($R^2 \sim 0.8$) between the CMC values and the length of column sprite elements. No correlation was found between the CMC values of the lightning and the number of column elements of a sprite event. Both results are confirming the results of Adachi et al. [2004]. Several physical mechanisms to explain the above results are suggested with various techniques to effectively measure the radiance, the length of column sprites and the number of elements in a sprite event.