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Revisiting the decreasing trend of atmospheric electrical potential gradient measured in Central Europe at Nagycenk, Hungary

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The atmospheric electrical potential gradient (PG), measured near the ground, can be used to characterise the global electric circuit (GEC) which is powered by thunderstorms and connects the surface of the Earth and the lower ionosphere electrically through the imperfectly insulating air between them. However, measured values of the PG are influenced also by various local effects so that proper interpretation of the measurements is a challenging task.

A decreasing trend in PG has been observed at various measuring sites in Europe including the Széchenyi István Geophysical Observatory (NCK, 47°38' N, 16°43' E), a site near Nagycenk, Hungary [1,2]. The decay of the PG has been attributed to a decrease in the GEC at least on a regional scale. This interpretation has been questioned on the base of independent observations of the ionospheric potential, which do not seem to show a similar change. Results of electrostatic modelling suggested that the decrease in the PG at NCK can be caused entirely by the increasing shielding effect of trees growing not far from the location of measurements [3]. However, the parameterization and the applicability of the model specifically to NCK data were then criticised [4] so that the corresponding debate has not been closed satisfactorily.

PG measurements at NCK between 1962 and 2007 have been examined carefully to reveal if any long term trend is mirrored by the records. Shielding effect of all trees surrounding the area of measurement has been modelled with the distances, heights, ages, and type of trees considered. If uncertainties in the applied model are taken into account, the results show that PG time series corrected for the shielding effect of nearby trees at NCK do not support directly and unambiguously the presence of a decreasing trend of PG in the examined time range.

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