

Atmospheric Electric Field of Lisbon (Portugal) affected by urban activity
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ABSTRACT: The atmospheric electric field (AEF) is affected by two main factors: a global effect related with worldwide thunderstorm activity imposing the known Carnegie curve; local effect caused by meteorology influences, that can influence variations in aerosol concentration, in the site where the measurements were made. Thus in a urban site it is expected that the PG at the surface, where the measurements are done, should be determined by the combination of local aerosol pollution and the global atmospheric electric circuit. Different approaches have been elaborated to distinguish both local and global effects in the PG, attempts were made to correct the local PG to obtain the global PG behaviour removing the effect of pollution. In fact, it is shown that for single aerosol sizes that the PG is linearly related with the aerosol particle mass concentration. For that reason it is expected that in an urban site the days with higher human activity cause more pollution and due to the relation cited before the atmospheric electric field should be higher in those days. This effect should impose its signature in the PG meaning that during the working days it should have higher values than the weekend days. In principle, Sundays should have the lower PG values. To clarify this we present a new approach for the investigation of the effect of urban activity on the PG, through the analysis of a dataset recorded at Portela meteorological station (Lisbon, Portugal) for the period from 1955 to 1991. We use spectral analysis to identify the characteristic frequencies of the PG related with the urban week cycle. This week cycle is linked with a week cycle of pollution and it should be reflect in the PG. We considered the complete time series of PG without separating bad-weather days from fair-weather ones, analysed with Discrete Fourier Transforms for equally spaced data. The mean week behaviour for each year is also calculated and reveals a significant decrease of the PG in the weekend especially in Sundays. This is consistent with a decrease in the pollution levels in the weekend due to the reduction of urban aerosol production and also by the sedimentation of the aerosols closer to the surface. Moreover, the spectral analyses of PG confirms the existence of one peak that has a period of 7 days. Further studies will clarify these preliminary findings. A deeper study of the spectral response of the PG will be done. Correlation with pollution levels of Lisbon is also planed.