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Simulating effects of the 774 AD solar proton event on atmospheric electricity

Stergios Misios^{1,2,3}, Mads F. Knudsen^{1,2}, and Christoffer Karoff^{1,2}

¹University of Aarhus, Department of Geoscience, Aarhus C, Denmark

²CLIMATE Interdisciplinary Centre for Climate Change, Aarhus University, Aarhus C, Denmark

³National Observatory of Athens, Athens, Greece

High energy cosmic rays of galactic and solar origin, natural radioactivity, lighting in thunderstorms and electrified shower clouds, produce ion clusters and charge the whole atmosphere causing a ubiquitous potential difference between the ionosphere and the surface. This Global Electric Circuit (GEC) allows the flow of charges to the surface in the fair-weather regions of the globe. Here, we simulate the effect of highly energetic particle radiation, in particular the 774 AD solar proton event, on the GEC with the aid of the global circulation model EMAC/MESSy. The simulations assume pre-industrial atmospheric conditions and the coupling of aerosol and atmospheric electricity schemes allows for ion-ion and ion-aerosol capture reactions. We discuss effects in fair weather current and atmospheric conductivity at different latitudinal bands.