

Correlations among sunspots, electrical storms and terrestrial climate

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Abstract: The modulation of the Earth's climate and the meteorological variables are correlated with solar activity. The Sun's differential rotation drove solar cycles, which last approximately 11 years, one being poloidal and the other toroidal. Sunspots show the beginning and the end of these cycles, shaping the Earth's Magnetic Field, which is bombarded by charged particles. These particles interact with the terrestrial atmosphere, especially in electrical storms and in the flow of galactic cosmic rays (GCR). GCRs are directly related to the formation of clouds in the lower atmosphere and are modulated by solar winds. All these relationships affect the Earth's climate, making their study important to understand their mechanisms and triggers. In this context, electrical storms in the city of São Paulo (Brazil) and their relationship with sunspots are previously studied over the last decades. These studies have been an attempt to understand the influence of the solar cycle on the modulation of the Earth's magnetic field and on the climate. Preliminary studies have already shown a long-term periodicity between these phenomena. For this study, we used the Wavelet analysis of the electrical storms of the city of São Paulo (Brazil), sunspots, and GCR time series. We notice an anti-phase relationship between the analyzed signals: in periods of solar maximum, there is a minimum of GCR fluxes and the opposite in solar minimums.

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